COMMUNITY GREENING PLAN 2.0

Priority Planning Area Plans

OCTOBER 2021

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PRIORITYPLANNINGAREAS

PRIORITY PLANNING AREAS

Capital Region Water developed Priority Planning Area (PPA) Plans for the three highest priority Planning Areas identified in the City Beautiful H2O Program Plan.

The three (3) Priority Planning Areas are Uptown, Lower Front, and Lower Paxton Creek. These Priority Planning Area Plans were created to help implement CRW's local wet weather control strategies. The PPA Plans provide a long-range strategy for GSI implementation within each Planning Area and identify and rank the highest priority GSI and "grey" storage treatment projects to move forward into construction under programmatic financing through PENNVEST over the next five years.

This Summary describes the process of analysis for GSI opportunities, including the evaluation and ranking of these opportunities, and implementation priorities for future financing through PENNVEST.

Commented [TR1]: Project list?

PROJECT GOALS & TARGETS

The City Beautiful H2O Program Plan (Program Plan) is Capital Region Water's responsible approach to addressing a combination of system-wide infrastructure deterioration and failure with high-priority water quality compliance activities. Capital Region Water must balance delivery of reliable service with environmental compliance obligations in a manner our ratepayers can afford.

The Program Plan balances the high-priority activities between two broad categories:

- Wet Weather Control: Manage stormwater runoff to eliminate localized flooding, reduce combined and sanitary sewer overflows, and control backups onto streets and into basements to improve the health of local waterways, and protect public health and safety.
- Rehabilitation of the Sewer System: Catch-up on previously deferred operation and maintenance needs and implement a comprehensive asset management system to ensure the sewer system continues to reduce localized flooding and provide reliable service to Capital Region Water customers.

HOW THE PLANNING AREAS WERE SELECTED

The Program Plan divides the CRW service area into 15 planning areas. This structure allows the Program Plan to establish the needs, priorities, recommended activities, and consequent levels of control for each planning area, then include them within the full Program Plan. The baseline level of control can achieve or exceed the presumptive level of control (i.e., capture 85 percent of the combined sewage volume in a typical year) in seven of the ten Planning Areas served by combined sewers.

The selected three Priority Planning Areas are areas of the city where baseline controls are less effective at reducing CSOs. CRW set planning-area-specific CSO control targets (see adjacent chart) for Uptown, Lower Front, and Lower Paxton Creek. These PPAs are considered a higher priority when determining where to focus investment for decentralized controls.

MAXIMIZING GREEN

In the first 10 years of the program, CRW plans to target 25.50 acres managed for the Lower Paxton Creek Planning Area, 14.80 acres managed for the Uptown Planning Area, and 8.90 acres managed in Lower Front Planning Area. In each PPA, CRW and consultants looked for ways to maximize green while furthing the community initiatives set forth in the Community Greening Plan. To that end, community-driven projects with the potential for providing multiple benefits to the community were prioritized in the analysis and evaluation of opportunities and projects.

Planning Area	Impervious Area (ac)	GSI Implementation Opportunities			Cumulative GSI Implementation Targets	
		High Potential	Moderate Potential	Strategic	Immediate (1-10 years)	Near Term (11-20 years)
Combined Sewer System						
Riverside	*53.7*	13%	46%	**10%**	**0%**	**0%**
Uptown	246	18%	41%	24%	6%	9%
Middle Front Street	*131*	22%	31%	19%	**0%**	**0%**
Lower Front Street	59.1	19%	62%	46%	15%	15%
Upper Paxton Creek - West	*162*	33%	52%	47%	**0%**	**0%**
Upper Paxton Creek - East	*28.5*	15%	64%	52%	**0%**	**0%**
Middle Paxton Creek - West	*97.3*	44%	39%	69%	**0%**	**0%**
Middle Paxton Creek - East	*201*	22%	**40%**	9%	**0%**	**0%**
Lower Paxton Creek	511	15%	34%	25%	5%	10%
Hemlock Street	*68.2*	1%	15%	44%	**0%**	**0%**
Subtotal	*1556*	**20%**	39%	29%	3%	5%
Separate Storm/Sanitary Sewer System						
Italian Lake	*157*	29%	46%	**0%**	N/A	N/A
Industrial Road	*208*	9%	**80%**	**0%**	N/A	N/A
Arsenal Blvd	*120*	39%	49%	**0%**	N/A	N/A
East Harrisburg	*64*	34%	**60%**	**0%**	N/A	N/A
Spring Creek	*103*	1%	35%	**0%**	N/A	N/A
Subtotal	*652*	21%	57%	**0%**	**0%**	**0%**
City-wide Non-Priority/Strategic						
	N/A	N/A	N/A	N/A	1%	2%
Total	*2208*	**20%**	44%	**20%**	3%	5%

Commented [TR2]: Minimal implementation in the first 20-years.

IN-LINE STORAGE

In-line storage refers to a series of technologies that are designed to maximize water storage within combined sewer systems. These technologies are a cost-effective method to help reduce the frequency or severity of CSOs. In-line storage is especially effective in areas where there is limited space for other types of green or grey controls.

Commented [TR3]: Storage can also be "off-line" which can be more cost- and space-efficient for larger storage units. These units are typically placed perpendicular to the mainline sewer at the downstream location where storage is desired. These units fill and draw from the same end and typically have baffles to keep solids near the storage unit inlet for ease of periodic cleaning.

In order to determine appropriate locations for potential in-line storage, CDM Smith conducted a preliminary analysis of opportunities within the three Priority Planning Areas. This included a review of areas where highly ranked projects and opportunities may overlap with in-line storage opportunities to reduce overall construction costs. Additional analysis was conducted to determine locations for other prime in-line storage opportunities that could potentially influence the overall ranking of any GSI opportunity or project area.

Commented [TR4]: Why are these areas considered "priorities"?

POTENTIAL OPPORTUNITIES

Analysis & Methodology

The existing combined sewer system pipes were analyzed for characteristics conducive to potential in-line storage opportunities. The following criteria were used:

- Pipe slopes less than 1% (ideally less than 0.5%).
- Pipe diameter less than or equal to 36 inches (larger pipes may not be effectively able to be enlarged further).
- Must not be a terminal pipe(s) at the far upstream end of a catchment (with a limited tributary area).
- The catchment area must be upstream of a CSO regulator structure.
- The analysis deliberately excludes sanitary pipes of partially separated catchment areas.
- There must be a continuous run of pipe of at least 500 ft (providing sufficient length for sufficient storage volume).

Commented [TR5]: Based upon these criteria, the author doesn't know much about inline or off-line storage.

Commented [TR6]: Pipes at steeper slopes are actually better candidates for inline storage – taller storage sections can be used without affecting upstream hydraulic grade lines.

Commented [TR7]: Not true – viability depends upon impacts to upstream hydraulic grade lines not the host pipe diameter

Commented [TR8]: Nope – works just a well in reducing SSOs in separate sewers

Commented [TR9]: Not true – depends upon volume to be stored, pipe slope, depth to pipe invert, site surface and sub-surface obstacles. Also, storage conduits can bridge across existing manholes.

Identified Opportunities

Nine projects identified as high priority opportunities in the P PA plans were identified as potential in-line storage opportunities. This includes three within Uptown, five within Lower Front, and one within Lower Paxton. Of these, seven intersected or were directly adjacent to proposed projects. This additional level of analysis was factored into determining high priority opportunities and early action projects.

Identical screening criteria were used for each PPA, yet there were more potential in-line storage opportunities identified within the Uptown area and limited opportunities within the Lower Paxton Creek area due to topography and existing pipe size within the combined sewer area. The summary information from these analyses (provided in a separate memorandum) is considered appropriate only for a screening-level exercise. The in-line storage opportunities will need to be investigated further for any projects selected for design. Prime candidates for in- line storage that align with project opportunities include:

- Midtown Development (Uptown PPA)
- Hamilton School (Uptown PPA)
- 4th & Emerald Park (Uptown PPA)
- Court at Washington Square (Lower Front)
- Intersection of Mulberry & 3rd Street (Lower Front)
- Intersection of Vine & 2nd Street (Lower Front)
- Pinnacle Health Parking Lots (Lower Front)
- Riverfront Park (Lower Front)
- Vernon Street Park (Lower Paxton)

Commented [TR10]: Suspect this is incorrect based upon the previous criteria descriptions. In-line/off-line storage is actually less costly to construct and functions better in areas having steeper ground slopes

These areas actually appear better-suited to on-street storage or GI.

Commented [TR11]: Suspect that once proper criteria are developed, there will be far more "prime" opportunities

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IN-LINE STORAGE OPPORTUNITY MAPS

CDM Smith created opportunity maps for each of the Priority Planning Areas. Each map identifies sewer segments with varying degrees of storage capacity as well as those that need further investigation.

Commented [TR12]: These all seem to be areas with flat topography – this is where on-street storage would work better than in-line storage and be far less costly – in-line/off-line storage typically$3.00>$6.00/gallon vs on-street storage typically $0.25>$0.50 per gallon

Less Storage

More Storage

Needs Further Investigation

UPTOWN PPA

LOWER FRONT PPA

LOWER PAXTON PPA

PROJECT ANALYSIS

Following the analysis of opportunities during the Community Greening Plan process and identification of Priority Planning Areas (PPA) in the City Beautiful H2O Program Plan (Program Plan), CRW embarked on Priority Planning Area Plans. These plans further the analysis of key opportunities and provide a long-range strategy and potential projects for GSI implementation through programmatic financing with PENNVEST over the next five years. The analysis of potential projects involved evaluation of scoring criteria which was organized by four key factors – Performance, Feasibility, Community, and Cost.

OPPORTUNITIES

Prior to the analyzing the potential opportunities for GSI implementation, maps and geodatabases were refined to help assess the feasibility of strategic project locations for decentralized stormwater control. The updated mapping included the compilation the relevant community-based projects, categorized in the separate greening program areas and opportunities from the Community Greening Plan and other relevant plans.

Opportunities were generated from:

- CRW Water and Sewer Capital Projects
- Community Greening Plan parcel and street opportunities
- City Street improvements
- Other traffic improvement priorities
- Areas identified for ROW impacts for improvements by other utilities, such as the gas utility
- City/Park/HRA/Other government property improvements
- Community plan public improvements
- Harrisburg School District capital budget improvements for facilities
- Planned redevelopment projects identified by community partners
- Large impervious area property owners

PROJECT CATEGORIES

These opportunities align with project categories established through an analysis of land uses and impervious area within each planning area. Based on the different land use characteristics of each planning area some project categories may be favored over others to maximize management of impervious area. The application of this analysis will be reflected in the strategies for implementation in the Prioritization and Implementation Plan (see appendix X).

Delineation of planning areas was based on receiving water, interceptor sewer shed, recognized neighborhoods, local groups of catchments to support satellite control strategies.

Target Project Categories	Basis	Lower Front IA Available (ac)	Lower Paxton IA Available (ac)	Uptown IA Available (ac)	Stakeholder(s)
BUSINESSES/ INDUSTRIES - LARGE	*10,000 sf and over*	7.15	121.53	18.96	Large IA Property Owners; Top 50 IA
BUSINESSES/ INDUSTRIES - SMALL	*10,000 sf and under*	0.91	10.63	5.24	Mid-size IA Property Owners; Top 200 IA
COMMUNITY CENTERS & FAITH-BASED ORGANIZATIONS	*Church Exempt; Community Center, Legion/ VFW/Club Exempt, Misc. Exempt, Libraries*	9.23	13.39	12.10	YMCA; Boys and Girls Club; YWCA; Churches; Jewish Community Center
HOMES	*Residential*	11.03	148.62	83.82	All Residents
OTHER PUBLICLY OWNED SPACES	*Public ownership (excludes vacant lots)*	0.26	0.28	1.62	City of Harrisburg Public Works/Facilities; Neighborhood Associations; Greenbelt Association
PARKING LOTS	*Parking*	11.36	16.81	12.00	City of Harrisburg, State, Standard Parking, Developers, Private Owners
PARKS	*Parks / Rec. LU*	0.63	7.95	0.82	City of Harrisburg Parks Department
PUBLICLY OWNED VACANT LOTS	*Publicly owned vacant*	0.06	0.04	0.84	Redevelopment Authority
REDEVELOPMENT	*Private Vacant Lots, certain owners*	0.67	14.54	8.10	Redevelopment Authority; Greenworks; Harristown; WCI; Vartan
SCHOOLS	*Edu. Exempt and Private Educ. Facility*	0.00	5.39	3.39	Harrisburg School District; Individual School Leadership; Charter School Leadership; Private School Leadership
STATE OWNED	*State/Govt Buildings Exempt*	2.05	0.48	1.52	Commonwealth, DGS, PennDOT, Department of Agriculture
STREETS	*Streets from impervious layer*	26.65	185.34	100.38	City of Harrisburg Engineering; PennDOT

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SUMMARY OF PROJECT CATEGORIES AND IMPERVIOUS AREA (AC) BY PLANNING AREA

Organizing opportunities and potential projects by land use category will help determine appropriate GSI strategies.

SCORING TOOL OVERVIEW

This process of identifying, evaluating, and ranking GSI opportunities and projects utilized a scoring tool or matrix paired with GIS and map-based analysis. A multi-phase process with the application of four criteria buckets – Performance, Feasibility, Community, and Cost – helps focus in on high value projects.

The three phases have different levels of project definition:

- Opportunity - Project ideas with general location and community / city level of interest defined, but project extents and drainage area not well defined.
- Project - Project with sufficient definition to determine drainage area, GSI area, performance (conceptual), and Cost (simplify approach).
- Design - Project approved by CRW to enter detailed design phase.

Performance

Physical factors that are used to assess the performance of projects for environmental requirements and objectives. This includes how well project reduce overflows, how many greened acres are achieved, the amount of impervious area managed, loading ratios, among others.

Feasibility

These factors assess ease of implementation and integration with other projects and ongoing maintenance. This includes number of physical constraints, condition of adjacent pipes and streets, potential utility conflicts, and physical proximity to other city or partner-led projects.

Community

This scoring criteria evaluates potential level of community support and ability of the project to have a positive impact on the community. Factors include overall alignment with community goals, ability to add green space or tree canopy to underserved areas, and alignment with redevelopment priority areas.

Cost

Ranking criteria for cost was determined based on total lifecycle cost over 20 years based on cost per greened acre and annual GSI maintenance costs by project type. However, it is important to note that cost, as defined as an assigned value to construct and maintain a project, is not developed until the later processes of the project phase. It is provided as a value, not a weighted factor in the ranking of projects.

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SCORING TOOL
OVERVIEW

CRITERIA	FACTOR	USED IN SCORING		METHODOLOGY
		OPPORTUNITY	PROJECT	
PERFORMANCE	Overflow Reduction Efficiency (ORE)	X	X	Extract ORE percentage from GIS Layer
	Reduces Flow to Flood Areas	X	X	Perform analysis to determine areas that are upstream of flood volume for 1-year storm (percentage of overlap of surcharge drainage area within)
	Greened Acres		X	Impervious Drainage Area x 1.5" (capture goal)
	Impervious Area (%)		X	Proportion of drainage area that is covered by impervious surfaces
	Loading Ratio (drainage area to site)		X	Ideal ratio is 10:1. Assign 0 to anything that is over 20:1; Assign 0.5 to anything > 15:1; Assign 1 to anything from 0:1 to 0:15
	Total Drainage Area (ac)		X	Acres of total drainage area (using defined drainage areas for each project)
FEASIBILITY	Number of Constraints	X	X	Total number of constraints appearing in each location or area
	Relates to other Public / City CIP Projects	X	X	Based on proximity to public or City CIP projects (GIS layer)
	Pipe Condition		X	If a project (GIS footprint or drainage area) crosses any pipe segment listed in the BRE dataset, it receives a score of 1
	Utility Conflicts		X	Calculate utility density present in an area. 3 pipes intersecting is the maximum number.
	Street with Poor Pavement Quality		X	ROW Projects that overlap with very poor or poor condition pavement receive a score of 1
COMMUNITY	Alignment with Community Goals	X	X	If an opportunity or project is listed in a prior report (e.g., CGP, etc.) it receives a score of 1
	Adds Green Space to Underserved Area (Equity)	X	X	Areas that intersect with the Park Need Layer (Trust for Public Land) receive a score of 1.
	In a Redevelopment Area		X	Areas that intersect or cross HRA-owned properties receive a score of 1.
	Adds Green Space (tree canopy, planting, etc.)		X	If a BMP has a surface expression (e.g., rain garden, tree trench, etc.) it receives a score of 1
COST	Total Lifecycle Cost		X	[(greened acres x 2021 construction costs) + (acres of impervious area managed x annual maintenance costs for GSI types) x 20 years)]

OPPORTUNITY RANKING CRITERIA

Opportunity Areas

First, all opportunities were compiled for consideration through the data analysis process, from the following sources: City of Harrisburg CIP list; CRW CIP locations; CRW-determined GSI opportunity areas from the Long Term Control Plan, the Community Greening Plan, existing studies or reports for the specific PPA, Storm Sewer Separation projects, and a "preferred land owners" list; City-Owned Vacant Lots (as of 7/13/20); community plans; specific additions related to redevelopment; and a Stakeholder meeting held on 6/23/20 with City agencies. The following polygons were considered as opportunity areas as well: parcels with greater than 1 acre of impervious surfaces; right-of-way greater than 75 ft in width; private parcels valued at less than $300,000; and City/County-owned parking lots.

Once these areas were determined, a series of absolute constraints were applied and removed from the defined opportunity areas. These constraints included • floodways, surface water, wetlands, streams, railroads, and buildings with a 10-foot buffer.

Commented [TR13]: agree

Evaluation

After all opportunity areas were identified, geoprocessing was completed, and the opportunity polygons were evaluated using the criteria established in the Scoring Tool. The results of the evaluation were scores for Performance, Feasibility, and Community as well as an overall Opportunity score. All opportunities with an overall score of 0.5 or higher (highest score of all opportunities was 0.71) were evaluated individually for constraints that may require exclusion from consideration (for those among the 50 highest rated opportunities scored at 0.66 or higher) or characteristics that may not have been considered in the scoring criteria which would make them more valuable projects. The resulting list of top projects include all categories: Parks, Streets and Alleys, Schools, Community Centers and Faith-Based, Publicly Owned Vacant Lots, Other Publicly Owned, and Redevelopment.

PROJECT EVALUATION PROCESS

Review of top projects

Top projects from the Opportunity Phase were brought forward into the Project Evaluation Phase where additional performance, feasibility, community, and cost factors were applied. To complete this evaluation, each project was further developed to determine potential drainage areas, GSI footprints, loading ratios, and other project details that contribute to a better understanding of their ability to fit within CRW's prioritization for projects.

Evaluation

Using the observations from individual evaluations of the top-scoring opportunities and the takeaways from discussions of opportunities with stakeholders, a set of GSI opportunities with rankings was established. This list of p rojects was influenced by updated community-based developments, the assumed ease and speed of the working with the owners, and the potential ability to expand drainage areas to these locations through combined adjacent opportunities and/or modifications to the existing storm drainage system.

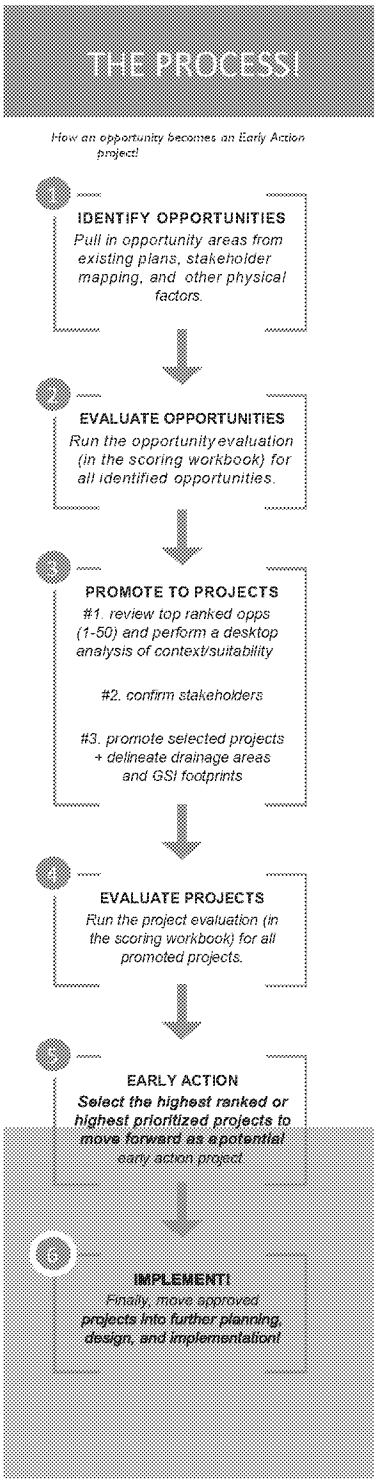
The review included:

- Identification large impervious areas in aerials to evaluate additional GSI projects.
- Evaluation of impervious drainage areas as High, Medium, Low
- GSI footprint sized to target 10:1 Loading Ratio
- Identification of high-level GSI type (tree trench, bumpout, etc to generally denote if GSI would be surface or subsurface based on location)
- Focus on projects CRW could execute solo that align with larger organization & community goals

An updated score was calculated using the Scoring Tool workbook with inputs from geoprocessing and desktop analysis.

Early Action Projects

From the top ranked projects, each PPA created a short list of early action projects that are estimated to meet the target acres managed fo r the first 10 years of the program. Some of these projects are being advanced in the current Phase 4 PENNVEST Construction Package. Others will be included in future project bundles. Additional information about these projects can be found in the final chapter of this report.



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LOWER FRONT STREET
PPA – ZONES OF GSI
PRIORITIZATION FROM THE CITY
BEAUTIFUL H2O PLAN

Commented [TR14]: These locations look very good for GI from development density and topographic viewpoints

LOWER FRONT STREET PPA

The Lower Front Street priority planning area consists of 87 acres of land extending southeasterly from the largely commercial Downtown Harrisburg area to the residential Shipoke neighborhood. Fifty-nine acres of the planning area are impervious. The area is bounded by Strawberry Street to the northwest, Interstate-83 to the southeast, the Susquehanna River to the southwest, and a rail corridor to the northeast. The Lower Front Street priority planning area is highly urbanized and primarily consists of governmental buildings, multi-story commercial buildings, apartment complexes, and hospital buildings, with a few single-family homes toward its eastern extent.

Commented [TR15]: Does this total include driveways & rooftops or just paved areas in the public ROW?

Major landmarks within the Lower Front Street priority planning area include Market Square, which has been the focus of multiple planning studies; the Harrisburg Train Station, just north of the study area; and Riverfront Park, which runs along the Susquehanna River for the extent of the study area. The Lower Front Street area is accessible by several modes of transit. These include several rail bridges, the Capital Area Greenbelt bike path, and several major roads including Front and Second Streets, which provide access to Interstate 83 to the east.

Being a highly urbanized part of the city, the Lower Front Street priority planning area contains many physical and logistical constraints for proposed infrastructure. Buildings occupy a high percentage of most parcels, particularly in the western portion of the study area. Rights-of-way, while typically wider than those found in other areas of the city, consist of multiple travel lanes and narrow sidewalks. A significant amount of linear infrastructure is located within rights-of-way including water, sewer, electric, gas, and steam utilities.

Commented [TR16]: Good place for pervious paver parking lanes – doesn't seem like that option was considered.

In this option, concrete block pavers would be installed in the parking lanes – automated paver equipment is now available that has reduced installation costs from $60/SqFt to $12>$15/SqFt which is comparable to conventional asphalt paving, but offers substantial aesthetic improvement in downtown beautification programs

In terms of combined sewer overflow (CSO) control, the planning area is characterized by Overflow Reduction Efficiency (ORE) scores that vary widely across the study area, ranging from 7% to 97%. The ORE is a measure of the relationship between volume storage and CSO reduction. The cluster of sewersheds centered around 2nd Street have some of the most consistently high ORE scores for the sewershed, around 50% to 60%. Notably, the Shipoke area features some of the lowest ORE scores (the exception being the furthest subcatchment to the east which features the highest ORE score of 97%) and several areas that do not contribute to the combined sewer at all. Further information regarding the ORE scores can be obtained from the Technical Memo provided by Brown & Caldwell, 2020.

OPPORTUNITY IDENTIFICATION

The initial identification of opportunities was based on a multi-faceted approach intended to include a range of potential project types. These opportunities were then further vetted for feasibility and potential during an iterative evaluation process. Based on these criteria, the team identified 64 opportunities within the planning area, each of which was then assigned an initial score using the Green-Grey Scoring Tool.

PROJECT DEVELOPMENT

Each opportunity was further analyzed to better understand the feasibility of implementing cost effective green infrastructure. More promising opportunities were then further developed as projects. One focus of the additional evaluation was to evaluate potential conflicts with existing utilities. Utility layers were digitized for the entire study area based on record drawings in to better understand feasibility constraints.

Opportunities were advanced to projects if they met the following two criteria, otherwise they were not considered for further analysis as a project.

- When considering utility layers, other spatial layers, aerial photography, and street-level imagery, a sufficiently sized stormwater control measure (SCM) footprint could be laid out within the vicinity of the opportunity without encroaching on existing uses.
- Nearby drainage areas are located within sewersheds that drain to a combined sewer area and could be captured and routed to the SCM footprint.

A significant portion of sites identified as opportunities, especially in the eastern portion of the study area, were removed from further consideration due to contributing drainage areas being entirely located within separate sewer or direct drainage sewersheds. In certain cases, contiguous and adjacent projects were aggregated into a single larger project. A summary of each opportunity, including reasons why certain opportunities were not advanced to the project level, has been included within the appendices of this report. Upon completion of the project development stage, 35 SCMs were identified as potential projects. Of these, four projects were explored further as early action projects.

EARLY ACTION PROJECTS

Commented [TR17]: More information is needed for final confirmation of the technical viability of the following GI projects; however, the general information presented in this report suggests that these projects would perform as CDM-Smith expects.

Four projects were identified as early action projects, each of which were then advanced through a more detailed evaluation of feasibility, community benefits, site conveyance, available storage, sewer connections, and cost. The four sites were chosen by their site score, an initial measure of the potential benefits and engineering feasibility, as well as their potential of delivering a large, impactful project on publicly owned land. Detailed early action project sheets can be found in the appendices of this report.

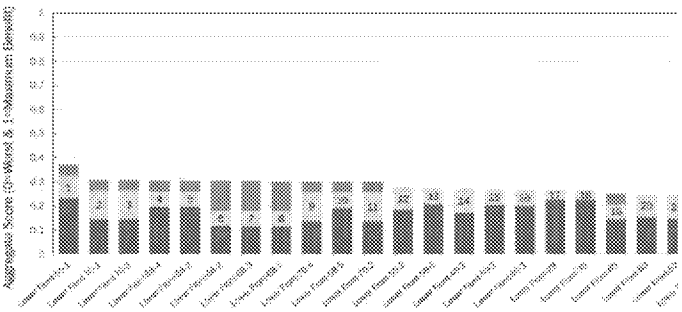
Riverfront Park

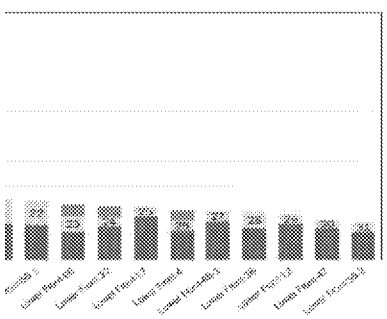
Riverfront Park is the largest contiguous open space within the planning area; it spans the entire length of the planning area along the Susquehanna River. Conceptually, the area provides an ideal opportunity to manage relatively large volumes of stormwater in a highly visible location. However, in addition to a large subsurface sewer main, the portion of the park within the planning area is home to several mature trees, memorials, and a regional bike path – all of which serve as constraints to green infrastructure placement. That said, there are several large, relatively unconstrained areas within the park that could provide suitable locations for green infrastructure. Successful surface green infrastructure practices

would likely be located close to the river, within the open areas that lie between the regional bike path and the significant vegetated slope that subdivides the park's lower and upper tiers. These concepts would require some regrading of the existing site due to the significant slopes present within the site's open areas. Locating green infrastructure within the park would also require diverting stormwater via a series of high-level separate sewers extending into the city grid. This water would then need to be collected and conveyed through the park, largely via new underground piping.

Despite some potential conflicts, the potential for managing a large amount of stormwater in the park is significant. When considering right-of -way drainage alone, the site could manage an estimated between 3.67 and 5.90 greened acres, while providing opportunities for community improvements such as ornamental plantings, interpretive art, and extensions to walking or bike paths. In addition to managing right-of-way drainage areas, this project presents a unique opportunity to disconnect up to 10 additional acres of on-site (i.e., located on non-right-of-way areas) impervious area. Much of this impervious area is in the densest part of the study area where alternate management strategies may be costly or infeasible. By working with property owners and other stakeholders to manage this on-site impervious area, the project could single-handedly substantially reduce stormwater overflows within the planning area. If this disconnection strategy is pursued, a scaled back version of the project could instead be aligned with an in-line storage project along Chestnut Street, as identified by the Potential In -Line Storage Opportunities for PPA Top Projects developed by CDM-Smith, 2021. No additional benefit would be gained by both disconnecting private properties and building the inline storage.

Commented [TR18]: Explain – does this mean that the stormwater runoff from 3.67 and 5.90 acres of impervious area is managed by this improvement?





RANKING OF TOP OPPORTUNITIES IN THE LOWER FRONT PPA

Performance

Community

Feasibility

Court at Washington Square

This property consists of a multi-family housing complex located along 2nd Street between Mary Street and Vine Street. Based on existing utility records, the complex is drained by an on-site separate sewer system that ultimately feeds into the city's combined sewer. The concept calls for intercepting fl ow from existing sewer infrastructure and constructing a subsurface storage facility to manage this flow prior to the connection to the combined sewer. By reusing the existing site conveyance, the project can incorporate centralized storage while avoiding the significant cost associated with installing new conveyance infra structure. Runoff generated by the interior roofs does not appear to flow directly to the onsite storm sewer and could thus be managed in rain gardens within the interior courtyard. The rain gardens could also provide a site amenity to residents. This project is also adjacent to an in-line storage opportunity along Mary Street, as identified by CDM-Smith, 2021.

2nd Street & Vine Street

The 2nd Street & Vine Street project is located entirely within the 2nd Street right-of-way. This site demonstrates the potential for targeted right-of-way interventions, where existing topography can be leveraged to minimize the need for significant conveyance infrastructure. The concept calls for impervious drainage areas that converge at this location to be managed within a subsurface infi ltration trench, providing up to 1.89 greened acres of management. Given that this project is completely within the right-of-way, little coordination with private landowners would be necessary. This could result in accelerated delivery time, and therefore an excellent early action opportunity.

This project is located along a portion of 2nd Street noted as part of Harrisburg's High Injury Network of Roads. An opportunity exists to coordinate this project with the goals set forth in the Vision Zero HBG Action Plan, 2019 by incorporating traffic calming/pedestrian safety elements for workers traveling from surface parking lots south of 2nd Street to the University of Pittsburgh Medical Center (UPMC, formerly Pinnacle Health) office building north of 2nd Street. Th ere is also potential for this project to be aligned with an in-line storage opportunity along 2nd Street (CDMSmith, 2021). Additionally, this project is surrounded by properties owned by UPMC, which is the largest private landholder in the planning area. This project could serve as a pilot project as part of a larger coordinated effort with UPMC that could include the development of a stormwater master plan for UPMC's holdings.

Municipal Parking Lot

The Municipal Parking Lot project is located on a city-owned, linearly shaped parking lot located adjacent to the rail corridor between 2nd Street and 3rd Street. Similar to the 2nd Street & Vine Street project, this project takes advantage of existing topography to direct a large amount of stormwater runoff to one collection point. At a minimum, this project would collect onsite drainage area and runoff from Dewberry and 3rd Streets that drain toward the property. This alternative would result in 1.87 greened acres of management. The project could be expanded to also collect drainage areas from other nearby parking lots, potentially increasing the managed area to 5.90 greened acres. Surface improvements su ch as noise barriers and tree plantings could substantially improve the experience for users of the parking lots, while reducing urban heat island effects. Since this project is located within one of the highest ORE subcatchments within the planning area, the project could play a significant role in meeting planning area goals given its substantial greened acre totals.

ADDITIONAL KEY PROJECTS

Two other high potential projects beyond the early action projects described above were identified. These projects show high potential but are expected to require additional community and property owner coordination, which may extend the project timeline.

Market Square

The first of these projects is Market Square (Opportunity LowerF ront-57), located at the intersection of 2nd and Market Streets. Other agencies have developed several planning studies and concept sketches for this location, such as the Transforming Market Square, 2018. Should the redesign of this area move forward, there could be opportunities for partnership and the integration of green infrastructure into a holistic design at a particularly visible location within the city. That said, in its current state, this area is not particularly accommodating to the integration of green infrastructure, primarily due to the existence of pedestr ian plazas and off-street vehicular infrastructure serving the nearby buildings. Additionally, steam utilities are located beneath the intersection.

Eight of the projects (Projects LowerFront-6, 19, 24, 25, 30, 3 2, 34, 48) identified within the study area are owned by UPMC. Many of these properties, particularly those located along 2nd Street west of its intersection with Paxton Street, include a large amount of impervious area in the form of ground-level parking lots. A successful green infrastructure plan for these properties could accommodate the current and future needs of both CRW as well as UPMC.= While extended planning and coordination efforts are expected, these sites provide a sig nificant amount of partnership potential.

CONCLUSIONS AND RECOMMENDATIONS

The urban nature of the Lower Front Street area presents several constraints to cost effective green infrastructure implementation. Through proper, coordinated planning this environment may however lend itself to the development of relatively low-cost partner projects with the potential for additional community benefits. A successful strategy will take advantage of both high-impact partner projects such as Riverfront Park, and projects that target underused spaces like Mulberry Street and the parking lots adjacent to the rail corridor. The early action projects explored as part of this analysis are some of the larger potential projects within the planning area. Buildout of these projects will meet initial target metrics for the study area. Several projects beyond those deemed early action are feasible but may have higher costs, logistical challenges, or engineering constraints not expected with the early action projects. Major corridors including Front, 2nd, Market, and Chestnut Streets span the study area. It is recommended that any projects along these corridors be integrated with other capital improvement projects, such as the planned improvements to Chestnut Street, to share cost and minimize disturbance. Several projects located within the right-of-way away from these major corridors, or on smaller parcels, were also identified. Should these projects be pursued, it is recommended that they be grouped together to mitigate higher unit costs due to diseconomies of scale and improve community benefits.

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LOWER FRONT STREET
PPA – ZONES OF GSI
PRIORITIZATION FROM THE CITY
BEAUTIFUL H2O PLAN

LOWER PAXTON CREEK PPA

The Lower Paxton Creek Planning Area encompasses a 948 acre area within the Paxton Creek Interceptor Sewershed. It is roughly bounded by the Paxton Creek on the west, Twenty-Fifth Street on the east, Interstate 83 on the south, and the City of Harrisburg boundary/Market Street on the north. The Lower Paxton Creek Planning Area largely consists of single-family residential development on the north and east ends, with commercial and institutional properties on the south and west ends and an overall impervious area of 464 acres. It encompasses seven combined sewer catchments and separate sanitary/stormwater catchments SS-011, SS-012, and SS-013. All of the catchment areas discharge to the Paxton Creek interceptor and/or overflow to Paxton Creek.

In terms of combined sewer overflow (CSO) control, the planning area is characterized by Overflow Reduction Efficiency (ORE) scores that vary widely across the study area, ranging from 30% to 70%. The ORE is a measure of the relationship between volume storage and CSO reduction. The majority of areas within Lower Paxton Creek drain to CSO-048, the largest CSO by volume. Areas within CSO-048 have similar OREs, ranging from 60% to 70%. The areas draining to CSOO-042,-044, -045, and -046 have a lower ORE.

OPPORTUNITY IDENTIFICATION

The initial identification of opportunities was based on a multi -faceted approach intended to include a range of potential project types. These opportunities were then further vetted for feasibility and potential during an iterative evaluation process. Top-ranked opportunities from each category of project were determined for the Lower Paxton Creek project area. Based on these criteria, the team identified X opportunities within the planning area, each of whi ch was then assigned an initial score using the Green-Grey Scoring Tool.

The results of the evaluation were scores for Performance, Feasibility, and Community as well as Overall Opportunity Scores. These scores are provided in the project fact sheets located in the appendices of this report. All opportunities with an overall score of 0.5 or higher (highest score of all opportunities was 0.71), as well as all Mish Run opportunities, were evaluated individually for constraints that may require exclusion from consideration (for those among the 50 highest rated opportunities scored at 0.66 or higher) or characteristic s that may not have been considered in the scoring criteria which would make them more valuable projects. An example of a project scoring between 0.5 and 0.66 which was considered for moving to the project phase even though it is not ranking in the top 50 opportunities, is the Argyle Park project, which is located on Argyle Street in a publicly owned vacant lot; upon evaluation, there is potential to create an entryway into the adjacent Mt Calvary Cemetery with this project.

PROJECT DEVELOPMENT

After geoprocessing was completed and the projects were evaluated using the criteria established in the Project Workbook, the results of the evaluation were scores for criteria in Performance, Feasibility, and Community categories. These scores were normalized such that each score was between 0 and 1 and the crieria were given weights, as shown in the Project Workbook. Combining the weighted scores, Overall Project Scores were determined. These scores and costs are provided in the project fact sheets along with other relevant information and a site assessment from field investigation. The projects were ranked by their Overall Project Scores.

A more detailed list of rankings and other information is provided in the appendices of this report. The top ranking project is 15th and Hunter Community Garden followed by Allison Hill Police Substation. Both of these sites received maximum Community scores. 15th and Hunter Community Garden has a low Performance score with an above average Feasibility score, while Allison Hill Police Substation has about average Performance and Feasibility scores. The third highest ranking project is the Boys & Girls Club with a very high Performance score and approximately average Feasibility and Community scores. If incorporating the new Environmental Justice (EJ) criteria, 15th and Hunter Community Garden and the Boys and Girls Club would still rank very highly as their EJ rankings are within the top 10. If factoring cost into the scoring, the Boys and Girls Club would still rank very highly as it has one of the lowest lifecycle costs per greened acre of all the projects. The locations of the top 10 ranking projects are dispersed across the Lower Paxton Creek area, indicating that no particular area caused a project to get scored significantly higher than any other area.

Storage

A feasibility analysis was performed to determine the feasibility of satellite storage and/or treatment projects as discussed in detail in the CSO 48 Storage Feasibility and Optimization Technical Memorandum. The evaluation compared proposed CRW Program Plan project locations with other proposed storage locations as part of a pilot optimization analysis for the CSO-048 basin. The analysis considered CSO and flood reduction benefits along with other non-cost factors including constructability, operations and maintenance, adaptability/resiliency, land use and planning, environmental impacts, and community disruption and acceptance. A consolidated storage location for a gravity-in, pump-out facility for the Program Plan storage option, was selected, and evaluated against additional upstream storage options to optimize CSO reduction and flood mitigation. An upstream storage basin in the vicinity of 18th Street and Berryhill Street was proposed in addition to downstream storage near CSO-048 and compared with the consolidated storage option from the Program Plan. The feasibility scores of the upstream storage basin and downstream storage were significantly higher than that of the Program Plan storage. If any storage projects are implemented in CSO- 048 basin, they should be reevaluated and potentially weighted more heavily in areas outside of CSO-048 since much of the runoff will be managed by the storage projects in this area. Further, if the up-stream storage basin at 18th and Berryhill is installed, a project at this location would not be considered.

Commented [TR19]: Typically the most cost-effective configuration

Environmental Justice Criteria

As a pilot initiative in the Lower Paxton Creek Area, additional criteria focused on environmental justice were studied and used to evaluate the projects. These include the Center for Disease Control Social Vulnerability Index data for Pennsylvania, previous investment locations by Capital Region Water, Environmental Exposure data from EJSCREEN Environmental Indexes, and Walkability Demand determined **by the 2019 5-Year American** Community Survey data, and these are described in detail in the appendices of this report.

If the Environmental Justice (EJ) criteria are factored into the overall scoring of projects, the overall rankings of the projects will change. Dependent upon the weighting of the criteria scores, several projects would likely move up in their ranking including the John P. Scott School, Rowland Intermediate School, Rowland Intermediate School Parking, Mt. Calvary Cemetery, and the Market St Streetscape at the old Bishop Devitt High School. Vernon St Park and Mayflower St Park would likely move up in overall ranking significantly. Several projects would move down in their overall ranking. In particular, the 6 projects within the Misfit Run area scored in the bottom 8 of EJ rankings; therefore, all 6 Misfit Run projects would likely move down in overall ranked projects.

Further evaluation is needed to determine if EJ criteria should be applied to other areas moving forward.

Groundwater Injection

The feasibility of a conceptual injection/gravity drainage well system to convey separated stormwater from the combined sewer system into a karst limestone aquifer was evaluated and discussed in the Underground Injection Well Evaluation Technical Memorandum. The feasibility study determined the following:

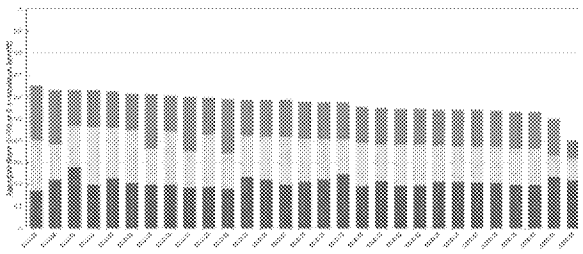
- Hydrogeology: The St. Paul Group soil located within the Lower Paxton Creek area may have the capability to accept the targeted volumes of stormwater. However, the only area with a suitable thickness of soil formation may be too close to or in conflict with Interstate 83.
- Stormwater treatment: Water quality of injected stormwater will need to meet or exceed ambient groundwater quality, and two unit processes were proposed to provide treatment.
- Groundwater injection: There is potential for sinkholes with large volumes of water infiltrating into a karst aquifer, but this can be prevented by casing the wells through the soil/limestone interface and into the limestone bedrock and providing monitoring during storm events to detect any water rising into the soil/limestone interface.
- Permitting: Other stormwater management systems in Pennsylvania have been permitted to use gravity drainage wells to dispose of stormwater in karst aquifers, indicated that groundwater injection would be permittable in Harrisburg as well.
- Construction Cost: The estimate of cost per gallon of treatment and injection well construction ranged from $0.04 – $0.61.

If CRW pursues groundwater injection as a stormwater management technique in Lower Paxton Creek, GSI project rankings should be reevaluated. GSI projects in areas where runoff will be captured and injected should be given lower priority to those outside of the injection well drainage area because will less runoff flowing to GSI areas, the GSI practices will be less impactful at reducing CSO events or surface flooding.

PennDOT Project

In the southern portion of the Lower Paxton Creek area, PennDOT is working on an I-83 Expansion Project to widen interstate lanes in both directions on I-83. The project will include the abandonment, relocation, and replacement of storm sewers and inlets in conflict with the project along with the installation of a storm sewer diversion pipe system to redirect stormwater flow from the CSO-0 48 combined sewer system to Paxton Creek. CDM Smith performed in-line storage analysis for this work. However, further analysis is needed to pair this with GSI projects.

Coordination with JMT, the lead drainage designer for the PennDOT roadway project, was conducted during the PPA process. Preliminary plan layouts were provided, including drainage areas and storm drain locations which we reviewed and discussed. The plans showed several areas of newly treated CRW areas where areas which are currently draining to the CRW system would be drained by the new I-83 pipe system, however, these areas are subject to change. The initial NPDES package for the corridor design has been submitted to the PA DEP and DC CD with significant changes to the storm drain layout from the previous plan. If the newly treated CRW areas remain in the drainage plans for the I-83 Expansion project, the GSI project locations should be reevaluated taking the I-83 corridor drainage into consideration.



A
RANKING OF TOP OPPORTUNITIES IN THE LOWER PAXTON CREEK PPA

- *Performance*
- *Community*
- *Feasibility*

EARLY ACTION PROJECTS

Commented [TR20]: Shopping list of what CRW can construct while completing their LTCP?

Thirty projects were identified as potential early action projec ts, each of which were then advanced through a more detailed evaluation of feasibility. Detailed project sheets can be found in the appendices of this report. Below are summaries of the highest-ranking projects from this analysis.

15th & Hunter Community Garden (Swatara Park)

The vacant lot at the corner of 15th and Hunter Streets was originally identified as a vacant lot GSI project in the original Community Greening Plan. This property is currently vacant and informally used as a community garden. Its adjacency to the planned Swatara Park (located at the corner of Swatara and 15th), identified in the Heart of the Hill Plan, and ability to contribute to the community's desire for more community gardens makes this project a potential priority project moving forward. This project has the potential to further CRW's partnership with HRA to implement green infrastructure and urban agriculture projects similar to the Summit Hill project. The concept calls for intercepting flow from adjacent rights-of-way and impervious surfaces and constructing a subsurface storage facility to manage this flow. A surface treatment rain garden adjacent to the planned community garden could provide an opportunity for educational interpretation and beautification, similar to the concept shown in the Community Greening Plan. Based on planning analysis, this project could contribute 0.4 greened acres and manage 0.28 acres of impervious area. This project is continuing into design in the Phase 4 package of PENNVEST.

Allison Hill Police Station

The Allison Hill Police Substation is located at the corner of 15th and Drummond Streets. It was constructed in 2020 and serves as a neighborhood hub to help build stronger relationships with residents and the police department. The concept for this project includes the construction of a biorention area on the south end of the parking lot that would capture runoff from adjacent rights-of-way, the parking lot,

and building. The project has the potential to provide a community amenity and improve tree canopy in an area of the city with low tree canopy. Based on planning analysis, this project could manage 0.30 acres of impervious area and contribute 0.45 greened acres.

Boys & Girls Club

The Boys & Girls Club is a youth center located on Berryhill Street that aligns with CRW's project typology for green community centers and has a high potential to manage stormwater. The concept includes a series of new bioretention areas adjacent to the field, parking lot, and street as well as a retrofit of an existing rain garden near the site's pavilion. The project has the potential to manage 2.05 acres of impervious area and contribute 3.08 greened acres. This proj ect is continuing into design in the Phase 4 package of PENNVEST.

Briarcliff Residential Rain Garden 2

This project is located in a residential neighborhood near the intersection of Pentwater and Hillside Roads. The concept includes a bioretention area that intercepts and filters water from adjacent residential development areas. It has the potential to manage 0.37 acres of impervious area and contribute 0.56 greened acres.

Derry Street Green Street

Derry Street between 17th and 18th Streets provides an opportunity to implement green streets measures in accordance with CRW's community-focused goals of supporting mobility, community safety, and beautification. The concept includes a series of biorention areas in the form of planters along Derry Street. These BMPs manage impervious area from adjacent sidewalks and the right-of-way. It has the potential to manage 0.30 acres of impervious area and contribut e 0.45 green acres.

CONCLUSIONS AND RECOMMENDATIONS

There are a number of opportunities to implement cost effective green infrastructure projects in the Lower Paxton Creek area. In addition to potential projects identified in this report, CRW has completed the Summit Terrace GSI project and is currently in the design phase for the Bellevue Stormwater Pond Retrofit project. A successful strategy will take advantage of this existing momentum and prioritize projects west of 17th Street to maximize CRW's investment and ensure equity in the distribution of open space and green infrastructure amenities in the area. Given the stormwater capture and management potential of the PennDOT project, target metrics for the study area should be reevaluated to determine what is feasible and cost effective.

UPTOWN PPA

The 341-acre Uptown Planning Area is bound by the Susquehanna River to the west and Sixth Street on the east. The area falls within the Front Street Interceptor Sewershed. It is roughly bounded by the Susquehanna River on the west, Sixth Street on the east, Schuylkill Street/Radnor Street on the north, and Verbeke Street on the south. The Uptown Planning Area largely consists of single-family residential development, with pockets of non-single family residential development along Front Street, 2nd Street, 3rd Street, Maclay Street, Schuylkill Street, Reily Street, and Verbeke Street, with an overall impervious area of 246 acres. It encompasses nine combined sewer catchments and the separate sanitary/stormwater catchment SS-004, all of which discharge to the Front Street interceptor and/or overflow to the Susquehanna River.

Much of this area falls within the Uptown Neighborhood, a well-established and stable neighborhood with access to the Capital Area Greenbelt and open space amenities like Italian Lake and the newly revitalized 4th and Dauphin Park. Early action green stormwater infrastructure projects at 4th and Dauphin Park have already been implemented with additional investments planned at the Camp Curtin YMCA and surrounding "Big Green Block," located just outside the boundary of the Planning Area. From vacant and underutilized lots to street rights-of-way, there are numerous opportunities to implement green stormwater infrastructure in this area to enhance the community, connect the people to the riverfront and adjacent green spaces, and build on the numerous cultural and community assets (e.g., the Broad Street Market, Pennsylvania National Fire Museum, Pennsylvania Governor's Residence, Madeline L. Olewine Memorial Library, and numerous civic organizations and places of worship) within and adjacent to the Uptown Planning Area. Particular areas of interest for green stormwater infrastructure, highlighted in the Program Plan, include street rights-of-way along Woodbine Street and Fifth Street, vacant and underutilized lots along Peffer Street and Hamilton Street, and the vacant school property at Fifth and Radnor Streets.

The Uptown priority planning area contains many opportunities for proposed green infrastructure with a number of vacant lots, large impervious parking areas, and wide street rights-of-way. However, buildings occupy a high percentage of parcels, particularly in the western portion of the study area and a significant amount of utility infrastructure is located within rights-of-way including water, sewer, electric, gas, and steam utilities.

In terms of combined sewer overflow (CSO) control, the planning area is characterized by Overflow Reduction Efficiency (ORE) scores that vary across the study area, ranging from 53% to 106%. The ORE is a measure of the relationship between volume storage and CSO reduction.
The Uptown PPA has the most variability in ORE estimates, with relatively significant differences in close proximity. Significant variation in OREs occurred in Uptown, with the downstream areas draining to CSOO-050, CSOO-006, and CSOO-008 having the highest OREs of over 90%. Areas draining CSOO-049 and the upstream portion of CSOO-011 have OREs below 60%. The ORE layer was particularly useful for prioritizing GSI projects within this study area. Notably, northwest and central portions of the study area feature some of the highest ORE scores. Further information regarding the ORE scores can be obtained from the Technical Memo provided by Brown & Caldwell, 2020.

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UPTOWN PPA – ZONES OF GSI PRIORITIZATION FROM THE CITY BEAUTIFUL H2O PLAN

OPPORTUNITY IDENTIFICATION

The initial identification of opportunities was based on a multi -faceted approach intended to include a range of potential project types. These opportunities were then further vetted for feasibility and potential during an iterative evaluation process. Based on these criteria, the team identified 552 opportunities (see adjacent map) within the planning area, each of which was then assigned an initial score using the Green-Grey Scoring Tool.

PROJECT DEVELOPMENT

Each opportunity was further analyzed to better understand the feasibility of implementing cost effective green infrastructure. The top 50 promising opportunities were further evaluated. Opportunities were advanced to projects based on the following considerations, otherwise they were not considered for further analysis as a project.

- large impervious areas that could be cost-effectively managed
- ability to accommodate GSI footprint sizes that met a loading ratio of 10:1
- opportunities that CRW could execute without outside resources and limited stakeholder coordination
- project types that align with larger organization and community goals

A significant portion of sites identified as opportunities were removed from further consideration due to size constraints. Many of these were single, mid-block vacant lots without adequate room to manage or direct stormwater. In some cases, including the Midtown development, contiguous and adjacent projects were aggregated into a single larger project with multiple BMPs. A summary of each opportunity has been included within the appendices of this report. Upon completion of the project development stage, 38 opportunities were identified as potential projects.

These projects were then further developed with an understanding of high, medium, and low potential drainage areas and high-level categorization of GSI project type and typology (e.g., bumpout, subsurface, tree trench, etc.). Of the 38 identified projects, there was a potential to achieve 24.5 greened acres utilizing high and medium potential drainage areas. After review of high potential projects with CRW, four projects were explored further as early action projects. These projects were selected due to their ability to achieve the Early Action Green Acre target for Uptown of 15 acres, which contributes to the overall green acre target of 23 acres.

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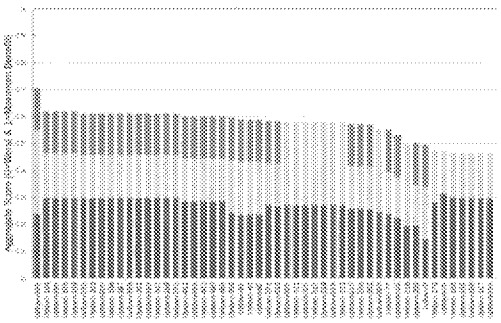

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RANKING OF TOP OPPORTUNITIES IN THE UPTOWN PPA

Performance

Community

Feasibility

EARLY ACTION PROJECTS

Four projects were identified as early action projects, each of which were then advanced through a more detailed evaluation of feasibility, community benefits, site conveyance, available storage, sewer connections, and cost. The four sites were chosen by their site score, an initial measure of the potential benefits and engineering feasibility, as well as their potential of delivering on multiple benefits and CRW's program goals. Detailed early action project sheets can be found in the appendices of this report.

Midtown Development

The project area referred to as Midtown Development is located between Clinton Street to the north, Calder Street to the south, 5th Street to the east, and 3rd Street to the west. This area was originally highlighted as an opportunity due to the pedestrian walkway along Boyd Street, also referred to as the Urban Meadow. After further investigation and understanding of utilities in the area, the concept expanded to adjacent rights-of-way, parking lots, and HACC-owned properties.

The team engaged in multiple stakeholder conversations with agencies and local developers who are currently planning a number of projects including a mixed-use residential building and parking garage. This project provides an opportunity for CRW to not only manage future stormwater, but also create a new model for

the incentive program to help catalyze future private GSI investment. Additional coordination and collaboration with the private developers, including Greenworks, will be crucial to the success of the project.

Potential issues and opportunities include: coordination with private developers and proposed development plans, PennDOT coordination, understanding of alternative solutions for cost-sharing that are constructed in the ROW, and development of an incentive program to form partnerships with private developers.

Despite the challenge of a variety of stakeholders and infrastructure conflicts, the potential for managing a large amount of stormwater in Midtown is significant. The 8 proposed GSI systems (bioswales, tree trenches, subsurface) can provide up to 14 greened acres with extended drainage areas. By working with developers and other stakeholders to manage large impervious areas, the project could single-handedly substantially reduce stormwater overflows within Uptown. There is also the potential of exploring in-line storage along 4th Street, Harris Street, Reily Street, Fulton Street, and Logan Street, as identified by the Potential In-Line Storage Opportunities for PPA Top Projects developed by CDM-Smith, 2021. This project is currently included in the Phase 4 package of projects for PENNVEST. Further stakeholder conversations and design explorations are underway.

Hamilton School

The Hamilton School project is a collection of up to 5 GSI projects (subsurface and tree trenches) located adjacent to the Hamilton School and affiliated parking lots. The area is bound by Woodbine Street, N. 2nd Street, Maclay Street, and N. Front Street. The ownership in this area varies from public to private. Additional coordination and collaboration with owners and stakeholders would be needed to determine feasibility of cost-sharing. The collection of projects could provide up to 7 greened acres. Potential issues and opportunities include coordination with private owners, PennDOT coordination, and reducing any con flict with future development potential of the site. BMPs would include infiltrati on trenches in the parking lots and tree trenches along Front Street and Woodbine streets.

4th & Emerald Park

4th & Emerald Park provides an opportunity to continue CRW's coordination with the City in implementing GSI in parks coupled with other recreation improvements. The concept envisions one GSI system with a rain garden and subsurface storage area. With extended drainage areas, the project could provide up to 6.14 greened acres. Potential issues and opportunities include: coordination with the City (especially in relation to other park improvements/upgrades and available funding), NPDES permitting, and the feasibility of extended drainage areas from local streets. While this project has great potential to further community and CRW goals, funding timelines and partnering with the City may extend the timeline for this project, removing it from a potential near-term early action.

HRA Urban Agriculture Lots (Peffer Street)

This project includes a collection of lots owned by the Harrisburg Redevelopment Authority near Peffer Street. Some of the lots are currently use d for urban agriculture/community gardens. Three potential GSI footprints (rain gardens with subsurface storage) are envisioned for the area that would manage drainage from adjacent rights-of-way similar to the implemented rain gardens in Summit Terrace. Additional coordination would be needed to determine the appropriate sizing of the surface GSI expression in a manner that is consistent with urban agriculture operations. This collection of projects could provide up to 1.64 greened acres. Potential issues and opportunities include: coordination with HRA and urban agriculture stakeholders and the feasibility of extended drainage areas from local streets. This project is currently included in the Phase 4 PENNVEST project bundle. Further evaluation of drainage areas and design is underway.

CONCLUSIONS AND RECOMMENDATIONS

The size and location of the Uptown area presents a variety of opportunities for green infrastructure implementation that meet the needs of community members and exceed performance goals for CRW. An engaged local community, existing partners, and high performance potential (high ORE values) creates an environment that is primed for CRW-led projects with community benefits.

A successful implementation and phasing strategy will take advantage of low-hanging fruit by completing projects that CRW can complete without funding partners as well as more complicated stakeholder-driven partner projects that require additional engagement, planning, and time. Buildout of potential early action projects are projected to exceed initial target metrics for Uptown with an estimated 29 greened acres. Several projects beyond those deemed early action (within the top 38 opportunities) are feasible but may have a longer implementation and planning timeline, higher costs, logistical challenges, or constraints that do not meet the criteria for consideration as an early action project.

>
MIDTOWN PROJECT
EXAMPLE STORYBOARD
SHOWING THE PROCESS
FROM OPPORTUNITY
EVALUATION TO PROJECT
EVALUATION AND NEXT
STEPS.

MOVING FORWARD

PENNVEST FUNDING

In 2019, Governor Wolf announced that Capital Region Water was one of 16 successful grant and loan recipients to receive funding through the Pennsylvania Infrastructure Investment Authority (PENNVEST). The $13 million loan will be used be used to construct green stormwater infrastructure projects throughout the city. This funding not only helps improve public health and the local environment, but it also reduces the financial burden on residents to finance infrastructure projects. The borrowing rate means that customers will save $3.5 million over the term of the loan when compared to traditional bond financing. Th is the assistance of this funding, Capital Region Water will manage 50 greened ac res over five years, resulting in an annual capture rate of between 20 and 40 million gallons of stormwater.

This funding is a major driver for the Early Action work. Phase 1 and 2 projects have been designed and started construction in 2020 or will proceed into construction 2021-2022. During 2020, the future phases of work were simplifie d and are outlined below. While there is some flexibility in the packaging of projects into individual phases, all phases of PENNVEST financing must be appr oved and in the construction phase by the end of the third year (Spring 2023).).

Phase 3 – 2019-2021

Projects include Camp Curtin YMCA and the Bellevue Stormwater Ponds Retrofit. Combined, these projects will contribute 21 greened acres at a cost of $3.6m.

Commented [TR21]: Were these projects implemented?

Phase 4 – 2022-2023

This phase is currently in design and targets approximately 23 greened acres in Lower Paxton Creek Planning Area and Uptown Planning Areas. This group of projects is expected to cost $4.7m. It includes:

Commented [TR22]: Is design underway for these projects?

- **Midtown Development (Uptown)** – this project includes a series of green street interventions near the intersection of 4th and Reily Streets. It is anticipated to provide 8 greened acres.
- **Swatara Park (Lower Paxton Creek)** – this project includes an underground storage component and above ground rain garden on a currently vacant lot that is slated for a future urban agriculture opportunity. It is anticipated that this project will provide 4.23 greened acres.
- **Boys & Girls Club (Lower Paxton Creek)** – this project combines recreation improvements and stormwater management with a bioswale, cisterns, and

underground storage combined with new seat walls and a leveled playing field. It is anticipated to provide 4 greened acres.

- **Peffer Street Lots (Uptown)** – this project incorporates green infrastructure improvements on vacant lots slated for future urban agriculture use, greened alleys, and new green street components. It is expected to provide 7 greened acres.

Phase 5 – 2023-2025

Approximately 20 greened acres located in Lower Paxton Creek Planning Area/ Uptown Planning Area/Lower Front Planning Area. This group of projects is expected to cost $4m.

Early action projects not included in Phase 4 will be considered for future phases of work within the PENNVEST program.

CAPITAL FUNDING

In addition to PENNVEST financing, Capital Region Water is dedicated to providing capital funding to implement system-wide infrastructure and green infrastructure improvements. Capital projects could be funded by Capital Region Water over a 20-year period while keeping the affordability threshold at or just below the high financial burden threshold. $2.5m a year will be dedicated to funding ongoing implementation projects identified in the Priority Planning Area Plans. A portion of this total 20-year investment will be needed to continue to address decades of deferred maintenance and to preserve system reliability. In contrast, the remaining portion of this capital funding capacity will be available for local, neighborhood, green stormwater infrastructure projects.