

A Blueprint to Scale Up Green Stormwater Infrastructure in Underserved Communities Across the Greater Chicago Region

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Metropolitan Water Reclamation District (MWRD) has no authorship of this report and views these recommendations as third-party input. This Blueprint is an abridged version of a full-length report submitted to MWRD that we are willing to share with public agencies upon request.

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About the project team

Started in 2020 and funded by the Great Lakes Protection Fund (GLPF), the *Resilient Infrastructure & Sustainable Communities* (RISC, www.risc.solutions) was created to establish a resilience and finance leadership cluster of municipal resilience officers and other sustainability leaders across the binational Great Lakes region. RISC's key goals include providing a forum for collaboration and innovation on an inter-regional scale on new models for project delivery, investment, financing, and asset management; promoting One Water; and helping implement large-scale investments that lead to sustainable stormwater infrastructure and green neighborhoods in Great Lakes communities, thus directly addressing water quality and quantity challenges presented by the changing climate.

Corvias Infrastructure Solutions (CIS) is a national leader in the development and implementation of public infrastructure solutions, focusing on improving the environmental, economic, and social condition of the nation's infrastructure through solutions that drive local economic inclusion and equity, reduction of public risk, and increased community investment and buy-in. CIS also offers related advisory/research expertise and services on topics including One Water/nature-based solutions, climate resilience, disaster prevention, environmental equity/justice/finance, water affordability, and public trust.

Delta Institute (Delta) collaborates with communities to solve complex environmental challenges throughout the Midwest. Delta addresses Midwestern environmental, economic, and climate challenges today, so that our home and region are more resilient, equitable, and innovative tomorrow.



Executive summary

This project, funded by the Great Lakes Protection Fund, looks at possible frameworks to scale up large-scale integrated green stormwater infrastructure (GSI) within the Metropolitan Water Reclamation District (MWRD) service area. MWRD is a special purpose government agency responsible for wastewater treatment and stormwater management in Cook County, Illinois, and is committed to protect the health and safety of the public and the quality of the water supply source (Lake Michigan), improve the water quality in watercourses in its service area, protect businesses and homes from flood damages, and manage water as a vital resource. This commitment has positioned MWRD to build upon its past work to implement integrated GSI for stormwater management on a large scale.

Cook County, the closest political subdivision to the MWRD service area, scores at or above the 75th percentile when compared nationally for several environmental justice indicators such as particulate matter (PM 2.5), ozone, diesel particulate matter, air toxics respiratory, air toxics cancer risk, proximity to traffic, lead paint, hazardous waste facilities, and underground storage tanks. Much of the city of Chicago, which comprises more than 50 percent of the population in the MWRD service area, is considered disadvantaged according to the White House Council of Environmental Quality's Climate and Economic Justice Screening Tool. Investing in disadvantaged communities is essential to create opportunities, bridge socioeconomic gaps, and foster inclusive growth for a more equitable and prosperous society.

MWRD is under a consent decree to eliminate a substantial percentage of its Combined Sewer Overflows (CSOs), establish and expand GSI, and provide onsite stormwater storage solutions such as rain barrels to residents in the service area. To date, these requirements have been met and exceeded by the MWRD. Average precipitation has increased by about 30 percent from 1960 to 2020, and if this trend continues, MWRD may face challenges with upholding the requirements established by the consent decree—facing greater risk for flooding and CSOs.

Our interviews with local community leaders suggest safety, health, and community development are consistently top priorities for EJ communities. GSI implementation in communities is lagging due to lack of resources, and assistance for project planning/development creating missed opportunities for accessing available funding. Community organizations, schools, and municipalities have entered partnerships with private and public entities to implement community projects and believe MWRD should be more involved in these projects. Funding and capacity for maintenance remains a major hurdle to municipal and community partners implementing GSI at scale in MWRD's service area.

MWRD will need to continue to scale up its investment in GSI to combat these emerging challenges. This will require MWRD to find new ways to generate funding to pay for these projects. MWRD will need new, innovative transactional frameworks and new sources of financing to deliver these projects. In this report, we provide a Blueprint for scaling up GSI across MWRD's service area, with an emphasis on supporting underserved communities. The suggested approach centers around the use of a Community-based Partnership (CBP).

CBPs are designed to be in place for an extended period – one or more decades – as a means of developing standard delivery framework with scalable development resources, risk sharing, and capacity building that result in efficiency and significant cost savings. The “front-end” investment of time and energy required to create the partnership can yield valuable benefits for decades.

A CBP would expand MWRD's established role as a national leader in proactive management of stormwater. For over two decades, MWRD has led innovative GSI programs and strategies to complement gray infrastructure. These green strategies clean and reduce the amount of stormwater runoff volume and pollution carried into creeks, rivers, and Lake Michigan. If created, MWRD's CBP would become the second such delivery vehicle within the Great Lakes basin and continue to showcase MWRD's leadership across the country.

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1.

Introduction



This project, funded by the Great Lakes Protection Fund, looks at possible frameworks to scale-up large-scale integrated green stormwater infrastructure (GSI) within the Metropolitan Water Reclamation District (MWRD) service area (Figure 1-1). MWRD is a special purpose government agency responsible for wastewater treatment and stormwater management in Cook County, Illinois, and is committed to protect the health and safety of the public and the quality of the water supply source (Lake Michigan), improve the water quality in watercourses in its service area, protect businesses and homes from flood damages, and manage water as a vital resource. This commitment has positioned MWRD to build upon its past work to implement integrated GSI for stormwater management on a large scale.

To serve its 5.19 million residents, MWRD owns and operates 560 miles of intercepting sewers and force mains, 23 pumping stations, 34 stormwater detention reservoirs and controls 76.1 miles of navigable waterways. MWRD's Tunnel and Reservoir Plan (TARP) includes more than 110 miles of tunnels

and three major reservoirs that protect area waterways from pollution and mitigates flooding in communities served by combined sewer systems across 375 square miles. MWRD operates seven wastewater treatment plants – including the Stickney plant, one of the largest in the world – that have a total plant design capacity of over 2 billion gallons per day and treat an average combined daily flow of 1.3 billion gallons (MWRD, 2022).

MWRD is under a consent decree to eliminate a substantial percentage of its Combined Sewer Overflows (CSOs), establish and expand GSI, and provide onsite stormwater storage solutions such as rain barrels to residents in the service area. To date, these requirements have been met and exceeded by the MWRD. Cook County, the closest political subdivision to the MWRD service area, scores at or above the 75th percentile when compared nationally for several environmental justice indicators such as particulate matter (PM 2.5), ozone, diesel particulate matter, air toxics respiratory, air toxics cancer risk, proximity to traffic, lead paint, hazardous waste facilities, and underground storage



tanks. Much of the city of Chicago, which comprises more than 50 percent of the population in the MWRD service area, is considered disadvantaged according to the White House Council of Environmental Quality's Climate and Economic Justice Screening Tool. Investing in disadvantaged communities is essential to create opportunities, bridge socioeconomic gaps, and foster inclusive growth for a more equitable and prosperous society.

Furthermore, over the last few decades, total precipitation amounts impacting the greater Chicago region have increased significantly, resulting in significant and repeated damage to homes, businesses, and other private and public property. Forecasts of future event precipitation amounts are significantly more than what they are today, suggesting the impacts of storms and the resulting damage will continue to get worse. Sinha et al. (2023) presents that across greater Chicago, the 10-year event rainfall volume has already increased by about 30 percent during 1960–2020 and is expected to grow by another 15 percent by 2050 and 20 percent by 2100.

For the 100-year event, the region's rainfall volume has already increased by 50 percent during 1960–2020 and is expected to grow by another 15 percent by 2050 and 20 percent by 2100, resulting in excess rainfall to be managed. Clearly, new bolder solutions are needed.

Expanding MWRD's green stormwater infrastructure (GSI) program can help to reduce flooding and pollution from precipitation events as well as generate various socioeconomic benefits. To further this effort, [Resilient Infrastructure Sustainable Communities](#) (RISC) undertook a review of the MWRD planning documents, projects, and finances along with climate projections, relevant literature, and stakeholder mapping to develop A Blueprint for GSI Scale up Across MWRD's Service Area, which includes a summary of financing and delivery approaches, transactional frameworks and revenue sources, and opportunity areas for future GSI investment. A summarized version of the project's findings is presented in this report.



Introduction

Cook County and Metropolitan Water Reclamation District of Greater Chicago

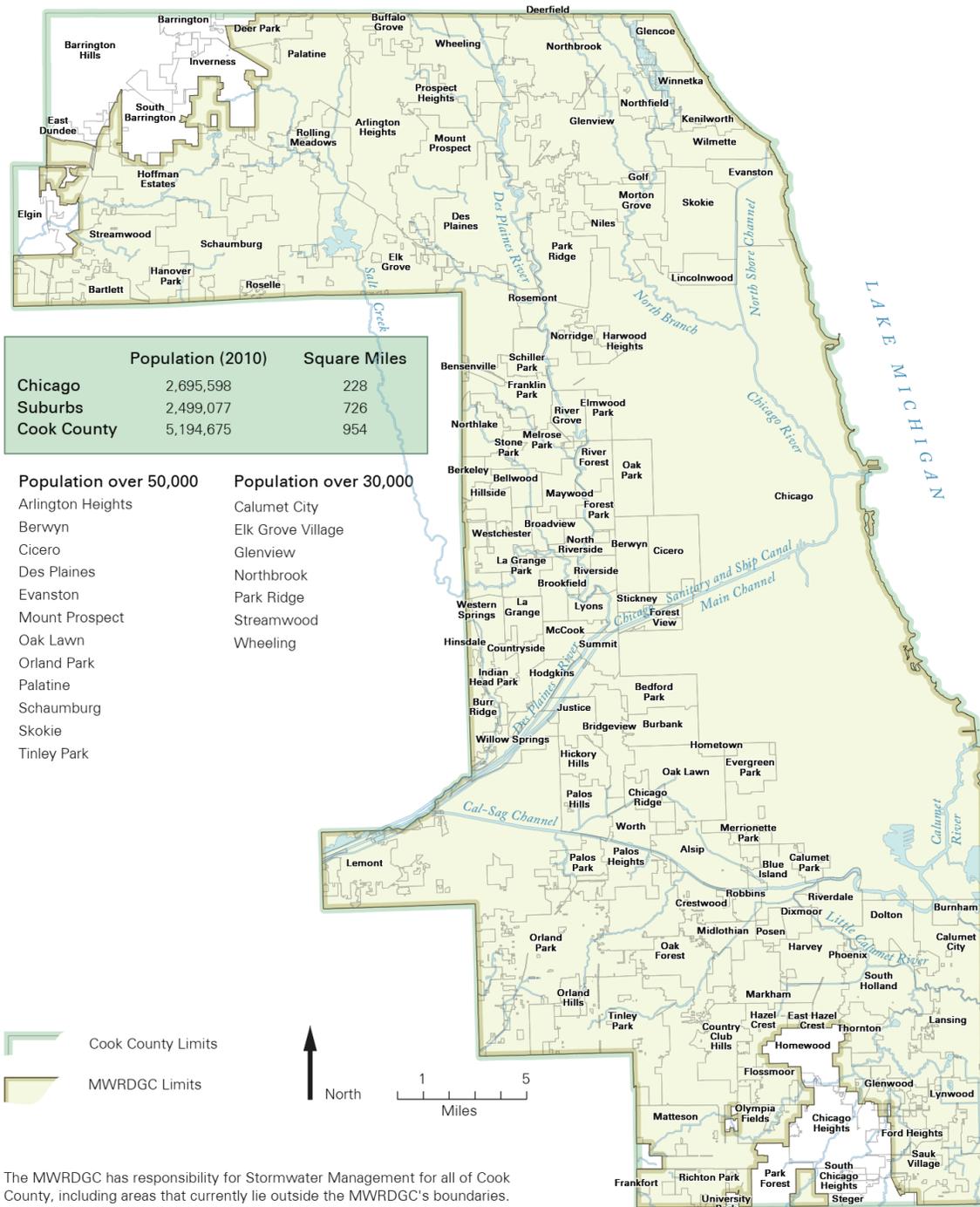


Figure I-1 MWRD's Service Area



2.

The Current State of MWRD's GSI Program



The Current State of MWRD's GSI Program



Recent release (2019) of Illinois State Water Survey's (ISWS) Bulletin 75 shows a 1-inch increase in the 100-year rainfall (from 7.5 inches in year 1989 to 8.5 inches in year 2020). That is equivalent to an additional 15 billion gallons of stormwater that need to be stored, diverted, and safely treated across MWRD's 882 square-mile service area.¹ MWRD has already updated stormwater ordinance based on increased rainfall, but the region needs to update floodplain maps to account for this increase in rainfall. Completion of the Tunnel and Reservoir Plan (TARP) by 2029, as required under the consent decree, will result in 17.5 billion gallons of storage capacity (Ellis, 2014).

By continuing to weave natural features into the built environment, GSI can not only provide stormwater management, but also several other environmental, social, and economic benefits not typically provided by gray infrastructure. GSI increases exposure to the natural environment, reduces pollution in the air and water, provides opportunity for recreation and physical activity, improves safety, promotes community identity and a sense of well-being, and provides economic benefits at both the community and household level (USEPA, 2017). By siting

GSI in underserved areas, it has the potential to increase equity in outcomes such as reduced heat island effect, visual aesthetics, and neighborhood desirability, increased green spaces, and reduced crime through revitalization of vacant lots. Research has shown that distributing GSI across the landscape, as opposed to clustering it either upstream or downstream, is effective even at low coverage during small storms (Zellner et al., 2016).

MWRD has several GSI programs that are made possible through partnerships with local communities, agencies, and other governmental organizations. The two most prominent ones are the Green Infrastructure Partnership Opportunity Program and Space to Grow. The adoption of a GSI Plan by MWRD has accelerated the interest and acceptance of GSI throughout Cook County.

In [2014, MWRD set up the Green Infrastructure Partnership Opportunity Program](#) to increase the use of GSI throughout Cook County. Starting in 2017, the MWRD introduced the GSI Call for Projects to scale up its investment into GSI. This effort resulted with MWRD initially partnering with 19 communities and public

¹ This assumes the entire service area is impervious, which is not the case. So, this additional volume of stormwater is an upper limit as per this projection.



agencies throughout Cook County to fund and build GSI projects. Due to the success of the program, a call for projects has been issued each subsequent year resulting in projects providing millions of gallons of stormwater runoff storage using rain gardens, bioswales, and permeable pavement in parking lots, alleys, and residential streets.

Since 2017, MWRD has partnered with municipalities, townships, school districts, park districts, and other governmental organizations for over 92 GSI projects that seek to reduce peak flooding, build community green spaces, and improve water quality. These projects that have finished construction provide nearly 6 million gallons of storage for stormwater runoff and their continued performance should remain effective if the projects are properly maintained by the municipal owner through the life of the GSI installation, which can last a minimum of 20–30 years.

MWRD’s collaboration with regional organizations such as the Chicago Metropolitan Agency for Planning (CMAP), Center for Neighborhood Technology (CNT), Metropolitan Planning Council (MPC), and others have ensured that projects are participatory, community-focused, and often funded and recognized for the full range of benefits they offer communities. For instance, in 2021, MWRD’s expansion of the Buffalo Creek Reservoir to increase flood resiliency won a [Regional Excellence Award](#) from CMAP. A similar collaborative framework has shaped the success of the Space to Grow program, which incorporates GSI in schoolyards (described in detail in Chapter 3). Finally, communities in the MWRD service area may choose to implement their own GSI projects without any funding or involvement from MWRD. Those will not be reflected in this analysis but will contribute to the improvements in water quality and flood control in the MWRD service area.

3.



The Case for GSI Scale Up



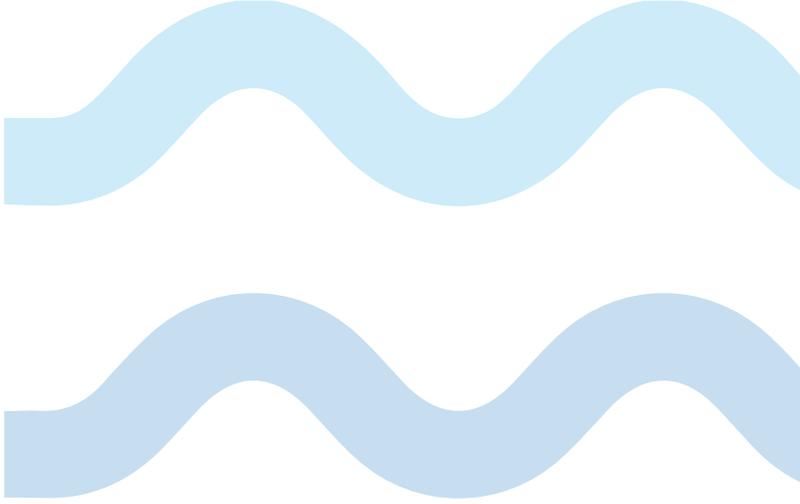


General Overview and Benefits

GSI often contributes significant economic, social, and ecological value to communities, which often outweigh those associated with gray infrastructure alone. First and foremost, GSI projects mitigate not only flooding but also extreme heat, whereas gray infrastructure projects can increase the urban heat island effect. Additionally, GSI produce ecosystem services that enhance quality of life and wellbeing, including improved aesthetics and urban beautification, increased property values, water and air filtration, food production, and so on. These projects can also create local jobs for landscaping and maintenance of urban greenspaces, which can be leveraged by cities to further address distributive and structural inequities by offering job training programs for underserved communities and jobs for formerly incarcerated persons (Hughes et al., 2021).

Cities around the world have committed to scaling up investments in green infrastructure, in part to mitigate the growing urbanization. Globally, urban areas are expected to increase from 15 percent in 2020 to 18.2 percent in 2030 (Wray, 2022). In 2021, thirty-one mayors – including Los Angeles, New Orleans, Seattle, and Austin – signed the C40 Urban Nature Declaration. This declaration pledges to convert 30 to 40 percent of urban surfaces to green or blue infrastructures and to ensure that 70 percent of residents have access to green or blue public areas within a 15-minute walk or bike ride by 2030 (C40 Cities, 2021).

Many cities throughout the U.S. have already made significant progress in scaling up green infrastructure. A recent report, *The State of Public Sector Stormwater Infrastructure 2022*, surveyed 52 public sector stormwater management organizations across the U.S. to understand current trends in GSI investment and explore barriers and opportunities for expanding these investments (Green Infrastructure Leadership Exchange, 2022). The participating organizations serve approximately 44.5 million people, or around 13.4 percent of the total U.S. population. The survey found that participants' fiscal year 2022 investments in GSI ranged from \$0 to \$90 million, with a median investment of \$280,000. Seventy three percent of respondents predicted at least a modest increase in GSI investment in the next five years, with 16 percent of respondents predicting a significant increase in their GSI investment – suggesting that a growing number of cities are realizing the potential benefit for incorporating GSI into their stormwater management strategies.





The Case for GSI Scale Up

Philadelphia is an example of a city that has rapidly scaled up its investment in GSI and realized significant benefits. In 2011, Philadelphia began to implement its *Green City, Clean Waters* plan to mitigate stormwater through GSI projects. Since 2011, the city has implemented 2,800 “green tools” or GSI projects at nearly 800 sites around the city (Philadelphia Water Department, 2022). These investments in GSI have kept 2.7 billion gallons of polluted water out of the city’s rivers. The city has also strategically selected areas of the city with high heat-stress to simultaneously address extreme heat risk. The city has surpassed its ten-year pollution reduction goal and is powering ahead to meet its 25-year commitment to the EPA to reduce CSOs by 85 percent. A study by Econsult Solutions in 2018 found that *Green City, Clean Waters* generated \$4 billion in economic impact, saving the city \$50 million annually in avoided health costs and access to green space and generating 1,160 new jobs annually.

Milwaukee is another example of a metro area growing its investment in GSI. The Milwaukee Metropolitan Sewerage District (MMSD) and Corvias Infrastructure Solutions, LLC recently created the Fresh Coast Protection Partnership (FCPP)² aimed at capturing 11 million gallons of stormwater across 19 municipalities, reducing overflow volume and regional flooding on private land, the combined sewer service areas, and in communities within the greater Milwaukee region. The FCPP has committed \$29.2 million in funding for GSI projects over an eight-year period. The partnership will not only mitigate flood risks but will also build local capacity and participation in the region and contribute to improved equity – awarding 30 percent of contracts to small, minority, and women-owned enterprises and siting at least 50 percent of projects in low-to-moderate income areas.



² Corvias. n.d. Fresh coast protection partnership. Accessed on June 22, 2023 at <https://www.corvias.com/projects/fresh-coast-protection-partnership>.

DRIVERS FOR GSI SCALE UP IN MWRD'S SERVICE AREA

There are several drivers for scaling up GSI across MWRD's service area:

Environmental Health and Compliance

Scaling up investments in GSI can support environmental compliance. On January 6, 2014, a federal judge approved MWRD's [consent decree](#) – a binding agreement between various parties including the EPA, the State of Illinois, and MWRD – that detailed specific steps the agency will take to maintain full compliance with the Clean Water Act and other federal guidelines. Under the consent decree, MWRD must implement measures to “eliminate a substantial percentage of CSOs” by December 31, 2029. To date, more than \$3.7 billion have been spent on TARP and less than \$50 million remains to be spent and the above goal remains on target by that date.

The 2014 consent decree includes establishment of a GSI program, which MWRD is required to maintain for the duration of the consent decree. Under the program, MWRD must provide 2 million gallons of design retention capacity using GSI within 5 years (2019) and subsequently increase that to 5 million gallons within 10 years (2024), and later to 10 million gallons within 15 years (2029). MWRD is well ahead of this goal – GSI installations since 2017 under the Green Infrastructure Partnership Opportunity Program alone account for 16 million gallons of design storage.

³ https://www.cmap.illinois.gov/updates/all/-/asset_publisher/UIMfSLnFfMB6/content/strategies-to-reduce-the-effects-of-flooding-in-metropolitan-chicago

⁴ Precipitation Frequency Estimates (PFE) are estimated rainfall depths for a given return period such as 10-years or 100-years. A 10-year return period event will occur, on average, once for every ten years of record or has a 10% chance of occurring in any given year.

⁵ Risk Factor. 2022. Does Cook County Have Risk? https://riskfactor.com/county/cook-county-il/17031_fsid/flood

Flood Risk Reduction

The Chicago region experiences significant and repeated damages from flooding and requires continued investment in flood control strategies like GSI. Between 2007 and 2014, \$2.3 billion in damages were paid out from public and private sources statewide, according to a 2015 Illinois Department of Natural Resources report that reviewed the cost and prevalence of urban flooding.³

An analysis of precipitation frequency estimates (PFE)⁴ of large Midwestern cities suggests that Chicago has experienced a 50 percent increase in PFE for a 100-year storm during the period beginning 1960 till present day (Sinha et al., 2023). The PFE for a 10-year storm has increased by about 30 percent during the same period. Projected PFEs for mid- and late-century suggest that the increase is likely to continue. Relative to currently used 10-year and 100-year estimates, Chicago is expected to experience a 15 percent increase by mid-century and 20 percent by late century, respectively. As a result, a 100-year event is expected to produce over 151,000 MG (9.9 inches) by mid-century and nearly 158,000 MG (10.3 inches) by late-century; by comparison, a similar storm event today will produce 131,600 MG (8.6 inches).

According to the First Street Foundation, more than 200,000 properties in Cook County, representing a quarter of all properties in the county, are at the risk of being severely affected by flooding in the next 30 years.⁵ Urgent action will be needed to mitigate flood risk as it grows more severe in the coming years.

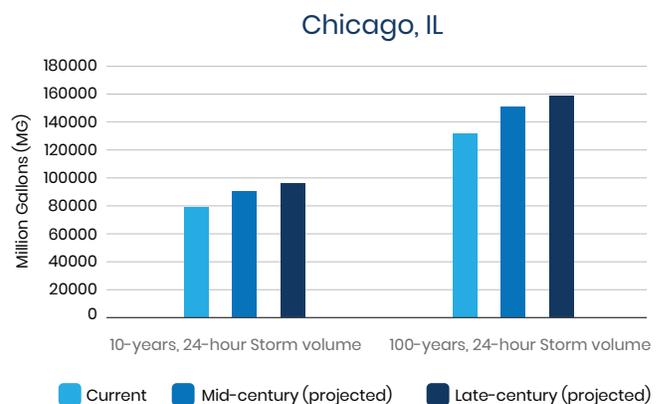


Figure 3-1 Chicago 10-yr and 100-yr Future Precipitation Estimates



The Case for GSI Scale Up

An equity analysis of GSI projects in the MWRD service area found that Space to Grow projects are indeed located in environmental justice (EJ) priority neighborhoods compared to the rest of the city. However, GSI projects are underrepresented in EJ areas under the Green Infrastructure Partnership Opportunity Program. Differences in program structure likely explain the varying results.

Equity and Environmental Justice

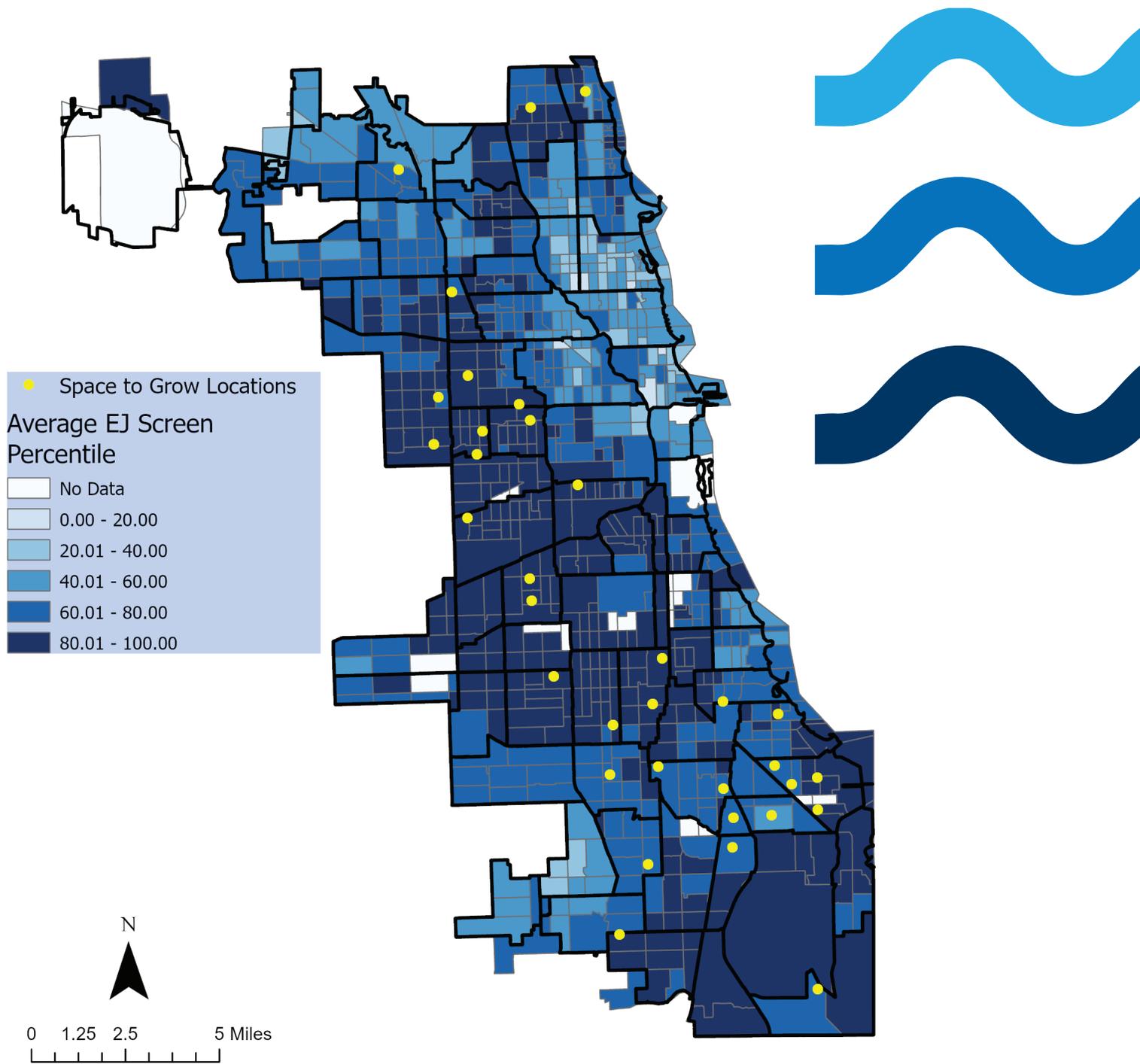
Flooding does not affect all populations equally. Exposure to flooding risks appears to be greater in populations and communities already facing vulnerability due to socioeconomic, demographic, and health factors (Lowe et al., 2013; U.S. Water Alliance, 2020). During flooding events, the elderly and residents with disabilities or illnesses are most vulnerable, particularly when power outages and transportation disruptions inhibit them from meeting daily needs, for example, for medical treatment. Low-income residents may struggle to pay for flood insurance, the clean-up costs and loss of personal belongings, as well as the repairs that could reduce their flood exposure even more in the future.

Black, Indigenous, and people of color (BIPOC) in segregated areas also face greater flood risk in many cities due to historic disinvestment in their neighborhoods and limited access to environmental amenities (Hughes et al., 2021). Property damage from recurring flooding can contribute to larger scale disinvestment that is not fully captured in insurance claim or disaster relief data. In turn, local governments already facing constraints due to disinvestment may have a particularly difficult time responding during floods or taking preventative measures that reduce future risk. GSI can be prioritized in underserved areas to mitigate flood risk and provide environmental amenities that enhance quality of life and well-being.

MWRD, in partnership with the Chicago Public Schools, the Chicago Department of Water Management, Healthy Schools Campaign, and Openlands, supports the Space to Grow program that incorporates GSI in schoolyards and transforms them into play and learning spaces. *Space to Grow* prioritizes communities with the greatest need for opportunities for physical activity and green space. Low-income communities with high rates of obesity are prioritized, as are schools that are at risk for flooding, geographic equity and schools that express a commitment to the program.

Overlaying the locations of these schools on a neighborhood map of Chicago along with the EJ scores suggests that not only are schools located in more disadvantaged neighborhoods (EJScreen percentile = 80.3) compared to the rest of the city (EJScreen percentile = 71.0, $p < 0.01$ using independent t-test), there is no significant difference between the census tract they are in (EJScreen percentile = 65.8) versus the rest of the neighborhood (EJScreen percentile = 71.4, $p = 0.70$ using paired t-test) (Figure 3-2). This implies that there is little to no selection bias and schools participating in this program are indeed not only located in disadvantaged neighborhoods but are in census tracts that are representative of that neighborhood.

Map of Census tracts delineated by community boundaries of the City of Chicago and colored according to EJ Screen Percentiles



Made with data from US Census Bureau, EPA EJ Screen Data 2022, Chicago Data Portal, Cook County, and MWRD files.

Figure 3-2 Equity analysis of schools participating in the *Space to Grow* program.



The Case for GSI Scale Up

A similar analysis of GSI projects in the MWRD service area funded through the Green Infrastructure Partnership Opportunity Program found slightly different results (Figure 3-3). Census tracts with GSI projects (EJScreen percentile = 65.80) are less disadvantaged than census tracts that do not have GSI project (EJScreen percentile = 71.37, $p = 0.69$ using independent t-test), but the results are not statistically significant. After excluding the City of Chicago and restricting the analysis to only those municipalities that have one or more GSI projects, the difference between census tracts with GSI projects (EJScreen percentile = 64.46) and those without GSI projects (EJScreen percentile = 64.13, $p = 0.91$ using paired t-test) narrows and they are statistically not different from each other. Conducting the same analysis with CDC's Environmental Justice Index scores (results not shown here) instead of EPA's EJScreen yielded similar results, suggesting the results are robust to method specification.

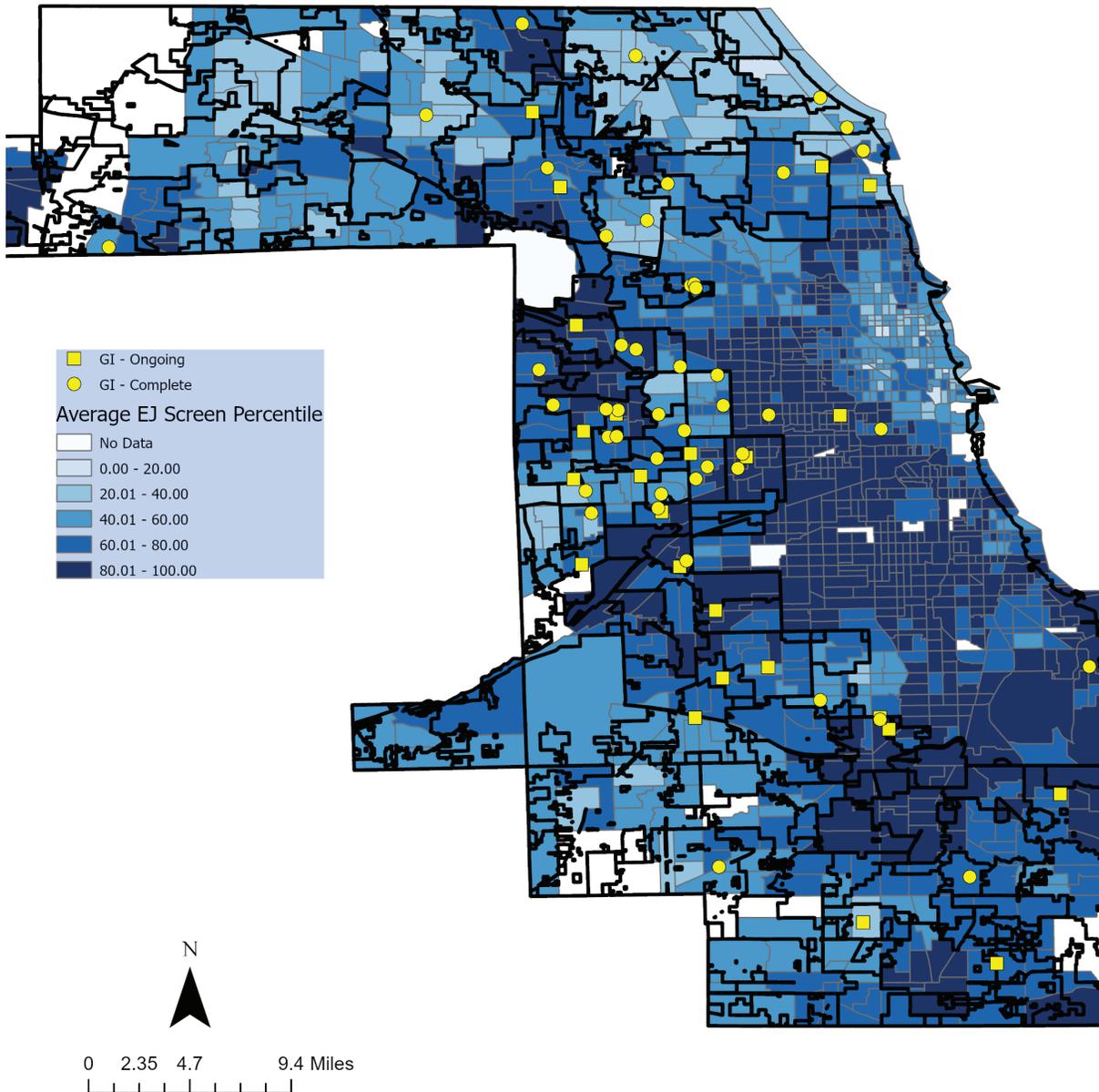
MWRD has committed to prioritizing equity and environmental justice through its investments, and GSI offers an opportunity to address past harms while providing new, environmental amenities to benefit underserved communities.

Political Support

Investments in GSI can help MWRD to achieve related policy goals and commitments, such as those for tackling climate change and environmental justice issues. In 2023, MWRD adopted a Climate Action Plan that prioritizes carbon reduction in support of the MWRD's 2021-2025 Strategic Plan.⁶ These documents guide future infrastructure planning and outline how the MWRD will address climate action through a variety of adaptation and mitigation strategies to maintain its reliable and essential services – which include a significant emphasis on stormwater management strategies utilizing GSI. Similarly, MWRD adopted an [Environmental Justice Policy](#) in 2023 that expands access to District resources across underserved areas and prioritizes flood control and outreach/technical assistance for these communities. GSI is viewed as one way to support this policy through programs such as *Space to Grow*.

⁶ MWRD. 2022. MWRD seeks public comments on draft climate action plan. Accessed on January 18, 2023 at: <https://mwrdd.org/mwrdd-seeks-public-comments-draft-climate-action-plan>

Map of MWRD Service Area delineated by US Census tracts and Service Areas. Census tracts have been colored according to EJ Screen Percentile data.



Made with data from US Census Bureau, EPA EJ Screen Data 2022, Chicago Data Portal, Cook County, and MWRD files.

Figure 3-3 Equity analysis of GSI projects in MWRD service area.



4.

MWRD's Capital Spend Plan and Allocation to GSI



MWRD's Capital Spend Plan and Allocation to GSI

In December 2021, the MWRD's Board of Commissioners approved a \$1.3 billion budget for 2022, a 7 percent increase over the 2021 budget. More than a quarter of the revenue comes from State Revolving Fund loans and future bond sales. A similar proportion comes from net assets appropriated and net tax sources. While varying each year, these three sources are the top revenue generation mechanisms for MWRD. The rest of the revenue comes from user charges, land rental, grants, investment income, and sewer permit fees.

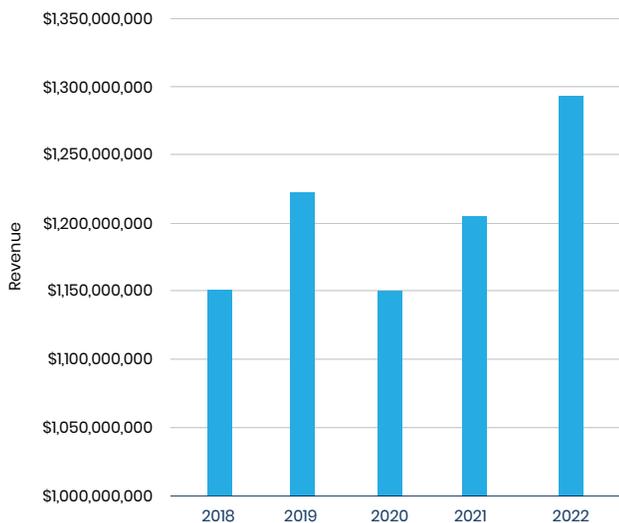


Figure 4-1 MWRD revenue during 2018-2022.

On the spending side, construction and design is the largest expense, followed by bond redemption and interest fund, plant operation and maintenance, and staff services. Related to the consent decree, the District invests a significant amount of funding in flood and pollution control. This spending includes costs associated with design and construction of “projects to build tunnels, reservoirs, and control structures under TARP, and manage construction of projects to construct and rehabilitate flood control reservoirs, relocated streams, and improve conveyance channels.” The 2022 budget appropriated \$4.5 million for flood and pollution control, a 46.8% increase from 2021. Flood and pollution control accounted for 16.3% of the Corporate Fund.

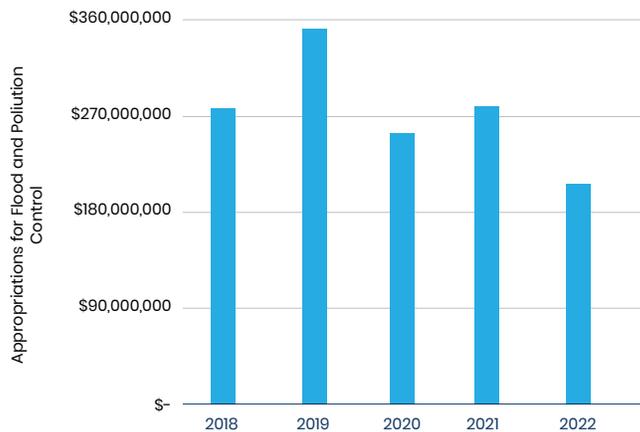


Figure 4-2 Appropriations for Flood and Pollution Control during 2018-2022.

The stormwater management fund is used to pay for gray and green stormwater infrastructure projects to control flooding and to help reduce pollution from CSOs. In 2022, MWRD appropriated \$97 million to the Stormwater Management Fund (Figure 4-2). The 2023 Budget has significantly increased appropriations for this fund, reaching approximately \$129 million, or a 33 percent increase from 2022. Meeting the requirements of the consent decree and implementing an equitable GSI program will require MWRD to continue scaling up its investment in stormwater management – especially as climate change contributes to greater flooding and could increase risk for CSOs.



Financing and Delivery Mechanisms for MWRD's Green Stormwater Infrastructure

Scaling up GSI across MWRD's service area will require new approaches for project financing and delivery as well as innovative transactional frameworks and revenue sources. In this section, we describe traditional public funding and financing approaches as well as innovative mechanisms adopted by MWRD's peer institutions across the country.



Public and Private Funding Sources

There are several funding sources that can be leveraged to pay for GSI scale up, including both public and private financing, as shown in Table 5-1.

Funding Source	Type	Description
Federal Government	Infrastructure Investment and Jobs Act (IIJA)	IIJA authorized \$10 billion for states, tribes, local governments, and other entities to support the implementation of green infrastructure, water efficiency and restoration projects. Additionally, the IIJA authorizes \$5 billion for the EPA to provide grants to states and tribes to help them address combined sewage and stormwater overflows.
	Inflation Reduction Act (IRA)	IRA will invest nearly \$370 billion in energy security and climate change efforts over a 10-year period. This includes \$27 billion to the EPA for a new Greenhouse Gas (GHG) Reduction Fund, of which \$8 billion is set-aside for low-income and disadvantaged communities; \$3 billion for "Environmental and Climate Justice Block Grants" to reduce pollution and climate threats in disadvantaged communities; \$19.5 billion for agricultural conservation programs through USDA; \$2.2 billion for tree planting and related activities under the Urban and Community Forestry Program at USDA; and \$1 billion funding for energy and water efficiency improvements through the Department of Housing and Urban Development (HUD).
State Government	Green Infrastructure Grant Opportunities (GIGO)	The State of Illinois' GIGO program provides funding for the construction of green infrastructure best management practices (BMPs) that "prevent, eliminate, or reduce water quality impairments by decreasing stormwater runoff into Illinois' rivers, streams, and lakes." The program has an annual budget of \$5 million and awards two to 10 awards per year. Eligible applicants include local watershed groups, land conservancies or trusts, public and private for profit and nonprofit organizations and institutions, governments (county, municipal, township, or state), universities and colleges, park districts and other local land managing agencies, soil and water conservation districts, and conservation organizations. GIGO provides up to 75 percent of the approved project costs (85 percent for projects in disadvantaged areas).
	Nonpoint Source Pollution Control Financial Assistance Program	The State of Illinois administers the Nonpoint Source Pollution Control Financial Assistance Program under Section 319(h) of the Clean Water Act. Funds can be used for the development, update, and implementation of watershed-based management plans including the development of information/education programs and for the installation of best management practices. The Illinois EPA expects to award \$4.5 million in funding during FY2024.
Local/Special District Government	Stormwater Management Fund	MWRD's Stormwater Management Fund is used to pay for gray and green stormwater infrastructure projects to control flooding and to help reduce pollution from CSOs. In 2022, MWRD appropriated \$97 million to the Stormwater Management Fund. MWRD can grow its existing revenue streams, including revenues collected via its tax levy, user charges, land rental, investment income, and sewer permit fees.
Private Sector	Environmental Impact Bond (EIB)	EIBs are a tool for helping cities finance innovative programs and projects where traditional sources of financing may be harder to access. These bonds draw in private capital for investments in environmental projects such as GSI for improving water quality and are repaid based on the relative success of the project in achieving anticipated outcomes. In addition to financial de-risking, key benefits of the impact bond model are ease of execution, which can accelerate funding for innovative uses, lack of a long-term privatization, or encumbrance of an asset, and a very high degree of flexibility.

Table 5-1 Possible Funding Sources

Delivery Framework for GSI Scale Up

The primary delivery framework we propose for scaling up GSI across MWRD’s service area is a community-based partnership (CBP). A CBP is a long-term partnership between a public and private entity to design, build, finance, operate, and/or maintain (DBFOM) stormwater infrastructure. The partnership provides a flexible, adaptive project delivery model that can provide long-term project financing, at risk upfront investment into capacity building to incorporate socio-economic goals, provide predevelopment for more shovel ready projects, expedite competitive procurements, and lower-cost implementation of GSI. The model will allow MWRD to undertake a CBP as either a region-wide program, or some subset of MWRD’s member and non-member communities.

A CBP is easily scalable and uses at-risk capital for project financing, which defers upfront costs and can enable MWRD to immediately implement significant GSI. In addition, by developing a partnership structure that drives surety of execution and lifecycle asset management, MWRD can access a wider variety of funding options and is not limited to either public or private financing. Instead, MWRD

can choose a hybrid of funding types that offers the best value for money. As discussed later in this chapter, a majority of CBPs across the country currently use state revolving funds, and the private partner in a CBP is typically agnostic to the type of financing or funding used by the partnership.

The legal framework of a CBP can be structured in many ways, and Figure 5-1 outlines one such method – a special purpose entity (SPE). A partnership that is constructed as a SPE has the right to carry out the construction and operation of the CBP. This enables the partnership to obtain a highly efficient, low-cost form of financing known as “limited recourse” or “non-recourse” financing (Prince George’s County, 2016). This type of financing is not treated as an MWRD borrowing. Instead, it resides within the partnership structure and therefore limits liabilities and investor recourse. With this type of structure, a dedicated revenue or funding stream can be leveraged to raise the debt required to fund the entire program with no recourse back to MWRD. Historically, this type of project financing has raised capital at 10-to-1 leverage ratios (Lueckenhoff and Brown, 2015).

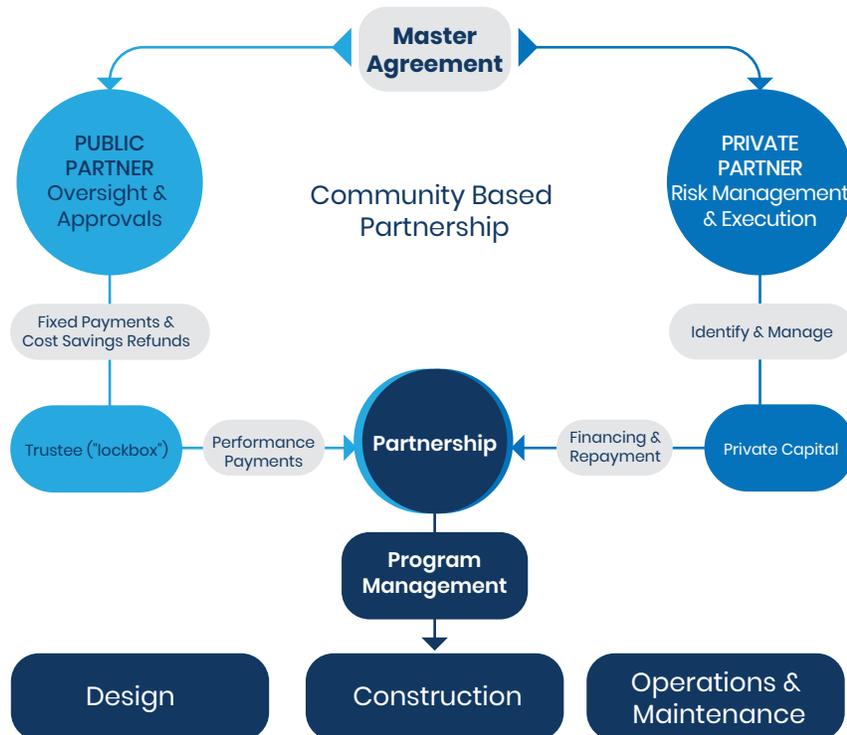


Figure 5-1 Legal framework structure of a CBP partnership



Financing and Delivery Mechanisms for MWRD's Green Stormwater Infrastructure

TRANSACTIONAL FRAMEWORKS AND REVENUE SOURCES

After reviewing the information provided by MWRD, the team identified two possible transactional frameworks that could be pursued to initiate a public-private partnership into GSI that include a CBP, with or without an EIB.

Option 1: CBP

This option proposes the formation of a 10-year to 30-year, formal, CBP with MWRD to design, build, finance, operate, and maintain (DBFOM) GSI on behalf of MWRD. Such a partnership typically includes the implementation of a tailored, socio-economic plan that provides local economic development and community revitalization benefits as outlined by MWRD.

The partnership can be in the form of a project or special purpose entity (SPE), typically in the form of a Limited Liability Company (LLC). The SPE is structured specifically for the public purpose and benefit; allowing for the SPE to be flexible and take on a variety of structures such as a Joint LLC, where both the public and private partner serve as members in the LLC, or a Service Concessionaire Agreement (SCA) where the public entity retains full ownership and contracts with the private sector to design, finance, construct, maintain and/or operate varying facilities or assets for a specified length of time. It is the uniqueness of this partnership structure that allows MWRD to separate itself from the financial risk of the program while still maintaining an appropriate amount of control and oversight. The partnership will be a separate entity with independent financial accountability and rights of access to implement the actual work for contract/project performance. MWRD will retain control over funding through a lender-appointed, third-party lockbox that is set up on behalf of the partnership and managed according to a mutually agreed-to servicing and lockbox agreement.

The partnership structure allows for access to a variety of low-cost financing structures, including SRF/WIFIA, tax-exempt bond financing and grant funding sources, which can provide debt to the project at very low interest rates and, more importantly, may not impact MWRD's debt capacity or rating. This leaves MWRD free to pursue other programs that may require debt financing. Utilizing a revenue stream that is determined during the collaboration phase with MWRD, the partnership will leverage the funds and raise the debt required to implement these programs with no recourse back to MWRD. While the revenue stream has not yet been quantified, historically this type of partnership has raised capital/annual revenue at 13.5-to-1 leverage ratios (Lueckenhoff and Brown, 2015).

The private partner's compensation will be in the form of performance-based incentive fees to be awarded with approval of MWRD based on the achievement of key performance indicators to be determined by the partnership and will only be paid if the parties perform. Unpaid fees will be invested back into these programs to be used as a source for construction or for future infrastructure upgrades at the discretion of MWRD. Limiting and incentivizing return, as opposed to sharing in the overall profitability of the project, accomplishes several important goals: aligned interests rather than competition for cash flow, maximized project funds to be reinvested, a sustainable financing structure, and a flexible approach.



Option 2: CBP with an EIB

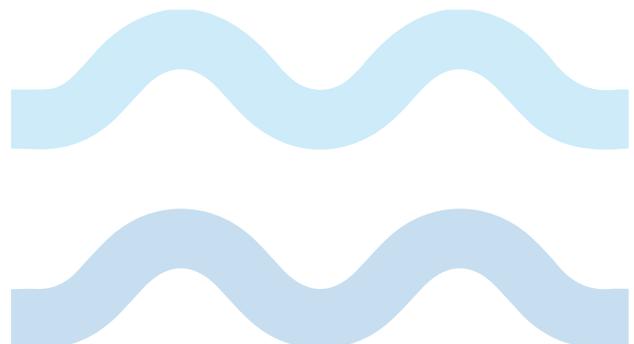
A CBP could also be implemented with an EIB. A typical EIB would fund a \$20–50 million GSI project but is flexible so MWRD could evaluate a larger project or a portfolio of smaller projects. Regardless of the size of the EIB, this structure reduces MWRD’s performance risk for the project, as their pay back is dependent on the project’s effectiveness. It also provides a rich data set to assess the cost effectiveness of various types of GSI.

An EIB is similar to a social impact bond, allowing the government to transfer the risk of trying something new partially or wholly to the private sector. Private-sector investors, typically motivated by impact investments, would provide capital to fund the construction, and, if desired, a portion of the maintenance of GSI projects, and the government would repay the loan based on how successful the program was at generating stormwater retention and management.

An EIB could be issued as a traditional tax-exempt municipal bond, depending on investors available, at MWRD’s long-term cost of capital. A successful EIB would require MWRD to work with all other relevant actors – including investors, bond counsel, project developers, and, potentially, philanthropy or private property owners – to agree upon what metrics should be used to determine the “success” of the project. Generally, with GSI, this would be related to the ability of the project to control stormwater at a given cost, but other metrics could be related to the

actual implementation of the project, such as workforce development. Based on these metrics, the parties would need to agree on several scenarios (e.g., “underperformance,” “performance,” “overperformance”) that would correspond to differing levels of return to the investor. These parties would also need to agree on how and when those metrics should be measured, and what different levels of repayment should be based on each scenario.

A potential challenge with reimbursement programs is lack of transparency as to what constitutes a cost-effective project. Projects applying for MWRD’s program cannot be expected to be comparable to large GSI projects led by the District, as they are of different scale. However, this does not mean that all projects are an equal use of MWRD’s limited grant budget. EIBs are the ideal financial tool for assessing which types of SCMs or locations are most cost-effective for managing stormwater and could be used to either assess requests or, ideally, to offer a flat amount based on gallons retained that would incentivize the most cost-effective projects and deter high cost, low impact projects.





CBPs: Case Studies:

Seattle Public Utilities (SPU) in Washington: A \$15 Million Program Funded by SPU General Funds

In 2023, the Seattle Public Utilities set up a CBP – the RainCity Partnership – to expand the use of GSI solutions to deliver high quality green stormwater retrofit projects as well as riparian restoration and other demonstrable community-based outcomes in BIPOC communities in Seattle to meet the flow, water quality, and racial and social equity objectives of the program. The program will incorporate no less than ten community-driven projects, at least one acre of riparian restoration, a minimum of 40 percent of the total workforce, hours worked, from priority hire zip codes, mentorship of at least twelve Minority Enterprise or Community Based Organizations and an anticipated inclusion of at least 28% Minority or Women Enterprise firms.

Los Angeles Bureau of Sanitation and Los Angeles Department of Water and Power: A \$14 Million Program Funded by County Stormwater Fees

In 2019, LA Sanitation and Environment (LASAN), in partnership with the Los Angeles Department of Water and Power (LADWP) and the California State Coastal Conservancy (SCC), set up a program to capture, filter, and recharge stormwater to increase groundwater replenishment in the San Fernando Valley Basin and improve water quality downstream in the Los Angeles River. The CBP allowed the aggregation of four green streets together to provide a guaranteed maximum price for the design, construction, monitoring, and maintenance of the program. More than 50% of contracted firms were Small, Minority and Women Owned Business Enterprises (SMWBEs). In 2021, the American Society of Civil Engineers (ASCE) Metropolitan Los Angeles Branch awarded this program the Outstanding Roadway and Highway Project of the year.



Milwaukee Metropolitan Sewerage District in Wisconsin: A \$29 Million Program Funded by State Revolving Funds

In 2020, the Milwaukee Metropolitan Sewerage District set up a CBP – the Fresh Coast Protection Partnership – to expand the use of GSI solutions to capture more than 11 million gallons of stormwater across 19 municipalities in the Greater Milwaukee Region. More than 50% of the projects are located in low to moderate-income areas to ensure historically under-invested communities are prioritized. The GSI projects use multiple device types, and 90% of the projects are implemented on private property. The program has already achieved 50% participation from Women Minority Business Enterprises (WMBE), well in excess of the 30% target.

City of Chester in Pennsylvania: A \$46 Million Program Funded by PennVest's Clean Water State Revolving Funds

In 2018, the Stormwater Authority of the City of Chester set up a CBP to meet the City's stormwater challenges and restore aging infrastructure. Located on the Delaware River, Pennsylvania's oldest city has been impacted by deteriorating infrastructure, localized flooding, and polluted waterways. With an annual per capita income of just over \$15,000 and about one-third of the population living below the poverty line, the CBP was structured with the goal of utilizing the needed environmental improvements as a catalyst for local economic growth and community involvement. To date, 52% of program expenditures have gone to minority-owned businesses. Local resident participation is approximately 35%, well above the goal of 15% under the program. The program has evaluated, restored, and repaired the City's 1,700 catch basins and is capturing harmful pollutants.

Prince George's County in Maryland: A \$350 Million Program Funded by Maryland Department of Environment's Clean Water State Revolving Funds

Since 2015, Prince George's County, MD has invested \$350 million to set up and maintain GSI across nearly 6,000 acres through a CBP called the Clean Water Partnership (CWP). The county needed a cost-effective and immediate solution to treat and manage stormwater runoff to meet its regulatory compliance under the Clean Water Act. To date, installed GSI removes more than 55,700 lbs. of nitrogen, 7,700 lbs. of phosphorous, and 5 million lbs. of suspended solids annually. The CWP is structured such that the program funds are to be used to contract with small, local, and minority-owned businesses, enabling them to participate in projects. To date, 79% of all funds have been awarded to target-class businesses, comprising of small, local, and minority-owned entities and 63% of the hours are worked by county residents.

6.

Public Input and Engagement





Public Input and Engagement

The project team interviewed eight community organizations and municipal departments from five priority areas located in the MWRD service area. These priority areas are made up of 34 communities and municipalities that:

1. Include census tracts with an Environmental Justice Index (EJI) score greater than 0.8, and
2. Have the highest Flood Susceptibility Index (FSI) score of 10 for most of the community.

The project team developed a stakeholder list containing contact information for local community organizations, places of worship, community leaders, and municipal community liaisons. The project team held 45-minute informal interviews with interested community members to understand community

priorities, flood mitigation and GSI needs, and recommend engagement strategies. Based on community engagement activities, the project team proposes several future GSI projects (as shown in Table 62). Representatives from the following organizations were interviewed:

1. [Garfield Park Community Council](#)
2. [Far South Community Development Corporation \(CDC\)](#)
3. [Rosemoor Community Association](#)
4. [Calumet WRP Community Partnership Council](#)
5. [Grow Greater Englewood](#)
6. [Urban Growers Collective](#)
7. [Maywood Park District](#)
8. [Chicago Department of Planning and Development \(DPD\)](#)

Project Name	Organization	Community	Description	Location
Dr. Martin Luther King Drive Gardens	Rosemoor Community Association	Rosemoor	<ol style="list-style-type: none"> 1. Upgrading the quality of the MLK Gardens to make them more accessible to public tours with focus on schools 2. Develop the Green space area to make it green friendly, engage the community with the development, and creating a space that is meditation inviting. 	E 99 th Pl Chicago, IL 60628
Englewood Nature Trail & Englewood Agro-Eco District	Grow Greater Englewood	Englewood	2-mile linear park that will connect with the Agro-Eco District, which will be a network of farms that promotes local food access, community health and wellness, and business and job development	Between W 58th St and W 59th St and S Hoyne Ave and S Lowe Ave
George Washington Elementary Playground	Calumet Partnership Council	East Side	CPC member mentioned that the elementary school was getting a new playground and suggested that it would be good to integrate GSI into the project.	3611 E 114 th St

Project Name	Organization	Community	Description	Location
Morgan Park Commons	Far South Community Development Corporation	East Morgan Park	12.06-acre project that will redevelop the former Jewel Osco into an affordable and market-rate rental housing and townhomes, retail, and a community center	115 Street and Halsted Street
The Rise at Halsted	Far South Community Development Corporation	East Morgan Park	The project will develop a 26-unit residential building with a ground floor retail.	113th Street and Halsted Street
Roseland Medical Center	Far South Community Development Corporation	Roseland	Far South Community Development Corporation was hired as the administrative support organization to manage the operations and programs for the Roseland Medical District Commissioners. The City of Chicago funded the comprehensive Master Plan for the 95-acre site.	45 W 111 th St Chicago, IL 60628
Jackie Robinson Office Center	Far South Community Development Corporation	Roseland	Redevelopment of a vacant commercial space into a 33,000 square feet of retail/office space.	Southeast corner of 106th Street and South Halsted Street
FED: Mixed Use Residential	Far South Community Development Corporation	Washington Heights	Development of 50 units of mixed-use housing with 8,000 square feet of retail space.	
Sustainable Square Mile	Blacks in Green	Woodlawn	Currently vacant lot to be developed into GSI as part of the Blacks in Green Sustainable Square Mile initiative	6444 S Langley Ave, Chicago, IL
Sustainable Square Mile	Blacks in Green	Woodlawn	Currently vacant lot to be developed into GSI as part of the Blacks in Green Sustainable Square Mile initiative	6357 S Langley Ave, Chicago, IL
Sustainable Square Mile	Blacks in Green	Woodlawn	Currently vacant lot to be developed into GSI as part of the Blacks in Green Sustainable Square Mile initiative. Will be the terminus of the mid-block greenway currently being planned, connecting the Till House Museum with the Green Living Room.	6429 S Evans Ave, Chicago, IL
Golden Gate Park	Far South Chicago Coalition	Riverdale	The park is often flooded after rain events and rendered unusable. Nearby residents have expressed a need for stormwater management solutions at this location, including GSI	13000 S Eberhart Ave, Chicago, IL

Table 6-1 Potential GSI Projects



Key Themes and Recommendations Identified Through Stakeholder Interviews:

1. Safety, health, and community development are consistently top priorities for EJ communities.

Every interview subject cited health and safety as the concern they hear most often from residents within their communities. Several subjects emphasized the importance of protecting the health and safety of children in the neighborhood. Organizations and municipalities have sought to address this by installing community gardens and gathering spaces that provide a safe space for children and adults to convene and engage with each other and nature. Several interview subjects spoke about the impacts of legacy pollution and other environmental justice issues affecting community health. Finally, community and workforce development are key priorities for residents and business-owners.

2. Flooding in the public right-of-way has become a recurring issue and community members don't know who is responsible for mitigation.

Most interview subjects agreed that flooding on private property was occurring but wasn't happening regularly enough or causing enough damage to be considered a major issue in their community. They did, however, believe that flooding in the public right-of-way and other public spaces was becoming a major issue in residents' daily lives. In Garfield Park, viaducts, roads, and sidewalks – especially around the park itself – are known to flood regularly. Interview subjects from the far south side of Chicago expressed frustration around similar flooding issues on their streets and in their parks. Many roads become impassable and parks, like the Golden Gate Park, are rendered unusable after rain events. They explained that the flooding has gone unresolved because residents don't know who they can contact to help mitigate the flooding. Stakeholders generally believed that public entities could do more to address flooding issues.



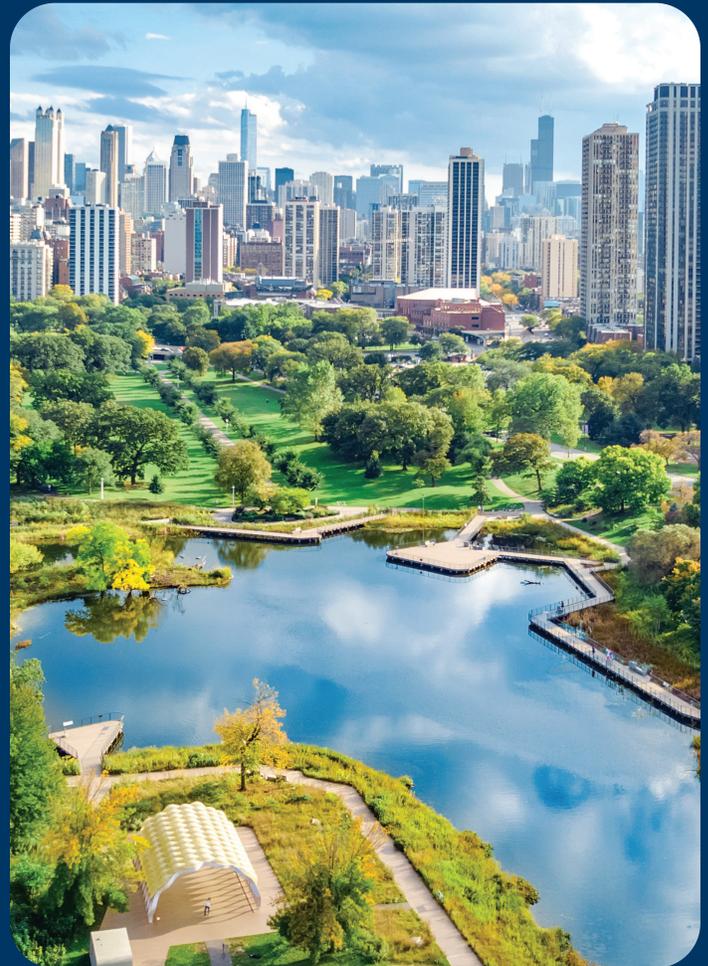
3. GSI implementation in communities is lagging due to lack of resources and limited funding or assistance for project planning/development.

Multiple stakeholders expressed interest in funding or capacity support to help them identify and develop GSI sites for development, particularly on vacant sites. The project team's discussions with stakeholders revealed limited GSI opportunities had been identified due to lack of technical expertise to site and plan GSI. The City of Chicago DPD piloted their Resiliency Corridor project in the Lawndale neighborhood with mixed results but believed that their partnership with MWRD exemplified a successful partnership that could help community organizations plan and implement GSI projects. DPD functioned as convener, landlord and technical expert, while MWRD provided the financial assistance, and the community partners provided the vision and design input. DPD staff expressed similar gratitude for MWRD's financial support on the Garfield Park Eco-Orchard project and believed these partnerships should continue to grow, if possible.



4. Community organizations, schools, and municipalities have entered partnerships with public and private entities to implement community projects and believe MWRD should be more involved. Multiple stakeholder groups interviewed had recently completed or were currently implementing community infrastructure projects and cited the Walnut Way project implemented by MMSD as a successful community-driven GSI project. This project could be a useful reference for MWRD going forward, as many stakeholders interviewed expressed interest in implementing projects with GSI, or with the potential of including GSI, in partnership with MWRD. Stakeholders stressed that trust is key and that is often built over time. The District has begun to take action to address this challenge. MWRD is currently piloting a Community Partnership Council for residents, living, working, or interested in learning about flood mitigation projects near the Calumet Water Reclamation Plant. The project team interviewed members of this council. The council is new, but members shared that they hope this council can provide a direct line of communication between the community and MWRD, which had previously been lacking. Stakeholders from other communities expressed interest – and cautious optimism – around this effort. Current council members hope that the pilot encourages MWRD to try this type of partnership in other parts of MWRD’s service area.

5. Funding and capacity for maintenance remains a major hurdle to municipal and community partners implementing GSI in MWRD’s service area. MWRD can learn from another GSI project implemented by the City of Chicago’s DPD and a collection of community groups in the Lawndale neighborhood, the Resiliency Corridor pilot project. A handful of city-owned vacant sites were identified by community partners and DPD staff as ideal for GSI installation due to several factors (e.g., stormwater drainage, proximity to existing gardens or institutions, nearby green space access). Implementation was successful due to the various roles each stakeholder took on, but the subsequent performance and success of each site has varied considerably due to uneven maintenance practices. DPD staff expressed that they have not identified any additional sites for GSI installation due to the maintenance issues experienced as part of the Resiliency Corridor pilot project. They would like to convert more vacant sites into GSI but have not yet identified a long-term funding source to help community partners maintain sites. DPD staff posited that MWRD should consider the viability of providing funding for implementation as well as maintenance.





7. Conclusion

The RISC Project Team undertook a review of the MWRD planning documents, projects, and finances along with climate projections, relevant literature, and stakeholder mapping to assist MWRD with expanding its GSI program. This report presents a summarized version of RISC’s recommendation to scale up GSI in underserved areas across the MWRD service area.

This *Blueprint* includes various recommendations for public and private funding sources and proposes the use of CBPs as a delivery framework for GSI scale up. We also suggest two transactional frameworks and revenue sources using this delivery framework – first is the use of a CBP, and second is the use of a CBP with an EIB. Finally, we performed preliminary community engagement activities to identify potential GSI projects across MWRD’s service area, prioritizing projects in underserved communities.

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October 2023

