STARTING *at the* SOURCE

HOW OUR REGION CAN WORK TOGETHER FOR CLEAN WATER

alcosan green
by mission ... by choice

Technical Report Summary
August 2015

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Introduction

ALCOSAN is responsible for implementing a Wet Weather Plan (WWP) that reduces sewer overflows caused by stormwater and groundwater entering the sewer system during and following rain and snowfall events. Sewer overflow control solutions fall into four technology types: remove it, hold it, move it, and treat it technologies. Source controls (or remove-it technologies) aim to reduce the amount of stormwater and groundwater entering the sewer system, and thereby increase the available wet weather conveyance and treatment capacity in the system.

To better understand the role source controls might play in the WWP, ALCOSAN conducted a regional analysis of opportunities to use the following remove-it technologies as an overflow control solution: green stormwater infrastructure (GSI), inflow and infiltration (I/I) reduction, sewer separation, and direct stream inflow removal.

The study's methods and results documented within this report include:

- A review of national and regional GSI and other flow reduction practices to provide perspectives as to what others are doing, what's working well, and where challenges exist;
- A regional flow reduction analysis to determine the overflow reduction benefit that wide-spread applications of GSI and other flow reduction measures could bring;
- A cost-performance alternatives analysis that identified areas where GSI and other flow reduction technologies might reduce or eliminate the need for grey infrastructure improvements;
- A GSI outreach program aimed at nurturing municipal interest and providing resources, including a feasibility screening that identified potential sites and concept plans that help visualize possibilities;
- An assessment of flow reduction incentives; and
- The development of a regional flow reduction program that advocates for, and incentivizes the use of, GSI and I/I reduction through ALCOSAN's Green Initiatives.

Four categories of sewer overflow control technologies

ALCOSAN's Green Initiatives

- Flow reduction financial incentives program
- Collaborative development of municipal flow reduction plans
- Flow reduction project development support
- Expand search for funding for municipalities and encourage partnerships
- Flow reduction ordinance support
- Long term flow monitoring program
- Regionalization of intermunicipal trunk sewers
- Green enhancements for ALCOSAN-owned wet weather facilities

Key Terms

Source Controls – Technologies that manage stormwater runoff and groundwater at or near the source so the water is kept out of the sewage collection system and does not need to be conveyed and treated. Examples of source controls include green storm water infrastructure, infiltration/inflow removal, direct stream inflow removal, and sewer separation.

Green Stormwater Infrastructure (GSI) – The use of vegetation, soils, and natural processes to manage stormwater, preserve natural hydrologic functions, and create healthier urban environments.

Inflow and Infiltration (I/I) – Excess water that flows into sewer pipes from groundwater and stormwater. Groundwater and stormwater (infiltration) seeps into sewer pipes through holes, cracks, joint failures, and faulty connections. Stormwater (inflow) enters into sewers more rapidly via roof drain downspouts, foundation drains, storm drain cross-connections, and through holes in manhole covers.

Sewer Separation – Involves laying separate pipes to take stormwater to receiving waters instead of mixing with wastewater in a Combined Sewer System (CSS).

Direct Stream Inflow Removal – Involves re-directing streams away from the sewer system.

Source Control Practices

Additional information can be found in Section 2 of the report.

The application of GSI has evolved organically from a low impact development practice to a strategic environmental compliance solution used by municipalities and authorities in complying with stormwater management and combined sewer overflow (CSO) control regulations. The evolution of GSI into a wet weather control strategy has been progressing nationally over the past decade or so, largely because of its multiple benefits. In addition to controlling sewer overflows, GSI provides other environmental, social and economic benefits; such as restoring the natural hydrologic cycle of watersheds, improving air quality, and creating green jobs.

The physical and institutional nature of GSI cuts across the traditional legal, institutional and political boundaries of municipal public works delivery systems. Over time, municipalities and wastewater and stormwater agencies can overcome these impediments. The rapidly evolving and growing number of urban regions that are incorporating GSI as a component of their wet weather programs demonstrates that over time, local impediments can be managed.

There are no insurmountable impediments to the installation of GSI on private properties by the property owners. Municipal policies such as Pittsburgh's code that requires the use of GSI for certain redevelopment projects and the developing County Stormwater Management Plan will facilitate regional applications of GSI. Widespread municipal adaption and standardization of GSI-enabling policies and codes throughout Allegheny County would expedite the growth of GSI.

Paralleling GSI, wet weather source control through I/I reduction has been evolving nationally. Municipalities are addressing I/I control from private property lateral sewers through various inspection and rehabilitation programs. Pursuant to their Consent Order and Agreements from the Allegheny County Health Department (ACHD), the sanitary sewer municipalities within the ALCOSAN service area require illicit source inspections when properties are transferred. Some ALCOSAN customer municipalities and a number of municipalities across Pennsylvania also require periodic lateral inspections and repairs as necessary. As the owners of the municipal collection systems,

Green Stormwater Infrastructure Co-benefits

ENVIRONMENTAL:

- Increased urban wildlife habitat and biodiversity;
- Hydrologic benefits through sustainable watershed management practices which recharge aquifers and reduce storm damage to riparian habitats through stream channel erosion, and use less energy by limiting the pumping of flows through traditional conveyance and treatment systems.

SOCIAL AND HEALTH:

- Health benefits beyond sewer overflow control, such as reduction of urban heat island effect;
- Improved air quality;
- GSI enhances recreation by improving access, appearance and opportunities.

ECONOMIC BENEFITS

- Economic opportunities for GSI contractors with entry-level landscaping and maintenance jobs;
- Aesthetic enhancements that can increase the quality of urban life, which may be reflected by higher property values.

GSI PRACTICE HIGHLIGHTS:

- GSI has evolved rapidly into a CSO control strategy that offers many environmental, social, and economic benefits
- GSI implementation cuts across traditional municipal lines of authority
- While ALCOSAN can support and facilitate GSI, the municipalities are best suited to implement GSI
- ALCOSAN, municipalities, county and state government, and stakeholders will need to work together to overcome institutional barriers

West View Rain Garden

Key Terms

Combined Sewer Overflow (CSO) – a discharge of sewage and stormwater from a combined sewer system.

Sanitary Sewer System (SSO) – discharge of sewage from a sanitary sewer system.

the municipalities or their respective municipal authorities have the legal capacity to implement I/I reduction programs through sewer renewal and replacement. A number of the ALCOSAN municipalities have made substantial investments in I/I reduction and system repairs.

I/I REDUCTION PRACTICE HIGHLIGHTS:

- I/I reduction is another sustainable source control practice municipalities are using to address sewer overflows
- Municipalities, with support from ALCOSAN, appear to have the legal and institutional capacities to address I/I from private sources

As a regional conveyance and treatment authority, ALCOSAN has no direct ability to mandate or implement the use of GSI on public or private properties. ALCOSAN is similarly limited in its ability to mandate or implement I/I reduction projects. However, as the region's wastewater authority, ALCOSAN has and will continue to play a leading role in facilitating the use of GSI and I/I reduction through its partnerships with municipalities, property owners, economic development agencies and the non-profit community. Working together will be a key success factor in realizing the water quality and community benefits GSI provides.

Regional Source Controls Analysis

Additional information can be found in Section 3 of the report.

The 2008 Consent Decree (CD) requires that ALCOSAN "discharge from the Conveyance and Treatment System only to the extent that such Discharges, as demonstrated by Post-Construction compliance monitoring, will meet the requirements of the Clean Water Act, consistent with the United States Environmental Protection Agency (USEPA)'s Combined Sewer Overflow Policy". ALCOSAN's draft WWP has proposed a set of capital improvements, the Selected Plan, developed specifically to meet these requirements. A key objective of this study is to identify opportunities to accomplish equivalent results using more GSI than was proposed in the Selected Plan, at an equal or reduced cost to ratepayers.

This objective was addressed for the ALCOSAN service area using the best local information available, including Hydrologic and Hydraulic (H&H) models of the ALCOSAN and municipal conveyance and treatment system; geo-climatic information like topography, land use, impervious cover, precipitation, soils (infiltration rates), and evaporation; and construction and operating cost estimates.

This regional source controls analysis has determined that there are numerous opportunities to reduce sewer overflows using GSI and other source control techniques. Source controls can play a key role in meeting the region's water quality improvement needs, the requirements of ALCOSAN's CD, and the municipalities' corresponding orders. The study has identified areas within the combined sewer system where GSI investments on the order of $44M have the potential to replace approximately $81M in ALCOSAN and municipal grey infrastructure, resulting in regional cost savings around $37M. Similarly, approximately $61M in strategically focused I/I reduction investments have the potential to eliminate the need for $122M in ALCOSAN and municipal grey infrastructure, leading to a regional cost savings of $61M. In total, a regional cost savings of nearly $100M has been identified thus far. On-going municipal coordination is expected to result in additional cost savings opportunities.

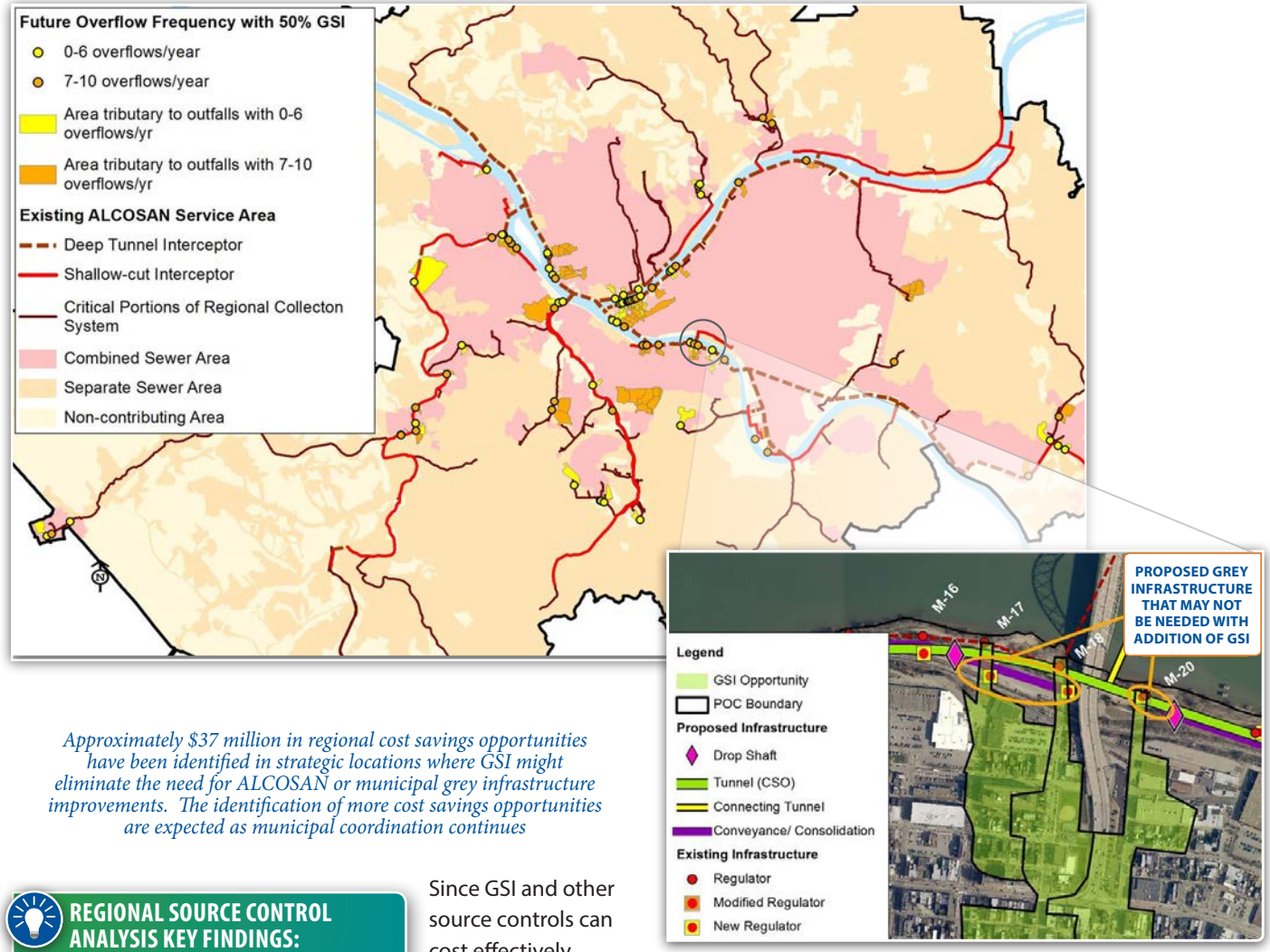
Another key rate-payer cost savings opportunity is implementing GSI through redevelopment. The implementation of county-wide stormwater management ordinances could require development and re-development projects to manage runoff on site, preferably using GSI, wherever feasible. In addition, GSI could be incorporated into ongoing public works projects, particularly municipal, County and Pennsylvania Department of Transportation (PennDOT) road reconstruction projects. These activities could lead to hundreds of millions of dollars invested in beneficial GSI. Over many years, as the region re-develops, very significant reductions of stormwater inflow to the municipal and ALCOSAN systems would be realized.

Regional Source Control Cost Savings Opportunities

- GSI has the potential to save the region approximately $37 million if it is used in strategic locations where it can replace ALCOSAN and/or municipal grey infrastructure needs
- Similarly, strategically applied inflow and infiltration reduction has the potential to save an additional $61 million in regional costs
- Nearly $100M in potential regional cost savings have been identified so far
- The identification of more cost savings opportunities are expected as municipal coordination continues
- A county wide development and redevelopment ordinance requiring on-site stormwater management, preferably using GSI, could lead to more cost savings and additional community benefits

Key Terms

Consent Decree (CD) – a judicial settlement expressing voluntary agreement between parties.



Approximately $37 million in regional cost savings opportunities have been identified in strategic locations where GSI might eliminate the need for ALCOSAN or municipal grey infrastructure improvements. The identification of more cost savings opportunities are expected as municipal coordination continues

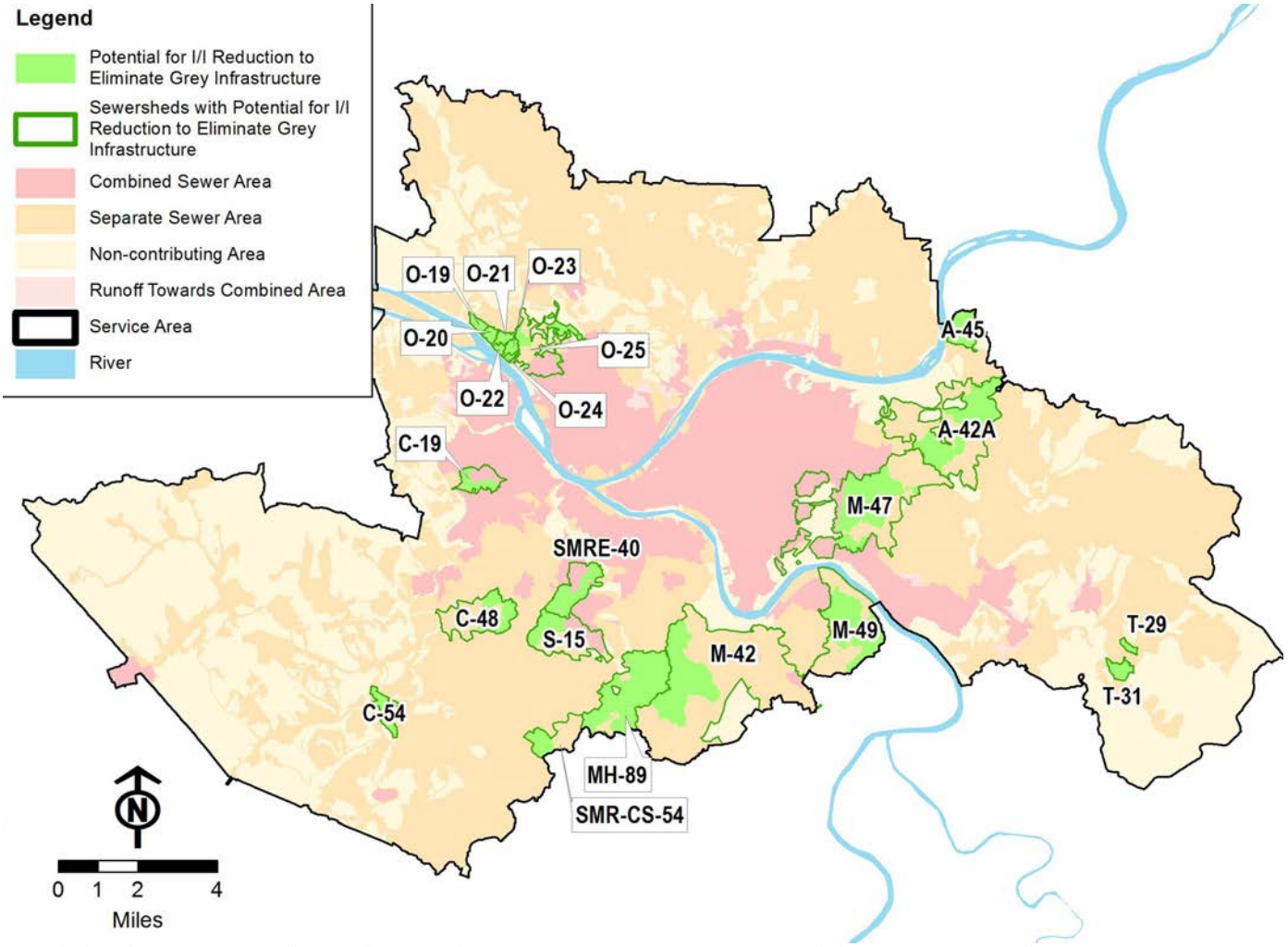
REGIONAL SOURCE CONTROL ANALYSIS KEY FINDINGS:

- GSI and other source controls can play a significant role in reducing sewer overflows in the ALCOSAN service area
- However, traditional grey infrastructure improvements will also be needed to meet consent decree requirements

Since GSI and other source controls can cost effectively reduce sewer overflows, while also providing other valuable community benefits, it will be important that ALCOSAN and its customer municipalities work together to integrate these solutions into the regional WWP. Analysis results also determined that source controls will be most effective when strategically paired with critical treatment and conveyance capacity upgrades that are necessary to meet water quality improvement requirements, even with intensive flow reduction. The key to identifying the best mix of green and grey infrastructure system improvements is through continued coordination with customer municipalities, regional planning agencies, USEPA, Pennsylvania Department of Environmental Protection, ACHD, and other clean water partners. These alliances will serve as the pathway to bringing these opportunities to life through partnerships that focus on the best interest of the region and maximizing water quality benefits.

Although this analysis has focused on opportunities to reduce the cost of the Selected Plan, which has been determined to be unaffordable, there are many other valuable source control opportunities within the ALCOSAN service area. Here are just a few GSI examples:

- Locating GSI in areas where there is particular public or municipal interest in GSI;
- Locating GSI upstream of small combined sewer overflows that are being addressed without associated capital cost in ALCOSAN's Selected Plan;
- Locating GSI in special focus areas of neighborhood revitalization;
- Locating GSI in areas facing affordability limitations. Investing in areas with less ability to pay for water quality improvements would represent a high-return social and environmental investment; and/or
- Locating GSI in areas not receiving new conveyance facilities during initial phases of WWP implementation.



Sewersheds with greatest potential for I/I reduction to eliminate proposed sanitary sewers, potentially leading to approximately $61M in regional cost savings

Municipal Opportunity Assessment & Potential Projects

Additional information can be found in Section 4 of the report.

In parallel with the regional analysis of the potential of source controls, ALCOSAN analyzed GSI project opportunities at a local, site-level and engaged community members in identifying their preferred source control projects. These efforts served as a continuation of ALCOSAN's role in providing technical and administrative support to municipalities to implement green stormwater infrastructure projects, and were extended to community stakeholder groups in helping all involved craft effective partnerships for future GSI implementation. ALCOSAN also took initial steps toward engaging municipalities on I/I reduction opportunities for future consideration and potential to eliminate proposed grey infrastructure.

To evaluate GSI projects at a site level, ALCOSAN conducted two different analyses. In the first analysis, ALCOSAN, with the assistance of 3 Rivers Wet Weather (3RWW), identified potential GSI project locations based on USEPA's and Analysis Integration (SUSTAIN) software and local engineering judgment. This was done in 29 different study areas throughout the combined sewer service area and resulted in identifying thousands of locations for potential GSI implementation. The second analysis approach focused on a pilot sewershed and evaluated the best sites for implementing GSI based on stormwater runoff reduction. This evaluation was performed for the combined sewersheds in the Lawrenceville area in the City of Pittsburgh and identified 5 of the top feasible sites for further evaluation.

Community feedback played a large part of identifying sites for GSI as ALCOSAN and 3RWW conducted over 80 meetings with municipal and stakeholder officials to discuss the SCS evaluation and broaden the perspective of how GSI can be implemented in the region. Through these meetings, over 200

Municipal Outreach Progress

- Over 80 meetings were held with municipalities and stakeholders to discuss potential GSI project opportunities
- Over 200 locations for GSI projects were suggested
- Over 75 site visits were conducted to assess GSI project potential
- ALCOSAN continues to meet with municipalities and stakeholders to build partnerships that will advance GSI and I/I reduction projects

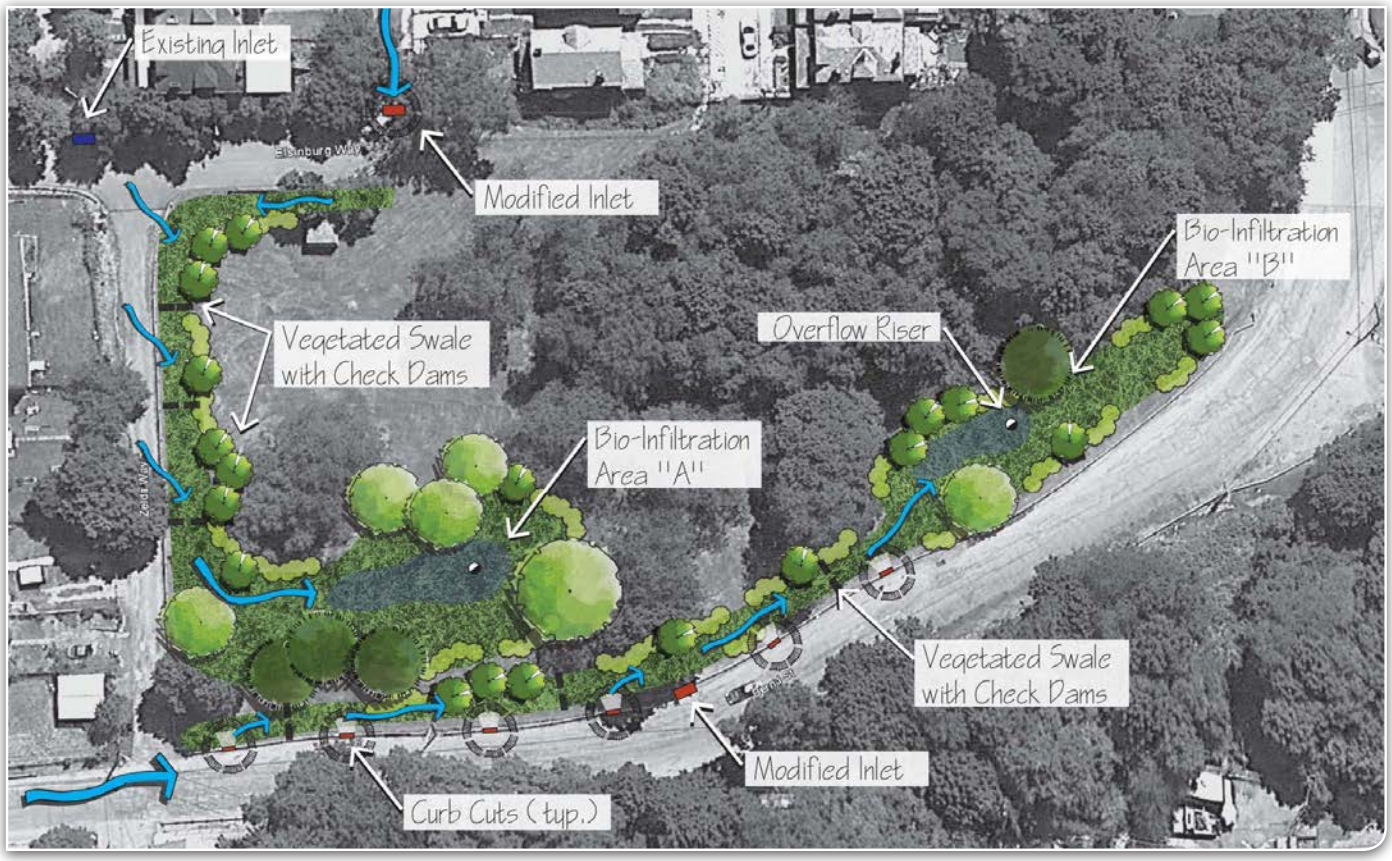
Rendering of Potential GSI Project in the City of Pittsburgh on North Avenue along Allegheny Commons

preferred locations for GSI projects were identified by municipalities and stakeholders.

ALCOSAN visited over 75 suggested GSI sites to evaluate concept projects for future consideration. ALCOSAN visited sites with an emphasis on locations that are currently the furthest advanced by municipalities and stakeholders, and on sites that could have the most significant CSO volume reductions even if they were years from potential implementation. Preliminary GSI project concepts were developed for feasible sites where no initial concept existed. ALCOSAN shared these results with municipalities and stakeholders for consideration and will continue to work with potential partners as individual project development continues. Working together, opportunities were identified to implement GSI as a sewer overflow control measure while also providing co-benefits to the community. ALCOSAN developed specific renderings and layouts for the most advanced projects to aid in visualizing these potential gains and advancing the project design.

Overall, the analysis provides:

- A more detailed look at sites where GSI could be implemented based on two different analysis methods;



McKinley Park Green Infrastructure Conceptual Layout

- A contemporary impression of the potential sites that community members are seeking to implement GSI projects; and
- Reflects upon the importance of coordinating future implementations together through effective partnerships.

A Greener Wet Weather Strategy

Additional information can be found in Section 5 of the report.

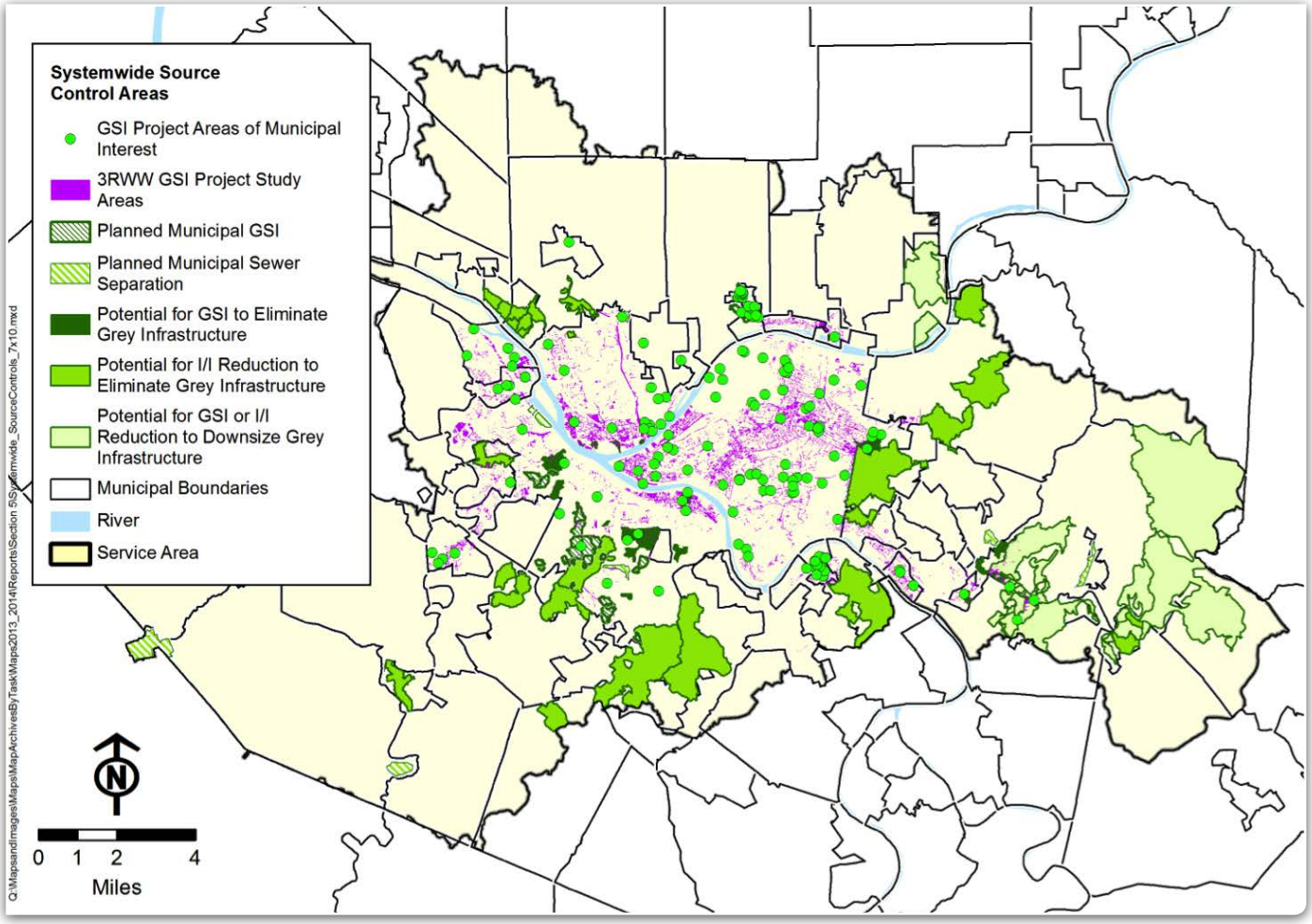
There are abundant opportunities for GSI and I/I reduction within the ALCOSAN service area. ALCOSAN, 3RWW, the City of Pittsburgh (including PWSA), smaller municipalities, and numerous neighborhood groups have identified more than 14,000 potential locations and applications for green stormwater management and inflow/infiltration (I/I) reduction. The map below and table on the following pages show the many project opportunities that emerged from coordination with municipalities and other stakeholders. While some of the project opportunities may prove to be infeasible, other opportunities yet to be envisioned will emerge.

The analyses documented in Sections 3 of this study show that a greener alternative to the WWP can add water quality and community benefits without additional cost to ALCOSAN's rate payers. This section presents conceptually a Greener Alternative that saves $37 million in regional costs using GSI and $61 million in regional costs using I/I removal in place of corresponding grey infrastructure leading to a combined regional cost savings of approximately $100 million. In addition, the conceptual Greener Alternative provides a higher level of overflow reduction (by approximately 220 MG annually) compared to the Selected Plan option identified in ALCOSAN's 2013 draft WWP.

Towards this end, ALCOSAN will leverage its regional leadership role and resources to foster the translation of GSI and I/I projects from concepts to reality through a comprehensive regional Flow Reduction Program, as outlined in Section 7 of the report.

ALCOSAN's Greener Strategy

- ALCOSAN has identified locations where GSI and I/I reduction could replace grey facilities and save the region nearly $100 million.
- Combining green and grey solutions can lead to greater environmental and community benefits.
- ALCOSAN will leverage its regional leadership role and resources to promote the incorporation of GSI and I/I reduction projects into the WWP.



Areas of Identified Project Opportunities

POTENTIAL PROJECT OPPORTUNITIES			
Project ID	Project Category[1]	Municipality/ Authority/ Stakeholder	Suggested Project Location
1	A	Braddock	Community Plaza at former UPMC hospital site
2	A	Braddock	Braddock Ave at the intersections of 4th, 5th and 6th Streets
3	A	Braddock	Future Redevelopment at Braddock Ave and Quarry St (site of former bakery)
4	A	Braddock	Vacant Lots
5	A	PWSA - Hazelwood	4800 Block of 2nd Ave
6	A	PWSA - Hazelwood	Hazelwood Carnegie Library Second Avenue and Tecumseh
7	A	PWSA - Hazelwood	ALMONO Development
8	A	PWSA - Squirrel Hill	Business District - along Forbes Avenue business district (between Murray Ave and Shady Ave)
9	A	PWSA - Squirrel Hill	Near O'Connor's Corner (Murray Ave and Phillips Ave)
10	A	PWSA - Squirrel Hill	Squirrel Hill Post Office
11	A	PWSA - Southside	S. 21st Street from Southside Park to the riverfront trail
12	A	PWSA - Saw Mill Run Watershed	Projects TBD
13	A	Project 15206 - Morningside	Heth's Run, Chislett St & Vetter St
14	A	PWSA - Beechview	Broadway Ave Streetscape
15	A	PWSA - Carrick	Brownsville Road Streetscape
16	A	PWSA - Strip District	Smallman Street - Road reconfiguration and resurfacing between 16th and 21st streets
17	A	PWSA - Chateau	Beaver Ave - Road reconfiguration
18	A	PWSA - Lawrenceville	43rd Street Overlook
19	A	PWSA - Highland Park	Heth's Run - Pittsburgh Zoo Parking Lot
20	A	PWSA - Hill District	Hill District Master Plan
21	A	Bakery Square Redevelopment	Bakery Square 2.0
22	A	PWSA - McDonough's Run	McDonough's Run GSI Evaluation
23	A	PWSA - Nine Mile Run	Nine Mile Run GSI Evaluation
24	A	PWSA - McNeilly Run	McNeilly Road Concept Projects
25	A	PWSA - Point Breeze	Frick Park Area Concept Projects
26	A	PWSA - Swisshelm Park	Swisshelm Park Concept Projects
27	A	PWSA - Brookline	Brookline Area Concept Projects
28	A	PWSA - Southside	Birmingham Bridge Grassy Areas (Southside End)
29	A	PWSA - Point Breeze	Forbes Ave between Beechwood Blvd and Braddock Ave
30	A	PWSA - Regent Square	Frick Park playground area at intersection of Forbes Ave and Braddock Ave
31	A	PWSA - Hill District	Lower Hill District, Cliffside Park
32	A	PWSA - Allegheny West	W North Ave near Allegheny Commons Park
33	A	PWSA - South Oakland	Bates Street Corridor in conjunction with removal of invasive species
34	A	PWSA - Lawrenceville	(A-29/A-29Z) Site 037+222 - Lawrenceville Shop n' Save
35	A	PWSA - Lawrenceville	(A-29/29Z) Site 0870 - Inlet at 48th and Harrison Street
36	A	PWSA - Lawrenceville	(A-29/29Z) Site 208+838 – In front of Allegheny Cemetery along Butler St between 46th and 47th St
37	A	PWSA - Lawrenceville	(A-29/29Z) Site 328+735+800 – Stanton Avenue between McCabe Street and McCandless Ave
38	A	PWSA - Lawrenceville	(A-34) Site 0033 – Butler Street between 55th and 56th Street, river side ROW.
39	A	McKees Rocks	Chartiers Ave Renovations
40	A	McKees Rocks	Third Street Park

POTENTIAL PROJECT OPPORTUNITIES			
Project ID	Project Category[1]	Municipality/ Authority/ Stakeholder	Suggested Project Location
41	A	McKees Rocks	Etna and Sefler Street area
42	A	McKees Rocks	Miller Street
43	A	McKees Rocks	Furnace St parking lot
44	A	McKees Rocks	P&LE Complex "McKees Rocks Flats"
45	A	PWSA - Hill District	Energy Innovation Center
46	A	PWSA - Hill District	Duquesne University
47	A	PWSA - Hill District	Former Civic Arena Site, within ROW of new roads
48	A	PWSA - Hill District	Hill House
49	A	PWSA - Crafton Heights	Clearview Ave
50	A	PWSA	Green Alleyways throughout District 2
51	A	Parkway Center Mall Redevelopment	Projects TBD
52	A	Wilmerding	Patton Street
53	A	Wilmerding	Airbrake Ave Walking Trails
54	A	Wilmerding	Ice Plant Hill Road, Westinghouse Ave and YMCA Parking Lot
55	A	Aspinwall	Business District
56	A	PWSA - Garfield	Hillcrest Street
57	A	Homestead	Renovation of Hazel Way between McClure and West Street to incorporate stormwater collection pipe and redirect stormwater flow into a bioretention pond between railroad tracks in vicinity of E 6th Ave and McClure Street.
58	A	Homestead	Municipal Parking Lot at West Street and 9th Ave
59	A	Homestead	Bumpouts along Ann Street
60	A	Homestead	Bumpouts along West Street
61	A	Homestead	Parking lot next to Citizen's Bank at 8th Ave and McClure St
62	A	Homestead	Triangular grass island property between Sarah and West Street, near 15th Ave
63	A	Homestead	Property at Glenn and 13th Street
64	A	Homestead	Small parking area at Hazel Way and McClure Street
65	A	Homestead	Tree wells with curb cutouts along Amity Street
66	A	Homestead	11th Avenue side of Frick Park between Ann St and Amity Street
67	A	Homestead	Playground at Sarah and 12th Street
68	A	Homestead	Parklet at site of Harry's Suit Shop along 8th Ave (210 E 8th Ave)
69	A	Homestead	Allegheny County Department of Human Services Homestead Complex
70	A	Homestead	Townhouse development along Amity Street
71	A	West Homestead	Redevelopment of former Keystone Plumbing site for rehabilitation center
72	A	Homestead	Voodoo Brewing redevelopment of former municipal building at Amity and 9th Avenue
73	A	Homestead	Stormwater ponding issues: Runoff from West St collects on 8th Ave; Runoff from Ann and McClure St collects on 6th Ave
74	A	Carnegie	Carnegie Library and Music Hall
75	A	Carnegie	Municipal Parking lot 10
76	A	PWSA - Oakland	Schenley Park - Panther Hollow Watershed Restoration
77	A	PWSA - Hill District	Hill District Master Plan
78	A	East Pittsburgh	Bioretention with community park near the vicinity of Grandview Ave and Christina Alley
79	A	PWSA - Downtown	Grass Triangle areas along Commonwealth Place and Liberty Avenue near the off-ramp from the Fort Pitt Bridge.

POTENTIAL PROJECT OPPORTUNITIES			
Project ID	Project Category[1]	Municipality/ Authority/ Stakeholder	Suggested Project Location
80	A	Millvale	Girty's Run GSI Evaluation
81	A	Millvale	Investigate CSO Impacts
82	A	West View	Girty's Run GSI Evaluation
83	A	PWSA - McKinley Park	McKinley Park - Perimeter roads Delmont Ave, Michigan Street, and Eldora Place.
84	A	PWSA - Hill District	Lower Hill District, Cliffside Park - Driveway
85	A	PWSA - Squirrel Hill	Schenley Park – Beacon Street
86	A	PWSA - Squirrel Hill	Schenley Park – Bob O'Connor Golf Course
87	A	PWSA - Squirrel Hill	Schenley Park – Westinghouse Memorial
88	A	PWSA - Squirrel Hill	Frick Park – Environmental Center at Frick Park
89	A	PWSA - Squirrel Hill	Schenley Park – Schenley Drive
90	A	PWSA - Highland Park	Highland Park – Heth's Run Stream Daylighting
91	A	PWSA - Hill District	MLK Field off of Kirkpatrick Street (Warren K Branch Park)
92	A	PWSA - Lawrenceville	Arsenal Park
93	A	PWSA - Oakland	Schenley Park – Panther Hollow Lake Restoration
94	A	PWSA - Oakland	Schenley Park – Daylighting Panther Hollow Lake Outfall
95	A	Stowe	Preston Park Area (Ohio Street and Center Street in Stowe Twp)
96	A	Stowe	Parking lot and triangular traffic island at the intersection of Nicol Ave and Graham St
97	A	Stowe	Corner of Main St and Hillcrest
98	A	Stowe	Corner of Fleming and Davis Ave
99	A, B	Etna	Butler St & Bridge St - 060
100	A, B	Etna	Butler St & Bridge St - 374
101	A, B	Etna	Butler St & Bridge St - 234
102	A, B	Etna	Butler St & Bridge St - 047
103	A, B	Etna	Butler St & Freeport St - 196
104	A, B	Etna	Bridge St - 057
105	A, B	Shaler/Etna	James St - 209
106	A, B	Etna	Walnut St & High St - 225
107	A, B	Etna	Union Alley, Bridge & Freeport - 056
108	A, B	Etna	Union Alley, Bridge & Freeport - 056a
109	A, B	Etna	Butler St - 067
110	A, B	Etna	Butler St - 372
111	A, B	Etna	Maplewood & Pine St - 243
112	A, B	Etna	Maplewood & Pine St - 238
113	A, B	Etna	Dewey St - 163
114	A, B	Etna	Dewey St - 164
115	A, B	Etna	Dewey St - 168
116	A, B	Etna	Vilsack St - 173
117	A, B	Etna	Church St & Wilson St - 011
118	A, B	Etna	Weible St & Angle Alley - 014
119	A, B	Etna	Highland St & Angle Alley - 014a
120	A, B	Etna	East side of Grant Ave - 099
121	A, B	Etna	West side of Grant Ave - 172
122	A	PWSA - Spring Garden	Spring Garden Ave - 1
123	A	PWSA - Spring Garden	Romanhoff St & South Side Ave - 2
124	A	PWSA - Spring Garden	Spring Garden Ave - 3
125	A	PWSA - Spring Garden	Damas St - 4
126	A	PWSA - Spring Garden	Phineas St, Perata St, Troy Hill Rd - 5
127	A	PWSA - Spring Garden	Tripoli St, Suismon St, Turtle Way - 6
128	A	PWSA - Spring Garden	Heinz St - 7
129	A	PWSA - Spring Garden	River Ave - 8
130	A	PWSA - Spring Garden	River Ave - 9
131	A	McKees Rocks	Sproul Street

POTENTIAL PROJECT OPPORTUNITIES			
Project ID	Project Category[1]	Municipality/ Authority/ Stakeholder	Suggested Project Location
132	A	Carnegie	Borough Building Entryway and Parking Lot
133	A	Carnegie	Seventh Avenue Park
134	A	PWSA - Brighton Heights	McClure Ave at Woods Run
135	A	PWSA - Brighton Heights	Marmaduke Parklet and surrounding area to Jack's Run
136	A	PWSA - Garfield/ Bloomfield	Penn Avenue between Mathilda St and Evaline St (Phase 1)
137	A	PWSA - West End	Main at Alexander, PPA lot
138	A	PWSA - Lincoln-Lemington and Larimer	Entire length of Lincoln Avenue
139	A	PWSA - Larimer	Larimer Ave on either side of E Liberty Boulevard
140	A	PWSA - Bloomfield	S. Winebiddle St. - Waldorf School of Pittsburgh
141	A	PWSA - Mt. Washington	Chatham Village
142	A	PWSA - Summer Hill	Zane Ave (north tip of Summer Hill)
143	A	PWSA - North Shore	River Ave from Heinz Lofts to Washington's Landing
144	A	PWSA - Squirrel Hill	Douglas/Phillips parking lot
145	A	PWSA - Larimer	Living Waters of Larimer will partner with current development or existing projects
146	A	PWSA - Larimer	Larimer Community Garden at the Village Green, Larimer Ave/Mayflower St
147	A	PWSA - Homewood	Rosedale area near Susquehanna - above culvert of NMR
148	D	Pittsburgh	Control up to 50% of combined area upstream of outfall A-56-OF
149	D	Pittsburgh	Control up to 50% of combined area upstream of outfall S-34-OF
150	D	Pittsburgh	Control up to 50% of combined area upstream of outfall M-17-OF
151	D	Pittsburgh	Control up to 50% of combined area upstream of outfall A-47-OF or sewer separation
152	D	Turtle Creek Borough	Control up to 50% of combined area upstream of outfall T-11-OF
153	D	Turtle Creek Borough	Control up to 50% of combined area upstream of outfall TR-01-OF
154	D	Turtle Creek Borough	Control up to 50% of combined area upstream of outfall T-13-OF
155	D	Pittsburgh	Control up to 50% of combined area upstream of outfall CSO_032N001
156	D	Pittsburgh/ Wilkinsburg	Control up to 50% of combined area upstream of outfall 1071-OF
157	D	Pittsburgh	Control up to 50% of combined area upstream of outfall M-18-OF
158	D	Pittsburgh	Control up to 50% of combined area upstream of outfall M-20-OF
159	D	Pittsburgh	Control up to 50% of combined area upstream of outfall S-46-OF
160	D	Pittsburgh	Control up to 50% of combined area upstream of outfall S-29-OF
161	D	East Pittsburgh	Control up to 50% of combined area upstream of outfall T-03-OF
162	D	Turtle Creek Borough	Control up to 50% of combined area upstream of outfall TR-02-OF
163	D	Pittsburgh	Control up to 50% of combined area upstream of outfall O-43-OF or sewer separation
164	D	Pittsburgh	Control up to 50% of combined area upstream of outfall S-28-OF
165	D	Pittsburgh	Control up to 50% of combined area upstream of outfall O-40-OF

POTENTIAL PROJECT OPPORTUNITIES			
Project ID	Project Category[1]	Municipality/ Authority/ Stakeholder	Suggested Project Location
166	D	Pittsburgh	Control up to 50% of combined area upstream of outfall S-42-OF
167	A	PWSA - McKinley Park	McKinley Park - Perimeter roads Zelda Way, Bernd St
168	A	Project 15206 - Highland Park	Hampton to Heths Park - 15206
169	A	Project 15206 - Highland Park	Bryant King to Lower Heths Park
170	A	Project 15206 - East Liberty	Penn Circle West
171	A	Project 15206 - Highland Park	Negley Run North
172	A	Project 15206 - Lincoln Lemington	Highland Dr & Lemington Ave
173	A	Project 15206 - Larimer	PAT_01 Parking
174	A	Project 15206 - Larimer	PAT_02 Parking
175	A	Project 15206 - Larimer	Washington Blvd Chatham Entry Bus Shelter
176	A	Project 15206 - Larimer	Rainbow St Chatham Parking & PAT property
177	A	Western PA Conservancy - Southside	Josephine & Greeley
178	A	Western PA Conservancy - Terrace Village	Centre & Herron
179	A	Western PA Conservancy - Greenfield	Greenfield & Irvine
180	A	3RWW – Swisshelm Park	Project located within the 1300 block of Windermere Dr. in Swisshelm - Permeable Parking
181	A	3RWW – Swisshelm Park	Project located within the 1300 block of Windermere Dr. in Swisshelm - Bioretention
182	A	3RWW – Swisshelm Park	Project located within the 1200 block of Windermere Dr. in Swisshelm - Bioretention #1
183	A	3RWW – Swisshelm Park	Project located within the 1200 block of Windermere Dr. in Swisshelm - Bioretention #2
184	A	3RWW – Swisshelm Park	Project located within the 1200 block of Windermere Dr. in Swisshelm - Bioretention #3
185	A	3RWW – Swisshelm Park	Project located within the 1100 block of Windermere Dr. in Swisshelm - Permeable Parking
186	A	3RWW - Point Breeze	Frick Museum - Private parking lot - Bioretention
187	A	3RWW - Point Breeze	Frick Museum - Private parking lot - Permeable Parking
188	A	3RWW - Point Breeze	S. Homewood Ave - Bioretention
189	A	3RWW - Point Breeze	S. Homewood Ave - Traffic Island Bioretention
190	A	3RWW - Point Breeze	Le Roi Road - Bioretention
191	A	3RWW - Point Breeze	Le Roi Road - Permeable Parking
192	A	3RWW - Point Breeze	Osage Lane - Permeable Alley
193	A	3RWW - Point Breeze	Roycrest Place - Permeable Parking
194	A	3RWW - Point Breeze	Card Lane - Permeable Parking
195	A	3RWW - Point Breeze	Lang Court - Permeable Parking
196	A	3RWW - Brookline	Sussex Ave North of Sageman Ave
197	A	3RWW - Brookline	Sussex Ave South of Sageman Ave
198	A	PennDOT - Northside	East Ohio Street between East and Chestnut
199	A	PennDOT - Downtown	Forbes Ave Between Smithfield St & Grant
200	A	Nine Mile Run Watershed Association - Crescent Elementary	Bennett Street and Tokay Street in City of Pittsburgh
201	A	Nine Mile Run Watershed Association - Oakwood & Batavia Streets	Oakwood and Batavia Streets in City of Pittsburgh

POTENTIAL PROJECT OPPORTUNITIES			
Project ID	Project Category[1]	Municipality/ Authority/ Stakeholder	Suggested Project Location
202	A	Nine Mile Run Watershed Association - Frankstown & Wheeler Streets	Frankstown & Wheeler Streets in City of Pittsburgh
203	A	PWSA - East Liberty	Samoan Way
204	A	PWSA - Squirrel Hill	Forbes Avenue & Wightman Street
205	A	PWSA - Squirrel Hill	Beacon Street & Murray Avenue
206	A	PWSA - Squirrel Hill	Wightman School Community Building
207	A	PWSA - Downtown	East of Municipal Courts Drive and the First Ave Parking Garage
208	B	PWSA	$9.6M in GSI in City of Pittsburgh combined portions of Saw Mill Run with proposed projects. (Specific locations unknown, but Figure 5-2 assumes the areas could fall within sheds MH-11, MH-18, MH-77, MH-80, MH-89, S-15, S-23 and SMRE-40.
209	C	PWSA	Sewer separation of all combined area in MH-55
210	C	PWSA	Sewer separation of selected combined areas in A-58
211	C	PWSA	Sewer separation of selected combined areas in SMRE-40
212	C	Pitcairn	Sewer separation of selected combined sewer area in T-26
213	C	Wilkins Township	Sewer separation of all combined sewer area in TR-02-04
214	C	Wilkins Township	Sewer separation of all combined sewer area in TR-03
215	C	South Fayette / MATSF	Sewer separation of all combined sewer area in C-54-16
216	C	McDonald Borough	Sewer separation of all combined area in C-45B-04
217	C	PWSA / PennDOT / ALCOSAN	Sewer separation of all combined area in O-09
218	C	PWSA / PennDOT / ALCOSAN	Sewer separation of all combined area in O-10
219	C	PWSA / PennDOT / ALCOSAN	Sewer separation of all combined area in O-11
220	E	Penn Hills	I/I reduction in separate sanitary portions of A-42A shed with high rainfall dependent inflow and infiltration (RDII).
221	E	TBD – Multiple municipalities	I/I reduction in separate sanitary portions of A-45 shed with high RDII
222	E	TBD – Multiple municipalities	I/I reduction in separate sanitary portions of C-19 shed with high RDII
223	E	TBD – Multiple municipalities	I/I reduction in separate sanitary portions of C-48 shed with high RDII
224	E	Bridgeville	I/I reduction in separate sanitary portions of C-54 shed with high RDII
225	E	TBD – Multiple municipalities	I/I reduction in separate sanitary portions of M-42 shed with high RDII
226	E	TBD – Multiple municipalities	I/I reduction in separate sanitary portions of M-47 shed with high RDII
227	E	TBD – Multiple municipalities	I/I reduction in separate sanitary portions of M-49 shed with high RDII
228	E	TBD – Multiple municipalities	I/I reduction in separate sanitary portions of MH-89 shed with high RDII
229	E	Avalon	I/I reduction in separate sanitary portions of O-19 shed with high RDII
230	E	Avalon	I/I reduction in separate sanitary portions of O-20 shed with high RDII
231	E	TBD – Multiple municipalities	I/I reduction in separate sanitary portions of O-21 shed with high RDII
232	E	Bellevue	I/I reduction in separate sanitary portions of O-22 shed with high RDII

POTENTIAL PROJECT OPPORTUNITIES			
Project ID	Project Category[1]	Municipality/ Authority/ Stakeholder	Suggested Project Location
233	E	Bellevue	I/I reduction in separate sanitary portions of O-23 shed with high RDII
234	E	Bellevue	I/I reduction in separate sanitary portions of O-24 shed with high RDII
235	E	TBD – Multiple municipalities	I/I reduction in separate sanitary portions of O-25 shed with high RDII
236	E	TBD – Multiple municipalities	I/I reduction in separate sanitary portions of S-15 shed with high RDII
237	E	Bethel Park	I/I reduction in separate sanitary portions of SMR-CS-54 with high RDII
238	E	TBD – Multiple municipalities	I/I reduction in separate sanitary portions of SMRE-40 shed with high RDII
239	E	Trafford	I/I reduction in separate sanitary portions of T-29 shed with high RDII
240	E	TBD – Multiple municipalities	I/I reduction in separate sanitary portions of T-31 shed with high RDII

POTENTIAL PROJECT OPPORTUNITIES			
Project ID	Project Category[1]	Municipality/ Authority/ Stakeholder	Suggested Project Location
241	F	TRB – Multiple municipalities	I/I reduction in separate sanitary portions of A-82 shed with high RDII
242	F	O'Hara	I/I reduction in separate sanitary portions of A-85 shed with high RDII
243	F	TBD – Multiple municipalities	GSI and I/I reduction in selected areas tributary to Selected Plan storage tank near T-10.
244	F	TBD – Multiple municipalities	I/I reduction in separate sanitary areas with high RDII and tributary to Selected Plan storage tank near T-27.

[1]*Project categories:*
A – GSI Project Areas of Municipal Interest
B – Planned Municipal GSI
C – Planned Municipal Sewer Separation
D – Potential for GSI to Eliminate Grey Infrastructure
E – Potential for I/I Reduction to Eliminate Grey Infrastructure
F – Potential for GSI or I/I Reduction to Downsize Grey Infrastructure

Source Reduction Incentives

Additional information can be found in Section 6 of the report.

ALCOSAN evaluated financial, technical and institutional incentives to encourage municipalities and property owners to reduce wet weather flows.

Financial flow reduction incentives can be in the form of wet weather charges that are intended to encourage wet weather flow reduction and to partially recover wet weather control costs. Financial incentives can also be through project funding assistance such as grants and source reduction agreements.

County Office Building Green Roof

Wet weather charges can be applied at the "retail" level by municipalities and wastewater authorities to individual properties. Twenty-two of the fifty largest municipalities with combined or mixed sewers have a wet weather charge. These can be variously named, ranging from "stormwater fee" to "Clean River Surcharge" (Columbus, Ohio). The charges are typically based on a property's ability to generate stormwater and use impervious area as a proxy for runoff potential. Sanitary or mixed sewer system wet weather charges can take the form of a standard additional fee that is intended to help pay for wet weather compliance costs, e.g. Louisville MSD's Consent Decree Charge.

Wastewater charges can also be applied at a wholesale level by a regional wastewater authority to its customer municipalities. For example, the Massachusetts Water Resources Authority includes peak monthly flows in their rate calculations for member municipalities.

It appears that ALCOSAN, its 83 customer municipalities and their affiliated municipal authorities could impose wet weather charges under current state statute; but could face restrictions under their articles of incorporation and service agreements.

The majority of municipalities or authorities who have a wet weather charge encourage GSI or other flow reduction by providing fee credits for implementing GSI or other source reduction steps. A number of sanitary sewered municipalities have adopted surcharges on users whose properties can contribute excessive inflow or infiltration as determined through mandatory inspections. East Norriton, PA provides one example.

Positive incentive programs that offer grants, rebates, low cost financing, etc. for GSI or I/I reduction source control are less common than credit programs. Onondaga County's Green Improvement Fund is an example of a large-scale program. Smaller programs tend to focus on assisting homeowners with lateral replacement such as Brookfield, Wisconsin.

ALCOSAN funding of GSI or I/I reduction projects would need to demonstrably relate to services that ALCOSAN provides under its articles of incorporation, i.e. the conveyance and treatment of wastewater from the customer municipalities. Therefore, GSI and I/I reduction projects funded by ALCOSAN would need to demonstrably support this mission through cost

Infiltration trenches and berms have been installed to reduce hillside erosion, converting lawns to meadows, and vegetative buffers in Pittsburgh's Schenley Park.

This demonstration project was partially funded through $400,000 in fiscal 2010 Clean Water Act appropriations and through support by ALCOSAN, PWSA and the Pittsburgh Parks Conservancy.

Saline Street Right-of-way Green Infrastructure Retrofit and Redevelopment Project

East Liberty Presbyterian Church On-site bioretention

Etna Parking Lot Green Infrastructure Retrofit and Redevelopment Project

ALCOSAN Customer Service and Training Building parking lot uses a rain garden and bioswales to capture and infiltrate stormwater.

Source Reduction Incentives Findings

Wet Weather Charges:

- Are becoming widespread nationally.
- Encourage flow reduction and partially offset compliance costs.
- ALCOSAN and the customer municipalities appear to have the statutory authority to implement, but could face other restrictions.

ALCOSAN Funding:

- ALCOSAN could fund municipal GSI and I/I reduction projects, or could directly implement GSI projects as appropriate.
- Funded projects would need to demonstrably support ALCOSAN's core services of wastewater conveyance and treatment.

ALCOSAN Technical and Institutional Support:

- More than 15 years of ALCOSAN GSI and flow reduction support.
- ALCOSAN provides technical and outside funding procurement (more than $40 million in Federal and state funding since 1997).

ALCOSAN / Municipal / County Cooperative Options:

- Flow reduction plans.
- Voluntary transfer of intermunicipal trunk sewers to ALCOSAN.
- Integration of GSI and I/I reduction through local ordinances.

savings or operational efficiencies. ALCOSAN's ability to directly fund projects on private property appears to be quite limited. ALCOSAN funding assistance for municipal flow reduction projects could come in the form of a source reduction funding agreement or as may better fit some conditions, through direct ALCOSAN project implementation.

Beyond project funding, ALCOSAN can provide technical and institutional support for GSI and I/I reduction projects. ALCOSAN has been helping municipalities with flow reduction for more than 15 years. This help has included project facilitation and technical support. ALCOSAN has provided engineering, technical and construction services totaling nearly $11 million and, through the diligent support of the Pittsburgh region's Congressional delegation, more than $40 million in federal and state funding for municipal flow reduction projects since 1997 has been realized.

ALCOSAN has identified opportunities to partner with the municipalities, Allegheny County, and other stakeholders to implement institutional changes that would reduce wet weather flows. ALCOSAN and the municipalities could cooperatively establish flow reduction plans intended to reduce the size and scope of grey wet weather facilities. ALCOSAN is also working with the municipalities towards the voluntary conveyance of inter-municipal trunk sewers to ALCOSAN. The integration of GSI into municipal property development and redevelopment via stormwater management ordinances could provide additional opportunities for flow reduction that would occur organically as properties are developed and/or redeveloped.

ALCOSAN's Flow Reduction Program

Additional information can be found in Section 7 of the report.

While GSI and I/I reduction can't eliminate the need for traditional grey facilities, they can lead to significant reductions in sewer overflows, cost savings and community benefits.

ALCOSAN is committed to help lead Allegheny County into a future with sustainably clean water and green communities. Towards this goal, ALCOSAN is proposing the following Green Initiatives including a Green Revitalization of Our Waterways (GROW) program which is already underway providing financial assistance to municipal green partnership projects;

- Green Revitalization of Our Waterways
  - — ALCOSAN is providing financial support towards municipal flow reduction partnership projects.
  - — ALCOSAN will provide municipalities with technical support resources for developing and implementing municipal GSI, direct stream inflow removal, and sewer rehabilitation projects.
  - — ALCOSAN will expand its pursuit of outside funding on behalf of interested municipalities and facilitate partnering opportunities between municipalities and key stakeholders, including public-private partnerships.
- Work cooperatively with customer municipalities to develop flow reduction plans.
- Collaborate with the municipalities, the County and other stakeholders towards developing service-area wide model stormwater management, planning and development ordinances, procedures and regional utility coordination efforts.
- Expand its long-standing program of sewer flow monitoring to assist the municipalities in identifying and confirming GSI and I/I project locations and in evaluating the efficacy of flow reduction projects.
- Accept ownership of and responsibility for inter-municipal trunk sewers transferred from municipalities to ALCOSAN. ALCOSAN anticipates that regionalization will support flow reduction initiatives, including the prioritization of sewer rehabilitation projects to reduce groundwater infiltration (GWI) along transferred trunk sewers.
- Include GSI, community enhancements and public education at ALCOSAN wet weather control facilities, wherever feasible.

ALCOSAN'S TO-DO LIST:

- Continue municipal GSI and I/I reduction incentives program
- Begin mutually developing flow reduction plans with municipalities
- Select and implement GSI and I/I reduction demonstration projects
- Expand flow reduction project support
- Regionalize intermunicipal trunk sewers

The goal of ALCOSAN's green initiatives is to capitalize on the benefits that GSI, flow reduction and regionalization can bring to the region. Success will require intensive and on-going coordination amongst many regional stakeholders; including ALCOSAN, its customer municipalities, the regulatory agencies, community and neighborhood groups, and regional planning and governmental agencies.

ALCOSAN is committed to seizing the opportunities identified in this study make a greener wet weather strategy a reality. More specifically, ALCOSAN will accelerate its ongoing efforts and take the following actions:

- Continue implementation of its GROW municipal partnership program;
- Participate in municipal coordination forums for mutually developing flow reduction plans;
- Use the findings of this source control study to work with the municipalities, community groups and regulatory agencies to design and implement GSI and other flow reduction projects;
- Ramp up its flow reduction technical support efforts, building on its 15-year tradition of partnering with municipalities on projects; and
- Continue the implementation of voluntary intermunicipal trunk sewer regionalization.

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