Lick Run Watershed Strategic Integration Plan

Cincinnati, Ohio

Partnership for Sustainable Communities

FINAL REPORT

JULY 2011

EPA Publication No. 905-R-11-006

Prepared Under:
Contract No. EP-W-07-023

Prepared for:
U.S. Environmental Protection Agency
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1.0 Introduction and Report Purpose

1.1 Project Groundwork and the Sustainable Infrastructure Program

To assist the Metropolitan Sewer District of Greater Cincinnati (MSD) in evaluating issues associated with sustainable infrastructure for addressing Combined Sewer Overflow (CSO) issues affecting the City and the Ohio River, the United States Environmental Protection Agency (US EPA) commissioned this Lick Run Watershed Strategic Integration Plan to outline coordinated actions, investments and decision-points that could be needed to implement a Sustainable Infrastructure Program approach for CSO control. This Plan's purpose is to identify the specific public investments, actions, milestones and opportunities that will be needed to implement a viable sustainable infrastructure alternative. This technical assistance was provided for US EPA's Office of Brownfields and Land Revitalization under contract by SRA International, Inc., and Tetra Tech, Inc. (Technical Assistance Team).

"Sustainable Infrastructure," will be used in this Plan to describe the following types of "green infrastructure" being considered by MSD as possible components of its program for CSO control. As defined in the Wet Weather Implementation Plan approved under the consent decree, this includes "source control or stormwater offloading through:

- Combined sewer separation (both natural conveyance and storm sewers)
- Bioretention and stormwater detention
- Stream restoration
- Stream daylighting
- Other Low Impact Development (LID) best management practices (BMPs)."

These source control measures can reduce the volume of stormwater flows draining into the CSO system during wet weather events. Between 2002 and 2010, the US EPA and MSD agreed to an Interim Partial Consent Decree (2002), a Global Consent Decree (Consent Decree on Combined Sewer Overflows, Wastewater Treatment Plants, and Implementation of Capacity Assurance Program Plan for Sanitary Sewer Overflows), and a First Amendment to Consent Decrees that have all been entered by the US District Court for Southern District of Ohio Western Division. These require that MSD must implement measures to address the approximately 14 billion gallons of annual overflows from the City's combined storm and sanitary sewers, and sanitary-only sewers.

The City's response, called Project Groundwork, will lead to an investment of over $2 billion in infrastructure improvements. Project Groundwork's history, requirements and program components are described in the Project Groundwork 2010 Summary Report, which is included with Appendix C. As described on the MSD's program website, **Project Groundwork** is intended to:

- Reduce or eliminate sewage overflows into local rivers and streams and sewage backups into basements;
- Benefit Hamilton County communities through environmentally, socially and economically sustainable solutions to these current problems; and
- Revitalize the economy through creation of jobs and growth opportunities for local businesses[1].

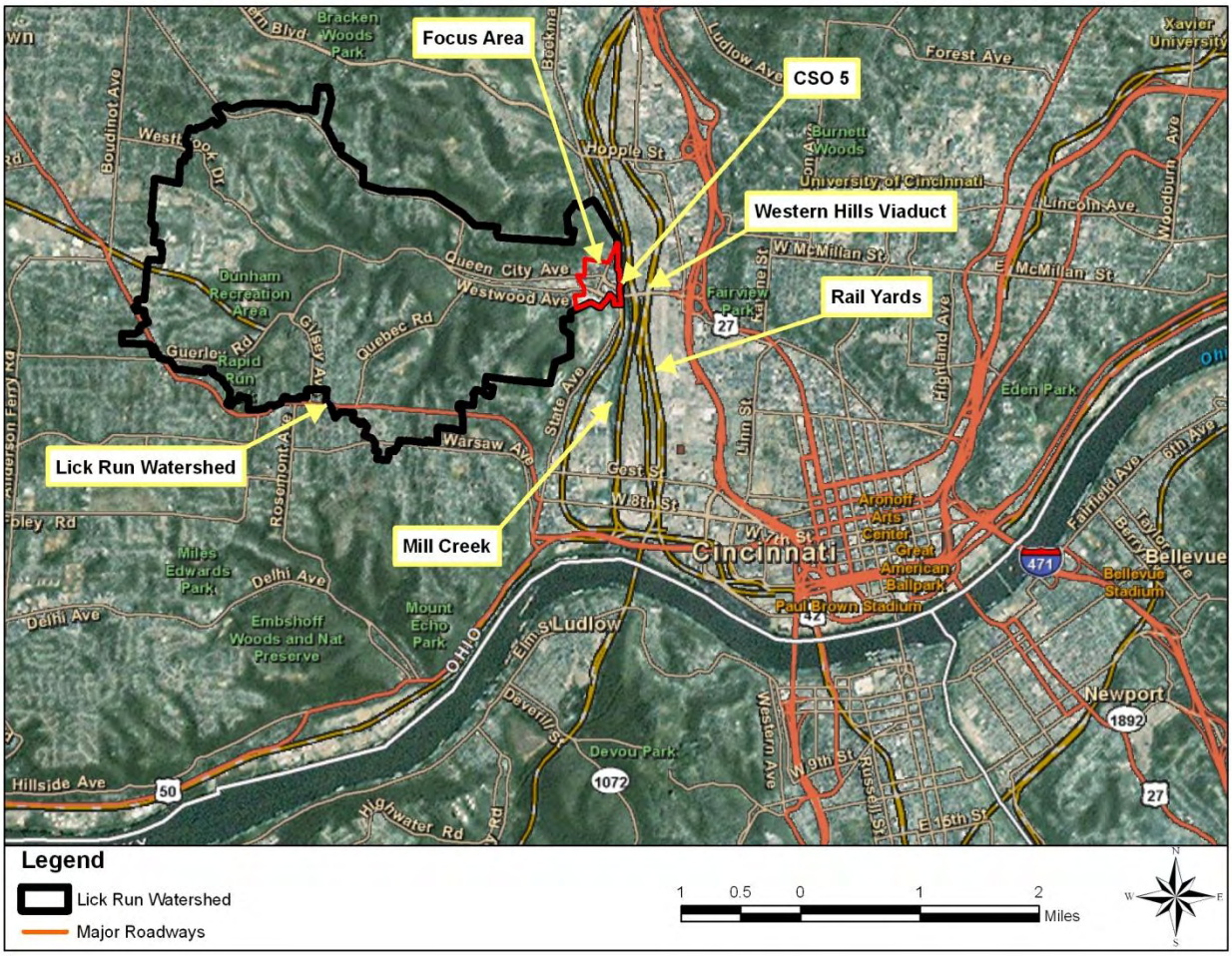
As an important component of Project Groundwork, the MSD is evaluating use of LID and source reduction stormwater techniques blended with the use of conventional sewer separation, conveyance and storage, sometimes called "gray infrastructure," to achieve maximum environmental, social and economic benefit while managing storm runoff volumes and preventing sewer overflows. The Sustainable Infrastructure approach combines the natural systems and processes of soils and plants used in LID and source reduction techniques with engineered systems, in order to store storm runoff and treat stormwater

[1] http://www.projectgroundwork.org/

through infiltration, evaporation and evapotranspiration. Sustainable Infrastructure techniques have the advantage of including landscape features that improve the aesthetic and environmental quality of neighborhoods where they are installed, and providing ancillary economic benefits. Within Cincinnati, the Sustainable Infrastructure Program is intended to enhance the quality of the neighborhoods, parks and districts where CSO improvements are made, and to yield an overall greater return on the public investment in CSO controls than would be realized through conventional, underground storage tunnels and systems.

The Lick Run Watershed will be a focus of MSD's Sustainable Infrastructure Program. This watershed lies within the Mill Creek Valley watershed and is a focus area for MSD's effort to evaluate use of both gray and green infrastructure, rather than conventional underground tunnels, to meet its CSO management needs in a way that improves the community. As one component of Project Groundwork, MSD must remove approximately 1.6 billion gallons of the annual combined sewer flows from this watershed area, which encompasses 2,700 acres at the west side of the City. The watershed includes the South Fairmount neighborhood along with portions of several others (Figure 1, Location Map), and is the site of MSD's largest combined sewer (CSO 5).

Figure 1 Location Map



Certain regulatory requirements affecting Project Groundwork, along with the history of the wet weather issues in Mill Creek Valley and an initial Sustainable Infrastructure concept for the Lick Run watershed, are documented in the MSD's *Wet Weather Strategy: Lick Run Watershed Report* (MSD 2009) (included with Appendix C). The strategy lays out the arguments for using the Sustainable Infrastructure approach, along with a description of the deep tunnel that is the "default setting" that must be implemented unless MSD can demonstrate that Sustainable Infrastructure projects will meet the reduction requirements of the Consent Decree.

While a conventional CSO storage tunnel could be designed to meet the numerical requirements of the first phase of the Consent Decree (and this is in fact the default solution for managing CSOs in the Lower Mill Creek service area), MSD believes that implementation of the Sustainable Infrastructure approach within the Lick Run Watershed offers a wide range of opportunities, and the potential to make a transformational change in both water quality and community livability. As part of past water management efforts in the early 1900s, the Lick Run stream was buried and constructed as an underground, sewer tunnel conduit. By re-introducing Lick Run and its tributaries as surface waters within the neighborhood, and coordinating these re-established waterways with engineered, naturalized stormwater treatment, the City and MSD intend to manage the watershed's storm flows and water quality, reduce stormwater inputs to the drainage system, convey more natural flow to the Mill Creek during both dry and wet weather conditions and create new landscape and environmental features that beautify the area, coordinate with other public investments, and enhance the area's opportunities for economic development.

Realizing the full potential of the Sustainable Infrastructure Program within Lick Run will require consistent, detailed coordination across the many departments, programs and investments ongoing and planned for the Lick Run Watershed and South Fairmount neighborhood. Sustainable Infrastructure approaches to CSO mitigation have been demonstrated to provide multiple social, environmental and economic benefits when coordinated with other revitalization efforts and investments, and when the new systems are effectively maintained[2]. As many important initial steps have been taken by US EPA, MSD and the City towards this goal, this Lick Run Watershed Strategic Integration Plan provides a framework and integration approach that can help organize and coordinate future steps among departments and programs. This Plan provides a set of "Framework Actions" – a set of ongoing, strategic topics that should be pursued consistently across departments to achieve the full potential benefits of the Sustainable Infrastructure Program. These benefits range from regulatory compliance and beautification to potential job training, land banking and revitalization that could be developed out of, or in strong partnership with, the Sustainable Infrastructure Program and Project Groundwork. This Plan also provides Strategic Integration and Schedule Tables that present the Framework Actions, along with associated opportunities, milestones, funding approaches and potential program synergies (see Appendices A and B). By keeping these Framework Actions in mind as other cross-program initiatives are developed, it is hoped that the City, MSD and particularly the South Fairmount neighborhood will see enhanced and ongoing benefits to the environmental, economic and social neighborhood quality as Project Groundwork is implemented.

1.2 Project Setting

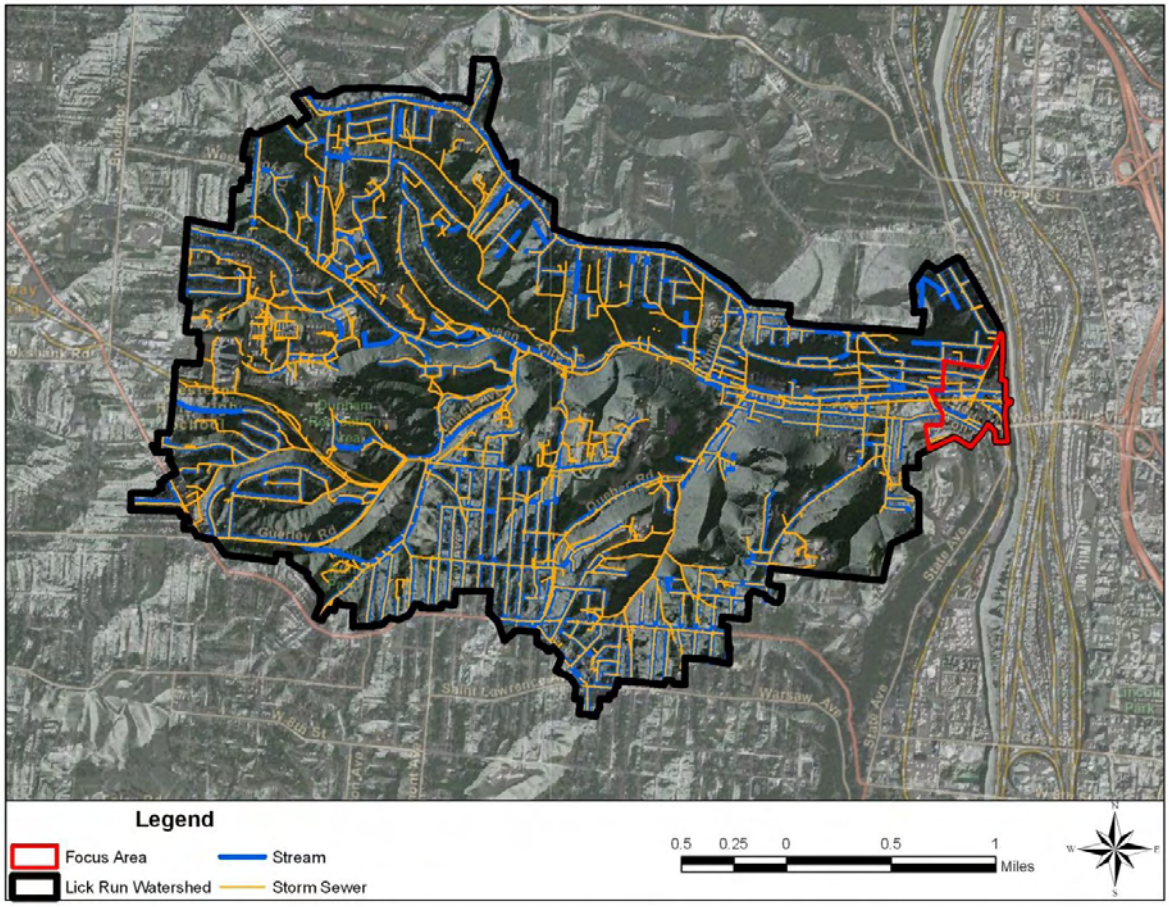
The Lick Run Watershed, where there is strong potential to restore surface water features along with pressing needs for urban revitalization, has been identified by MSD as the pilot neighborhood for the Sustainable Infrastructure Program and MSD's accompanying Communities of the Future (COF) initiative for public outreach and engagement. As described on MSD's Sustainability website, COF is

[2] As references, see Water Environment Research Foundation publications: *Decentralized Storm Water Controls for Urban Retrofits and CSO Abatement*; *Protocols for Studying Wet Weather Impacts and Urbanization Patterns*; *Best Practices for the Treatment of Wet Weather Wastewater Flows*; and *Benchmarking Decision Criteria for Urban Wet Weather Abatement*

intended to develop "…an alternative vision that addresses the source of the problem (rainwater) and marries this source control strategy with community revitalization. MSD has designated Lick Run as our first, fully integrated effort to develop a sustainable solution for the community based on source control." (MSD website 2010; http://projectgroundwork.org/sustainability/groundwork/cof.html)

Several factors make Lick Run an ideal watershed in which to pilot the Sustainable Infrastructure Program for CSO mitigation, and also make the outreach, engagement and planning essential to its success. First, the historic encasement of Lick Run itself and several of its tributary streams provides an opportunity to restore a natural, historic stream feature to the neighborhood as both an open space/urban design and wet weather management feature. As noted in MSD's Lick Run Technical Report (MSD 2009, see Appendix I) and the Wet Weather Strategy, several tributaries of Lick Run have been enclosed within a 19.5-foot-diameter pipe that runs 3,700 linear feet through the neighborhood (Figure 2, Current Drainage Features). This pipe connects to CSO 5, a relief outfall at the east end of Queen City Avenue that overflows into Mill Creek during heavy rains. Of the 1.7 billion gallons of combined sewage and stormwater that goes through CSO 5 annually, approximately 75% comes from storm drains and what used to be natural stream flow, rather than from sewage. From an engineering standpoint, this means that a strong program of stormwater source control, and creation of a natural stream channel with a functioning floodplain, is likely to be a highly effective means of reducing stormwater inputs to the sewer system, and thus preventing overflows.

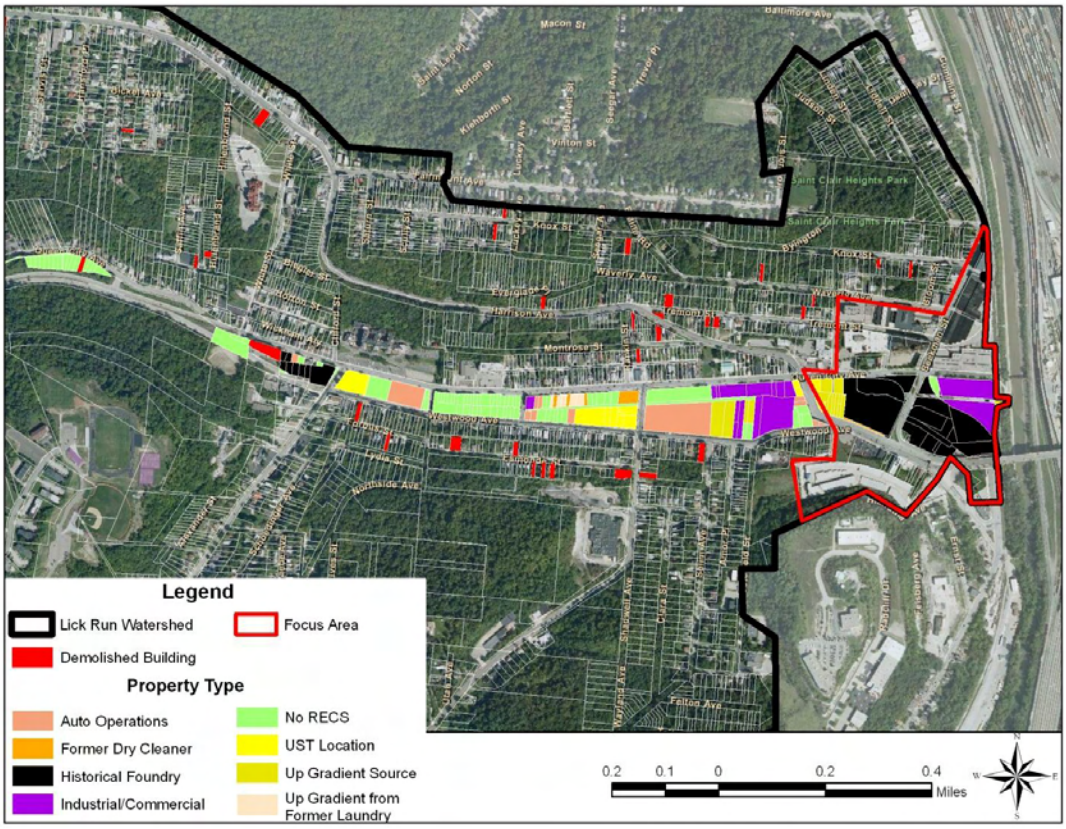
Figure 2 Current Drainage Features



Second, the Lick Run Watershed and South Fairmount also are strong candidates for sustainable infrastructure because of the neighborhood's physical and socio-economic conditions. From a physical standpoint, the Lick Run Watershed has a relatively low percentage of impervious surface area, relative to other highly urban neighborhoods: roughly 30% impervious, versus upwards of 70% in some urban residential neighborhoods (MSD 2009, p. 2-8). The watershed area has approximately 1,200 acres with tree canopy cover (MSD 2009, p. 2-3), and roughly 400 acres of land under public ownership, including portions of the Cincinnati Parks system (MSD 2009, p. 2-7). This combination of available open land, public land, tree cover and substantial areas of permeable land makes it more likely that green infrastructure and LID practices such as infiltration and bioretention can be sited in the watershed.

As further documented in the Lick Run Technical Report, however, the socioeconomic and land use conditions in the area make revitalization investments especially important, opportune and timely. The South Fairmount area has higher than average unemployment rates, high school dropout rates and housing vacancy rates, along with lower median household incomes than other parts of the City, region and state (MSD 2009, pp. 2-14 to 2-18). The area also features an abundance of vacant and under-market properties, including a number of Brownfields (abandoned and potentially contaminated) sites. The US EPA has been investigating many of these Brownfield sites, completing both Phase 1 and Phase 2 environmental site assessments to identify potential locations for remediation. The City has been adding to the amount of open land within the neighborhood and watershed: (1) for many years it has applied funds from the Department of Housing and Urban Development's Neighborhood Stabilization Program (HUD-NSP) to purchase and demolish vacant and dilapidated housing, and (2) MSD has been purchasing land to support infrastructure plans. Figure 3 (Demolished Buildings and Brownfields Investigation Sites) shows a composite of the sites that are being, or have been, investigated as Brownfields and buildings demolished through the HUD-NSP program in the project area.

Figure 3 Demolished Buildings and Brownfields Investigation Sites



Note: RECS indicates recognized environmental conditions.

In the proposed Sustainable Infrastructure approach to combined sewer mitigation and particularly stormwater source reduction, vacant properties become part of the physical infrastructure for stormwater attenuation and management, making identification and planning for these parcels especially important. Sustainable Infrastructure approaches will involve modifications and improvements using these vacant parcels, along with investments that affect the visual appearance and sometimes function of buildings, parks, streets and other open spaces. As a result, there must be a strong vision for the desired outcome and strong support for the physical and land use changes that will need to occur in the area. Public investments ranging from transportation through historic preservation must be coordinated and planned with the Sustainable Infrastructure outcome in mind, so that decisions made by one sector do not compromise the overall plan. MSD has recognized this need for integrated planning by establishing the COF approach for Lick Run; the COF establishes a multi-agency/stakeholder forum for communication and engagement, which is a first step in achieving success. The remainder of this Strategic Integration Plan outlines other coordination and cooperative steps that will need to be taken to ensure that maximum revitalization benefits are accomplished from the Sustainable Infrastructure Program.

1.3 Strategic Integration Plan Purpose

Identifying and organizing efforts across multiple City departments, agencies, non-profit organizations and public initiatives is, in and of itself, one of the core challenges of a Sustainable Infrastructure project. This Plan presents the specific public investments, actions, milestones and opportunities involved in the implementation of this Sustainable Infrastructure project, organized as Framework Actions and Supporting Actions. This plan further identifies ongoing activities in the watershed (sponsored by multiple departments and organizations), which can be coordinated to support successful implementation of the Sustainable Infrastructure project (Supporting Actions). The Strategic Integration Table in Appendix A provides a summary of the plan's recommended actions, showing how the various Framework Actions and other investments in the area can be integrated. The Schedule Matrix in Appendix B lays out the important past approvals, upcoming milestones and anticipated construction dates pertinent to Lick Run, along with other prospective actions that will affect the success of the Sustainable Infrastructure Program – and how much ancillary community benefit is received from these investments.

The Framework Actions and Supporting Actions are summarized in Table 1.

Table 1: Framework Actions and Supporting Actions

Framework Actions: systems, agencies and decisions needed to construct the project	**Supporting Actions**: actions, investments and policies that can support implementation
Community Engagement & Vision Definition	Planning & Historic Preservation
Park and Open Space Coordination	Housing & Community Redevelopment
Code and Regulatory Framework	Transportation, Transit & Bikeways
Land Acquisition, Brownfields and Land Use Strategy	Economic Development
Maintenance Agreements	

Two critical elements of the feasibility and ultimate success of the Sustainable Infrastructure Program involve other significant City departments and initiatives. The first is ongoing coordination and continued updates of the existing Memorandum of Understanding (MOU) between MSD and Cincinnati Parks (see Appendix D). Because the Sustainable Infrastructure project essentially involves using landscape and open space as water treatment infrastructure, a strong understanding between the City's open space managers – Cincinnati Parks – and its infrastructure managers – MSD – is critical to implementation and long-term success. Cincinnati's accomplishments through the MOU are commendable and especially important to the viability of the Sustainable Infrastructure Program; the absence of this level of common purpose and clearly articulated responsibilities for funding, maintenance and planning has been a major

barrier to comparable infrastructure approaches in other cities. Updating, amending or expanding the MOU over time as the project evolves will be essential.

The second major funding and planning initiative is the Land Development Code (LDC) update effort, funded in part through a U.S. Housing and Urban Development (HUD) Community Challenge Planning Grant awarded to the City's Department of Planning and Buildings. The LDC update is an umbrella project involving multiple, discrete planning and code amendment activities, and includes a Lick Run Watershed Master Plan and Lower Mill Creek Watershed Master Plan led in partnership with MSD. According to the City's initial grant application to HUD (City of Cincinnati 2010, p. 7), the watershed plan is to include a housing evaluation and action plan, transportation plan and master plan geared towards informing the update of the City's codes and regulations. As the ultimate purpose of the LDC-related plans may differ somewhat from what MSD and others must accomplish for specific aspects of the Sustainable Infrastructure Program, this Plan recommends several elements (notably a strategic land acquisition and use strategy) that should either be included within the LDC-related effort, or implemented as a complementary effort.

This Lick Run Watershed Strategic Integration Plan also advocates that MSD and the City continue the strong, consistent public engagement effort that has been initiated through COF, and which can be strengthened with the development of a detailed, neighborhood-specific information, outreach and engagement program. Sustainable Infrastructure Program components will affect individual parcels, buildings and neighborhood land use patterns to a much greater degree than conventional subsurface sewer and storm drainage projects; having on-the-ground support for the goals of the project as well as individual actions will be critical. The public engagement strategy must both define a vision for the area, and identify neighborhood-scaled impacts and issues at early stages in each component of the project. While the charrettes and public engagement events currently underway and discussed in this Plan are important, a micro-scale local action plan for outreach and communication is essential as well.

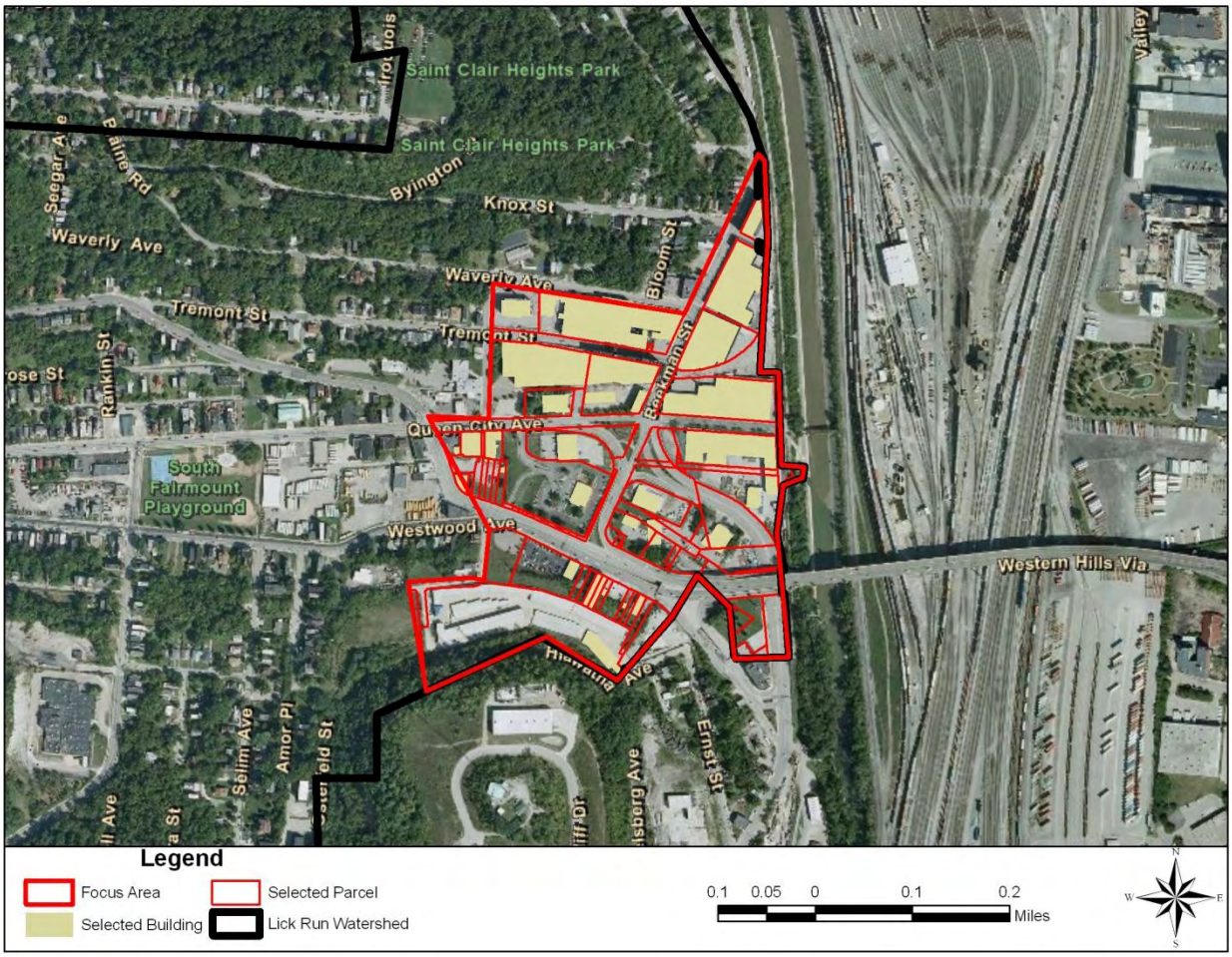
Finally, the intent of this Plan and the Framework Actions is to offer flexible, adaptive guidance on the types of investments and initiatives that can be linked to Project Groundwork to achieve greater benefits in the Lick Run Watershed. To this end, this Plan identifies investments in the Lick Run Watershed that may occur during the timeframe of Project Groundwork (such as planned improvements through the City's Department of Transportation and Engineering, Brownfields assessment and remediation and the work of the Mill Creek greenway trail project). This Plan makes every effort to incorporate known organizations and initiatives that can serve as Supporting Actions for area revitalization and Sustainable Infrastructure efforts. Over time, however, there will be a host of potential synergies among and between the Sustainable Infrastructure Program investments and other City, regional and non-profit agencies. These could range from "green jobs" training for maintenance of Sustainable Infrastructure to sidewalk improvements that incorporate bioretention and stormwater storage. The Framework Actions are intended to ensure that there is a system and framework in place for identifying, shaping and directing these new investments and supporting activities as they arise.

2.0 Project Background

2.1 Lick Run Watershed /South Fairmount Setting

This Strategic Integration Plan focuses on upcoming and potential actions in the eastern-most 60 acres of the Lick Run Watershed and the South Fairmount neighborhood (Focus Area, Figure 4). This 60-acre area is a key portion of the overall Lick Run Watershed, which comprises 2,720 acres in total, and for Project Groundwork, since many of the major drainage system components and opportunities for the Sustainable Infrastructure Program are found within this smaller area. The focus area includes the eastern end of the Lick Run channel, the most intensely-developed properties in South Fairmount and the Western Hills Viaduct. As discussed in this Plan, the Western Hills Viaduct is a major transportation feature in Greater Cincinnati and is part of the focus area; this viaduct is slated for rehabilitation or reconstruction as funding is made available and capital planning permits.

Figure 4 Focus Area



Like many of the nation's urban neighborhoods, the South Fairmount community was developed on top of historic, natural and hydrologic features, including Lick Run and a number of stream tributaries. Currently, a number of previous natural streams have been replaced with man-made underground sewer lines (for example, the former Lick Run stream) (Figure 2, Drainage Infrastructure). A major change associated with the Sustainable Infrastructure approach is restoring the Lick Run channel to an open,

flowing stream. While upstream areas of the watershed have substantial areas of tree canopy and undeveloped or permeable lands, the lower focus area does not. The intensive transportation system and historic land development pattern, which rely on combined storm and sanitary sewers to convey water out of the area, resulted in significant discharges of stormwater to the sewer system during rain events. When these combined flows cannot be handled by the downstream wastewater treatment plant, overflows of untreated sewage and rainwater reach Lower Mill Creek. As a result, Lick Run and Lower Mill Creek are a significant focus for MSD's CSO abatement strategy.

Implementing the Sustainable Infrastructure Program requires a thorough and site-by-site understanding of the neighborhood where these improvements will be installed. The Lick Run Technical Report prepared for MSD in 2009 describes the land use, socioeconomics and physical characteristics of the Lick Run Watershed and South Fairmount focus area. Historically, the area developed around a broad range of manufacturing and industrial enterprises located along Queen City Avenue and Westwood Avenue, with single-family residential neighborhoods flanking the main corridor. As noted in the Technical Report, the neighborhood has many substantial "anchor" buildings dating from the community's historic development, including churches, schools, industrial buildings and the Cincinnati Water Works (MSD 2009, p. 2-11). The other legacy of this development history is the presence of the potential for significant site contamination or "Brownfields" properties. These brownfields properties are being documented by the US EPA and the Port of Greater Cincinnati Development Authority (Port Authority) through a series of Phase 1 and Phase 2 environmental site assessments.

The transportation network through the corridor is an important land use feature in and of itself. There are 214 acres of road right-of-way (MSD 2009, p. 2-10), with high through-traffic volumes accessing I-75 at the Western Hills Viaduct, which crosses both Mill Creek and the CSX Queensgate rail yard. Despite having sidewalks on both sides of the local street network and nearly continuous bus service through the corridor, the high traffic volumes (Table 2) and auto-oriented land use pattern in the Westwood Avenue corridor discourage pedestrian use.

Table 2: Lick Run Corridor Traffic Volumes

Road Segment	Average Annual Daily Vehicle Traffic (AADT)
	Year
Western Hills Viaduct east of State Avenue	22,563 (2006)
Queen City Avenue at Quebec Road	17,339 (2006)
Westwood Avenue east of Grand Avenue	18,205 (2006)
Westwood Avenue west of Harrison Avenue	44,926 (2004)

Source: Ohio-Kentucky-Indiana Regional Council of Governments Regional Traffic Count Directory, http://www.oki.org/pdf/traffic_count/HamiltonDirectory1995-2006.pdf, accessed 3/1/2011.

As discussed in Section 4 of this Plan, the final design of the Sustainable Infrastructure Program and particularly the central Lick Run corridor will have significant impacts on the existing street network, and as such will constitute a neighborhood transportation plan. Determining and gaining City Department of Transportation & Engineering sign-off on a preferred alternative for the circulation network flanking Queen City Avenue and Westwood Avenue is a fundamental decision point for the project. More broadly, plans for reconstruction of the Western Hills Viaduct and other I-75 improvements also may offer opportunities for coordinating stormwater management approaches and investments.

Finally, the Technical Report also describes the socioeconomic conditions in South Fairmount and the greater Lick Run Watershed area, which has been affected by population loss and economic decline. Measures such as median household incomes, property values and educational attainment are well below

City and regional figures (MSD 2009, pages 2-16 to 2-19). Data in Table 3 provides community profile information and comparisons to the City of Cincinnati as a whole.

Table 3: South Fairmount Socioeconomic Profile

Category and Data	Comparisons/Analysis
Population	
Total Population: 3,215 (2000) 2,842 (2008) Population > 25 years old without high school completion: 37% (2008) Race: 38% White (2008) 54% Black (2008)	Slight decline in population from 2000 to 2008 Compared to city as a whole: • Appears to have greater loss in population from 2000 to 2008 • Significantly greater percentage of adults not completing high school (37% versus 19%)
Housing	
Persons per household 2.44 (2008) Four-person households 24% (2008) Average home value: $60,000 (2008) Percent home vacancy: 27% (2008) Percent of Section 8 Housing >12%* (2008)	Compared to city as a whole, • Household size and percent of four-person households is greater (24% versus 16%) • Percent of vacant houses is higher • Average home value is 54% lower • Generally higher percentage of Section 8 housing *Note: The mortgage crisis hit areas such as South Fairmount particularly hard and these impacts may not be completely captured in the available data.*
Income/Employment	
Median household income $27,197 (2008) Per capita income: $13,000 (2008) Households with income < $15,000 32% (2008) Unemployment: 14% (2000)** Joblessness[3]: 49% (2000)**	Compared to the city as a whole: • Median household income is 73% of city-wide average • Per capita income is 51% of the city-wide average • Per capita income growing at a slower pace (2000 to 2008) Change in unemployment and joblessness (1980 to 2000) in South Fairmount* • Unemployment is 61% higher • Joblessness is 33% higher

Notes: > = greater than; < = less than.

Primary Data Source: Lick Run Draft Technical Memorandum (MSD 2009) (included as Appendix I). *Source: US HUD Data (2008), reported in Cincinnati Enquirer by Gregory Kort and Mike Nyerges. Accessed at: http://www.enquirer.com/editions/2008/09/14/0914Section8percent.pdf

Responding to the economic and property distress in the area, the City has used HUD Neighborhood Stabilization Program (NSP) funds to purchase properties or demolish buildings in disrepair (particularly in the East Price Hill area), which adds to the stock of vacant land in the watershed that may be re-purposed for stormwater management and CSO reduction through the Sustainable Infrastructure project, or else banked and used for redevelopment in the future. As discussed in this Plan, in addition to repurposing abandoned properties and those in disrepair to productive uses supporting the Sustainable Infrastructure approach, the Framework and Supporting Actions discussed in this Plan provide opportunities to integrate social, economic and environmental investments to improve conditions and create a sustainable, livable community for those that reside in, work in and move through the focus area.

[3] ** Joblessness includes citizens outside the traditional civilian labor force (e.g., those in institutions, students and those over 65). South Fairmont in this report includes two census tracks (the eastern is the eastern part of Lick Run (census tract 87); data above appear to address the entire South Fairmont area). The Social Areas of Cincinnati: An Analysis of Social Needs. Fourth Edition. Patterns for Four Census Decades. University of Cincinnati, School of Planning, UC Institute for Community Partnerships (UCIP) (Maloney and Auffrey, 2004). Accessed in January 2010 at: http://www.socialareasofcincinnati.org/report.html

2.2 Conventional versus Sustainable Infrastructure Approach for Lick Run

In response to the US Department of Justice and US EPA's Enforcement Order and Consent Decrees, MSD has developed and evaluated several alternatives for removing stormwater flows from the combined sewer system and reducing CSOs from the Lick Run Watershed (MSD 2009; MSD 2010). The Sustainable Infrastructure Program uses the opportunity of drainage improvements as a catalyst to revitalize the neighborhood, while achieving the required reduction targets, using a restored stream channel, distributed stormwater treatment features, and a robust program of source reduction through street, sidewalk and building retrofits. The Sustainable Watershed Evaluation Process (SWEP) is a watershed based evaluation process that assists in the evaluation of alternatives to traditional grey infrastructure. Preliminary concepts for Lick Run Watershed have been developed at a conceptual design level, as illustrated in Figure 5, the Preliminary Synthesis Plan. MSD must now present compelling evidence of the potential to implement this approach on a timetable suitable for compliance with the framework of the Consent Decree, which calls for MSD to submit its Preferred Alternative in 2012.

Figure 5 Preliminary Synthesis Plan

Source: Developed by Human Nature, Inc; Strand Associates, Inc.; and XCG Consultants, Inc., for MSD.

Two principal CSO mitigation alternatives have been outlined and are being considered as acceptable solutions for Phase 1 of the Consent Decree, both focusing on Lick Run. Both options – construction of an underground storage tunnel and the Sustainable Infrastructure Program – are described in detail in the 2009 Lick Run Technical Report (MSD 2009) and summarized briefly below.

Storage Tunnel: This option is a 30-foot diameter, 1.2 mile-long, underground storage tunnel that would collect stormwater and wastewater and direct it to a wastewater treatment plant. The tunnel is referred to as the "default" setting because its engineering design would provide for sufficient physical storage of rainwater to meet the numerical removal goals in the Consent Decree. It is estimated in the Consent Decree that the tunnel would require $244 million in capital investment to construct. The annual maintenance and capital cost of the tunnel would be significant and "lumpy," with larger costs incurred at infrequent intervals rather than smaller and more predictable regular maintenance costs. The tunnel approach likely would tie MSD into future CSO solutions that would include extending the tunnel. And finally, sending storm flows to wastewater treatment plants that are designed to treat pollution-heavy sanitary wastewater, rather than relatively clean stormwater flows, is a costly and energy-intensive solution from a capital and operational expense perspective.

Sustainable Infrastructure Program Alternative: The Sustainable Infrastructure Program alternative, illustrated in Figure 5 and described in Section 3.01 of the Technical Report, would rely on a network of surface water and natural storage features, along with a set of distributed underground infiltration and storage facilities, extensive stormwater source reduction and disconnection measures, and

additions to the watershed's tree canopy. The intent of the Sustainable Infrastructure Program is to mimic the functions (particularly stormwater storage) of the natural hydrologic and watershed systems that originally existed, thereby reducing the amount of storm flows reaching the combined sewer system. A reconstructed or "daylighted" Lick Run would be the central feature. The stream would bring the underground stream flows to a naturalized channel on the surface and remove much of the underground inflow to the sewer system that currently contributes to CSOs. Along with the stream, a network of surface detention features would be retro-fitted or built to provide upstream stormwater management. Concurrently, flows from impervious surfaces such as roofs, sidewalks, streets and parking areas would be intercepted and managed through source reduction measures, such as green roofs, rain barrels or cisterns and infiltration areas on available sites or within the transportation right-of-way.

In conjunction with the Technical Report, three alternatives were assessed for daylighting Lick Run and installing the other stormwater storage features: an Urban Ravine/Canal alternative, a Green Spine/Central Park alternative and a Green Street/Main Street alternative. Each alternative also looked at redevelopment opportunities for the adjacent land uses and buildings (including the historic and "anchor" buildings described previously), as well as impacts on (and options for) the adjacent transportation system. A "synthesis plan" was then developed that adopts most of the components of the Green Street/Main Street alternative, including a range of elements such as:

- Transform the former Queen City Avenue into a Main Street, with an improved pedestrian realm (traffic-calming elements, street trees and street planters); potentially combine Queen City and Westwood Avenues into a multi-lane parkway coordinating with recent improvements to Queen City Avenue.
- Preserve and provide adaptive re-use of architecturally significant buildings identified in the plan.
- Encourage mixed-use redevelopment, pedestrian-friendly development (including civic, commercial, office and residential uses) (see Figure 5).
- Promote larger-scale, mixed-use redevelopment (industrial, institutional, civic, and/or commercial) at the eastern end of the corridor.
- Create a central green space with a day-lighted stream, trail/path opportunities, active recreation and other amenities.
- Celebrate the connection of the stream to Mill Creek with a large-scale pond/detention area, which would be the primary interactive, civic and celebratory space for the neighborhood.

From a cost standpoint, the Sustainable Infrastructure Program alternative requires a similar level of capital investment. The Sustainable Infrastructure alternative involves highly complex construction, land acquisition and O&M planning challenges compared to the Storage Tunnel alternative, including (1) sewer and water line relocations and replacements, clear-span bridge crossings, retrofits and construction of detention facilities, and (2) a wide array of site-specific source control interventions throughout the watershed However, the Sustainable Infrastructure alternative is estimated and projected to be substantially less expensive and to have more predictable maintenance expenses than the Storage Tunnel option, both in terms of annual operating costs and on a present value basis. Moreover, this alternative can serve multiple public goals, particularly environmental and aesthetic improvements to the neighborhood and coordination with other public projects as outlined in Sections 3 and 4 of this Plan. This longer-term and holistic approach would use the Consent Decree requirements as an opportunity for meeting stormwater/CSO abatement requirements in the short term, and laying the foundation for environmental, economic and social benefits in the long term.

Regulatory Considerations: The key regulatory differences between the two options are construction feasibility and engineering estimates of volumes of CSO removal. Sizing of the tunnel for various stormwater volumes is, from a regulatory standpoint, perceived as managing a definable quantity of water, unaffected by variability in natural systems or by the timing and location of multiple source control, storage and natural feature restoration projects. By contrast, because green infrastructure relies on the stormwater storage functions of natural systems across multiple sites, rather than storing water in a

concrete structure with a known and defined size, implementation of the Sustainable Infrastructure Program is less easily estimated with respect to storm volumes than a physical underground storage space. The land use impacts and setting are more complex as well, which is one reason this Plan has been commissioned to look at the overlapping issues involved in changing the neighborhood's surface area to manage stormwater. Implementing the Sustainable Infrastructure Program, and particularly stream restoration, will profoundly change the physical features of the corridor by creating a stream where there are now streets and buildings. This option involves multiple land parcels under multiple ownerships and relies on a collection of individual features and designs to determine the total volume likely to be treated. Building a storage tunnel would put the CSO solution principally underground, and while disruptive during implementation, the existing land use and transportation patterns in the neighborhood would resume (or be enhanced) after construction.

2.3 Project Leadership and Community Engagement

The complexity of the Sustainable Infrastructure Program alternative, and its impact on the physical appearance and function of the neighborhood, underscores the central importance of leadership and community engagement in implementing the alternative. As the owner of the drainage infrastructure and wastewater treatment facilities serving the Lick Run Watershed and greater Cincinnati, MSD has principal responsibility for compliance with applicable pollution control laws and the authority to levy sewer and water fees on system customers to pay for required improvements. MSD has primary responsibility for implementation of Project Groundwork and compliance with the Consent Decree, and will make significant investments that can help other departments leverage additional funds and resources.

However, the physical outcome of the Sustainable Infrastructure Program will depend on many decisions made by agencies including the Cincinnati Department of Planning & Buildings, transportation agencies and particularly by Cincinnati Parks and the Cincinnati Recreation Commission, which is responsible for the spray park and ball fields in the neighborhood. As individual components of the project are implemented, different neighborhood land use features (such as parks, sidewalks, access points, travel paths, etc.) will be disrupted or altered, even if temporarily. Moreover, the incremental nature of a sustainable Infrastructure approach makes future changes in schedule, design and siting not only possible but likely, requiring further communication. Thus, planning for Lick Run must be communicated early in the process to the public and other stakeholders (including city planning, recreation, transportation, housing, economic development and local residents and organizations) to ensure that all parties have provided input and that the best solution is identified, agreed upon and integrated into area revitalization efforts.

Goal - *Through strong community engagement and coordination with Project Groundwork, establish an over-arching vision and framework for the Sustainable Infrastructure Program so that public and private actions in the Lick Run watershed help leverage maximum benefits from investments in planning, economic development, transportation and transit systems, housing, parks and open space and ongoing maintenance.*

The four project alternatives in the Technical Report illustrate the types of decisions to be made and the public communication issues that must be addressed to develop a successful project. From these four alternatives, MSD could choose the baseline investment in a standard stream channel feature and several small, sub-surface storage areas to achieve regulatory compliance, without adding enhancements such as an urban tree canopy, new greenspaces within the neighborhood, or a linear recreation path along the restored stream. By contrast, with sufficient public support, land area and co-investment from transportation and parks, MSD could pursue the option to create a linear park feature with public access, improved streets and sidewalks that act as drainage features, enhanced habitat, new greenspaces within the neighborhood as stormwater treatment features and strong aesthetic benefits that galvanize interest and investment in the neighborhood.

Public outreach completed to date for Project Groundwork, and the COF effort, have created a strong foundation for dedicated outreach within the Lick Run Watershed and particularly South Fairmount. Recent community open house meetings (Appendix E, COF Outreach) and upcoming planned charrettes, other actions identified in the MSD's Lick Run Watershed Conceptual Solution Ongoing Communications Strategy, and ongoing public engagement programs and events, will continue to keep the Sustainable Infrastructure Program and its potential benefits in front of the public and local stakeholders. Moving forward, MSD has challenges on two fronts: (1) continuing this outreach and dialogue on design alternatives, future land use options and coordination with other City departments and initiatives (notably transportation and parks); and (2) refining and implementing a "micro-level" public outreach and communication process specific to the South Fairmount neighborhood where so much of the implementation, and potential disruption, will take place. This is discussed specifically under the Framework Actions in Section 3. With the schedule for decision-making and action relatively short, it is imperative that all stakeholders understand the project goals along with individual responsibilities and decision points.

2.4 EPA Partnership for Sustainable Communities

As described in the Introduction, the Cincinnati Department of Planning & Buildings is preparing to begin a major planning effort that will culminate in an overhaul of the City's development codes and regulations. The umbrella project for these tasks, the LDC Update, recently received $3 million in grant funding through the Partnership for Sustainable Communities, a joint initiative of the US EPA, HUD and the U.S. Department of Transportation. MSD itself is providing $3 million in matching funds for the initiative, which is intended to improve access to affordable housing, provide more transportation options, and lower transportation costs while protecting the environment. Projects funded through this initiative are intended to support Livability Principles (right) by coordinating federal housing, transportation and environmental infrastructure investments in ways that enhance environmental quality, promote equitable development and also address the challenges of climate change.

Sustainable Communities Livability Principles

- *Provide more transportation choices.*
- *Promote equitable, affordable housing.*
- *Enhance economic competitiveness.*
- *Support existing communities.*
- *Coordinate and leverage federal policies and investment.*
- *Value communities and neighborhoods.*

Because the Sustainable Infrastructure Program within the Lick Run Watershed has the potential to affect multiple aspects of community development, from parks to public buildings, and provide land for housing and economic development, the Partnership's livability principles and focus on coordinating investments are especially relevant. This Plan's recommendations for public outreach and engagement, discussed in Section 3.2, stress the importance of the Livability Principles to the core messaging that will be done for Project Groundwork and particularly for the Lick Run Watershed Plan task as part of the LDC Update.

2.5 Upcoming Decisions and Steps

This Plan was commissioned in part to support a series of decisions and action steps anticipated in 2011. By September 2011, MSD plans to begin assembling an internal preliminary plan that presents and evaluates the alternatives to the tunnel storage approach to federal and state regulators. The final plan must be submitted for approval by December 2012, and the 2 billion gallons of overflow reductions must be achieved by 2018 within the Lower Mill Creek. These mandated deadlines form a baseline schedule, into which Framework Actions and Supporting Actions must be integrated. The actions and schedule integration are presented in Sections 3 and 4 and Appendices A and B.

3.0 Framework Actions

3.1 Overview

Achieving the potential benefits of the Sustainable Infrastructure Program will require significant and ongoing inter-agency and inter-department coordination. Responding to the upcoming schedule milestones, work done to date and events and initiatives planned for the remainder of 2011, this section outlines five "Framework Actions" that should be formalized and pursued to underpin the Sustainable Infrastructure Program: (1) Community Engagement & Vision Definition; (2) Land Acquisition and Use Plan; (3) Cincinnati Parks Coordination; (4) Planning & LDC Update; and (5) Maintenance Agreements. The section concludes with recommended coordination actions and steps linking these Framework Actions to the MSD's compliance schedule, and the anticipated timing of upcoming planning initiatives, construction projects and other actions affecting the watershed area.

3.2 Framework Action #1: Community Engagement & Vision Definition

Goal:	A consistent and effective communication and engagement strategy at both the watershed/City and micro/neighborhood scales, providing a consistent message across City and non-profit initiatives and directly engaging neighborhood members who will be affected by the physical changes from the Sustainable Infrastructure program.
Opportunity:	Align a community revitalization message across all upcoming public investments. Leverage multiple agencies' public communications to promote goals. Develop local understanding and support for site-specific project components.
Lead responsibility:	MSD, working with a local communications coordinator/point person.
Key agencies:	MSD; Planning & Buildings (LDC update); Transportation; Housing Authority; Schools; Neighborhood agencies and organizations.
Timeframe:	Initial plan and messaging: ongoing Detailed local communications plan and coordination: Implementation underway; ongoing development, events and outreach to occur Vision/messaging strategy: mid-2011 Outreach and integration with other initiatives: 2011-12 Continued communication and feedback: 2013 →

Because of the ground- and building-level changes and impacts of the Sustainable Infrastructure approach, it is essential to ensure that residents, businesses and community leaders in schools, community lending and housing thoroughly understand and, ideally, strongly support a vision for how the project can transform the community's visual quality and amenities over time. As discussed in this Plan, two levels of engagement are needed to ensure that the Sustainable Infrastructure Program can be implemented and, more important, strongly supported within the immediate neighborhoods where the physical changes will take place. The first is the higher-level engagement of agencies, funders and decision-makers whose investments will affect the viability of the overall outcome, such as Cincinnati Parks, Planning & Buildings, and Transportation and Engineering. This type of engagement ensures that the goals of Project Groundwork and particularly the Sustainable Infrastructure Program will be thoroughly integrated into plans and policies; it also helps avoid conflicting approaches or policies that could undermine the project. To date, MSD has strongly engaged other City departments in Project Groundwork, and the collaboration on the HUD Community Challenge Grant is an excellent example of the type of leveraging that has already been achieved through this collaboration. MSD's Project Groundwork Communication Plan also defines the engagement process at this broader level. Design charrettes planned for the late summer and

fall of 2011 will further this level of engagement, especially with respect to the micro- or neighborhood-level design and land use planning options for the area.

The second level of engagement, at the micro or neighborhood scale in the affected parts of South Fairmount, requires additional definition and is a recommended Framework Action for the immediate future. The recommended steps are outlined below.

1. Continue to utilize the COF Advisory Committee (CFAC) and expand membership with people knowledgeable about the area's information pathways and experience with public sector projects and investments.

MSD's work on the CFAC within the neighborhood can assist with implementation of the neighborhood-level engagement plan, since MSD has already compiled a sizeable stakeholder database and on January 19, 2011, hosted a targeted neighborhood outreach event (Appendix E, COF Outreach). The CFAC is intended to act as a community sounding board, and to provide input to MSD on its vision to link local improvements to other community revitalization goals.

It is recommended that COF be tasked with steps 2 through 5 below, and that individuals with a working knowledge of the neighborhood's "information systems" be engaged to help. One option could be to restructure a sub-committee or projects committee from within CFAC to work on specific issues, and offer a point for communication, and engagement by specific stakeholders. Participants of great value would include staff or clergy of the neighborhood's churches; staff from the Cincinnati Metropolitan Housing Authority knowledgeable about the area; Community Reinvestment Act officers from the banks active in the area (potentially including nearby branches of Warsaw Federal Savings & Loan, Cincinnati Federal Savings & Loan and PNC Bank); police officers, particularly the District 3 Neighborhood Liaison Officers who cover the watershed's neighborhoods; and staff from the Orion Academy who have roles or experience with parent communications.

2. Define neighborhood "information pathways" and understand how the area's residents and businesses obtain information about public projects and actions.

A critical element in the communications plan, which MSD has begun to define and address, is to outline how the neighborhood residents and businesses who will be affected by the project receive their information, particularly regarding public-sector actions. It is essential to understand what sources are credible, and what sources are seen as suspect – possibly including City agencies themselves, and what information pathways are most likely to convey accurate information effectively. Common information pathways in urban neighborhoods may include local schools, churches or community newspapers; however, informal information sources, such as bulletin boards at laundromats or supermarkets, are equally important to identify. The need for Spanish-language materials or publications, and appropriate outlets such as radio, TV or newspapers, is also important to define.

Recent public actions can provide ways to identify information pathways. As one example, recent NSP expenditures in the area have led to the purchase and demolition of housing. It would be valuable to design of the Sustainable Infrastructure Program to understand what neighbors know about the NSP purchases and demolitions, how they learned about these actions, and whether the information received was found to be sufficient.

3. Define a message for Project Groundwork and the Sustainable Infrastructure Program.

Once information pathways are defined, a consistent, simple message should be developed in partnership with the CFAC that introduces the program, its potential benefits, how it affects residents and businesses and where people can go for further information. While the message can be simple, it should be backed with opportunities to obtain more information and engage in other aspects of the project and public outreach process. The message also will need to address, or at least acknowledge, that land and housing units are being acquired by MSD (as well as HUD), and should offer further credible information and

resources for anyone concerned about the impact or process for acquisitions. Moreover, it is important to clarify that while NSP funds from HUD are being used for acquiring properties, and an overall strategy and understanding for land use is crucial to the neighborhood, NSP acquisitions are not made for the Sustainable Infrastructure Program per se and must be done in accordance with NSP purposes and guidelines.

4. Develop Frequently Asked Questions (FAQs)

It is strongly recommended that the CFAC and MSD continue to develop and distribute new, and targeted, "Frequently Asked Questions" outreach materials specific to the neighborhood. These should address residents' likely concerns and also their opportunities to become involved in the project. MSD has already developed and distributed FAQs in the Lick Run Watershed area; however, regular updates will be needed as the project evolves and different events or milestones are reached. Since the Sustainable Infrastructure Program will rely heavily on very localized source reduction and stormwater retention systems, residents and businesses who will live with these systems must be informed, and must develop trust that Sustainable infrastructure measures will not lead to any harm; questions about mosquitoes and flooding must be anticipated and credible answers made available. It has been the experience of many communities working on green infrastructure capital programs and projects that a thorough FAQs list is one of the more consistently used and useful documents generated in the course of a project; this step is recommended to be completed as soon as possible, preferably before the upcoming round of charrettes.

As a related issue, public land acquisition within an existing, developed neighborhood like South Fairmount is often very controversial and can provoke concerns and animosity if residents and businesses are not very clearly informed of the reasons for acquisition, the decision-making process involved, and where this information can be found. A FAQ with links to further information is an important resource to keep current and updated, in order to ensure that appropriate information is made readily available.

5. Establish a communication feedback loop specific to the neighborhood.

Finally, it will be essential to continue to have an outreach coordinator familiar with the neighborhood's information pathways, the mission and the FAQs to ensure consistent, locally-responsive information. There will need to be accountability for continuing feedback both locally, and at the City level. This outreach coordinator could be visible in the community by attending South Fairmount Community Council meetings and other meetings with local groups and non-profit organizations. As one example of the type of outreach that will be needed, business owners who want to understand the impacts of the project on their properties and investments need a point of contact that is familiar with the neighborhood and Project Groundwork to address questions on scheduling, construction-phase disruption or land purchases. Likewise, constituents for specific neighborhood features (such as the spray park) must be able to go to a credible source for information, or there may be objections to an aspect of the project that cause delays and misunderstanding.

3.3 Framework Action #2: Land Acquisition, Brownfields and Land Use Plan

Goal:	Develop a central, strategic land ownership and use inventory and plan for the watershed and focus area, identifying public acquisition and Brownfields status; outlining criteria and procedures for acquisition, revegetation and management; and identifying options for re-use of acquired lands.
Opportunity:	Take a multi-agency approach to evaluating the watershed's inventory of under-market, vacant or publicly-owned lands to find opportunities and develop a strategic stormwater, open space and redevelopment plan. Develop zoning strategies in conjunction with the LDC update to implement a strategic plan and support redevelopment.
Lead responsibility:	Department of Planning & Buildings and/or Department of Community Development.
Key agencies:	MSD; US EPA (Brownfields); Port Authority of Cincinnati; Cincinnati Parks; Cincinnati Metropolitan Housing Authority, Department of Community Development, Cincinnati Recreation Commission.
Timeframe:	Plan development: 2011-12 Integration with zoning: 2013 Monitoring/adaptation: 2014 →

Because sustainable infrastructure approaches use land surfaces rather than underground storage to manage stormwater, initiatives like the Sustainable Infrastructure Program for Lick Run are, essentially, neighborhood land use plans. Implementation within the Lick Run Watershed will create a land use setting with a network of open spaces that are used principally for stormwater management. The channel will be the major and organizing feature of this network, but additional lands on City parks and within the neighborhood will be involved.

Public land acquisition is an increasing part of the local land use setting. Cincinnati Parks and the Cincinnati Recreation Commission own land within the watershed and corridor, and both MSD and the City are continuing to purchase land, to prepare for Project Groundwork activities or remove abandoned or unrepaired housing, respectively. In addition, the corridor along Westwood Avenue and Queen City Avenue has a significant inventory of identified contaminated or "Brownfields" properties that are the subject of Phase 1 or Phase 2 investigations; many of these may ultimately be involved in the Sustainable Infrastructure Program, raising further issues regarding their potential for adaptive reuse. As a result of all of these activities, there will be a substantial and changing inventory of publicly-owned property that will require planning and management, but which could create opportunities for land assembly to carry out both stormwater and other revitalization projects.

All of these issues point to the need for a strategic, comprehensive land use plan and strategy. The strategy would focus on the potential uses of properties in the Sustainable Infrastructure Program, as well as the potential uses and opportunities for current or future publicly-owned properties that are not ultimately used for stormwater and CSO control. The purpose of such a plan is to help prioritize and focus acquisitions across departments, understand the potential opportunities and challenges of the emerging pattern of public land ownership, and enable Cincinnati to target public investments in land – whether Brownfields remediation, housing redevelopment, economic development, community open space and parks or stormwater management.

As one example of a strategic land use plan of this type, airport authorities acquiring lands under the U.S. Federal Aviation Administration's (FAA's) Part 150 noise program are required to develop noise land inventories and land use plans, including specific plans for reuse of purchased properties for airport purposes or "disposal" (sale) if acquired lands are not needed for airport purposes. This type of plan

provides both local land use agencies and the public with a sense of how and where properties will be acquired, and the options for future use.

It is recommended that a Land Acquisition, Brownfields and Land Use Plan be prepared, either independently or as a component of the Partnership for Sustainable Communities/LDC Update process task in Framework Action #4 below, with the following components:

1. Comprehensive Land Use Inventory with Ownership Status

A comprehensive and fine-grained (parcel-by-parcel) inventory of the land use within the 60-acre Focus Area should be prepared including ownership status (e.g., privately owned, MSD, Parks or Housing Authority); potential for public acquisition; potential purpose for public acquisition (e.g., neighborhood stabilization, Project Groundwork, both or other purpose); and brownfields investigation/remediation status. This inventory ideally would include rights-of-way and potential right-of-way acquisition for transportation projects.

2. Brownfield Coordination

Developing a strategy for dealing with brownfields – properties potentially contaminated by prior land uses – is among the most important planning issues for implementing Project Groundwork in the Lick Run Watershed. A strategic Land Acquisition and Use Plan will need to incorporate information on brownfields status so that evaluation and remediation efforts can be focused in the areas where remediation or evaluation can enable either a Project Groundwork component, or another land use plan objective. The brownfields objectives may also inform future land use recommendations, since some sites may require more intensive remediation to become suitable for residential uses than others and, therefore, may be preferred uses for commercial or other purposes.

Phase 1 and Phase 2 brownfields investigations are underway throughout the project focus area and Westwood Avenue/Queen City Avenue corridor, through the Port Authority of Cincinnati and US EPA. The US EPA is actively supporting brownfields assessments in the area through its own contracting and has provided a $1 million Targeted Brownfields Assessment (TBA) grant to the Port Authority of Cincinnati, which will fund assessments of area properties. MSD and the City's Department of Planning & Buildings may seek grant funding from the Clean Ohio Fund for Phase 2 Assessments and remediation, which will include environmental assessment of publicly-owned properties in the Lick Run corridor, and evaluation of additional properties that may require relocation. The City also may apply for an EPA Brownfields Assessment Grant since it allows for area wide planning (up to 75% of the total) efforts that might support the TBA grant work. This area wide planning effort might focus on the older industrial buildings located in the eastern gateway study area.

Project Groundwork, associated transportation improvements, neighborhood stabilization efforts, and housing and economic development all will require excavation and property transfers, which can be complicated significantly by soil and groundwater contamination. Among many other conditions, soil contamination conditions greatly affect the potential cost and viability of infiltration and other Sustainable infrastructure practices, as well as the cost to remediate a site for residential versus commercial use. Therefore, all of the agencies involved in the comprehensive strategy for Lick Run must maintain close coordination and information exchange regarding the brownfields assessments being done in the corridor.

One of the rationales for Framework Action #2, the strategic Land Acquisition, Brownfields and Land Use Plan, is to identify properties whose acquisition or re-purposing can help accomplish a larger goal, such as aggregating sufficient land for redevelopment, transportation right-of-way or Project Groundwork needs. The same principle should be carried through to prioritizing Brownfields and particularly remediation investments, so that funds are directed first to the sites with greatest opportunity. Incorporating Brownfields information within plans and inter-agency discussions will help ensure that remediation provides the greatest benefit, and that brownfield issues are as small of a barrier as possible to Project Groundwork implementation.

3. Greenspace/Parks Analysis

Once an inventory has been prepared, one area of analysis should be the status and availability of open space and public parks (both active and passive) to different areas of the community, and the potential for Sustainable Infrastructure Program components to provide or enhance green space within the neighborhood, particularly for underserved areas. This could be done through ongoing coordination with Cincinnati Parks (Framework Action #3 below) or another planning venue, and provides an excellent opportunity for further public engagement in the shape and outcome of the Sustainable Infrastructure Program. This task also should consider the need and opportunity for community gardens, if suitable lands for a garden are not required for Project Groundwork.

4. Market and Opportunity Analysis

With the extent of land being purchased by different public agencies, and the major investments envisioned for this corridor through Project Groundwork, there may be opportunities to assemble suitable areas of land for larger-scaled economic development or housing initiatives, as well as to add to transportation rights-of-way for reconstruction or realignment projects. A market and opportunity analysis would identify locations where groupings of land acquisitions are anticipated, along with the current ownership/acquisition and Brownfields investigation status of each parcel. These areas could be flagged as important resources either for the Sustainable Infrastructure Program, or as sites to be considered for economic development or housing. This type of analysis may help prioritize MSD and HUD NSP or other investments synergistically, to maximize opportunities for enabling more substantial projects over the coming years.

5. Zoning and Implementation Strategy

Completing a Land Acquisition, Brownfields, and Land Use Plan in advance of the City's LDC update represents an excellent opportunity to develop zoning and code provisions for implementation. Whether through form-based coding or conventional zoning districts, it will be beneficial for Project Groundwork and the neighborhood to have a land use strategy developed before the code update occurs.

3.4 Framework Action #3: Cincinnati Parks Coordination (Ongoing)

Goal:	Continue to update and work through the MOU between MSD and Cincinnati Parks to accomplish planning and implementation of the Sustainable Infrastructure Program and improve neighborhood open space and park resources.
Opportunity:	Provide a model for cooperative maintenance, funding and upkeep of distributed stormwater source control and treatment; provide "green jobs" opportunities and training once projects are implemented.
Lead responsibility:	MSD and Cincinnati Parks.
Additional agencies:	Mill Creek Restoration; HUD Neighborhood Stabilization; Cincinnati Schools.
Timeframe:	First MOU expires December 30, 2012; MOU Renewal for 2013 – 2015.

On April 1, 2010, MSD and Cincinnati Parks entered into an MOU that represents a crucial positive step towards making the Sustainable Infrastructure Program a feasible response to the regulatory requirements of the Consent Decree (Appendix D, MSD and Cincinnati Parks MOU). The second and third clauses of the MOU describe the vital relationship between Cincinnati Parks, its lands and activities and the outcome of the Sustainable Infrastructure Program:

> "WHEREAS, Parks controls and operates a system of parks and spaces and has experience in mitigating uncontrolled and unplanned stormwater runoff through urban forest development and management and through the development and management of park lands.

> "WHEREAS, the Infrastructure Programs will be for the use and benefit of MSD and may include…practices and structures that use or mimic natural processes to infiltrate or reuse stormwater, and includes the use of the city's parkland as a stormwater mitigator."-- *(MSD April 1, 2010; page 1)*

The current MOU provides for MSD to reimburse Parks and the Cincinnati Parks Board (CPB) for the time and expenses Parks incurs providing services on MSD-authorized projects related to urban forest development, planning and management, as well as management and maintenance of stormwater best management practices (BMPs). Among other provisions, MSD is to provide the CPB with manuals for various stormwater BMPs, and CPB is to provide public relations support to "…inform affected property owners and to educate citizens on the intent and benefits of such collaborative work."

The MOU emphasizes that Cincinnati Parks, as managers of and planners of the City's urban forest and open spaces, are vital to all phases of the project from planning to long-term maintenance. This collaboration is a core Framework Action; monitoring the success and any issues with the MOU and its provisions should be a continuous process. It is also worth emphasizing that Cincinnati Parks' participation in the upcoming charrettes, as well as an expanded CFAC process, is essential.

In the short term, it is also essential to ensure that Cincinnati Parks is fully engaged in planning for the details of the Sustainable Infrastructure Program, particularly the main linear Lick Run restoration area. In the next year, many decisions will be made on the details of the water feature that will determine both how a daylighted Lick Run functions as a recreation area (or not), and its future maintenance issues and costs. Cincinnati Parks, and the Cincinnati Recreation Commission, also may need to be actively involved in any Project Groundwork components that would affect local recreation facilities, such as the recently-improved South Fairmount Aquatic and Recreation Area. Input from Cincinnati Parks is also crucial to plan for specific park and recreation impacts that could occur during construction if neighborhood facilities must be affected or taken out of service.

3.5 Framework Action #4: Regulatory Framework and Land Development Code (LDC)

Goal:	Develop a watershed-area plan and regulatory framework fully supportive of Project Groundwork implementation and the strategic land acquisition, brownfields, and land use plan.
Opportunity:	Build source reduction and green infrastructure into the land use planning and regulatory/implementation structure for the Lick Run Watershed.
Lead responsibility:	Department of Planning & Buildings.
Additional agencies:	MSD; Cincinnati Parks; Economic Development; Department of Community Development.
Timeframe:	Watershed area plan and task definition: 2011 Charrettes: Summer 2011 Watershed area plan development: 2011-2012 Regulatory framework development: 2013

Cincinnati has recently embarked on what will be a crucial under-pinning of the Lick Run Watershed plan: a comprehensive update of its LDC, the City's basic governing statute for building, development and land use review. US EPA has recognized that the Sustainable Infrastructure Program could substantially advance other US EPA-backed Sustainable Community goals by contributing to many important features of community livability, such as access to parks and open space, aesthetic

enhancements, educational opportunities and improved air quality. The LDC is intended to move beyond traditional regulation to consider and manage the impacts that development regulations have on public health and the environment, through working collaborations with the Cincinnati Health Department, MSD and the MCRP. This LDC effort is timely since it will assist with the implementation of the recently adopted *Go Cincinnati Plan*.

The LDC project incorporates large-scale planning projects that will serve as models and test cases for planning prior to the actual update of the LDC. Along with the Cincinnati Streetcar initiative and a master plan for the Lower Mill Creek watershed (which is to include corridor restoration for Mill Creek coordinated with Mill Creek Restoration, Inc.), the City's third specific task identified in the grant application is a watershed plan for Lick Run. Like the Lower Mill Creek Watershed Master Plan, the Lick Run Master Plan is intended to: (1) develop strategies to expand affordable housing and transportation options that pair with MSD's proposed infrastructure investments; (2) advance redevelopment with reuse of Brownfields, vacant or otherwise abandoned and underutilized properties for economic and job creation; and (3) incorporate strategies to expand traffic choices and connect the urban greenways to urban centers. As currently described, the activities envisioned for the Lick Run Master Plan are: (1) data collection for integrating housing and transportation within four watersheds, (2) public preference sessions, (3) public visioning charrettes, (4) housing evaluation and action plan, (5) transportation plan, and (6) master plan development.

This task is clearly complimentary to Framework Action #3 discussed above. Depending on the lead agency chosen, the two could be combined as long as the specific components from Framework Action #3 are defined. This task is also already in process as a series of design charrettes are planned for the Lick Run Watershed area in the summer of 2011, sponsored through MSD. To improve the reach and effectiveness of the charrettes, it is recommended that the Lick Run Master Plan and charrettes should include the following scoping and task development activities:

1. Detailed Land Use Inventory for Watershed Features

Integrating watershed concepts into the initial data collection could greatly improve coordination and multi-benefit outcomes as housing, transportation and green infrastructure are designed. As detailed in Section 3.4 above, parcel level detail is needed for the watershed. This parcel level data should integrate ownership, land use, Brownfield investigation findings, impervious cover and forest cover data, including any updated data sets from City or regional agencies. Moreover, the data collection for "integrating housing and transportation" should look specifically at opportunities for building- and site-level disconnection and retrofits to support MSD's source reduction and control needs as part of the Sustainable Infrastructure Program. Data collection must include not only housing types and conditions, but also lot drainage types and infrastructure by neighborhood and block, lot development types, yards or other areas available for disconnection and green infrastructure features, and potential land use "hot spots" (e.g., areas with illegal dumping or informal vehicle storage) where more active source control or stormwater management could be beneficial. In addition, potential path and transportation connection points might be identified and then correlated to soil type and relationship to drainage infrastructure, to see where permeable pavement installations could be used to meet both transportation and source control needs.

2. Transitional Design and Management Standards for Vacant Lots

An important contribution that could be made through this plan are protocols and design concepts for managing the many publicly-owned vacant and transitional parcels in the watershed, which will be a feature of the Project Groundwork process as acquisition and implementation happen over time. The Pennsylvania Horticultural Society (PHS) developed an extremely successful and cost-effective model for managing vacant lots during the transition between public ownership and demolition, and eventual reuse for stormwater management, community gardens, redevelopment or neighborhood parks (Appendix G, Land Stewardship and Green Job Examples). PHS uses a standard grading and planting plan, along with

simple wooden fencing, to improve the appearance of stabilized lots and to discourage illegal dumping. The lots are then maintained by "Community LandCare Organizations," providing further support to community organizations. PHS has found that marking and caring for the lots creates a positive public awareness of the City of Philadelphia's green infrastructure program, which is an especially important and transferable lesson for South Fairmount and the Lick Run Watershed. Adopting a similar standard approach among Cincinnati Parks, MSD, Transportation & Engineering, and Neighborhood Stabilization would support public engagement needs as well as the multi-benefit objectives of the Sustainable Infrastructure Program. Community gardens are another opportunity; Cincinnati recently enacted regulations within the Zoning Code for community gardens, which will offer another option for managing vacant lands.

3.6 Framework Action #5: Maintenance Agreements

Goal:	Outline and assign responsibility and funding for maintenance of Project Groundwork components, including individual building-site source reduction, transportation-related facilities, regional stormwater storage and treatment facilities and the Lick Run channel restoration—supporting a green jobs mission wherever possible.
Opportunity:	Identify possible green jobs training and development strategies, and supplemental funding sources that can help support Project Groundwork maintenance over time.
Lead responsibility:	MSD
Additional agencies:	Cincinnati Parks; Community Development; Office of the Mayor.
Timeframe:	Set up communication structure among agencies: 2011-12 Work to define expectations and maintenance issues: 2012-13 Identify green jobs partnerships, opportunities and funding: 2012→ Develop agreements for maintenance and funding: 2013 → Implementation and feedback: 2014→

The final Framework Action, under the catch-all of "Maintenance Agreements," encompasses the need to begin developing long-term provisions for managing the ultimate network of Sustainable Infrastructure Program facilities – from individual source reduction measures, such as cisterns or green roofs, to the restored Lick Run channel and ancillary detention basins, to stormwater management features within the right of way, as well as the neighborhood's open spaces and corridors that result from land acquisitions, transportation improvements, Brownfields remediation and other revitalization initiatives.

One of the important potentials of the Sustainable Infrastructure Program is the opportunity to enhance the community's aesthetic, environmental and economic climate by building a network of well-managed landscape features that can be maintained (and in some cases constructed) by well-trained local crews – as opposed to an underground tunnel, whose construction and maintenance requirements are not suited to local job and community management programs. As the Sustainable Infrastructure Program and Framework Actions evolve, care should be taken to look for opportunities to create community-based maintenance, installation and stewardship programs wherever possible. These efforts can engage and use the particular skills of citizens of the area, local universities and colleges, non-profit organizations, area businesses and others. Some of these opportunities are listed below, and examples of comparable efforts are included in Appendix G:

1. Vacant property stabilization can be supported by community members (PHS's Community LandCare Organizations)
2. Installation of building- and site-level source controls, such as rain barrels, can be done through community-based training (Savannah, GA Water Resources Bureau and Rutgers (NJ) Cooperative Extension)

3. Stream channel and detention/infiltration area maintenance often can be done through youth organizations or conservation corps projects (South Burlington, VT/Vermont Youth Conservation Corps)
4. Implementation of community gardens, coordinating through the Civic Garden Center of Greater Cincinnati and evaluating the effectiveness of the recently-enacted zoning code provisions for community gardens , or stormwater management features such as rain gardens, on previously-vacant sites
5. Urban forestry and tree planting included in MSD's source control modeling and calculations can in many cases be coordinated with community-based groups, working closely with Cincinnati Parks.

The purpose this Framework Action is to ensure that community engagement in the physical implementation, maintenance and well-being of the Sustainable Infrastructure Program is a consistent, over-arching goal, even though it will require substantial administrative work to ensure that appropriate agreements are available to cover funding, staffing, training, legal, liability and performance issues. Green infrastructure programs often are not pursued in this way because it is simpler to use existing contract vehicles than engage in the often difficult process of building local capacity to manage LID BMPs. While easier in the short-term, the simpler approach would not yield the long-term value of engagement and community participation. With the extent of the investments that will be made in the Lick Run Watershed, the amount of land area and vacant land that will be affected through different programs and the level of economic distress, this is a critical opportunity that warrants consistent attention and resources.

4.0 Supporting Actions

As discussed previously, Supporting Actions are ongoing and planned to support the Sustainable Infrastructure Program, though they may not be directly required to implement the infrastructure alternative. This section presents Supporting Actions identified during development of this Plan and provides a framework for integrating additional Supporting Actions over time.

4.1 Overview

One of the greatest challenges for implementation of the Sustainable Infrastructure Program is the sheer number of public and private investments that either are affecting, or may affect, implementation as time progresses. As City departments, stakeholders and MSD work to implement the COF concept and the Framework Actions discussed in Section 3.0, other City actions, private investments and community initiatives will be taking place in the neighborhood that will need to be coordinated, at least in pertinent parts, with the Sustainable Infrastructure Program.

If organized around the goals and objectives of the Framework Actions, the investments to be made by MSD and other agencies provide opportunities for coordinated, co-investment in public features such as streets, sidewalks, lighting, landscaping, drainage and transportation systems. Using LID BMPs and green infrastructure design principles and features can also help improve community livability by, for example, incorporating streetscape bioretention into projects that fix broken or incomplete sidewalks; using the construction of stormwater treatment or constructed wetland areas as catalysts for improving parks and public spaces; identifying sites with ponding water and chronic icing as priority locations for improved drainage; and using separation and other construction projects as opportunities to address inadequate street lighting or landscaping, which also supports crime prevention and environmental health.

The long-term economic conditions of South Fairmount also can benefit from both the Framework Actions and active coordination of the housing, economic development, land acquisition and facility maintenance work that will be involved in Project Groundwork and components of the Sustainable Infrastructure Program. As discussed in Section 3.3, land acquisitions may be structured to support future housing and economic development, and the types of community-based maintenance activities described in Section 3.6 have been used in other jurisdictions as a source of "green jobs" training and employment opportunities. Moreover, ongoing investments in a consistent and organized regulatory framework, community livability and well-functioning infrastructure are strong economic development catalysts in and of themselves.

This section of the Plan lists and briefly discusses initiatives of several City and regional agencies that will affect South Fairmount and the Lick Run Watershed in the same timeframe as the Project Groundwork investments, and highlights some opportunities for coordination. Maintaining current information through updates on these program areas and the addition of new areas will be important to the success of the project over time. The planning and investment actions with the greatest importance in the near term, presented below, are: (1) planning and historic preservation, (2) housing and economic development, and (3) transportation, transit and bikeways.

4.2 Planning and Historic Preservation

Cincinnati has a long and distinguished history of planning. Recently, the City initiated a multi-year process called "Plan Cincinnati" to update the Comprehensive Plan last completed in 1980. This process included extensive community outreach, and an Issues Paper on infrastructure that describes Project Groundwork and the Lick Run issues in particular (see Appendices F, Area Planning Activities, and Appendix H, Plan Cincinnati Infrastructure White Paper). Hamilton County's Community Compass and Agenda 360: A Regional Action Plan (http://www.agenda360.org/) are two other regional initiatives that have included public outreach and engagement on general long-range planning.

Sustainable Infrastructure planning and Brownfields investigation are both, fundamentally, neighborhood land use planning. In using a Sustainable Infrastructure approach in Lick Run, coupled with investigating and mitigating Brownfield sites, Cincinnati has the opportunity to pioneer the use of natural and engineered features that not only manage stormwater runoff, but also create public and neighborhood green spaces, enhance the neighborhood's aesthetic quality, and integrate with improved public facilities from parks to sidewalks, streets and redevelopment sites.

Land Use Planning: Following the completion of Plan Cincinnati, the next major land use planning initiative will be the Lick Run Watershed Plan task in the LDC update. This is a critical planning task for the Sustainable Infrastructure Program. Linking the land acquisition and management components with a comprehensive plan and vision for the community's design, environmental function and character will bridge the gap between the high-level vision for the watershed and the site-specific implementation issues. Working Sustainable Infrastructure principles and individual projects into the overall goals of the Lick Run Watershed Plan, and directly incorporating the Framework Actions identified in this Strategic Integration Plan (particularly parks coordination and land acquisition, brownfields, and land use planning) may allow the Lick Run Watershed Plan to function as the main working document for Project Groundwork within this area.

Historic Preservation: As noted in the Technical Report (MSD 2009, page 2-11), South Fairmount has several historic buildings that anchor the study area corridor along Westwood Avenue. The Urban Audit completed for the Technical Report identified examples of many architectural styles representing different periods and styles found elsewhere in Cincinnati, including Italianate, Queen Ann, Greek Revival and Empire. Some historic buildings in the neighborhood, such as the St. Francis Apartments, have been modernized through adaptive reuse, and others are candidates for this type of investment. Many of the buildings are rental units, which could benefit from the use of the Historic Preservation Tax Credit as a redevelopment tool. It is strongly recommended that any historic preservation activities or adaptive reuse enable and include source reduction measures, such as rainwater harvesting cisterns, rain barrels and planters, in all phases of design and implementation.

Section 106 review for Project Groundwork will be necessary, and complex. There may be opportunities to consolidate reviews, possibly using the consolidated land use plan as a basis for evaluating the interaction of historic resources with potential acquisition, Brownfields investigation and future redevelopment plans.

City Buildings and Schools: Ohio's ambitious program for greening schools and public buildings has become a national model for improving urban sustainability, and Cincinnati Public Schools has received national attention for its work on green schools design. The initiative within the Lick Run Watershed will be furthered substantially by incorporating as many stormwater source reduction and site permeability measures as possible into all public building and school greening efforts in the future, in addition to the basic Leadership in Energy and Environmental Design (LEED) standards for stormwater management and water-conserving fixtures. Any retrofits that can highlight source reduction and rainwater capture will greatly further the effort and create more visibility and support within the community. As the Land Acquisition, Brownfields and Land Use Plan evolves, other opportunities for City buildings and schools may include creating or maintaining community gardens or green spaces that complement public facilities, and using these spaces to showcase Project Groundwork components such as rainwater harvesting or rain barrels, constructed wetlands, permeable pavements or xeriscaping (landscaping designs that reduce or eliminate the need for supplemental irrigation).

Recommendations:

- Develop a scope for the Lick Run Watershed Plan, as part of the LDC update that makes implementation of the Sustainable Infrastructure Program a principal goal and brings together the Framework Actions identified in this Plan.

- If possible, structure the Lick Run Watershed Plan to act as the overall coordinating document for implementing the Sustainable Infrastructure Program in the focus area over time.
- Coordinate with sustainability efforts for schools, City-owned buildings and Clean Ohio-funded programs to include source reduction, Sustainable Infrastructure techniques and educational components in any City building sustainability or retrofit projects, above standard LEED measures for water-conserving fixtures and stormwater management.
- Ensure that the LDC update's provisions regarding historic buildings and particularly adaptive reuse enable or encourage incorporating source reduction features such as green roofs, rainwater harvesting structures and permeable landscaping materials.
- Look for sites in the Land Acquisition, Brownfields, and Land Use Plan that are proximate to, or could complement, greening efforts for the neighborhood's public and historic buildings.
- Through the US EPA's current Targeted Brownfield Assessment project, ensure that information on site assessment status and results for all parcels within the Lick Run Watershed is continuously provided to MSD and to the Department of Planning & Buildings, so that this information is fully incorporated into the Land Acquisition, Brownfields, and Land Use Plan, Lick Run Watershed Plan/LDC update, and decisions regarding the use of NSP funds.
- Through collaboration among MSD, the Department of Planning & Buildings, US EPA, and the Port Authority, begin to outline a potential priority list and schedule for remediation, focusing on properties whose analysis or remediation will provide the greatest value to advancing Project Groundwork design or implementation.
- Investigate creation of a land bank authority that could be a partnership between Hamilton County, City of Cincinnati, and the Port Authority. Continue to look for opportunities to leverage funds through brownfields tax credits and other strategies in support of redevelopment and restoration.

4.3 Housing & Economic Development

As has been the case in many of Cincinnati's historic neighborhoods, South Fairmount has experienced significant disinvestment, leading to falling property values and an abundance of vacant and under-utilized properties. New investment since the 1970s has consisted principally of auto-oriented development, such as fast food restaurants, convenience stores and gas stations. Within the larger Lick Run Watershed, the resulting land use pattern is principally residential, with a large stock of single-family units; the focus area at the eastern end of the watershed is a mix of commercial, institutional and industrial land use. The area now serves as a major commuter pass-through area for significant volumes of vehicle traffic from the western suburbs to downtown, particularly along Westwood Avenue.

The focus area and Lick Run Watershed has received federal HUD monies for many years, through several different programs. Both Community Development Block Grant (CDBG) and NSP funds have been used in the area for stabilization, principally demolition of abandoned or unrepaired housing, but also for loans for rehabilitation projects such as the St. Francis Senior Apartments. The St. Francis Senior Apartments is an important example of the type of project that will further both neighborhood revitalization and Project Groundwork, as this complex is also the site of a green infrastructure stormwater project that is replacing excess pavement with rain gardens.

Current attention remains focused on vacant properties and removing abandoned buildings, but preserving existing housing stock is a long-term goal. As another long-term concern, there is the possibility of gentrification for South Fairmount that coincides with the public infrastructure improvements coming from Project Groundwork as well as other transportation improvements. Throughout the redevelopment process, there needs to be dialogue with the present residents of the Lick Run Watershed about the opportunity to continue living in the neighborhood after the implementation of the Wet Weather Plan.

Housing Redevelopment: Depending on population trends, market conditions and economic development opportunities in the Lick Run Watershed, there are a number of potential sources of redevelopment financing that could promote both improved housing stock and conditions, and implementation of Sustainable Infrastructure program components. Continued activity through CDBG and the NSP may be adjusted to support land acquisition, demolition, planting and stabilization of vacant sites, and community land management, as described in Framework Action #4. In addition, South Fairmount may be able to take advantage of the Build Cincinnati Development Fund (BCDF), which is intended to provide pre-development loans for residential projects and small businesses in some of the City's underserved neighborhoods. The Cincinnati Development Fund, a non-profit providing gap financing for projects that are traditionally difficult to finance through other sources, is another active source of rehabilitation funds, having made over $200 million in loans for over 3,500 units of housing. Cincinnati Housing Partners, Inc., which rehabilitates housing for low- and moderate-income households also may become active within the watershed, along with other local housing organizations.

Economic Development: South Fairmount's income and employment profile point to the level of economic distress that the neighborhood has experienced for many years. At present, the neighborhood has many liabilities that are driving away potential economic development: an abundance of vacant and under-utilized parcels; extensive brownfield issues; a traffic corridor with high volumes of through traffic; and historic "anchor" buildings in varying states of use and repair. However, all of these conditions represent opportunities to improve economic conditions through strategic investments, transportation improvements, and redevelopment.

Project Groundwork's upcoming investments in the neighborhood offer a potential catalyst for economic development, both through direct investments in infrastructure projects and through the LDC planning and regulatory update process. Four of the Framework Actions are directly related to the economic development goals of Project Groundwork in this watershed. Coordinating actions and recommendations include:

Local business support during construction: The locally-specific engagement and communications program in Framework Action #1 is essential to helping preserve and support existing businesses within the watershed and focus area, especially as construction activities begin. **Local businesses that will be affected by construction- and operation-phase disruptions, particularly to traffic and parking, must be identified and engaged as soon as possible,** and preferably before construction plans have to be presented as a "done deal." Taking the approach of many "main street" transportation projects, MSD should consider making traffic and access plans the first step for all of its construction work in the corridor, including identification of construction-phase parking, business access and temporary signage so that businesses experience as little disruption as possible.

Economic and retail market analysis: As part of Framework Action #2 (Land Acquisition and Use Plan) or #4 (Regulatory Framework and LDC Update [including the Lick Run Watershed Plan task]), **it is recommended that analysis of real estate, retail and economic development market conditions be completed within the next year so that all stakeholders can understand the realistic, well-founded options for revitalization in the area**. A market analysis would evaluate data such as vacancies, highest and best uses, competitive retail areas, retail functions served within the neighborhood, population trends and demand scenarios to establish a common understanding of the short- and long-term potential for viable redevelopment in the neighborhood. The market analysis also may indicate that a change in transportation and circulation patterns would facilitate one potential outcome over another. As an example, the Lunkenheimer site, a historic anchor building with its foundry still partially in use, could have a host of reuse options, but both brownfields assessment and an understanding of market and competitive opportunities will be needed to form effective strategies. Ideally, some housing and economic market analysis would be presented at the beginning of the upcoming summer design charrettes, so that plans and designs reflect realistic opportunities and focus on how to achieve them.

Supporting local green jobs through maintenance and implementation: As outlined in Framework Action #5, **realizing the potential for Project Groundwork to support and catalyze strong, locally-generated "green jobs" and land stewardship will require organization, attention and investment.** Since source control construction and maintenance activities will be required to implement the project, this is perhaps the most certain upcoming economic opportunity for the neighborhood resulting from Project Groundwork. Recommendations in this area include:

Recommendations:

- Target CDBG and NSP funds, along with other available housing funds, to support implementation of Project Groundwork and the strategic goals of the Land Acquisition, Brownfield and Land Use Plan (Framework Action #2).
- Complete a market analysis outlining the competitive housing and economic development climate within South Fairmount and its market area, and short- and long-term reinvestment and redevelopment opportunities.
- Provide competitive market information to inform the charrettes so that land-based solutions reflect realistic scenarios for redevelopment.
- Include detailed plans and outreach to local businesses in all construction planning for Project Groundwork activities, including construction-phase plans for business signage, access and parking and make contact with business owners or representatives well in advance of finalizing construction plans.
- Make locally-generated green job components a central focus of all investments and economic development activity within the watershed.

4.4 Transportation, Transit & Bikeways

The initial Synthesis Plan for restoration of Lick Run and the Sustainable Infrastructure program (Figure 6) highlights the central importance of transportation planning to the ultimate outcome of the project for the neighborhood. Because the central feature of the Sustainable Infrastructure Program will parallel Westwood Avenue and may eliminate Beekman Street (Figures 6 and 7, Transportation Networks), planning for the final form of the stormwater infrastructure network and the transportation network cannot be separated. A phased construction plan will be needed as a mid- to long-term goal. The goal will be to avoid significant disruptions of the large volume of commuter traffic through the corridor; MSD and the City are encouraged to coordinate schedules so sewer projects occur at the same time that road projects occur.

Figure 6 Current Transportation Network (Bus Routes and Abandoned Rail)

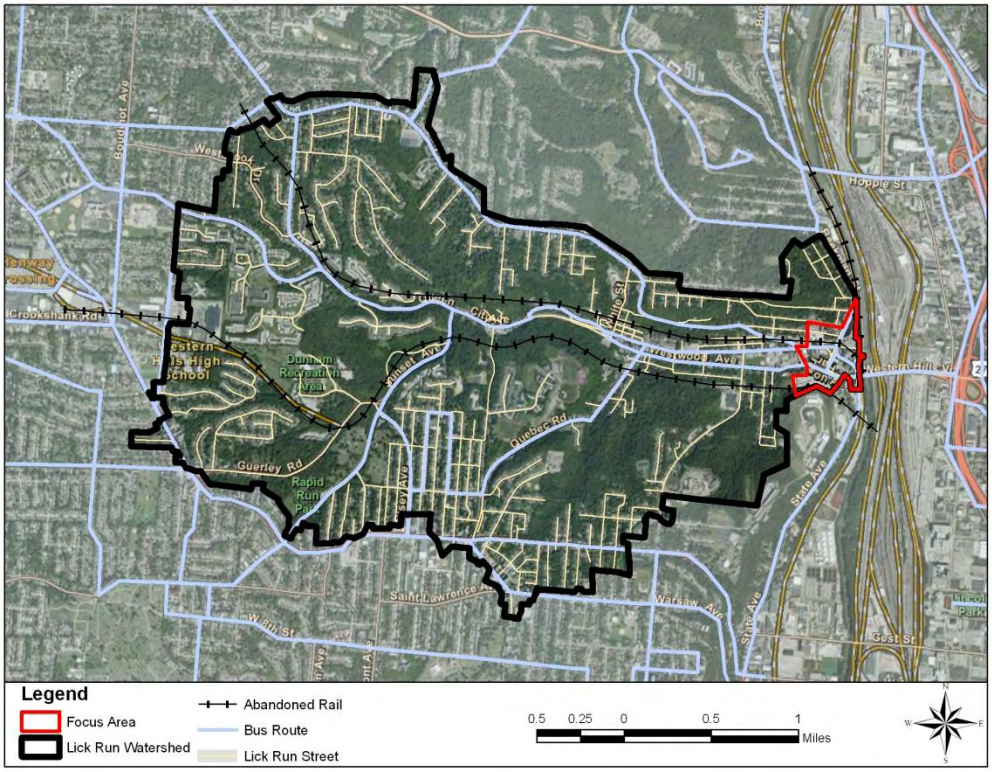
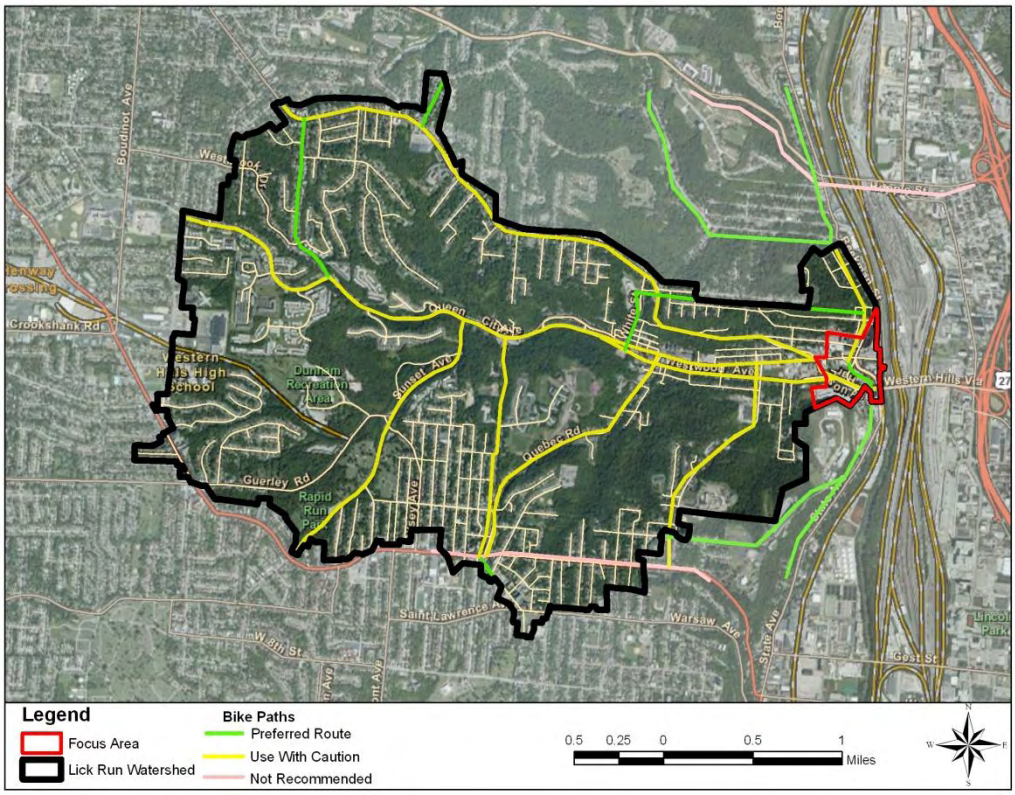


Figure 7 Current Transportation Network (Bicycle Paths)



As noted in Section 2 of this Plan, despite sidewalks on both sides of most streets and nearly continuous bus transit service through the corridor, the focus area has high traffic volumes, limited pedestrian facilities and few features that would improve its walkability.

Representative intersections and sidewalk/streetscape images are provided below.

Photographs showing current Lick Run Focus Area and watershed sidewalks, intersections and streetscapes.

In keeping with the Sustainable Communities Livability Principles of the LDC update process, the City and MSD have committed to improving options for transit, walking and bicycling as planning and implementation occur. Project Groundwork will have a substantial impact on the resulting transportation network, the environment and facilities for walking and biking, and on housing and redevelopment efforts whose form will depend, in large part, on the available transit and traffic network.

Many transportation plans and projects are in varying states of preparation through the Ohio Department of Transportation (Ohio DOT), the City's Department of Transportation & Engineering, the Southwest Ohio Regional Transportation Association (SORTA), and more recently the HUD Sustainable Communities Grant, which as noted above requires a focus on transportation alternatives and transit-oriented design. Among the key projects that will be evolving in the area are:

Replacement/Repair of Western Hills Viaduct: The Western Hills Viaduct (WHV), which is owned by Hamilton County but maintained by the City, is being evaluated for replacement or expansion. A final scoping study is due in November 2011. MSD and the City Department of Transportation & Engineering (DOTE) have met and agreed to combine efforts on the National Environmental Policy Act (NEPA) analysis that will be required for both the WHV project and transportation changes related to MSD efforts in the area; however, it is reasonable to expect that this will be on a longer timeframe than Project Groundwork within the corridor.

Transit: SORTA manages public transportation in the City of Cincinnati and is responsible for ongoing transit planning activities. Through different studies and discussions, the potential to locate a bus transfer location in South Fairmount has been noted, but more study is needed. Evaluation of a bus transfer location would be an excellent add-on or component of the LDC update's Lick Run Watershed Plan, since adding a bus transfer station could reduce the neighborhood's function as a pass-through for traffic, and potentially create a node for economic development. Siting,

Constructing green infrastructure features in locations with poor sidewalks improves water quality and pedestrian facilities. (City of Los Angeles 2010, www.lastormwater.org)

potentially create a node for economic development. Siting, however, would need to be coordinated with the final decision on the transportation and circulation network.

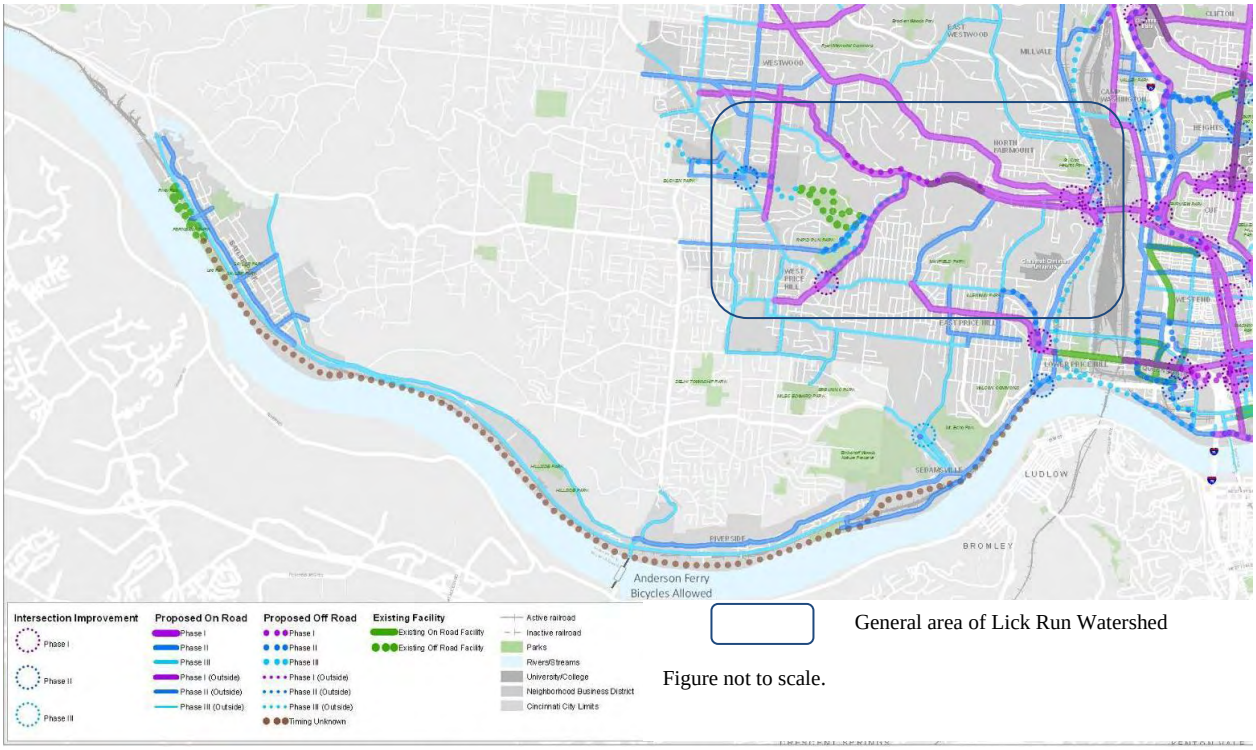
Complete Streets: Cincinnati is working to finish its Complete Streets Policy, which requires active design to incorporate safe bicycle, pedestrian, and transit facilities in all road reconstruction projects. A first Complete Streets project was implemented in the summer of 2010 along Madison Road between Grandin Road and Dana Avenue. This policy is important to the Sustainable Infrastructure program, and also represents an opportunity to move beyond the City's existing policy to pilot greater use of stormwater infiltration techniques in roadway and right-of-way projects. Any street network changes made as part of Project Groundwork will need to comply with the City's guidelines, but in addition, could incorporate LID techniques such as infiltration or bioswales to create a "Green Street" as well as a "Complete Street," as illustrated above. Cities also are using green infrastructure and infiltration techniques within traffic calming measures such as curb bump-outs (curb extensions) or chicanes (an S-shaped curve in the vehicle driving path). These options are another possible consideration for Lick Run, depending upon final street network design, anticipated traffic volumes, soil types and available land area.

An example of a "green street" with bioretention (Low Impact Development Center 2011)

Pedestrian Facilities: Implementing green infrastructure offers several important ways to ensure that pedestrian needs are met and walkability is promoted, as outlined in the Sustainable Communities Livability Principles. As the Sustainable Infrastructure program is designed, participants should be encouraged identify poor quality or missing sidewalks, excessively wide intersections, locations prone to flooding and icing, areas without street trees or furniture, and particularly areas with missing or poor quality streetlights, street furniture or transit shelters as "opportunity spots" for Sustainable Infrastructure program components, and other livability improvements. Since MSD will have flexibility in siting the specific location of source control measures like infiltration areas, bioswales, permeable pavements, and street trees, engaging residents in a "walk-through" to find the locations most in need of better infrastructure or improvements (e.g., permeable pavement in a location prone to flooding, pedestrian refuges or curb bump-outs with infiltration at wide intersections) will provide a direct link between Project Groundwork construction work and community benefits.

Bicycling: Implementation of "Complete Streets" and green streets in the watershed and focus area, in conjunction with a re-worked street network, could gain substantial support and insights from bicycling advocates and plans for the area. The City of Cincinnati Bicycle Transportation Plan includes plans for bicycle facilities in Phase I through North and South Fairmount areas, and recommends intersection improvements and bike lanes within the heart of the focus area along Westwood Avenue, Queen City Avenue and Harrison Avenue. (Figure 8, Cincinnati Bicycle Transportation Plan, June 2010, Map B, Phase I Network by Preliminary Facility). Any of these bicycle plans, including current DOTE planning for Harrison Avenue between Kling Avenue and Queen City Avenue, would be substantially affected by the final circulation plan within Project Groundwork. Therefore, bicycling groups such as Queen City Bike and its Bicycle Friendly Destinations Program should be engaged (particularly in the design charrettes) to ensure that they are supportive of the project goals and can offer input on final roadway profiles, bicycle facilities and network design.

Figure 8 Bicycle Plans for Lick Run Watershed



Source: Toole Design Group and KZF Consulitng in support of City of Cincinnati Bicycle Transportation Plan.

Mill Creek Restoration: Lick Run is a tributary to the larger Mill Creek watershed, which drains to the Ohio River. Mill Creek Restoration Project (MCRP), a non-profit organization focusing on communities along Mill Creek, has been active since the mid-1990s. The organization has been successful in obtaining grant funds from the State of Ohio to build sections of greenway along Mill Creek and its tributaries, as well as organizing educational programs in area schools. Over the next five years, MCRP plans to complete a continuous 13.5 mile greenway from the Hamilton County Fairgrounds in Carthage to the Ohio River, including a section along Mill Creek within the project focus area.[4] The current plan is for this section to be constructed in 2013, but the schedule could be accelerated or pushed back depending upon MSD's progress and schedule for the daylighted Lick Run channel. MCRP's engagement and lessons learned from its years of activity in the larger watershed will be valuable, particularly in considering the design of greenway and bicycle/pedestrian features along a daylighted Lick Run channel. MCRP also may be able to assist with support for outreach to schools, environmental education, water quality testing and reforestation efforts. Recommendations for this area include:

Recommendations:

- Begin laying groundwork between MSD and Cincinnati Department of Transportation & Engineering (DOTE) for a phased construction plan that will eventually cover changes to the street network and various phases of Project Groundwork in the area; each phase should include the business outreach and access planning described in Section 4.4.
- Identify a dedicated "point person" within Ohio DOT and DOTE who will agree to be responsible for keeping MSD and the CFAC informed of the status of transportation projects in and around the Lick Run Watershed.

[4]Robin Corathers, MCRP, personal communication, October 22, 2010

- If possible, evaluate the potential for bus transfer locations as part of the watershed planning process in the LDC update, or through another transportation planning initiative, and incorporate findings into the strategic Land Use and Acquisition Plan for the focus area.
- As part of the public engagement and outreach process, conduct neighborhood "walk-throughs" or surveys to identify locations where pedestrian infrastructure is inadequate or missing, and work to make these priority sites for Sustainable Infrastructure program components (e.g., permeable pavements, bioswales, tree planting, infiltration areas) along with enhanced street lighting, transit stops, or other needed improvements.
- As plans for the street network in the focus area are developed, work with DOTE to incorporate Sustainable Infrastructure and LID concepts into the "complete streets" principles when planning traffic calming, bicycle lanes and reconstruction projects.
- Engage Queen City Bike, the MCRP and bicycle system planners in the upcoming design process so that options for the street network, greenway and enhancing pedestrian/bicycle facilities are understood and supported.

5.0 Implementation: Governance and "Glue"

Within the Lick Run Watershed, and particularly South Fairmount, Project Groundwork offers an enormous opportunity to transform a neighborhood and build its capacity for revitalization. It also involves a sprawling network of potential connections across over a dozen federal, City and State agencies, each with its own responsibilities, mission and limited resources. The project also is slated to take place within a neighborhood that does not have strong social infrastructure in place. There is a clear need for additional governance support, and also for an individual or dedicated team to act as the project's "glue," holding the pieces together so that opportunities are not overlooked.

There are several options for addressing this issue, none of which will be ideal and each of which will require some investment of both staff time and financial resources. At a minimum, it is recommended that the City explore options for at least a temporary staff person to work directly in the community, potentially for the South Fairmount council office, and for the City's Inter-Department Task Force (described in #2 below) to evaluate other governance and management needs as soon as possible in light of the Framework Actions and upcoming schedule. The goal should be for a team and chain of command to be established with the responsibility to carry out the recommended actions and shape the upcoming tasks (particularly the design charrettes and scoping for a Lick Run Watershed plan through the LDC update) around the Framework Actions and goals.

Considerations for the City's Inter-Department Task Force should include:

1. Inter-agency points of contact.

Responsible persons must be designated within Cincinnati Parks, the Cincinnati Parks Board, DOTE, MSD, Department of City Planning & Buildings, Port Authority, Hamilton County, US EPA, HUD and Office of the Mayor (at a minimum) who have the responsibility, and authority, to maintain a current working knowledge of the many cross-cutting initiatives affecting Lick Run and communicate regularly with their counterparts. The City has established a joint task force composed of multiple department heads that will meet regularly to discuss the Lick Run corridor, led by Tony Parrott (Executive Director, MSD), which was scheduled to convene in January 2011. Below the department head level, designation of a point of contact in each agency is strongly recommended.

2. City Planning Project liaison.

This initiative, while principally led by MSD, will require strong inter-department coordination and dedicated staff attention. A staff liaison within the Department of Planning and Buildings can serve as a liaison for the Lick Run project and provide a strong cross-department presence that will lead to better coordination as MSD and Planning begin the tasks in Project Groundwork and the LDC update. Continuous monitoring should be done by the Inter-Department Task Force to ensure that the staff member charged with these responsibilities has a well-defined role, sufficient lines of communication with other departments and the Inter-Department Task Force and sufficient resources to carry out assigned responsibilities. With respect to the staff member's role, strong coordination with DOTE is particularly important given the impact of Project Groundwork on the street network, and the opportunities for incorporating stormwater source control into transportation, street and sidewalk improvements.

3. Sustainability Team Involvement.

The City's Office of Environmental Quality (OEQ) has the opportunity to become more involved in this project and there are many opportunities to connect
Green Cincinnati efforts to this neighborhood. Roles for the Sustainability Team should be defined carefully so that expectations about the scope of Project Groundwork and LDC update tasks are well managed; however, the Sustainability Team could be an excellent liaison for outreach or initiatives that could involve schools, community gardens and grant opportunities. OEQ also could play a role in

tracking the GHG impacts of MSD's Project Groundwork, and would be able to use its communications networks to tell the story of these impacts and benefits.

4. Foundations.

Local foundations have not yet been invited to the table as part of this effort. With the variety of issues encompassed in this Plan, a foundation may be able to support a community organizer who can focus on the neighborhood, and particularly the outreach, communication and green jobs capacity-building needs, at least during the planning phases of development. Temporary staff positions with the South Fairmount Council may be one option for foundation support; a staff member within this office could work to coordinate with City departments and local residents on community engagement and green jobs and land stewardship activities.

5. Cincinnati-Area Universities.

Given the lack of existing community organizing resources available in the neighborhood, Cincinnati's universities may be able to provide support for various phases of the project as long as initiatives are coordinated through a dedicated staff person with oversight responsibility.

Appendix A Strategic Integration Table

Independent City, Regional and Organization Actions:

Framework Actions to Implementing Integrated, Sustainable Infrastructure	LAND USE & WATER			PARKS & TRAILS		TRANSPORTATION & TRANSIT					HOUSING & ECONOMIC DEVELOPMENT					SUSTAINABILITY		
	Project Groundwork	LDC Update: Lick Run Study	UDC Update: Charrettes & Code Language	Cincinnati Parks Planning	Mill Creek Restoration	Western Hills Viaduct Project	SORTA Multi-Modal Planning	Queen City/Westwood Parkway	Complete Streets Guidelines	Harrison Road Improvements	HUD Neighborhood Stabilization Program	Community Development SPUR Initiative	EPA Brownfields Support	City Environmental Justice Ordinance	Blue-Green Alliance Green Jobs	Sewer Credit Program	Cincinnati Sustainable Schools Program	GCEA Energy Audits
#1: COMMUNITY ENGAGEMENT & VISION DEFINITION																		
NEED: Ongoing and consistent messaging to local stakeholders, including micro/site issues																		
RESPONSIBILITY: Local area project and outreach coordinator																		
Refine/restructure COF Advisory Committee with locally-focused task force and stakeholders																		
Understand local information pathways & create dissemination plan																		
Prepare updated FAQs, upcoming outreach needs and other connections/resources needed																		
Continue with one-time events and ongoing feedback/communications																		
Implementation & ongoing feedback																		
#2: LAND ACQUISITION, BROWNFIELDS & LAND USE PLAN																		
NEED: Central inventory & adaptive plan for lands to be acquired/involved in Sustainable Infrastructure Program																		
RESPONSIBILITY: MSD; Planning & Buildings; US EPA; Port Authority																		
Compile information on land acquisition, park & brownfield status and create joint map																		
Identify additional involved lands in Green Infrastructure Program, Brownfields, recreation, parks																		
Conduct market and opportunity analysis incoprorate into plans & charrettes																		
Develop land use plan and site management standards for acquired land & transitional sites																		
Begin developing zoning and policies for disposition of extra lands (e.g. housing, transportation, etc.)																		
#3: CINCINNATI PARKS COORDINATION (ongoing)																		
NEED: Joint MSD/Parks Plan for Green Alternative Project Components + Mill Creek Greenway Project																		
RESPONSIBILITY: Cincinnati Parks & MSD; Mill Creek Greenway																		
Continue cooperative work under MSD-Parks MOU																		
Identify potential localized/site specific park impacts of Green Infrastructure Program construction																		
Through charrettes, identify concepts for recreation/park uses of GIP lands																		
Work with Mill Creek Greenway on extension opportunities, requirements & phasing																		
Continue to assess neighborhood park needs and impacts as GIP components are designed																		
Identify additional funding sources for park/recreation components																		
#4: LAND DEVELOPMENT CODE (LDC) UPDATE																		
NEED: Regulatory Strategies and Plans Supporting Green Infrastructure Program																		
RESPONSIBILITY: Planning, coordinated with MSD																		
clear statement of current and future source reduction needs as baseline for planning, eventual code update																		
Design and conduct charrettes to ensure GIP principles, source reduction needs are fully incorporated																		
Incoporate land acquisition.use plan, planning through Parks MOU into land use plans and zoning for area																		
**Ensure source reduction standards for housing, transportation, capital facilities are incorporated into UDC																		
articipate in updates of related technical standards and codes, particularly streets and public works standards																		
Participate in Complete Streets implementation																		
#5: MAINTENANCE AGREEMENTS																		
NEED: Working agreement with affected City departments for maintenance of Sustainable Infrastructure Project components																		
RESPONSIBILITY: MSD, Parks, and multiple departments																		
Create composite plan and identification of Green Alternative BMPs and facilities																		
Use MSD-Cincinnati Parks MOU as starting point for maintenance agreement negotiations																		
Composite list of maintenance needs by affected facility (i.e. streets, sidewalks, parks, conveyance, housing)																		
Identify differences from current maintenance regimes and costs																		
Develop inter-department agreements on maintenance of different facilities as needed																		

Appendix B Strategic Integration Schedule

Lick Run Watershed Strategic Integration Plan Sequencing for Framework Actions

	Immediate Term	End of Year 1	Year 2	Years: 3 to 5	6 to 10
#1: COMMUNITY ENGAGEMENT & VISION DEFINITION	Designated Coordinator	Message & Integration		Feedback	
NEED: Ongoing and consistent messaging to local stakeholders, including micro/site issues					
RESPONSIBILITY: Local area project and outreach coordinator					
Refine/restructure COF Advisory Committee with locally-focused task force and stakeholders					
Understand local information pathways & create dissemination plan					
Prepare updated FAQs, upcoming outreach needs and other connections/resources needed					
Continue with one-time events and ongoing feedback/communications					
Implementation & ongoing feedback					
#2: LAND ACQUISITION, BROWNFIELD & LAND USE PLAN	Develop Scope	Complete Plan		Monitor & Update	
NEED: Central inventory & adaptive plan for lands to be acquired/involved in Green Infrastructure Program					
RESPONSIBILITY: MSD; Planning & Buildings; US EPA; Port Authority					
Compile information on land acquisition, park & brownfield status and create joint map					
Identify additional involved lands in Green Infrastructure Program, Brownfields, recreation, parks					
Conduct market and opportunity analysis incorporate into plans & charrettes					
Develop land use plan and site management standards for acquired land & transitional sites					
Begin developing zoning and policies for disposition of extra lands (e.g. housing, transportation, etc.)					
#3: CINCINNATI PARKS COORDINATION (ongoing)	Continue MOU Activities	Plans & Uses; Funding Plan		Implement & Fund	
NEED: Joint MSD/Parks Plan for Green Alternative Project Components + Mill Creek Greenway Project					
RESPONSIBILITY: Cincinnati Parks & MSD; Mill Creek Greenway					
Continue cooperative work under MSD-Parks MOU					
Identify potential localized/site specific park impacts of Green Infrastructure Program construction					
Through charrettes, identify concepts for recreation/park uses of GIP lands					
Work with Mill Creek Greenway on extension opportunities, requirements & phasing					
Continue to assess neighborhood park needs and impacts as GIP components are designed					
Identify additional funding sources for park/recreation components					
#4: LAND DEVELOPMENT CODE (LDC) UPDATE	Scope Watershed Plan	Develop Plan		Implement Plan	
NEED: Regulatory Strategies and Plans Supporting Green Infrastructure Program		Charrettes	Develop Regulations		Evaluation
RESPONSIBILITY: Planning, coordinated with MSD					
ate clear statement of current and future source reduction needs as baseline for planning, eventual code update					
Design and conduct charrettes to ensure GIP principles, source reduction needs are fully incorporated					
corporate land acquisition, and use plan, planning through Parks MOU into land use plans and zoning for area					
***Ensure source reduction standards for housing, transportation, capital facilities are incorporated into LDC*					
Participate in updates of related technical standards and codes, particularly streets and public works standards					
Participate in Complete Streets implementation					
#5: MAINTENANCE AGREEMENTS	Continue Parks MOU Work	Scope Maintenance Needs		Agreements & Funding	
NEED: working agreement with affected City departments for maintenance of Green Infrastructure Project components					
RESPONSIBILITY: MSD, Parks, and multiple departments					
Create composite plan and identification of Green Alternative BMPs and facilities					
Use MSD-Cincinnati Parks MOU as starting point for maintenance agreement negotiations					
Composite list of maintenance needs by affected facility (i.e. streets, sidewalks, parks, conveyance, housing)					
Identify differences from current maintenance regimes and costs					
Develop inter-department agreements on maintenance of different facilities as needed					

Appendix C Wet Weather Strategy for Lick Run

Some general and area-specific information on the Wet Weather Strategy is attached with this appendix (Project Groundwork - Sustainable Infrastructure Broadens the Options and Link Run Fact Sheet). Additional information on Metropolitan Sewer District of Greater Cincinnati wet weather efforts can be obtained at the following links:

http://www.projectgroundwork.org/problems/index.htm

http://projectgroundwork.org/sustainability/groundwork/

http://projectgroundwork.org/lickrun/

Contacts for additional information are listed with links. One such contact is through Project Groundwork at the following phone number: (513) 244-1300 or e-mail: MSD.Communications@cincinnati-oh.gov

Project Groundwork: Sustainable Infrastructure Broadens the Options

Consent Decree Negotiation Facilitates Sustainable Infrastructure Solutions

Consent Decrees are the product of intensive negotiation between all parties involved. In MSD's case, we worked with the regulators and other interested parties to ensure the affordability of the program, flexibility in project selection, and that MSD's wet weather strategy supports the goals of the Consent Decree. The Consent Decree provides for the incorporation of sustainable source control solutions, and MSD has adopted a three-pronged approach to evaluate and implement these techniques. The strategic prong focused on optimizing the solutions for reducing CSOs, especially stormwater source control. The flexibility prong enabled us to investigate and demonstrate the value of sustainable infrastructure solutions in the overall wet weather program approach. Finally, and importantly, the economic prong insisted on an affordable solution for ratepayers. Because of this focus, our source control demonstration projects are documenting the economic value of these solutions in addition to technical parameters.

Project Groundwork is MSD's program for meeting the requirements of the federally mandated Consent Decree. The detailed projects and plans for Project Groundwork are posted at the dedicated program Web site, at *www.projectgroundwork.org*.

Project Groundwork is one of the largest public works projects in the history of our community, costing an estimated $3 billion by the time the second phase is complete, and involving the construction of new, separated sewer infrastructure, enhanced treatment capacity at MSD's wastewater treatment plants, and installation of rainwater source controls.

In this section, we present a special aspect of Project Groundwork's Wet Weather Strategy that incorporates both environmental and social aspects of sustainability – the sustainable infrastructure strategy for "source control" and the potential community benefits that can be realized through integrated public/private planning and investment.

Source Control: A Key Aspect of the Wet Weather Strategy

To achieve the required improvements, MSD's Wet Weather Strategy focuses on storage and conveyance, treatment, and source control. The first two approaches represent a more traditional approach to wet weather improvements, which entails collecting, conveying, and treating combined rainwater and sewage. The third approach – source control – is more strategic. It involves diverting rainwater from the sewer system, thereby eliminating the need to convey and treat essentially "clean" water.

Source control techniques use natural systems (such as forests, fields, ponds, and streams), or simulations of natural systems (such as green roofs, porous pavement, bioswales, and raingardens). These systems are designed to detain or drain stormwater into the soil or allow it to evaporate into the atmosphere. Sometimes, this type of infrastructure is called "green" or "sustainable" because it mimics the processes that nature uses to soak up rain.

Figure 7 shows a variety of source control techniques being evaluated. Source control is the greatest leverage point for solving the CSO problem as required by the Consent Decree, because clean rainwater entering the sewer system is the primary cause of CSOs. If these types of solutions are installed at many locations within a watershed, they could radically reduce the amount of stormwater entering the sewer system during a rainstorm.

Figure 7: **Sustainable Source Control Techniques**

Bioswales are designed to capture stormwater, filter out pollutants, and reduce flooding.

Green roofs not only detain stormwater – they also insulate buildings and create habitat for birds and insects.

Reforestation restores the natural water balance in the region and enhances water quality in streams.

Community garden create permeable open space and make great places for people to meet and play.

Native meadows naturally absorb rainwater, keeping it out of storm drains and streams.

Pervious pavers help rainwater seep into the ground, thereby helping to reduce stormwater runoff.

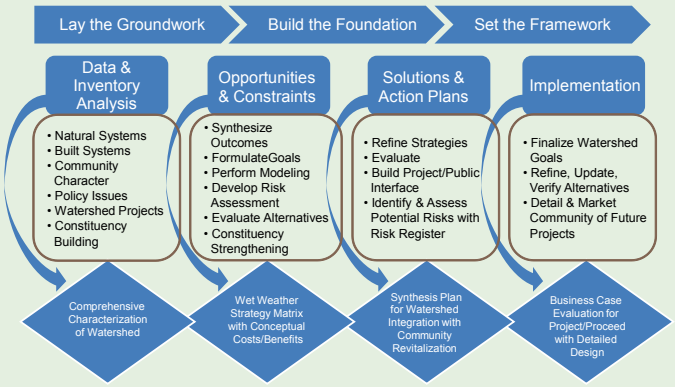
MSD's SWEP – Looking at Sustainable Wet Weather Solutions by Watershed

To create successful outcomes for wet weather projects, MSD needed to develop a systematic approach to identify opportunities for source control of rainwater. Keeping rainwater from entering the sewer system can lower construction costs of future infrastructure, and more importantly can provide the best opportunity to keep future annual costs as low as possible.

MSD developed the Sustainable Watershed Evaluation Process (SWEP), to take stock of ambient conditions and consider a wide range of options and strategies before determining the best way for reducing the volume of CSOs.

In South Fairmount (see the story on page 21), the SWEP was used to identify and evaluate existing and historical conditions of natural resources, infrastructure (roads, sewers), and socio-economic factors. The evaluation allowed MSD to develop a wet weather strategy and systematically determine how to best address wet weather needs in different locations and conditions. The process identified four different approaches to be deployed throughout the Lick Run watershed to achieve a potential reduction of over 1 billion gallons of overflow reduction.

The MSD Sustainable Watershed Evaluation Process



Aside from reducing CSOs, source control offers many other environmental and social benefits. When rainwater is removed, it frees up capacity in the sewer system for sanitary sewage flow and vastly reduces the number of overflows into local streams. This reduces the public health threat caused by the pollutants in the CSOs, improves water quality for recreation and aquatic life, and eliminates offensive odors and unsightly debris. It also lowers the operation and maintenance costs at wastewater treatment facilities.

MSD's program to support and investigate source control options follows three avenues, with the purpose of substantiating the technical, economic, social, and environmental costs and benefits of these techniques.

- **Direct Implementation** – Through Project Groundwork, MSD has begun the planning, design, and implementation of sustainable CSO reduction projects. These projects are funded and staffed by MSD.
- **Enabled Implementation** – MSD has assisted project partners to construct demonstration and early success projects.
- **Inform and Influence** – MSD encourages other organizations to research and deploy source control installations, by providing information and education.

MSD selected projects to demonstrate early successes and measure real impacts in terms of source control. The following project examples feature the kind of sustainable solutions, community partnerships, and results that MSD is striving to achieve.

Rain barrels collect stormwater from roofs making it available for garden irrigation.

Rain gardens soak up stormwater before it runs off into streets and sewers.

American Red Cross Demonstrates and Educates

The American Red Cross recently built a new headquarters located just off Interstate 71, between Evanston Avenue and Realistic Avenue, in Cincinnati. The project site is located at a CSO structure currently averaging 58 annual overflows, resulting in 201 million gallons of annual overflow volume.

As part of Project Groundwork's enablement projects, MSD sponsored the American Red Cross' effort to construct two source control features, including a 2,000-square-foot, sloped, vegetative roof and a 13,330 square-foot bio-infiltration area. The sloped roof will be highly visible and will demonstrate the effectiveness of green roofs in reducing the volume of rooftop runoff. The bioinfiltration basin will store stormwater so that it doesn't contribute to peak flows in combined sewers, and it will reduce stormwater flow overall by enabling stormwater seepage into the ground. As a result, in a typical year of rainfall, the combined annual runoff volume could be reduced by nearly 978,000 gallons.

The American Red Cross coupled a significant educational program with these features, so that visitors could learn about the benefits of source control. The educational program included posters, brochures and flyers that highlight the stormwater management systems and MSD's role in this project. An interactive, electronic touch-screen display describes the major components. The data from a flow monitor is also incorporated into the interactive display.

North Fairmount Spray Aquatic Park: Early Success with Source Control

Like many cities, the Cincinnati Recreation Commission (CRC) is making investments and enhancing community value by reinventing urban aquatic parks. The Commission is pressed to eliminate traditional swimming pools and construct facilities with lower operating costs, such as spray water parks. Since many of the CRC facilities are also located within the same watersheds where MSD needs to remove stormwater from the combined sewer system, MSD is seeking to collaborate with some of these planned public investments.

In the Denham Watershed, the CRC had planned to construct a spray park in the North Fairmount Community and MSD was looking for strategic stormwater source reduction projects. These dual goals can give rise to a collaboration that created a win-win-win for the CRC, MSD, and the community of North Fairmount.

The result is a spray park funded by CRC and scheduled to open in June 2011, for which MSD is contributing buried infrastructure (a 60" separate storm sewer within the park footprint for future MSD stormwater separation work), porous concrete for the walkways around the park, and a 2-acre bio-infiltration basin to improve water quality. The addition of the bio-infiltration basin will expand the park boundary and add environmental education features, thereby enhancing the park's value to the community. While the CRC project requires MSD to accelerate its timeline for Project Groundwork in this area, doing so will reduce the negative impact of future construction on the same property.

Wyoming Rain Barrel Project Uses the Power of Multiplication

In the City of Wyoming, the total average overflow volume amounts to about 9 million gallons per year. As part of a pilot program to reduce CSOs to the Mill Creek, MSD and the City of Wyoming teamed up to offer Wyoming residents rain barrels at a sharply discounted price. Rain barrels help manage stormwater runoff by cutting down on the amount of runoff entering the storm sewer system. While one rain barrel may not have a great impact, the installation of many can help reduce the regional combined sewer overflow problem. For example, a 1,000-square-foot roof can generate 24,600 gallons of runoff a year. Multiply this by a thousand homes, and the runoff volume climbs into the millions of gallons.

In June 2010, 206 rain barrels were sold to property owners. Roughly half the property owners purchased more than one barrel. MSD is working on how to verify that rain barrels were installed and to quantify the volume of rooftop runoff captured by the rain barrels.

Cincinnati Zoo Leads in Green Infrastructure Projects

Aiming for high impact and high visibility, MSD partnered with the Cincinnati Zoo in an effort to remove the Zoo from the stormwater grid. The first project, located at the Zoo's Main Entry, incorporates over 30,000 square feet of pervious pavers; a rainwater harvesting, storage, and irrigation reuse system; and bioinfiltration of collected runoff via the nearby elephant moat.

MSD is monitoring these features through a series of shallow wells and measuring flow volumes in the nearby combined sewer. MSD provided funding for installation of small-scale stormwater controls, including a rain garden, pervious concrete and a green roof in an educational Green Garden located behind the entry court. This project was completed in April 2009. Since then, over 1 million zoo visitors have walked over the pervious paving and enjoyed viewing lush vegetation kept healthy by the reuse of rainwater.

The second project, now under construction, is in the new African Savannah exhibit. MSD funding will be used to replace an asphalt parking lot with pervious surfaces, including grasses, with enhanced soils and porous concrete walkways. A new 55,000-gallon underground storage facility will re-distribute rainwater collected from nearby roofs and hard surfaces to an irrigation system, and replenish water in Swan Lake and the Zoo's bear pools. We anticipate that these features will capture between 12 and 15 million gallons of stormwater runoff in a typical year.

Cincinnati Zoo New Main Entry with MSD-Funded Storm Water Control

MSD worked with the Zoo to help design, fund, manage, and construct this project. Focused on enabled implementation of projects such as this, opportunities for cost sharing and collaboration between MSD and key watershed stakeholders are a vital element to MSD's approach to help reduce overall treatment costs and meet the demands of the Consent Decree. Through an internal grant program, MSD is able to offer funding to support these types of green infrastructure improvements. In return, MSD hopes to demonstrate savings in CSO control and treatment costs as green infrastructure is integrated into the traditional pipe catchment method.

Furthering our partner's goals as well, the stormwater source control improvements at the Zoo has contributed to part of an ongoing, award-winning effort by the Cincinnati Zoo to establish itself as "the greenest zoo in America." The Cincinnati Zoo will now serve as a nationwide educational resource to learn not only about elephants and giraffes, but also about the many benefits of source control.

Transformation in Center Hill: From Landfill to Light Industrial Development

Through early actions surrounding the Consent Decree, MSD began design and construction of six Supplemental Environmental Projects (SEPs). Starting in 2004, our collaboration with Mill Creek Restoration, a local nonprofit organization dedicated to improvement and restoration of the Mill Creek watershed, ensured that the SEP projects would leverage work that was already being done.

Four of the SEPs involved stabilizing a stream bank and constructing more than a mile of Greenway trail extending to the Elmwood Place Landfill and the Center Hill Landfill. The projects included building leachate collection systems that would prevent further landfill pollution from entering the creek. At the same time, the City of Cincinnati was assessing and remediating the landfills as a part of their Strategic Property for Urban Redevelopment (SPUR) program. The 60-acre Center Hill site, a SPUR district, is located less than a mile west of the Winton Hills neighborhood and could support up to 500,000 square feet of new light industrial space. If the project achieves its potential, City officials estimate that it could bring up to 500 new jobs to the area, while adding $1 million in annual property tax revenue and just under $500,000 in earnings tax revenue.

Within 5 years, the City of Cincinnati obtained the Covenant Not to Sue (CNS) from the Ohio Environmental Protection Agency, making the site ready for redevelopment as the Center Hill Commerce Park. Now, with filling operations nearly complete, the City is preparing for negotiations with several light industrial end-users that have expressed an interest in the site. A lasting legacy of MSD's contribution, this SPUR district has the first mile of constructed Greenway Trail along Mill Creek.

Bioinfiltration Basins at St. Francis Court Apartments

Located in Cincinnati's South Fairmount neighborhood, the St. Francis Court Apartments occupy nearly 11 acres just north of Queen City Avenue. This landmark property was formerly the St. Francis - St. George Hospital. During rainstorms, stormwater used to flow down the steep hillsides south of Harrison Avenue to the St. Francis property. On the property's eastern vacant concrete parking lots, stormwater had nowhere to go but into the combined sewer system.

Based on a typical year of rainfall, annual stormwater flow from the property is about 417,000 gallons. To help reduce the volume of stormwater runoff from this site, the property owner agreed to partner with MSD on the project to remove two underutilized parking lots and replace them with two large rain gardens, also known as bio-infiltration basins.

Although the basins look like regular gardens, they use special soils and native plant species to absorb and clean stormwater runoff. The upper rain garden captures stormwater flowing off the adjacent hillside. The lower rain garden captures excess flow from the upper garden. The site also includes a walking path for maintenance as well as community gardens for residents to grow plants and vegetables. In addition, trees were planted along the eastern half of the property and along the southern edge of the main parking lot to help provide shade and stormwater benefits.

This project provides numerous benefits to both MSD and the South Fairmount community, including:

- The rain gardens will reduce the volume of stormwater entering MSD's combined sewer system by about 27 percent.

- The garden plants will absorb and cleanse stormwater while simultaneously providing habitat and food sources for insects, birds, and butterflies.
- Trees will help capture rainfall while also providing attractive landscaping for this highly visible site.
- Community gardens will give residents an opportunity to meet each other and grow their own produce.

Leverage for Creating Community Value

The Consent Decree requires MSD to make significant investments in wet weather infrastructure in order to achieve the mandated reduction in CSOs. The scope and scale of these investments offers a unique platform, from which MSD and its partners can leverage additional investments in brownfield development, urban revitalization, and the creation of livable communities.

Sustainable stormwater source control, described earlier, is a central part of this strategy. Because sustainable source control solutions typically feature vegetation, landscaping, and water features, they can do double-duty as parks and trails for walking and biking. Such amenities, according to the Trust for Public Land, are important investments in community well-being that contribute to economic development and urban renewal. MSD is contributing its expertise in source control to several projects aimed at community revitalization, including the examples shown here.

Communities of the Future Brings Sustainability Into Focus Through Source Control

An MSD initiative called Communities of the Future is leading the development of an alternative vision for MSD's largest CSOs – a vision that addresses the source of the problem (rainwater) and marries this source control strategy with community revitalization. MSD has designated the Lick Run as our first, fully integrated effort to develop a sustainable solution for the community based on source control.

South Fairmount was first settled in the early 1800s around the Lick Run, the primary stream in this watershed that drains to Mill Creek. As Cincinnati grew, roadways, buildings and sewer pipes gradually replaced streams and trees. The resulting increase in runoff led to increased frequency and intensity of flooding events and sewer overflows. Gradually, Mill Creek and tributaries like Lick Run became the dumping ground for human and industrial waste.

To move the waste away from the South Fairmount neighborhood and resolve this public health threat, several tributaries of Lick Run were enclosed within a large sewer pipe. That 19.5-foot-diameter pipe remains today, running a distance of 3,700 feet along buildings and streets. It connects to CSO #5, a relief outfall at the east end of Queen City Avenue that overflows into Mill Creek during heavy rains. Each year, about 1.7 billion gallons of combined sewage and stormwater overflow through this CSO. Of that total, only 25 percent is sewage; the rest comes from stormwater drains and what used to be natural stream flow.

Today, the South Fairmount area faces many challenges. People who live in this neighborhood bear one of the highest unemployment rates, lowest median household incomes, and highest school dropout rates in the region. The area also has a high volume of under-utilized lands, brownfields, and abandoned properties.

The Communities of the Future watershed solution for Lick Run includes the installation of over 75,000 linear feet of strategic storm sewers or reconstructed waterways along with retention basins for storage. Reforestation and downspout disconnections were identified as other strategic methods to apply in selected areas, resulting in a whole-systems approach to wet weather control. The resulting improvements can help to spur revitalization efforts and improve the quality of life within the neighborhood, while achieving the wet weather goal of reducing the amount of water that must be sent to a tunnel to be pumped and treated.

The pictures below illustrate source control and reconstructed waterway solutions that create community value in Kalamazoo, Michigan, and could be used for the Lick Run.

Revive Cincinnati Puts Source Control to Work

The Cincinnati I-75 Corridor is a dynamic area with key transportation routes and infrastructure, major industry, and established neighborhoods. The City of Cincinnati and MSD are jointly conducting the Revive Cincinnati neighborhood study, which capitalizes on Ohio Department of Transportation investments, GO Cincinnati, Agenda 360, and multiple community renewal efforts. The project has four focus areas:

- Mitchell Avenue Interchange
- I-74 Interchange
- Hopple Street Interchange
- Queensgate/Central Business District

The project seeks to create beautiful, viable neighborhoods along the I-75 corridor that offer attractive places to live, work, and play. To achieve this vision, the City of Cincinnati and MSD studied opportunities for creating community value, neighborhood revitalization, and transportation improvements. After an extensive community involvement process, the final plan for Revive Cincinnati will be put before the City Council for adoption in the final quarter of 2010. The Revive Cincinnati plan will also be incorporated into the City of Cincinnati's Comprehensive Plan.

MSD's contribution to the plan was to promote the use of source control to meet two goals: improve stormwater management and create positive conditions for economic development. The plan includes ecosystem restoration through planting trees, adding wetlands, and building raingardens throughout the corridor. The result will reduce peak stormwater flows while enhancing property values, create more livable communities, and attract new businesses.

PROJECT GROUNDWORK
your pipeline to clean water

Lick Run Watershed
Fact Sheet

The Metropolitan Sewer District of Greater Cincinnati (MSD) is seeking the input of residents, property owners, businesses, schools and other organizations in South Fairmount, East and West Price Hill and Westwood regarding potential major sewer improvements in these areas. This fact sheet provides an overview of the problem and potential solutions for making our rivers and streams cleaner and healthier.

What's the Issue?

During heavy rains, raw sewage – mixed with storm water – overflows from our sewers into local rivers and streams and can also back up into basements.

The vast majority of overflows occur from combined sewers, which carry both sewage and stormwater in the same pipe. Combined sewers are typically located in the older areas of Cincinnati and Hamilton County.

When large amounts of stormwater enter combined sewers, these pipes – many built more than 100 years ago – are often filled beyond their capacity. To relieve pressure on the sewer line and prevent widespread flooding and sewage backups, combined sewers were designed to overflow directly into local waterways through outfalls known as combined sewer overflows or CSOs.

Hamilton County is among the top five locations in the nation for urban CSOs. Overflows occur as many as 105 times a year at some locations.

What's the Solution?

To resolve this public health and environmental issue, MSD has embarked on the largest public works project in the history of our community to rebuild and improve our sewer system.

Called **Project Groundwork**, this multi-year and multi-billion dollar initiative includes hundreds of sewer improvements and stormwater control projects.

Federal and state regulators, including the U.S. EPA, Ohio EPA and the Ohio River Valley Water Sanitation Commission (ORSANCO), have mandated that MSD capture, treat, or remove at least 85% of the 14 billion gallons of annual overflows from combined sewers and eliminate all overflows – about 100 million gallons annually – from sanitary only sewers.

A Three-Pronged Approach

MSD seeks to reduce or eliminate sewage overflows by using three different strategies:

Storage and conveyance: constructing larger sewers to transport wastewater to treatment plants or large underground storage tunnels to capture excess wastewater.

Product Control: upgrading existing treatment plants to handle more wastewater or constructing enhanced high-rate treatment facilities to treat flows at the CSO outfall prior to discharge.

Source control: solutions that control the source of the overflow problem – stormwater. These solutions include controlling runoff from hillsides, removing streams from combined sewer system intakes, installing storm water retention basins and using other controls such as pervious pavement or rainwater harvesting systems that prevent or delay stormwater from reaching combined sewers.

Sewer overflow at CSO 5 in South Fairmount

Focusing on Lower Mill Creek Watershed

The Lower Mill Creek watershed, which drains into the Mill Creek, contributes more than 7 billion gallons or 50% of the total 14 billion gallons that overflow annually from combined sewers in Hamilton County.

Federal and state regulators have asked MSD to develop a specific plan for resolving 2 billion gallons a year of overflows from this watershed by 2018. This is considered a "partial remedy" of the overflows in this area.

The Lower Mill Creek watershed includes numerous smaller watersheds, including Lick Run.

The Tunnel is the "Default Solution"

To eliminate 2 billion gallons of annual overflows within the Lower Mill Creek watershed, federal and state regulators are requiring MSD to design a "storage and conveyance" solution – an underground storage tunnel about 30 feet in diameter and 1.2 miles long. The tunnel would store excess flows during heavy rains and eventually discharge to an enhanced high-rate treatment facility (EHRT).

The regulators are also allowing MSD to explore alternatives or supplements to the tunnel. Source controls, such as stream separations, stormwater detention basins and rain gardens, can reduce the amount of stormwater entering the sewer system, freeing up capacity for wastewater flows from other areas within the Lower Mill Creek watershed and lowering operation and maintenance costs associated with treating the flows.

To meet the 2018 deadline, MSD must move forward now with preliminary planning and design for the tunnel and alternative solutions.

Lick Run Watershed in Lower Mill Creek

The Lick Run watershed is home to CSO 5, the largest CSO in Hamilton County. The watershed, located within the larger Lower Mill Creek watershed, includes Cincinnati's South Fairmount neighborhood and portions of East and West Price Hill and Westwood.

Every year, about 1.7 billion gallons of combined sewage and stormwater overflow from CSO 5 – located at the east end of Queen City Avenue – into the Mill Creek. Of that total, less than 25% is sewage – the rest comes from stormwater and what used to be natural stream flow.

The Lick Run watershed is roughly bounded by Harrison Avenue to the north, Ferguson Avenue to the west, Glenway Avenue to the south and the Mill Creek to the east.

Source Control in Lick Run

MSD is currently evaluating the use of source controls in the Lick Run watershed to reduce or eliminate overflows from CSO 5. Stormwater source controls in this watershed are anticipated to be more cost effective than larger sewers and other storage and conveyance-type solutions.

In fall 2009, MSD began evaluating a stream separation project that would divert natural stream flow and stormwater from the Lick Run interceptor in South Fairmount. This 19.5-foot diameter combined sewer runs under 3,700 feet of buildings and streets and overflows through CSO 5 when its capacity is exceeded.

In spring/summer 2010, MSD also initiated several pilot stormwater control projects in South Fairmount, including rain gardens, pervious paving and tree plantings.

MSD is also conceptually exploring linking the stream separation project with an open water channel, greenways or parks and repurposed vacant or abandoned lots.

Your Input

MSD will be seeking your input on potential sewer improvements in the Lick Run watershed. You will have multiple opportunities to learn more, ask questions and share your opinions or concerns.

Any potential projects in the Lick Run watershed are in the early evaluation stages and will require approval by the Hamilton County Commissioners and regulators.

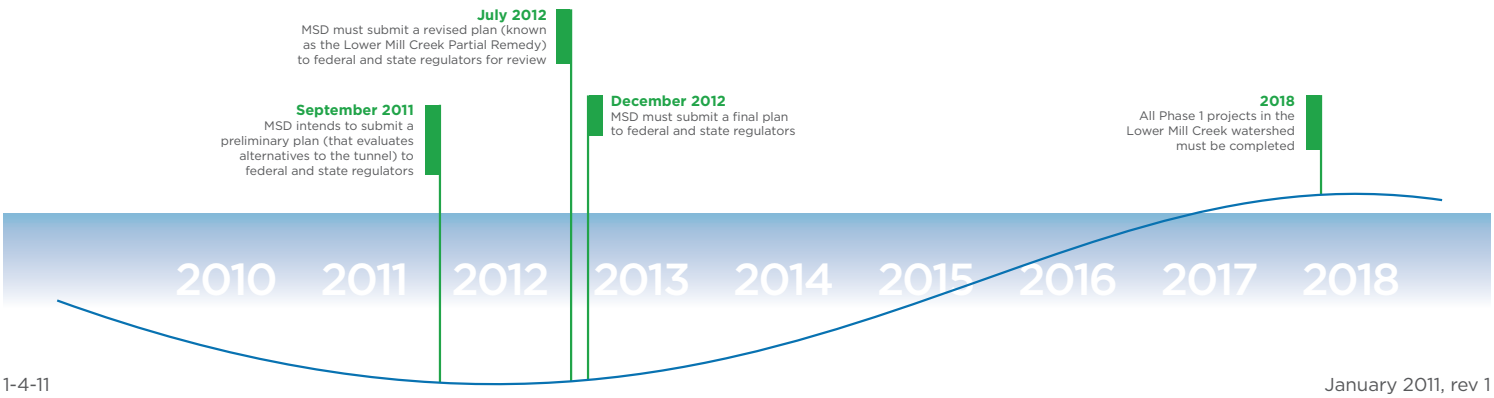
No final decisions have been made, and we welcome your voice in the decision-making process.

Project Groundwork is your program. It's an investment in your community for generations to come.

Need More Information?

For more information visit
www.projectgroundwork.org

or contact **Ms. Cassandra Hillary**
(513) 244-5133
MSD.Communications@cincinnati-oh.gov



Appendix D Memorandum of Understanding (MOU), MSD and Cincinnati Parks

MEMORANDUM OF UNDERSTANDING
THE DEPARTMENT OF SEWERS
AND
THE CINCINNATI PARKS DEPARTMENT

This Memorandum of Understanding ("MOU") is made between the Department of Sewers ("MSD") and the Cincinnati Parks Department ("Parks").

WITNESSETH

WHEREAS, MSD is developing Green Infrastructure Programs as part of the MSD Wet Weather Improvement Program ("WWIP") to reduce or prevent overflows from combined and separate sanitary sewers required under the Federal Court Consent Decree in Case No, C-1092107, dated June 9, 2004; and

WHEREAS, Parks controls and operates a system of parks and green spaces and has experience in mitigating uncontrolled and unplanned stormwater runoff through urban forest development and management and through the development and management of park lands,

WHEREAS, the Green Infrastructure Programs will be for the use and benefit of MSD and may include, but are not limited to, vegetated swales or median strips, permeable pavement, trees and tree boxes, rain barrels and cisterns, vegetated roofs, rain gardens and infiltration planters, wetlands, riparian buffers, or other practices and structures that use or mimic natural processes to infiltrate or reuse storm water, and includes the use of the city's parkland as a stormwater mitigator; and

WHEREAS, MSD has determined that professional services are needed to review and evaluate the level of specialized planting, community outreach and other related support to meet the planning phase needs of green infrastructure; and

WHEREAS, Parks has been selected to provide these professional services;

NOW THEREFORE, MSD and Parks agree as follows:

SECTION 1. SCOPE OF SERVICES

Parks agrees to provide the professional services described in the Scope of Services attached as Exhibit A ("Services") in accordance with current professional standards and in a satisfactory and proper manner as reasonably determined by MSD.

SECTION 2. TERM

This MOU is effective on April 1, 2010 ("Effective Date") and terminates on December 30, 2012 ("Termination Date"). The Termination Date may be extended by written agreement of the parties.

SECTION 3. COMPENSATION AND METHOD OF PAYMENT.

A. The Compensation/funding shall consist of:

- 1 Salary reimbursements of Park Employees for the time spent providing services on projects authorized by the MSD assigned Parks MOU Project Manager.
- 2 Direct expenses such as invoices for contractors, materials, and supplies that provided any service to CPB concerning this MOU and for all service related to an approved project.
- 3 Reasonable out of pocket expenses incurred by CPB for approved projects; equipment, safety gear, fuel, etc.
- The administrative overhead of the CPB employees shall not exceed $250,000 per year. This overhead shall include administrative functions such as; procurement, human resource management, and financial services support.

B. The total reimbursement to Parks for all managed contracts and services shall not exceed $4 million per year for the term of this MOU, unless modified by agreement of the parties.

- 1 MSD will submit a list/work plan of annual green capital projects to CPB by October I of each year. This work plan will detail the scope schedule and budgeted cost for each project. CPB will develop a work plan based on the green capital project list, designating expenditures for contractual, supplies, and staffing for the following year. The plan will be approved or modified by MSD and will be implemented beginning January 1 of the following year, after the approval of the MSD budget by the Board of County Commissioners.
- 2 MSD shall allocate funds to enable CPB to encumber funds towards contracts to execute the approved MSD work plan. This fund shall be used by CPB to encumber and pay payroll, contractual, and supply services. The CPB will invoice MSD monthly for actual expenses, and MSD wi1l review, approve and pay the invoices within 30 calendar days.

SECTION 4. MSD RESPONSIBILITIES

A. MSD agrees to provide Parks, in a timely manner, requested information that is reasonably necessary for Parks to satisfactorily complete the Services.

B. MSD shall compensate Parks as provided under Section 3.

C. MSD shall use its best efforts to meet with Parks staff as needed and will provide names and contact information, roles, and responsibilities for key MSD staff.

D. MSD shall provide to Parks existing information related to storm water mitigation practices and regulations and will make available appropriate staff to work with Parks staff to develop new zoning requirements to allow for the use of Green Infrastructure.

E. MSD shall provide community contact information and selected venues for' desired community educational outreach programs.

F. Should MSD desire to add new greenspace for use as green infrastructure, MSD shall be responsible for some portion or all of the long-term maintenance of such properties when such properties are used to meet combined sewer overflow reduction

credits. Each project and site is unique and maintenance responsibilities will be determined on a case by case basis. Maintenance responsibility for each project will be finalized prior to construction of the project.

SECTION 5. SUBCONTRACTING

Parks may contract for the Services covered by this MOU. Parks will use contractors to subsidize the workforce that performs some of the scope of services of the MOU. All contracts will be competitively bid according to the City bid process. Alternatively, Parks may utilize term contracts currently in force.

SECTION 6. TERMINATION

Either party may terminate this MOU upon delivery of written notice of termination to the other party within 10 days of the effective date of the desired termination. If MSD terminates this MOU it shall compensate Parks for Services performed prior to the effective date of termination in accordance with Section 3 of this MOU. If the MOU is terminated by either party, Parks shall promptly provide MSD copies of all work performed up to the effective date of termination.

SECTION 7. REPORTS, INFORMATION AND AUDITS

A. Parks shall assist MSD in any audit or review relating to the Services, and such assistance shall include providing any records or information requested by an auditor or reviewer.

B. MSD, or its authorized designee, shall be afforded reasonable access to Parks' records relating to the Services at times and places mutually agreed upon. Parks shall retain all financial and other records for a minimum of three years following completion of the MOU, and shall permit MSD, or its authorized designee, access to such financial or other records.

C. Except as authorized by MSD, Parks shall not disclose or provide confidential non-public MSD information, including internal technical and infrastructure

SECTION 8. MSD OWNERSHIP OF PROPERTY

Title to and the ownership of all written materials and documents produced or prepared by, or with the assistance of, Parks in connection with the Services provided by Parks under this MOU shall reside with MSD.

SECTION 9. NOTICES

All notices provided for in this MOU shall be in writing and delivered to the appropriate individuals listed below:

If to MSD: James A. Parrot
Executive Director
Department of Sewers (Metropolitan Sewer District)
Cincinnati, Ohio 45204

If to Parks: Willie F. Carden, Jr.
Director
950 Eden Park Drive
Cincinnati, Ohio 45202

Either party may change the named person or address above by providing written notice to the other party.

CINCINNATI PARK BOARD

Willie F. Carden, Jr.

Date: 4-20-10

DEPARTMENT OF SEWERS

James A. Parrott, Executive Director

Date: 4-22-10

Approved as to Form:

Assistant City Solicitor
Date: 4/20

EXHIBIT A
Scope of Services

The staff of the Cincinnati Park Board (CPB) will assist the Metropolitan Sewer District of (MSD) in the development and implementation of a sustainable green infrastructure program within the City of Cincinnati. The program consists of the following:

1. Urban forest development and management
2. Management and maintenance of stormwater controls, herein referred to as Best Management Practices (BMPs).

PART 1: URBAN FOREST DEVELOPMENT AND MANAGEMENT

A. BACKGROUND

I. Trees, tree canopy, and forested areas -herein referred to as trees -within the MSD combined sewer service area provide a direct benefit to MSD by reducing and/or delaying the volume of stormwater entering the combined sewer system, thereby reducing the volume of combined sewer overflows (CSOs).

1. One of the most effective ways to reduce stormwater runoff is to intercept runoff at its source. Trees represent a first line of stormwater interception.

2. Research has demonstrated and characterized benefits from trees as follows:

   a) Based on a typical year, average annual rainfal1 in Greater Cincinnati, trees reduce stormwater runoff by approximately one million gallons (per acre of tree canopy). The mechanisms for this reduction include interception of rainfall by leaf surfaces; infiltration of rainfall by surrounding soils; and evapotranspiration.

   b) Trees play an integral role in our natural systems. For example, trees limit erosion by binding soils together and stabilizing hillsides, and improve water quality by reducing sedimentation of our rivers and streams.

   c) Temperatures in urban areas are higher than in rural areas due to the high percentage of impervious surfaces. These surfaces have a greater amount of solar heat gain and therefore lead to higher energy costs for cooling in warm months. Trees, through shading and evapotranspiration, help attenuate the "urban heat island" effect.

   d) Trees intercept, absorb, and remove particulate matter and other pol1utants from the atmosphere. The mechanisms for pollutant reduction and removal include interception and absorption by leaf surfaces and/or through root uptake.

   e) Trees sequester and store atmospheric carbon. An urban forest can store approximately 2.6 tons of carbon per acre per year.

   f) Trees have economic, social, and psychological benefits as well, including higher property values, increased quality of life, and noise abatement. Trees have been shown to reduce stress and foster a greater sense of civic pride.

B. OBJECTIVE

I. WHEREAS The CPB has a standing mission of greenspace management and maintenance of the city's parklands and road rights-of-way.

1. WHERESAS the CPB has technical expertise in planning, planting and maintenance of other public lands per mutual agreements.
2. WHEREAS MSD's ownership of property within its service area is limited to directly related facilities that convey, treat or otherwise support the process of waste water management, which limits the land area available to maximize the benefit of tree canopy to the MSD system.
3. THEREFORE, through this collaborative agreement, MSD will utilize the CPB's existing lands, relationships, and expertise to further a holistic reforestation effect on public lands in the city of Cincinnati; AND,
4. THEREFORE, the CPS shall provide PLANNING, PLANTING, MAINTENANCE, and PROJECT MANAGEMENT services in conjunction with the Urban Forest Development and Management.

C. PLANNING

I. The CPS shall work collaboratively with MSD's staff and designated consultant to identify and plan areas for reforestation that would maximize the benefits to MSD's combined sewer system. These planning efforts will utilize geographic information systems (GIS) mapping, CITY green analysis and other appropriate tools to prioritize areas of reforestation and represent the corresponding benefits to the MSDGC system. Reforestation projects can be collaborative with CPB's ongoing efforts; however, for reporting purposes, reforestation efforts conducted on behalf of and funded by MSD shall be mapped and tracked separately.

1. Trees planted under this program are considered capital infrastructure improvements and shall be protected from disturbance and removal by other parties consistent with the CPB's existing public tree protections, which may require compensation by other parties affecting such trees.
2. The CPS shall provide public relations support as part of this work consistent with the CPS's Greenspace Management Procedures, as well as consideration of MSD's Project Groundwork procedures. This work may include project signs and ongoing public awareness and outreach. The intent is to inform affected property owners and to educate citizens on the intent and benefits of such collaborative work.

D. PLANTING

I. Proper tree species selections shall be made to maximize benefit, to consider longevity and non-invasive characteristics, and to emphasize natives where practical.

1. Planting methods shall be utilized following accepted industry standards including International Society of Arboriculture (ISA), and American Association of Nurseryman (AAN).
2. Planting shall be carried out to maximize the canopy coverage of the targeted area. Planting sites shall be selected with suitable soils and growing conditions. Soils shall be amended as required according to industry standards.

3. The CPS shall facilitate the acceptance of tree plantings, assuring the compliance of design specifications and contract documents.

E. MAINTENANCE

I. The CPS shall facilitate the life-cycle management of reforestation sites through proper care, regular maintenance to promote canopy growth, and long-term tree health. This work may include, but is not limited to, watering, fertilization, invasive weed control, mulching and pruning.

II. While it is the intent to maximize the benefit of trees and canopy cover to the MSD combined sewer system, it is desirable to establish a sustainable reforestation program in which maintenance requirements are greatly reduced over time and urban forests become self-sustaining.

F. PROJECT MANAGEMENT

Project Management shall address the following three areas:

I. Work Plan The CPB shall prepare a work plan outlining the proposed locations and extent for reforestation, and a projected maintenance plan with proposed maintenance of previously planted trees. The work plan shall encompass the upcoming 12-month period and be submitted to MSD by December 1st of each year.

1. Annual Reports The CPB shall submit to MSD annual reports on the number and location of new plantings, as well as a summary of maintenance procedures conducted during the previous l2-month period. An annual report shall be submitted to MSD by December 31st of each year·. Reports shall include updates to data collected on planting projects and data which is required under the planning and mapping sections of this document.

2. Mapping The CPB shall maintain GIS data records of reforestation projects and submit the appropriate data to MSD Document Control at the time Annual Reports are submitted. Data shall include, but is not limited to: the number, size and species of trees planted; the date of planting and spacing of trees planted; and the MSD sewershed (i.e., boundary and CSO number).

PART 2: MANAGEMENT AND MAINTENANCE OF STORMWATER BMPs

A. BACKGROUND

I. Stormwater BMPs help to reestablish and/or mimic natural processes by absorbing, infiltrating, filtering, detaining, or otherwise managing stormwater runoff

1. Stormwater BMPs can include both living systems and engineered or inert components, configured and constructed in such a way as to divert, infiltrate, detain or otherwise reduce direct inflow of stormwater runoff into the combined sewer system.

2. Stormwater BMPs provide a direct benefit to MSD by reducing and/or delaying the volume of stormwater entering combined sewers, thereby reducing the volume and frequency of CSOs.

B. OBJECTIVE

I. WHEREAS MSD is planning and implementing stormwater BMPs within the MSD combined sewer service area.

1. WHEREAS stormwater BMPs will be distributed within the MSD service area to maximize the benefit to the MSD sewer system, as well as to promote benefits to multiple agencies or other stakeholders.
2. WHEREAS stormwater BMPs may include, but not limited to, bioinfiltration basins, bioswales, green street planters, wetland systems, green roots and bioretention areas.
3. WHEREAS The CPB has a standing mission of greenspace management and maintenance of the city's parklands and road rights-of-way.
4. WHERESAS the CPB has technical expertise in planning, planting and maintenance of other public lands per mutual agreements.
5. WHEREAS MSD's ownership of property within its service area is limited to directly related facilities that convey, treat or otherwise support the process of waste water management, which limits the land area available to maximize the benefit of stormwater BMPs to the MSD system.
6. THEREFORE, through this collaborative agreement, MSD will utilize the CPB's existing lands, relationships, and expertise to maintain stormwater BMPs in the city of Cincinnati; AND,
7. THEREFORE, the CPB will provide MANAGEMENT, MAINTENANCE, and PROJECT MANAGEMENT services in conjunction with the Urban Forest Development and Management.
8. While sites may include both living systems and engineered systems, it is the intent of this agreement to cover only the living systems (i.e., plant and vegetative components) of the associated stormwater BMPs.

C. MANAGEMENT

1. The CPB will track and manage existing and newly constructed stormwater BMPs (i.e., only the living systems).
2. MSD will provide CPB with relevant data on such stormwater BMPs, including but not limited to:
    a) Construction Plans and Specifications
    b) Locations and limits of BMPs in a GIS data file.
    c) Performance criteria established by MSD's BMP designer, including ponding depths, planting plans and infiltration rates of soils. Infiltration rates shall be confirmed after original construction of in-situ materials by contractor and become part of the project record.
3. MSD will develop and provide to the CPB a BMP manual that will be utilized by designers of stormwater BMPs to ensure consistency of benefit and performance throughout the system. The

BMP manual will be used by the CPB to understand and guide the management and maintenance of the BMPs.

4. The CPB shall manage and maintain tile living systems of stormwater BMPs consistent with the aesthetic intent and neighborhood context.

5. The CPB shall manage and maintain the living systems of stormwater BMPs in such a manner as to not compromise public safety. This includes but is not limited to: maintaining clear lines-of-sight for vehicles and pedestrians, and eliminating potential obstructions to travel of vehicles or pedestrians and other potential public hazards. Stormwater BMPs established and maintained under this program are considered capital infrastructure improvements and shall be protected from disturbance and removal by other parties. The CPB shall document and notify MSD of any such disturbance or destruction of BMPs during the course of this work.

6. The CPB shall provide public relations support as part of this work consistent with tile CPB's Greenspace Management Procedures, as well as consideration of MSD's Project Groundwork procedures. This work may include project signs and ongoing public awareness and outreach. The intent is for CPB to provide information and collaborate on materials to assist MSD's outreach efforts to inform affected property owners and to educate tile citizens on the intent and benefits of such collaborative work.

D. MAINTENANCE

1. The CPB shall maintain tile living components of a stormwater BMP in such a way as to maintain its original intent and performance based criteria.

1. Maintenance work shall include: Planting, seeding, repairing and preventing erosion; removal of trash; removal or management of organic debris to prevent degradation of planting and storm water flow.

2. If infiltration is part of the expected performance of a BMP, the CPB shall conduct infiltration testing bi-annually (or by another mutually-agreeable interval) to ensure infiltration rates are within the limits set forth in performance criteria of the BMP.

3. If necessary, the CPB shall maintain and modify soils in BMP according to infiltration and plant growth requirements.

4. MSD will provide, through direct services or sub-contractor, the necessary maintenance of pipes, inlets, drains, pumps or other "engineered" components of a multi-component BMP to ensure functioning according to original design intent. The CPB will send written request for such work to MSD.

5. The CPB shall facilitate the life-cycle management of the BMP sites through proper care, as well as through regular maintenance that promotes the growth and long-term health of the plants. This work may include, but not limited to: watering, fertilization, invasive weed control, mulching, and pruning.

E. PROJECT MANAGEMENT

Project Management shall address the following three areas:

1. Work Plan
    a) The CPB will prepare a work plan for the upcoming year to include each BMP area and a projected maintenance plan. Plan will be based on original design documents provided by MSD; however, to the CPB shall manage and recommend ongoing improvements to BMPs to sustain function and appearance of the BMP. The work plan shall include a description of the frequency and type of maintenance conducted per BMP area or BMP type.
    b) The CPB shall facilitate the life-cycle management of the stormwater BMP sites and facilities through proper care and regular maintenance, and by recommending timely rehabilitation of capital investment to sustain and/or enhance the effectiveness and efficiency. The CPB will develop annual maintenance cost centers during the design and review of each newly-proposed green infrastructure project.
    c) If the CPB is requested by MSD to perform maintenance of green infrastructure sites (in addition to sties included in this MOU) it will be based on the annual cost center over a 2-year term.
    d) The CPB shall develop a BMP Evaluation Form for annual evaluations and reporting. An example of evaluation form is included as Appendix B for reference.
    e) The Work Plan to encompass upcoming 12-month period and be submitted to MSD by December 1st of each year.
2. Annual Reports
    a) The CPB shall submit annual reports to MSD on each BMP utilizing the BMP Evaluation Forms developed for this work and a summary of maintenance procedures conducted during the previous 12-month period. An annual report shall be submitted to MSD by December 31st each year. Reports shall include updates to data collected on planting projects and data which is required under the planning and mapping sections of this document.
3. Mapping
    a) The CPB shall maintain GIS data records of BMPs and submit the appropriate data to MSD Document Control at the time Annual Reports are submitted. Data shall include, but is not limited to: the location and type of BMP, and the MSD sewershed (i.e., boundary and CSO number).

Appendix A

BMP EVALUATION FORMS

DEFINITIONS

1. Tree Canopy -the outer limits of the branching structure and leaves around a single tree trunk or the collective interconnected canopies of multiple trees forming an overall area canopy area irrespective of a single tree trunk.
2. Public Lands -Parcels owned directly by the City of Cincinnati and its various departments.
3. BMP -Best Management Practice

EXHIBIT B

Price Sheet

Title	Hourly Rate
City Parks Department Director	$102.38
Division Manager	$76.58
Superintendent of Operations	$76.58
Environmental Solid Waste Prig. Coord.	$73.85
Principal Architect	$74.15
Senior Engineer	$62.20
Florist	$30.80
Truck Drivers	$29.00
Laborers	$26.80
Municipal Workers	$15.00
Supr. of Park/Rec Maintenance & Construction	$55.45
District Crew Leader	$44.25
Service Crew Leader	$31.20
Administrative Specialist	$47.20

Equipment and fuel costs are calculated at Municipal Garage rates.

Design and programmatic recommendations for specific design, construction, and maintenance issues.		
Issue	**BMP Design Recommendations**	**Stormwater Programmatic Recommendations**
DESIGN ISSUES		
BMP Geometry	• Amend current standards for length/width ratio and flow path, and add a standard for shortest flow path • Encourage multi-cell designs • Develop more specific standards for curb cut designs	• Address BMP geometry and flow path issues during pre-design meetings because they may affect site grading issues
Pretreatment	• Develop more prescriptive standards for pretreatment design • Add staff rods or measuring devices to pretreatment for quick visual indication of clean-out level	• Include specific pretreatment maintenance tasks in maintenance plan and maintenance agreement • Ensure that pretreatment is part of construction and maintenance inspections
Filter Media	• Continue to refine filter media standards so that media is readily available and relatively simple to test • Require that filter media be certified to meet appropriate standards	• Encourage or require media from qualified vendors that periodically test the media according to standards • Carefully record track record of various media types versus BMP performance and maintenance issues
Other Design Issues	• Require that water quality BMPs be utilized for a substantial portion of a development site • Review design standards for placement of BMPs that can clog from upgradient sediment (e.g., permeable pavement) • As proposed standard indicates, promote multiple depth zones in stormwater wetlands to avoid monoculture BMPs	• Revise plan review procedures that lead to a good BMP treating a small or inconsequential part of the site • Enhance local BMP landscaping and plant lists to avoid monoculture BMPs • Include proper sizing and elevations as part of construction inspections and approval of as-builts

Center for Watershed Protection, 2009. *Technical Report-Stormwater BMPs in Virginia's James River Basin: An Assessment of Field Conditions & Programs.* Prepared by David Hirschman, Laurel Woodworth, and Sadie Drescher, eds. Ellicott City, MD.

2010 Early Success Projects for Parks MSD MOD

Early Success Projects are defined as site-specific stormwater management strategies that provide water quantity and water quality benefits; that build community support and trust with watershed stakeholders; and that result in early benefits for both MSDGC and the community. In order to provide communities with innovative and multi-faceted stormwater management strategies, MSD will work with watershed partners to implement Early Success Projects.

Potential Early Success Projects include detention basins, bioinfiltration features (e.g., bioinfiltration basins, bioswales, or rain gardens), green corridors, permeable pavements, and reforestation. MSD plans to construct ten (10) Early Success Projects -at least five (5) within the Lick Run Watershed and the remaining within the other combined sewer areas.

Early Success Projects are low impact development (LID) projects implemented with the assistance of the Cincinnati Park Board (CPB) to provide design-build expertise and public and private property owners to agree to operate and maintain the improvements. MSDGC will collaborate with CPB in developing concepts and candidates for Early Success Projects, and CPB will oversee implementation and execute the maintenance agreements with property owners. This collaboration will ensure that projects provide community value and long-term benefits as a sustainable stormwater management solution.

	Lick Run Watershed
Immanuel United Church of Christ	Bioinfiltration areas, rainwater harvesting, stormwater planters
St. Francis Court Apartments	Community gardens, bioinfiltration areas, porous pavement, rainwater harvesting, pedestrian crosswalk improvements
San Antonio Church	Bioinfiltration areas, parking lot improvements
Central Fairmount Elementary	Reforestation
Queen City Avenue	Reforestation
Rapid Run Park	Bioswale system, bioinfiltration areas, reforestation
Glenway Woods	Green Corridor, natural conveyance
	Other Lower Mill Creek Watersheds
WestCURC (Former Habig's Parking Lot	Porous pavement, bioinfiltration areas, parking lot and drainage improvements
Roselawn Park	Bioinfiltration areas, reforestation
Ault Park	Stream restoration, separation
Burnett Woods	Stream restoration, bioinfilatration areas, reforestation
Denham/Carll Street Ravine	Bioinfiltration areas, biswale, reforestation

Appendix E Communities of the Future Outreach

The Metropolitan Sewer District of Greater Cincinnati is implementing a range of outreach efforts related to Project Groundwork and the Lick Run Alternative (part of Project Groundwork). These include: web site information, open houses, videos, community workshops, and tours. Example outreach materials for Lick Run are attached with this appendix (various materials from an open house implemented in January 2011).

Additional information can be obtained at: http://projectgroundwork.org/lickrun/index.htm
Contacts for additional information are listed with links. One such contact is through Project Groundwork at the following phone number: (513) 244-1300 or e-mail: MSD.Communications@cincinnati-oh.gov

PROJECT GROUNDWORK
your pipeline to clean water

We Need Your Input...

to make our rivers and streams cleaner and healthier.

Please join us

to talk one-on-one with

MSD representatives, local

leaders, and city and county

Open House

6:00 - 8:30 p.m.

Wednesday, January 19, 2011

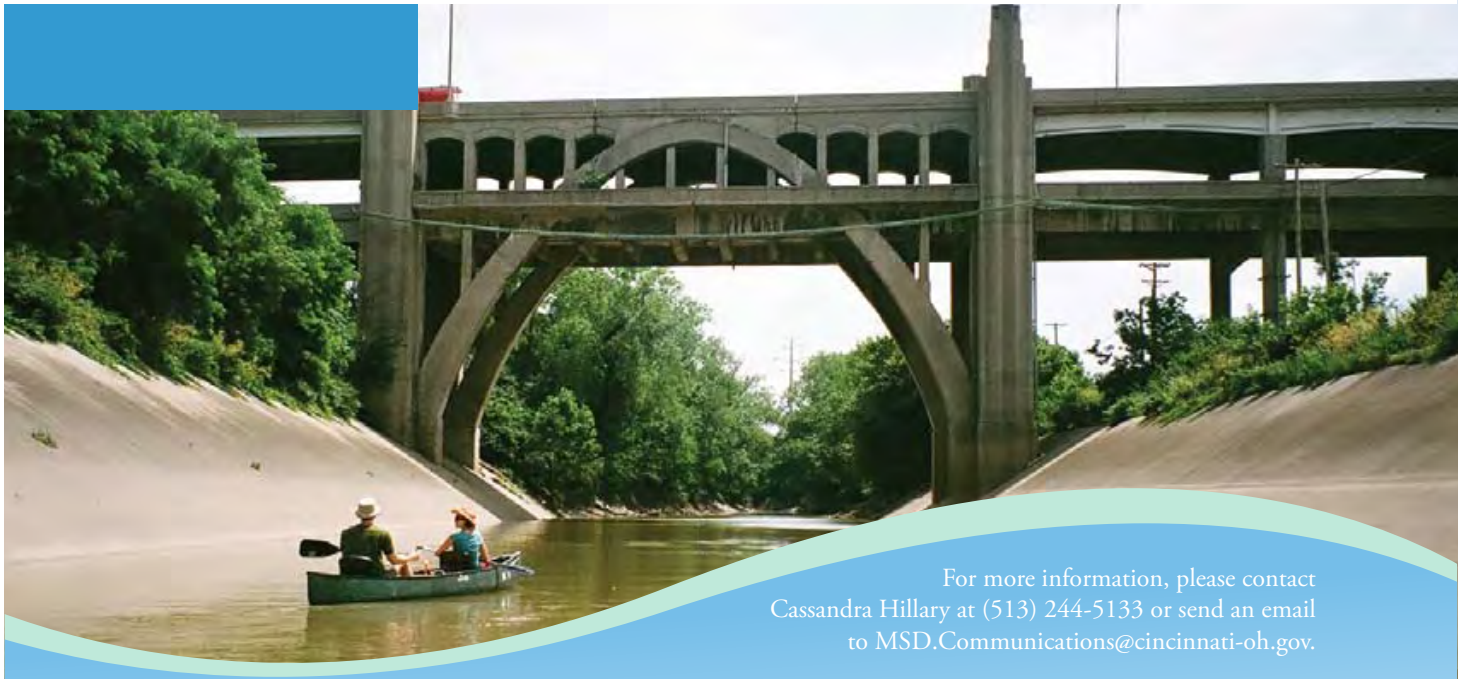
Orion Academy in South Fairmount

1798 Queen City Avenue - Cincinnati, OH 45214

The Metropolitan Sewer District of Greater Cincinnati (MSD) is hosting an open house for residents of the Lick Run watershed.

This watershed includes South Fairmount and portions of East and West Price Hill and Westwood.

Drop by anytime between 6-8:30 p.m. to talk one-on-one (there will be no formal presentation).



For more information, please contact
Cassandra Hillary at (513) 244-5133 or send an email
to MSD.Communications@cincinnati-oh.gov.

Project Groundwork and the Lick Run Watershed

What's the Issue?

During heavy rains, raw sewage - mixed with storm water - overflows from our sewers into local rivers and streams and can also back up into basements.

The vast majority of overflows occur from combined sewers, which carry both sewage and stormwater in the same pipe. Combined sewers are typically located in the older areas of Cincinnati and Hamilton County.

When large amounts of stormwater enter combined sewers, these pipes - many built more than 100 years ago - are often filled beyond their capacity and overflow directly into local waterways through outfalls known as combined sewer overflows or CSOs.

Hamilton County is among the top five locations in the nation for urban CSOs. Overflows occur as many as 105 times a year at some locations.

What's the Solution?

To resolve this public health and environmental issue, MSD has embarked on the largest public works project in the history of our community to rebuild and improve our sewer system.

Called ***Project Groundwork***, this multi-year and multi-billion dollar initiative includes hundreds of sewer improvements and stormwater control projects.

The U.S. EPA has mandated that MSD capture, treat, or remove 85% of the 14 billion gallons of annual overflows from combined sewers and eliminate all overflows - about 100 million gallons annually - from sanitary-only sewers.

Lick Run Watershed

The Lick Run watershed is home to CSO 5, the largest CSO in Hamilton County. The watershed, located within the larger Lower Mill Creek watershed, includes Cincinnati's South Fairmount neighborhood and portions of East and West Price Hill and Westwood.

Every year, about 1.7 billion gallons of combined sewage and stormwater overflow from CSO 5 - located at the east end of Queen City Avenue - into the Mill Creek. Of that total, less than 25% is sewage – the rest comes from stormwater and what used to be natural stream flow.

Your Input

MSD will be seeking your input on potential sewer improvements in the Lick Run watershed. The January 19 open house will be one of multiple opportunities to learn more, ask questions and share your opinions or concerns. We hope you can attend.

Project Groundwork is your program. It's an investment in your community for generations to come. For more information, visit www.projectgroundwork.org.

PROJECT GROUNDWORK
your pipeline to clean water

PROJECT GROUNDWORK
your pipeline to clean water

Welcome

Welcome to the Lick Run Open House, hosted by the Metropolitan Sewer District of Greater Cincinnati (MSD). The format of this meeting allows you to talk one-on-one with MSD representatives, community leaders and city and county officials about challenges and solutions for reducing combined sewer overflows (CSOs) into local streams and rivers.

Eight information stations are presented in a specific sequence, so please consider visiting the stations in numerical order to gain an understanding of the issues. Handouts are available at each of the stations.

If you have questions or comments, please write them on the comment cards provided at each station or at the registration table. Be sure to provide your name, address and email so we can respond to you.

Station 1: What is the Challenge?

- History of combined sewers
- Challenges created by combined sewer overflows (CSOs)
- How CSOs impact our communities

Station 2: What is the Solution?

- Federal mandate to reduce and eliminate CSOs
- MSD's solution: Project Groundwork
- MSD's three-pronged strategy and timeline

Station 3: What are the Benefits of Project Groundwork?

- Environmental, health, social and economic gains
- Can we fix sewers and help our communities?

Station 4: What Role Does Lower Mill Creek Play?

- Characteristics of Lower Mill Creek watershed
- MSD must resolve 2 billion gallons of CSOs in Lower Mill Creek by 2018
- Default solution is a tunnel and enhanced high-rate treatment facility
- Alternative stormwater control solutions

Station 5: What is the Lick Run Watershed?

- Characteristics of the Lick Run watershed
- Concepts for potential solutions
- Benefits of daylighting combined sewers
- Why does MSD need property in the Lick Run watershed?

Station 6: What are Current Projects in the Community?

- Pilot projects in the Lick Run watershed that showcase techniques for controlling stormwater

Station 7: How Can I Get Involved?

- How to voice your opinion or learn more
- How to help protect water quality at your own residence

Station 8: Business Growth and Relocation Assistance

- Services and programs offered through Cincinnati's Department of Community Development to help retain businesses within the city

Open House Terminology

Brownfield – As defined by the EPA, a brownfield is "real property, the expansion, development, redevelopment, or reuse of which may be complicated by the presence, or potential presence of a hazardous substance, pollutant, or contaminant."

Charrette –A charrette is process that links a multidisciplinary team with community stakeholders through a series of feedback loops, during which alternative concepts are developed, reviewed by stakeholders, and revised accordingly. For detailed information on the charrette process, please visit the Station 7: "How Can I Get Involved."

Clean Water Act (CWA) – The primary federal law in the United States governing water pollution, effective October 18, 1972. The CWA regulates discharges of specific chemical pollutants from traditional "point source" facilities, including municipal sewage plants and industrial facilities. More recently, the CWA also has taken a more holistic, watershed based approach for addressing "non-point" sources of water pollution, such as runoff from streets, construction sites, farms, and other sources.

Combined Sewer Overflow – A structure designed to overflow when a combined sewer is filled with sewage and stormwater beyond its volume and/or pressure capacity, usually during wet weather

Consent Decree - A legal agreement approved by a judge between two parties in a lawsuit. In the case of Project Groundwork, it is between the state and federal EPA, with ORSANCO and the U.S. Department of Justice, and mandates the utility to make infrastructure improvements to improve environmental conditions to meet Clean Water Act standards.

Conveyance – the movement of stormwater and wastewater from the source to the treatment plant

Early Success Projects – Site-specific stormwater projects that bring early benefits for both MSD and the community. Please visit Station 6: Projects in the Community for more details on Early Success Projects.

Effluent – the treated output flow of a wastewater treatment plant

Gray Infrastructure – Traditional forms of sewer infrastructure such as conveyance pipes, upgraded treatment plants, and stormwater storage structures, that helps manage or control the volume of sewage and storm water in our sewers

Green Infrastructure – A stormwater management practice or technology that mimics or facilitates naturally occurring processes. Examples include pervious paving, rain barrels, bioretention basins, and stream separations, as well as other types of infrastructure that helps keep storm water out of the sewers.

Impervious Surfaces – Surfaces such as parking lots, roads, and rooftops that obstruct or prevent the infiltration of rainwater into the ground

Influent – The untreated wastewater or raw sewage coming into a wastewater treatment plant

Regulators – refers to the U.S. Environmental Protection Agency, the Ohio EPA, the US Department of Justice, and ORSANCO, who are responsible for monitoring the progress of meeting the Consent Decree

SBU or sewer backups –During major wet weather events, the combined amount of rainwater and wastewater is more than the pipes can handle, the water stops flowing forward and begins to back up. Excess water may get pushed out of the pipe through manhole lids and through private lateral drains that connect buildings to the sewer system. When this happens, basements and lower levels get flooded with the sewage/rainwater mixture. For more information, please see the Sewer Backup Fact Sheet at Station 1: What is the Challenge?

Sewer-shed – An area, similar in concept to a watershed, which is drained by sewers all flowing in the same general direction.

Source control –The practice of reducing stormwater runoff as close to the point where rainfall occurs ("the source"), through storage, infiltration, or diversion techniques

Sustainable or sustainability – In the context of Project Groundwork and at MSDGC, sustainable or sustainability refers to the simultaneous pursuit of economic prosperity, environmental quality and social equity, now and in the future. Measuring these goals is known as the "Triple Bottom Line."

Stakeholders - The range of people and organizations with direct and indirect vested interests in MSD's activities. Primary stakeholders include customers (the ratepayers), employees, the Board of County Commissioners, bond investors, community partners, neighbors, local government partners, regulators, and advocacy groups

Triple Bottom Line – In practical terms, the Triple Bottom Line means expanding the traditional financial accounting framework to include factors such as ecological and social performance. The Triple Bottom Line provides a way for MSDGC to evaluate the interest of the community in addition to the ratepayers.

Watershed – The land area that contributes surface water to a given location. It is defined by surface topography; water that falls on one side of a ridge ultimately drains to a given location; this process defines the watershed.

Wet weather - A general term describing storms that generate sufficient stormwater runoff to cause flooding and overflow events in combined sewers and sanitary sewers

WHAT'S THE CHALLENGE?

Every year, about 14.1 billion gallons of raw sewage - mixed with stormwater - overflows from our sewers into local streams and rivers and backs up into basements.

Understanding Our Past

- Cincinnati's first stormwater sewers were built in the 1800s to carry rain and snow away from buildings and streets. As indoor toilets and plumbing evolved, sanitary sewer lines were connected to the stormwater sewers.

- Sewage and stormwater mixed in the same pipe is called a combined sewer. Cincinnati is one of about 772 cities in the U.S. with a combined sewer system.

Brick sewer from the 1800s

Example of CSO outlet

Focusing on CSOs

- Combined sewers can become overloaded with sewage and stormwater during heavy rains, causing sewage backups in buildings and unsanitary conditions.

- Overflow outlets on the sewers allow excess stormwater and sewage to discharge directly into waterways.

- For years, combined sewer overflows (CSOs) were an acceptable engineering practice for handling excess flows. Today, the U.S. EPA is focused on controlling CSOs through enforcement of the Clean Water Act.

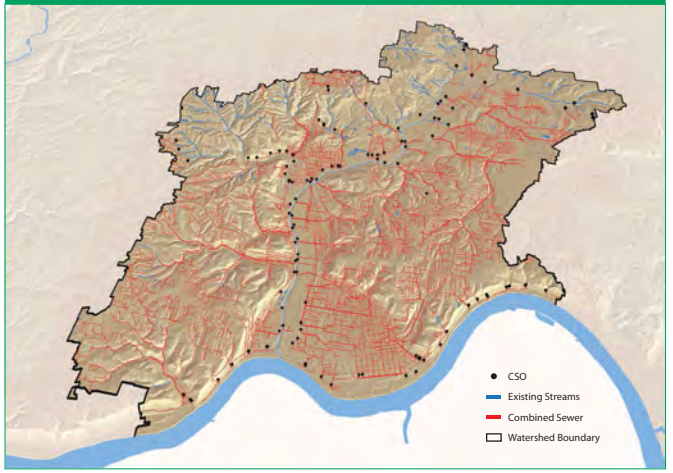
Lick Run CSO in South Fairmount under dry and wet conditions

Hamilton County is one of the top 5 locations in the nation for urban CSOs. Overflows occur as many as 105 times a year at some locations.

PRE-DEVELOPMENT WATER FLOW PATTERNS

More than 300 miles of streams once flowed freely through the Lower Mill Creek area.

TODAY'S WATER FLOW PATTERNS



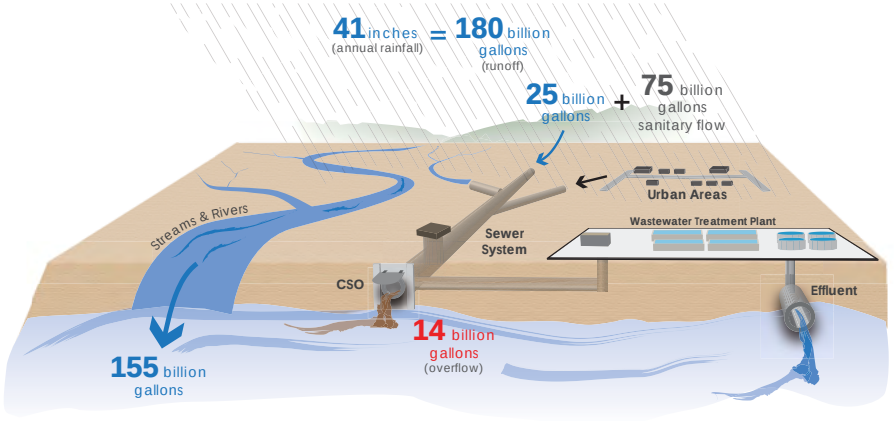
Many of the streams became combined sewers. Today, only 75 miles of natural streams remain, with more than 600 miles of combined sewers.

METROPOLITAN SEWER DISTRICT of greater CINCINNATI

HOW DO COMBINED SEWER OVERFLOWS (CSOs) AFFECT US?

Overflows from combined sewers threaten public health, negatively impact the environment and degrade our quality of life across the entire Cincinnati community.

MSD'S SEWER SYSTEM DURING WET WEATHER



CSOs Impact Our Communities

Excess flow in combined sewers can cause sewer backups in homes and businesses.

CSOs Impact Our Waterways

- After heavy rains, many area waterways are unsafe for swimming or wading due to high levels of *E. coli* bacteria.
- CSOs are a main source of *E. coli* bacteria in local waterways.
- Fish and other aquatic life are impacted by the water pollution.

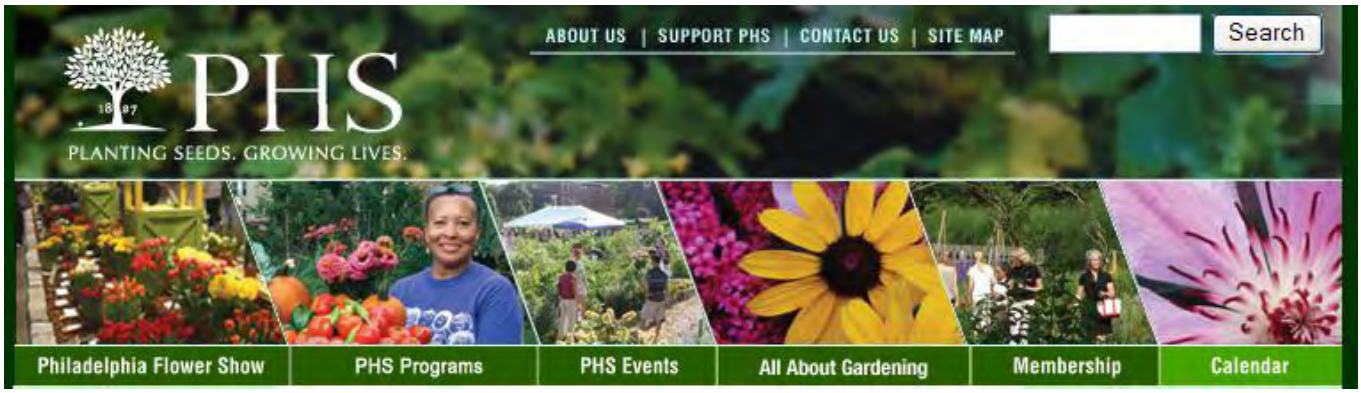
CSOs cause offensive odors and leave toilet paper and other unsightly debris behind.

METROPOLITAN SEWER DISTRICT of greater CINCINNATI

Appendix F Area Planning Activities

Plan Cincinnati	Plan Cincinnati is expected to be completed in Spring 2011. Also, this planning effort includes input through surveys, Facebook pages, public meetings and other activities that may support community engagement and input in the Lick Run area.
Agenda 360	See text above on Agenda 360 and its ties to Lick Run. Also, this planning effort includes outreach and input efforts that might provide information to support community engagement and input in the Lick Run area.
Go Cincinnati Plan	Completed in January 2008, the Growth and Opportunities (GO) Plan for Cincinnati includes recommendations for a strategic approach for economic development. The GO Cincinnati Steering Committee and Project Teams - more than 200 community and business leaders - presented 14 recommendations to help the city reposition its assets to attract businesses, employees and residents. The comprehensive approach to developing the recommendations considered not just job expansion, but workforce development, transportation, neighborhood revitalization and job attraction and retention. Section 6.3 is a Strategic Plan for Queensgate-Mill Creek Corridor (bounded by as river to south and I75/I-74 interchange to north, and I-75 to East and State/Beekman Streets to the west) focusing on the area as a regional serving place, including drivable suburban development with walkable development in the Lower Price Hill area (lies adjacent and south of South Fairmount), with development of an eco-industrial park – the first for the Upper Midwest and Cincinnati area.
Climate Protection Action Plan: The Green Cincinnati Plan	GreenCincinnati Plan - City of Cincinnati Office of Environmental Quality led efforts to reduce greenhouse gas emissions by 2% by the year 2042. The mission is to lead the Cincinnati City Government and larger community toward sustainability and the practice of good environmental stewardship. Goals appear to integrate with Lick Run sustainable/livable community goals (including decreasing carbon footprint and improve economy). City of Cincinnati Office of Environmental Quality led efforts to reduce greenhouse gas emissions by 2% per year for each through 2042. The mission is to lead the Cincinnati City Government and larger community toward sustainability and the practice of good environmental stewardship. Goals integrate with Lick Run sustainable/livable community goals (including decreasing carbon footprint and improve economy).
OKI Strategic Regional Policy Plan	Adopted in 2005, this plan provides an overall 20-year vision for regional vitality, sustainability, and competitiveness, focusing on the land use–transportation connection. Goals appear to integrate with Lick Run sustainable/livable community goals.
Riverfront Development Master Plan	This plan was developed in the late 1990s for redevelopment of the riverfront in Cincinnati and across the river in Northern Kentucky (now known as The Banks). This project included public sporting arenas, parks, businesses, and walkways) and may provide examples of redevelopment success and organizational structures for implementation that could be drawn upon for Lick Run.

Appendix G Land Stewardship and Green Jobs Program Examples



Vacant Land Stabilization Program

Once a property is selected for stabilization in one of the six target areas, the transformation can begin. By disposing of litter, grading, and seeding, Philadelphia Green lays the groundwork for a remarkable makeover. The next step is to install trees and a simple wood fence to complete the look and prevent illegal dumping. Presently, more than 7 million square feet of land has undergone this treatment.

These green spaces aren't meant to be permanent; rather the stabilized sites serve as placeholders to display the land's full potential. The land may eventually be developed or converted to a community garden or park—both major steps toward making a neighborhood more desirable to businesses and prospective homeowners.

But cleaning and greening the lot isn't enough. Maintenance is an equally important component to making vacant land management effective. As part of a contract with city government, all of the sites are divided by zip-code and assigned to a maintenance crew. Many of these lots are cared for by the Community LandCare organizations that also manage unimproved land. Each contracted group is required to tidy and mow their sites every two weeks from April through October.

Source URL: http://www.pennsylvaniahorticulturalsociety.org/phlgreen/vacant-stabilization.html

Roll out the rain barrel

Compost, too

Posted: March 1, 2011 - 1:20am

By Mary Landers

An event popular with local gardeners is making a command re-appearance Saturday at East Broad Elementary School.

Savannah's Water Resources Bureau will be selling rain barrels and compost bins at well below typical retail prices: $45 for an 80-gallon composter and $55 for a 55-gallon cistern.

The last such event, in late 2009, sold out quickly and left a demand for more.

"We have had consistent calls and requests of 'when are you going to do another one?'" said Laura Walker, environmental administrator. Personnel changes at the company supplying the barrels delayed the second sale. Now that it's arrived, it will offer about five times more of both products. The city will have 500 composters and 550 rain barrels available on a first-come, first-serve basis. The sale is open to anyone, not just Savannah residents, and there's no limit on the number of items an individual can purchase.

"We want to get rid of them and we want people to use them," Walker said. They're not rejects or seconds, she added. The discounted price is possible because of the city's bulk purchase; it's passing along those savings to consumers, Walker said.

Water Resources Bureau promote the use of rain barrels to increase water conservation and reduce storm water runoff, Walker said. Composters benefit the city's water system by diverting kitchen scraps away from disposals.

"Kitchen sink disposals are the scourge of the wastewater treatment system," Walker said. "Some municipalities actually ban their installation." She cited Raleigh, N.C., as an example. Nutrient-rich kitchen scraps contribute to the pollution that's a source of coastal dead zones in estuaries across the world, Walker said. It also takes extra water to flush those scraps through a disposal.

Step-Up Savannah, an anti-poverty business and government collaborative, is co-sponsoring the event. Its construction apprentices are trained to install the rain barrels on an elevated platform of cinder blocks to increase water pressure and make them more useful for chores such as washing a car or watering a lawn. They will also attach the barrels to gutters on homes with gutters.

"You can place an order if you don't have time or are nervous about installing it," said Garrison Marr, director of work force development.

The cost is $55 for a house without gutters; $65 for a house with gutters, which is slightly more complicated to set up.

"We're really doing this because want as much green job training as possible," Marr said. "It is competitive in construction and we want to give them the tools to stand out. It's a low-cost way make money while learning more about the industry."

Rain barrel/composter sale

9 a.m.-3 p.m. Saturday at East Broad Elementary School, 400 E. Broad St.

Cost is $55 for "The Systern" 55-gallon rain barrel; $45 for Earth Machine 80-gallon compost bin. Checks and credit cards only. No cash.

Source URL: http://savannahnow.com/news/2011-03-01/roll-out-rain-barrel

Appendix H Plan Cincinnati Infrastructure White Paper

PLAN CINCINNATI

a comprehensive plan for the future

Utilities and Infrastructure
Existing Conditions Report Supplement
October 6, 2010

city of CINCINNATI

Table of Contents

Purpose

To our Working Group Members, and others interested in Plan Cincinnati:

This document is the second in a series of Existing Conditions Reports for Plan Cincinnati.

The information in this document is provided to give basic background information that is appropriate for use by the **Utilities and Infrastructure** Working Group.

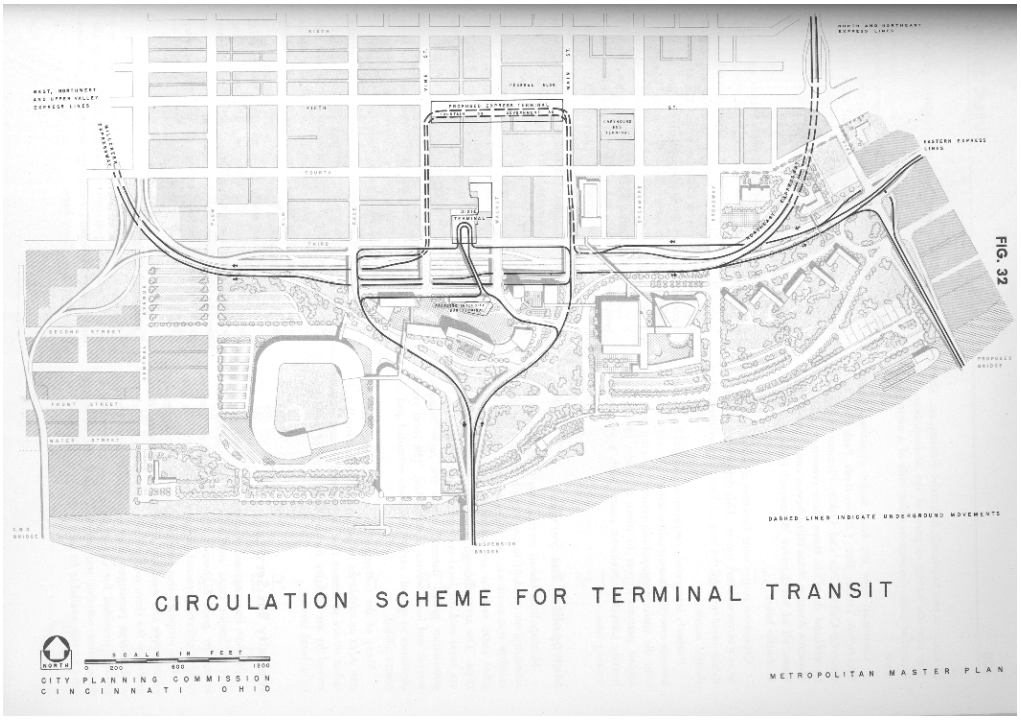
On September 2, 2010, we released the first Existing Conditions report, which was appropriate for use by all 12 Working Groups. This document is a supplement to that report, and others will be released that will focus on information and data that is needed for each Working Group.

All of the information and data provided is based not only on what was requested by individual Working Groups, but also the information that Planning Staff felt was necessary to provide so that Working Group members were armed with the background necessary to make good decisions. For that reason, not all pieces of information or data requested will be contained in these documents, and not everything contained was requested by a Working Group.

All Existing Conditions Reports released will be available to the public on our website: www.plancincinnati.org and we encourage you to review all of the Reports, not only those that pertain to your particular Working Group.

The maps in this and future documents may be scaled to fit the document, and are not appropriate for detailed viewing. For this reason, all maps will be available in their original size on our website.

Thank you for your participation in Plan Cincinnati! We hope you enjoy this process of learning more about our City.



Source: Cincinnati Metropolitan Master Plan (1948)

Utilities and Infrastructure in Past Comprehensive Plans

Cincinnati holds a prestigious position in the history of Planning in our nation. In 1925, Cincinnati was the first city in the United States to have a Comprehensive Plan approved by a City Council. Since that time, there have been only two other Comprehensive Plans - in 1948 and in 1980.

The following is an analysis of how each of these plans addresses Transportation.

Official Plan of the City of Cincinnati (1925)
The 1925 Comprehensive Plan was a very general plan, with visionary ideas. The scope of the plan aimed to coordinate with the region's needs, not only the needs of the City. Citizen involvement was stressed very heavily; the plan suggested including citizen groups, contests with prizes, exhibits of the plan in libraries and museums, and even cartoons about the plan to be deployed in the newspaper.

The general location of Garbage Disposal Facilities was a primary concern for the City, in order to care for the handling of ashes, rubbish and garbage produced. Distribution of population was used as the main criteria to determine the location of a plant. Other criteria for the location of the plant included the method of treatment, wind direction and its orientation with respect to residential districts.

The plan emphasized the transportation of garbage and the use of proposed devices to minimize the nuisances associated with refuse and garbage. It was also suggested that the location of a plant should be close to rail and water transportation facilities.

Based on the per capita production of garbage in Cincinnati at that time, it was estimated that in the future Cincinnati would need two units handling one hundred tons per day of garbage at each plant. As per the zoning ordinance at that time, the most logical location for the plant would be Industrial "C" districts. However, alternative locations were suggested, specifically around the Mill Creek Valley.

Cincinnati Metropolitan Master Plan (1948)
The scope of the 1948 plan is the whole Metropolitan Area (defined in the plan as urbanized portions of Hamilton County in Ohio, and Kenton and Campbell counties in Kentucky). This plan aims to assess the existing conditions of all of these areas, and then, through intergovernmental cooperation, address the needs of the community to ensure healthful living conditions and the highest degree of economic well-being possible.

To accomplish this goal, the plan acts as a guide, showing relationships between different aspects of the community, and it estimates conditions that will exist in the future. In doing this, the plan realizes goals that may be set very short-term, or for ten years in the future.

The Coordinated City Plan: Volumes I and II (1980)
The four primary objects of the Plan are to: plan to produce with our available limited assets; plan to develop the assets of a mature city; plan to conserve and rehabilitate in order to avoid costly replacement; and, plan to improve the quality of the physical environment rather than expand the quantity of physical facilities. During this plan's development, Cincinnati was facing decreased revenue. Because of this, redevelopment and seeking new sources of revenue became themes of the plan. This makes the plan seem like more of an analysis of existing conditions than anything else.

In 1948, the plan forecasted a rise in population and employment, and increases in development. In 1980, population was not projected to grow, and the City's revenue was no increasing. On top of that, the demand for services was increasing. Because long-range trends and conditions are impossible to predict accurately, the 1980 Coordinated Plan focuses on many short-range projects geared towards the realities of funding.

The second volume of the 1980 plan outlines "Strategies for Comprehensive Land Use." These strategies are structured around three basic

concepts. The first is that the physical setting of Cincinnati is that of a well-developed city with an established and easily recognizable urban form. The "form" of Cincinnati being that the residential areas are generally on the hilltops, the non-residential uses are generally in the valley corridors, and the two are separated by undeveloped hillside. The second concept characterizes Cincinnati as a "mature city" with a declining or stabilized population, limited tax revenue, and increasing demands for public services. This means that planners must look at the priorities of the city as a whole and recognize the economic constraints that shape its development. The third concept is that the plan is a process and a set of documents. The process follows a method whereby the plan map recommendations incorporate on a continuing basis all proposals adopted by City Council and all proposals from other sources that conform to the strategies and policies.

The 1980 plan proposes many improvements to the City's sewer system, as well as the extension of utility services beyond Cincinnati's corporate boundaries. In 1977, the Cincinnati Water Works began a five-year capital improvement plan that would extend to 1981. One of the sources of funding for the Capital Improvement Plan was the U.S. Environmental Protection Agency. This source provided Cincinnati with research grants that allowed for Water Works to begin a comprehensive research program to enhance water quality.

The City of Cincinnati had been considering the development of a resource recovery center rather than contracting new landfills. A private firm submitted a proposal to establish said center at the former Center Hill incinerator. No capital expenditures would be involved since the private firm would be renting or purchasing the incinerator.

Few capital funds had been provided in the years prior to the 1980 plan for necessary sewer improvements.

Water and Sewer Management

Greater Cincinnati Water Works (GCWW)

On June 25, 1839, Cincinnati Water Works became the first municipally-owned water system in Ohio when the City of Cincinnati purchased a privately owned water company for $300,000. With two steam pumps, 3½ miles of iron pipe and 19 miles of wooden pipe, Cincinnati Water Works provided just over one million gallons of raw Ohio River water per day to approximately 45,000 people.

Today, Greater Cincinnati Water Works (GCWW) remains a municipally owned and operated utility. GCWW now produces over 48 billion gallons of high quality drinking water annually and serves more than 900,000 consumers in the Greater Cincinnati area including the entire City of Cincinnati, the majority of Hamilton County, parts of Butler, Warren, and Clermont Counties in Ohio and the City of Florence and Boone County in northern Kentucky.

GCWW drinking water is produced at two treatment plants. The Richard Miller Treatment Plant, located in the community of California, treats surface water pumped from the Ohio River and supplies drinking water to 88% of GCWW customers. The Charles M. Bolton Treatment Plant, located in the City of Fairfield, treats ground water pumped from wells in the Great Miami Aquifer and supplies 12 % of GCWW customers.

GCWW uses the latest treatment techniques in these state-of-the-art facilities. The granular activated carbon (GAC) treatment process utilized at the Miller Plant has received numerous awards. GAC treatment is considered to be the best way to remove organic materials from drinking water. GCWW pioneered the use of GAC treatment and the GAC facility at the Miller Plant remains one of the largest GAC facilities in the U.S. From these treatment plants, the water is pumped into our distribution system that consists of 21 pumping stations, 23 tanks and reservoirs, and approximately 3,000 miles of water main. This water reaches the taps of over 235,000 residential and commercial accounts.

Water Quality

GCWW performs over 600 tests daily to ensure safe drinking water, including:

- Testing of water after each step in the treatment process.
- Water samples from the distribution system are analyzed in GCWW laboratories.
- Monitors with alarms are located throughout the treatment plants and in the distribution system to continuously monitor water quality.
- Source waters are tested routinely before they enter treatment plants.

The Ohio Environmental Protection Agency reviews test results monthly to ensure that health standards are consistently met.

GCWW water met or exceeded all state and federal health standards for drinking water in 2009.

A Water Quality Report is prepared annually to meet the EPA's National Primary Drinking Water Regulation for Consumer Confidence Reports (CCRs).

A full copy of the 2009 Water Quality Report is available at: www.cincinnati-oh.gov/water/downloads/water_pdf38998.pdf

Ultraviolet (UV) Disinfection

Construction is slated to begin in late 2010 at Greater Cincinnati Water Works' (GCWW) Richard Miller Treatment Plant to install Ultraviolet (UV) Disinfection treatment technology - one of the most significant advancements in water treatment technology since Granular Activated Carbon (GAC) became the standard in the 1990's.

UV disinfection has been identified by the US Environmental Protection Agency as one of the best technologies to inactivate pathogenic microorganisms, such as cryptosporidium (crypto) in drinking water. With the addition of UV, GCWW will be the only water utility in the nation

to use sand filtration followed by GAC and UV creating a true multi-barrier treatment approach for protecting public health.

To reduce GCWW's carbon footprint, a component of the UV project includes installation of solar panels atop the new facility and a second installation on existing Water Works facilities. The entire project (UV and solar) is designed to protect public health with advanced water treatment technology and protect the environment by advancing the use of solar energy. As currently designed, this solar project will represent one of the largest solar-generated electric supply installations in Ohio.

UV disinfection uses UV light, in low doses, to inactivate disease-causing protozoa such as Cryptosporidium and Giardia. No chemicals are added, and there is no residual effect once the water leaves the UV reactor.

There are many serious concerns about the vulnerability of the Ohio River watershed to contamination, including microbial and viral contamination from emerging microorganisms that are resistant to chlorine disinfection, as well as future contamination issues that will need to be addressed. Since 2000 GCWW has been conducting research with national and international groups on technologies available to address these concerns.

In 1993 a deadly waterborne disease outbreak from Cryptosporidium occurred in Milwaukee, Wisconsin. Nearly 400,000 people became ill and over 100 deaths were reported. Chlorine, which is a commonly used disinfectant at water treatment plants, is ineffective in killing Cryptosporidium. UV disinfection at water treatment plants is a proven and effective technology for addressing this contaminant.

Wastewater treatment plants release discharges of municipal wastewater into the Ohio River. Although discharges are regulated, several contaminants of concern, including Crypto, are found in wastewater effluents. Municipal and residential wastewater systems and wastewater treatment plants are known to have incidents of raw sewage discharge or treatment malfunctions

GCWW and the City of Cincinnati have consistently expressed concerns regarding a wastewater treatment plant located near Alexandria, Kentucky, discharging just 11 miles upstream of our drinking water intakes.

New or unexpected contaminants are sure to be discovered in our source water in the future. UV disinfection, combined with GCWW's current treatment processes, provides an extra layer of protection against those contaminants. This is an important step in insuring public health now and for future generations.

The project is scheduled to be complete in early 2013.

Metropolitan Sewer District (MSD)

Prior to 1968, Hamilton County and the City of Cincinnati maintained separate sewage operations. The Metropolitan Sewer District of Greater Cincinnati (MSD) was formed on April 10, 1968, pursuant to an agreement between the Board of County Commissioners of Hamilton County and the City of Cincinnati. The agreement provides for a consolidation of the City Sewer Department and the County Sewer District.

The agreement established the respective responsibilities and duties of the City and the County. Pursuant to the agreement, the County retained authority and control of the Sewer System including, but not limited to, the sole authority to establish sewer service charges, adopt rules and regulations and approve capital improvement programs.

The City is the managing agent for the operation of the Sewer District, subject to the control and direction of the Board as provided in the agreement. Subject to the retained authority of the County, the City agreed to undertake the management and operation of MSD for and on behalf of the County for a period of 50 years commencing on May 1, 1968 and expiring on April 30, 2018. The County agreed to maintain Sewer System service charges and revenues at rates which would at all times be sufficient to pay the reasonable expenses of operation and maintenance

of the Sewer System and the debt service charges on all then existing and future indebtedness of the City and County related to the Sewer System. The County also transferred its entire sewer system related personal property, equipment, and vehicles to the City so that the City could operate the Sewer System. The City agreed to plan, design and supervise the construction of all sewers and sewage treatment facilities, maintain and operate all sanitary and combined sewers and all sewage pumping and treatment facilities and generally operates the Sewer System.

As part of the consolidation, and in connection with the execution of the agreement, the City granted the sole and exclusive use of all sanitary and combined sewers and sewage treatment facilities to the County. The City, however, retained legal title to all such facilities. MSD also provides management and administrative services to the City's Stormwater Utility Management Department for a fee, on an annual basis.

The Department of Sewers of the City is responsible for the performance of the City's responsibilities of the agreement to manage and operate MSD. The head of the Department of Sewers is the Director of MSD and is primarily responsible for the administration of the entire Sewer System, including design, construction, repair, maintenance and operation of all sewers and sewage treatment facilities. The Department of Sewers administers MSD through the Office of the Director and five operating divisions: the Administration Division, the Engineering Division, the Wastewater Treatment Division, the Industrial Waste Division and the Wastewater Collection Division.

Because the City operates MSD and the Sewer System for the County, the Director of Sewers is appointed by the City Manager of the City of Cincinnati and all other supervisory personnel are either appointed by the City Manager or selected pursuant to the civil service rules applicable to City employees.

The Sewer System covers approximately 400 square miles. It serves a residential population of approximately 800,000 and substantially all of the industry in Hamilton County through over 200,000 sewer connections and operates and maintains over 3,100 miles of sanitary and combined sewers, 7 major wastewater treatment plants, 6 package treatment plants, 136 package lift stations and 8 major pumping stations.

Cincinnati, like many older cities in the Northeast and Midwest, has a sewer system that contains both sanitary and combined sewers. Combined sewer systems were based on technology and theories, prevalent until the early to mid-1900's, that both sanitary waste and surface drainage or rain water could be handled jointly and safely discharged directly into streams and rivers. As the systems developed and communities grew, interceptors were used to capture this discharge, bypass the small creeks or streams and discharge it directly into large rivers. Interceptor sewers now have their flow directed to wastewater treatment plants. Combined sewer systems are designed so that during dry weather, an interceptor sewer captures the wastewater and conveys it to a treatment plant. During wet weather, because of the large inflow of stormwater, the combined wastewater and stormwater flow may exceed the capacity of the interceptor sewers resulting in an increased, but still less than complete, flow to the treatment plants, and the remainder discharging directly into creeks, channels or rivers. This discharge is commonly referred to as a combined sewer overflow or "CSO," and is part of the design of the system. As is the case with SSOs, CSOs are also a national issue that has received increasing attention from the U.S. EPA.

Combined Sewer
A combined sewer is a large diameter sewer that carries both storm water and sanitary sewage (wastewater from your drains and toilets) to a treatment plant for treatment. In Hamilton County, combined sewers are generally found in older portions of our community, like the City of Cincinnati. They comprise about 40% of our current sewer system and date back to nearly 180 years old in parts. During heavy rains, combined sewers are often filled beyond their capacity. To relieve pressure on the sewer line and prevent widespread flooding and sewage backups into buildings, combined sewers were designed to overflow directly into local streams, creeks, and rivers through outfall structures known as

combined sewer overflows or CSOs. At the time they were built, CSOs were an acceptable way of handling excess flows, but their environmental impacts are now controlled under the present regulations of the federal Clean Water Act. By the mid 20th century, combined sewers were largely discontinued in favor of separated sanitary sewer and storm water lines.

Sanitary Sewer
Sanitary sewers are small diameter pipes that are not designed to carry storm water. In Hamilton County, sanitary sewers are commonly found in newer areas of Cincinnati and suburban "bedroom communities" that surround the city. Storm water is handled by a separate line.

During heavy rains, however, storm water can enter sanitary sewer lines through manholes, defective sewer pipes, and illicit connections (e.g., downspout connected directly to the sanitary sewer). If the sanitary sewer line is filled beyond capacity, it will overflow through sanitary sewer overflow (SSO) relief structures (constructed as part of manholes) or through manhole lids into local waterways, adjacent yards, and streets. SSOs are considered a greater danger to public health than a CSO, and therefore are not permitted under the Clean Water Act.

Sewer Overflow
A sewer overflow is a discharge of raw sewage mixed with storm water that overflows from a sewer into local streams and rivers. Overflows occur when there is too much wastewater for the sewer system, pump station, or treatment plants to handle, such as after heavy rainstorms. To relieve pressure in the system and minimize backups into homes and businesses, excess sewage is discharged into local waterways. State and federal regulations require the Metropolitan Sewer District of Greater Cincinnati (MSD) and sewer agencies across the country to reduce overflows and meet Clean Water Act requirements.

Sewage overflows affect the quality of water in our streams and rivers, can impact public health, and are aesthetically unpleasant. After heavy rains, many Hamilton County streams and rivers do not meet Ohio state standards for recreational activities such as wading or swimming. Habitat for fish and other aquatic organisms is also degraded. Overflows are a main source of E. coli bacteria in local water. If you swallow water with high levels of E. coli, you can become ill. Raw sewage can also contain viruses and other pathogens. Sewer overflows also often result in odors and leave unsightly sewer debris behind.

There are different requirements for managing overflows from the combined sewer system and overflows from the sanitary sewer system. The volume coming from CSOs in Hamilton County is much greater than from SSOs; however, regulations are more stringent for SSOs since sanitary sewers are not supposed to release untreated sewage into the environment at all. MSD's goal is to eliminate SSOs and significantly reduce CSOs by implementing affordable controls.

MSD Consent Decree
Every year, about 14.1 billion gallons of raw sewage – mixed with storm water – overflows from our sewers into local streams and rivers and also backs up into basements. Buried deep underground, parts of our current system are deteriorating due to age, and portions are not big enough to handle the present mixture of sewage and storm water that enter it during heavy rains, the result of a sewer system designed to meet the needs of an earlier generation, not our modern society.

In the late 1980's and 1990's, the federal government, through the Clean Water Act, called for the elimination of sanitary sewer overflows (SSOs) and a reduction of discharges from combined sewer overflows (CSOs). This action affected every wastewater system in the country, including the Metropolitan Sewer District of Greater Cincinnati (MSD). Increased scrutiny from the U.S. Department of Justice (DOJ) and U.S. Environmental Protection Agency (EPA) brought the issue to the forefront in the late 1990's as these government bodies began enforcing the ruling in large cities and leveling heavy civil penalties on those out of compliance.

Hamilton County is not alone in this problem. There are roughly 772 communities across the U.S. with aging combined sewer systems, according to the U.S. EPA. These older, urban communities are mainly located in the Northeast and Great Lakes

regions and the Pacific Northwest. Like Hamilton County, many are under federal orders to resolve their sewer overflow issues. Regionally, these areas include Northern Kentucky and Louisville, Columbus and Toledo, Indianapolis, Pittsburgh, and St. Louis.

To better protect our health and the environment, wastewater utilities like ours across the nation are being required to improve their sewer systems, particularly those with combined sewers that carry both sewage and storm water in the same pipes. To resolve this problem, the U.S. EPA has mandated that MSD capture, treat, or remove 85% of the 14 billion gallons of combined sewer overflows (CSOs) and eliminate all sanitary sewer overflows (SSOs), about 100 million gallons. In 1999, MSD entered into negotiations with the EPA, DOJ, and the State of Ohio to establish a formal remediation program that would be recognized and supported by the government, but also was affordable for local ratepayers. This mandate, known as a "Consent Decree," requires Hamilton County residents to invest in their sewer system once again.

Sewer Credit Program

The Ohio Environmental Protection Agency (OEPA) regulates the operation of MSD's local sewer systems, including the combined sewer system. Its policy requires that no changes be made to the combined sewer system that will increase the amount of pollution discharged through CSOs during a rain event. This means that for MSD to make or allow new connections into the combined sewer system, other measures must be taken to remove storm water flow from it. More specifically, for every new gallon of sanitary sewage added to the system, four gallons of storm water must be removed. Directing storm water sources away from the combined sewer and into a creek, stream or river normally accomplishes this.

MSD uses a system of connection "credits" to manage new sewer connections under OEPA's policy. Any change that will increase wastewater flow in the sewer system, such as development or redevelopment, requires an application of credits to connect into the system. The amount of credits owed depends on the amount of wastewater to be introduced through the new connection. In general, one credit is required for new connections that will generate a flow equivalent to that which is produced by an average single-family residential property. If more wastewater is to be added, more credits will be required. To obtain one connection credit, an amount of storm water equivalent to the amount of wastewater flow generated by four residential properties must be removed from the system.

MSD creates credits by completing sewer improvement projects that increase capacity and flow in the combined sewer system (the number of credits that result from each project depends on the type of work done). MSD then banks its credits and makes them available to developers on a first-come, first-served basis. Developers can also create credits and apply them toward their own projects; however, developers must be aware of regulations guiding credit creation and use. For example, credit-generating projects must be completed upstream of a CSO location, and credits apply only to the sewer drainage area in which they were created – credits acquired for one drainage area cannot be transferred to another. MSD regularly works with developers to identify and locate projects that can result in the generation of connection credits. Credits are valid for three years and can be used at any point during that time.

Connection Credits for Separated Sewer Systems

Approximately 10 percent of the City of Cincinnati uses separated sewer systems to manage wastewater. Separated sewer systems use two separate pipes to manage wastewater: one for sanitary sewage and one for storm water. Even though sanitary sewers are not designed to carry storm water, for many reasons storm water finds its way into sanitary pipes. Then, as with sewers in the combined system, sanitary sewers may become overwhelmed under certain conditions (such as heavy rain) and overflow into area waterways. These overflows are known as Sanitary Sewer Overflows, or SSOs.

Connection credits also apply to separated sewer systems. To create one credit for a separated system, five gallons of storm water must be removed for every one gallon of wastewater added. As with combined sewer systems, MSD

creates credits to be used by developers, or developers may create their own credits by improving the sewer system upstream of an SSO. If an overflow has not occurred at a known SSO location for at least two years, credits are no longer required for new connections to that system.

As properties in areas of the City are being newly developed or redeveloped, or work that will increase the wastewater flow from a property is being planned, sewer connection credits will likely be needed. MSD's Rules and Regulations Article V, Sections 515 and 516 provide the detailed requirements and are available at www.msdgc.org.

Project Groundwork (aka Wet Weather Plan/Strategy)

The plan developed in 2006 to address the Global Decree's requirements and to implement capacity-based sanitary sewer and CSO issues of the Interim and Global decrees was known as MSD's Wet Weather Improvement Plan. In 2008, MSD branded this improvement effort as "Project Groundwork", one of the largest public works projects in the history of our community. This multi-year initiative is comprised of hundreds of sewer improvement and storm water control projects across our area.

The projects will provide community benefits through sustainable solutions designed to:

- Reduce combined sewer overflows (CSOs) into local rivers and streams;
- Eliminate sanitary sewer overflows (SSOs) in a typical year;
- Eliminate sewage backups into basements caused by MSD's sewer system;
- Reduce sewage debris and sewage odors in local waterways and make streams more pleasant after heavy rains.

Types of sustainable infrastructure projects include:

- New sewers – to replace existing sewers that are deteriorating or too small.
- Sewer separation – to divide a combined sewer into separate sanitary sewer and storm water lines.
- Upgrading pump stations – to handle greater amounts of wastewater during heavy rains and prevent overflows at the pump station.
- Upgrading treatment plants or building new ones – to treat greater amounts of wastewater during heavy rains.
- Eliminating pump stations and replacing them with gravity sewers – to eliminate overflows and odors at pump stations and reduce energy demands.
- Flow regulators – to control how much sewage and storm water moves through a sewer pipe.
- Enhanced high-rate treatment facilities – to treat combined sewer flows directly at the CSO outfall prior to discharge to a local waterway.
- Underground or aboveground storage facilities (e.g., tunnels) – to store excess wastewater during heavy rains.
- Stream separations or stream "daylighting" that remove storm water from a combined sewer and restore a natural stream channel.
- Green infrastructure such as pervious paving, bioretention basins, green roofs, and bioswales that keep storm water out of sewers.

Since 2004, MSD has already invested about $300 million in 71 wet weather projects, mainly focused on eliminating SSOs such as SSO 700, located along the Mill Creek in Reading.

Project Groundwork will be conducted in two phases: Phase 1 (2009-2018) and Phase 2 (after 2018).

Phase 1 (2009-2018)

Phase 1 projects, estimated to cost about $1.145 billion (in 2006 dollars), must be completed by or before 2018. Phase 1 projects and their schedules are stipulated in a "wet weather plan," which was conditionally approved by the U.S. and Ohio EPAs in June 2009.

Phase 1 is comprised of:

- 45 construction projects, including a deep tunnel to store storm water and wastewater in the Lower Mill Creek area. These sewer infrastructure improvements will take place in Green, Springfield, and Symmes townships, the City of Cheviot, and 19 neighborhoods within the City of Cincinnati.
- A 3-year action plan (2009-2011) for the Lower Mill Creek area, located to the west and northwest of downtown Cincinnati, to resolve two billion gallons of combined sewer overflows each year. The remedy listed is a deep tunnel, but MSD is researching more sustainable alternatives.
- A 3-year study (2009-2011) to determine the best "green practices" to control storm water flows in combined sewer areas.
- Planning work for specific projects to be completed in Phase 2.

Phase 1 projects will be complemented by Project Groundwork Asset Management and Assessment Sewer projects.

Phase 2 (after 2018)

Phase 2, estimated to cost about $2.1 billion (in 2006 dollars), is comprised of about 256 construction projects across Hamilton County. The Phase 2 projects are stipulated in a "wet weather plan," which was conditionally approved by the U.S. and Ohio EPAs in June 2009. The project schedule for Phase 2 has not yet been developed. It must be submitted to the U.S. and Ohio EPAs by 2017 for approval. Planning and design of these projects may occur prior to the 2017 schedule submittal. Phase 2 projects will be complemented by Project Groundwork Asset Management and Assessment Sewer projects.

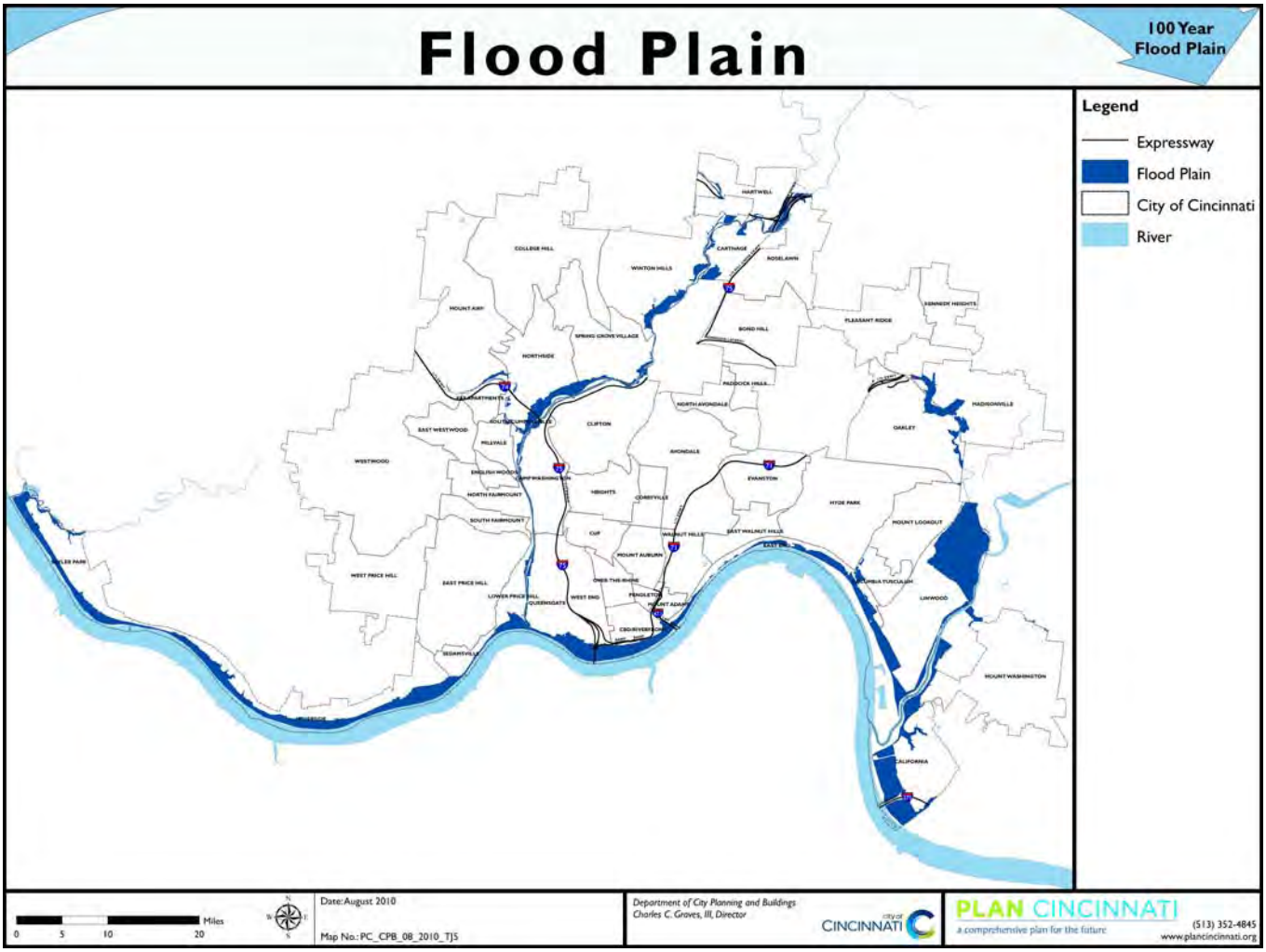
Floodplain Management

Federal Emergency Management Agency (FEMA) is a part of the United States Department of Homeland Security and their mission is to support U.S. citizens and first responders to ensure that as a nation we work together to build, sustain, and improve our capability to prepare for, protect against, respond to, recover from, and mitigate all hazards. They work off of the Statutory Authority of the Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988. FEMA is also responsible for the National Flood Insurance Program and floodplain management.

According to FEMA, the definition of floodplain management is the operation of a community program of corrective and preventative measures for reducing flood damage. Communities across the nation agree to adopt and enforce floodplain management ordinances, particularly in new construction cases, which is an important piece of making flood insurance available to home and business owners.

Flood zones are geographic areas that FEMA has defined according to varying levels of flood risk. These zones are depicted on a community's Flood Insurance Rate Map (FIRM) or Flood Hazard Boundary Map. Each zone reflects the severity or type of flooding in the area.

Parts of Cincinnati are considered to be in Moderate to Low Risk flood zones, generally near the Ohio River and other waterways throughout the city. FEMA's maps designate areas of low flood hazard (areas where flooding has a 0.2% chance of being exceeded in any given year; formerly referred to as a 500-year flood zone) and areas of moderate flood hazard (areas where flooding has a 1% chance of being exceeded in any given year; formerly referred to as a 100-year flood zone). Chapter 1109 of the Cincinnati Municipal Code contains the "Flood Damage Reduction" regulations to maintain the City's compliance with the National Flood Insurance Program (NFIP).



Lunken Levee' Decertification

FEMA modified the Hamilton County Flood Maps showing the Lunken Airport within the regulatory flood plain effective February 17, 2010. FEMA's reason was the levee' around Lunken Airport did not protect to the height of base flood elevation (BFE) plus 3 feet. The 3 feet freeboard requirement is where the Lunken levee' fell short. Therefore affected property owners must now purchase flood insurance and construction of new buildings or addition to existing buildings will be cost prohibitive or technically infeasible. The existing grade around the airport is about 484 feet. The BFE at this location is at 501 feet. Any new construction or substantial improvement will need to be elevated by approximately 17 feet to be above the BFE and this would be a costly proposition.

Energy

Smart Grid

Smart grid is an umbrella term that covers modernization of both the transmission and distribution grids. The modernization is directed at a disparate set of goals including facilitating greater competition between providers, enabling greater use of variable energy sources, establishing the automation and monitoring capabilities needed for bulk transmission at cross continent distances, and enabling the use of market forces to drive energy conservation.

Smart grid technology delivers electricity from suppliers to consumers using digital technology with two-way communications to control appliances at consumers' homes to save energy, reduce cost and increase reliability and transparency. Smart grid technologies overlay the electrical grid with an information and net metering system to increase the efficiency and security of the electrical grid. Such a modernized electricity network is being promoted by many governments as a way of addressing energy independence, global warming and emergency resilience issues. Smart meters may be part of a smart grid, but alone do not constitute a smart grid.

The smart grid is made possible by applying sensing, measurement and control devices with two-way communications to electricity production, transmission, distribution and consumption parts of the power grid that communicate information about grid condition to system users, operators and automated devices, making it possible to dynamically respond to changes in grid condition. A smart grid will include an intelligent monitoring system that keeps track of all electricity flowing in the system. The smart grid can integrate renewable electricity such as solar and wind to offset peak use demands. When power is least expensive the user can allow the smart grid to turn on selected home appliances such as washing machines or factory processes that can run at arbitrary hours. At peak times it could turn off selected appliances to reduce demand.

Many smart grid features readily apparent to consumers such as smart meters serve the energy efficiency goal. The approach is to make it possible for energy suppliers to charge variable electric rates so that charges would reflect the large differences in cost of generating electricity during peak or off peak periods. Such capabilities allow load control switches to control large energy consuming devices such as hot water heaters so that they consume electricity when it is cheaper to produce. To reduce demand during the high cost peak usage periods, communications and metering technologies inform smart devices in the home and business when energy demand is high and track how much electricity is used and when it is used. To motivate them to cut back use and perform what is called peak curtailment or peak leveling, prices of electricity are increased during high demand periods, and decreased during low demand periods.

It is thought that consumers and businesses will tend to consume less during high demand periods if it is possible for consumers and consumer devices to be aware of the high price premium for using electricity at peak periods, this could mean cooking dinner at 9pm instead of 5pm. When businesses and consumers see a direct economic benefit of not having to pay double for the same energy use to become more energy efficient, the theory is that they will include energy cost of operation into their consumer device and building construction decisions.

There are a great many smart grid definitions, some functional, some technological, and some benefits-oriented. A common element to most definitions is the application of digital processing and communications to the power grid, making data flow and information management central to the smart grid. Various capabilities result from the deeply integrated use of digital technology with power grids, and integration of the new grid information flows into utility processes and systems is one of the key issues in the design of smart grids. Electric utilities now find themselves making three classes of transformations: improvement of infrastructure; addition of the

digital layer, which is the essence of the smart grid; and business process transformation, necessary to capitalize on the investments in smart technology. Much of the modernization work that has been going on in electric grid modernization, especially substation and distribution automation, is now included in the general concept of the smart grid, but additional capabilities are evolving as well.

Governments and utilities funding development of grid modernization have defined the functions required for smart grids. According to the United States Department of Energy's Modern Grid Initiative report, a modern smart grid must:

- Be able to heal itself
- Motivate consumers to actively participate in operations of the grid
- Resist attack
- Provide higher quality power that will save money wasted from outages
- Accommodate all generation and storage options
- Enable electricity markets to flourish
- Run more efficiently
- Enable higher penetration of intermittent power generation sources

Federal Policy for Smart Grid

Support for smart grids became federal policy with passage of the Energy Independence and Security Act of 2007. The law, Title13, sets out $100 million in funding per fiscal year from 2008–2012, establishes a matching program to states, utilities and consumers to build smart grid capabilities, and creates a Grid Modernization Commission to assess the benefits of demand response and to recommend needed protocol standards. The Energy Independence and Security Act of 2007 directs the National Institute of Standards and Technology to coordinate the development of smart grid standards, which Federal Energy Regulatory Commission (FERC) would then promulgate through official rulemakings. Smart grids received further support with the passage of the American Recovery and Reinvestment Act of 2009, which set aside $11 billion for the creation of a smart grid.

President Barack Obama announced the largest single electric grid modernization investment in U.S. history on Oct. 27, 2009, with DOE tapping $3.4 billion in American Reinvestment and Recovery Act funds for 100 projects. The funds will be matched by $4.7 billion in private investments. According to the president, the smart grid projects will help build a renewable energy superhighway, with a goal of increasing energy efficiency and helping to spur the growth of renewable energy resources such as wind and solar power. The grants range from $400,000 to $200 million, and will reach every state except Alaska.

The smart grid grants will pay for installing more than 2.5 million smart meters, which allow utility customers to access dynamic pricing information and avoid periods of peak electricity use, when power is most expensive. The grants will also support the installation of other smart grid components, including more than 1 million in-home energy displays, 170,000 smart thermostats, and 175,000 other load control devices to enable consumers to reduce their energy use. The funding will help expand the market for smart washers, dryers, and dishwashers, so that U.S. residents can further control their energy use and lower their electricity bills. Such smart grid technologies can also better accommodate the use of plug-in electric vehicles and the production of renewable energy from customer-owned systems, such as solar power systems or wind turbines.

Much of the funding will support upgrades to the utility power grids, including the installation of more than 200,000 smart transformers, which will make it possible for power companies to replace units before they fail. Utilities will also install more than 850 sensors that will cover the entire electric grid in the contiguous United States, making it possible for grid operators to better monitor grid conditions and allowing them to take advantage of intermittent renewable energy, such as wind and solar power. Finally, utilities will install nearly 700 automated substations, which will make it possible for power companies to respond faster and more effectively to restore service when bad weather knocks down power lines or causes electricity disruptions.

Alternative Energy Sources

Solar Power

This alternative energy source is readily available and easily capable of providing many times the total current energy demand. It is not available at all times, but can be stored or supplemented by another energy source during that time. Solar panels are used for collecting energy from the sun and are a clean and environmentally-friendly way of collecting solar energy.

GCWW Solar Panel Installation

In 2009, a 42 KW solar array was installed on the roof of GCWW's Spring Grove Avenue facility. Plans are underway to add an additional 279 KW solar array. This combined installation will create enough power to cover nearly 12% of the facility's annual electric usage. The sunlight causes photovoltaic (PV) cells to generate electricity within the building, which includes lights, boilers, HVAC system, etc.

The roof of the proposed UV building at the Richard Miller Treatment Plant will include solar panels covering 7,200 square feet, and generate an estimated 72 KW. The combined solar project will give GCWW a solar electric generating capacity of 393 KW and will represent one of the larger planned solar arrays in the State of Ohio. After completion, 535,070 lbs of carbon dioxide will be avoided per year.

Wind Power

Wind can be a useful form of energy. There are several tools used in collecting wind as energy. Wind turbines are used to make electricity, wind mills are used for mechanical power, and wind pumps are used for pumping water or drainage. Wind is even harnessed by sails to propel ships.

Biomass Power

This is a renewable energy source that is biological material from living organisms. It is generally plant matter grown to generate electricity or produce heat, but can is also in the form of wood, waste, hydrogen, and alcohol fuels.

Communication

The telecommunications industry is a system of switches and lines that interconnect to provide communication between multiple parties. Today, the telecommunications industry includes local telephone service, long distance telephone service, wireless telephone service, paging service, Internet service, Voice over Internet Protocol (VoIP), and a wide array of other competitive products and services. All of these different methods of communication operate through networks forming a global telecommunications industry.

Telephone
Telephone service in Hamilton County is provided by Cincinnati Bell.

Cellular Communications
Cincinnati is served by several cellular carriers, and there are 724 Federal Communications Commission (FCC) registered cell towers in the Cincinnati area.

Broadband
Broadband in telecommunications refers to a signaling method that includes or handles a relatively wide range (or band) of frequencies, which may be divided into channels or frequency bins. Broadband is always a relative term, understood according to its context. The wider (or broader) the bandwidth of a channel, the greater the information-carrying capacity. In radio, for example, a very narrow-band signal will carry Morse code; a broader band will carry speech; a still broader band is required to carry music without losing the high audio frequencies required for realistic sound reproduction. A television antenna described as "broadband" may be capable of receiving a wide range of channels; while a single-frequency or Lo-VHF antenna is "narrowband" since it only receives 1 to 5 channels. In data communications a digital modem will transmit a datarate of 56 kilobits per seconds (kbit/s) over a 4 kilohertz wide telephone line (narrowband or voiceband). However when that same line is converted to an non-loaded twisted-pair wire (no telephone filters), it becomes hundreds of kilohertz wide (broadband) and can carry several megabits per second (ADSL).

Broadband in data can refer to broadband networks or broadband Internet and may have the same meaning as above, so that data transmission over a fiber optic cable would be referred to as broadband as compared to a telephone modem operating at 56,000 bits per second. However, a worldwide standard for what level of bandwidth and network speeds actually constitute Broadband have not been determined.

However, broadband in data communications is frequently used in a more technical sense to refer to data transmission where multiple pieces of data are sent simultaneously to increase the effective rate of transmission, regardless of data signaling rate. In network engineering this term is used for methods where two or more signals share a medium. Broadband Internet access, often shortened to just broadband, is a high data rate Internet access—typically contrasted with dial-up access using a 56k modem.

Dial-up modems are limited to a bitrate of less than 56 kbit/s (kilobits per second) and require the full use of a telephone line—whereas broadband technologies supply more than double this rate and generally without disrupting telephone use.

Sustainable Public Infrastructure

Sustainability

According to the U.S. Environmental Protection Agency (USEPA), the traditional definition of sustainability calls for policies and strategies that meet society's present needs without compromising the ability of future generations to meet their own needs.

The 1970 National Environmental Policy Act (NEPA) formally established as a national goal the creation and maintenance of conditions under which humans and nature "can exist in productive harmony, and fulfill the social, economic and other requirements of present and future generations of Americans".

The concept of sustainable development was described in a 1981 White House Council on Environmental Quality report: "The key concept here is sustainable development. If economic development is to be successful over the long term, it must proceed in a way that protects the natural resource base of developing countries."

In the 30 years since that time, the concept of sustainability has evolved to reflect perspectives of both the public and private sectors. A public policy perspective would define sustainability as the satisfaction of basic economic, social, and security needs now and in the future without undermining the natural resource base and environmental quality on which life depends. From a business perspective, the goal of sustainability is to increase long-term shareholder and social value, while decreasing industry's use of materials and reducing negative impacts on the environment.

Common to both the public policy and business perspectives is recognition of the need to support a growing economy while reducing the social and economic costs of economic growth. Sustainable development can foster policies that integrate environmental, economic, and social values in decision making. From a business perspective, sustainable development favors an approach based on capturing system dynamics, building resilient and adaptive systems, anticipating and managing variability and risk, and earning a profit.

Sustainable development reflects not the trade-off between business and the environment but the synergy between them.

Source: www.epa.gov

Communities of the Future

Communities of the Future is a unique framework for combining sustainable sewer improvements with urban renewal in areas which experience frequent CSOs. MSD is partnering with local communities to identify solutions to sewer overflows that simultaneously address community issues such as brownfields redevelopment, urban blight, vacancy, and property abandonment. This approach can provide tangible community benefits such as improved housing and transportation, increased safety, lower crime, and enhanced parks and recreation. MSD is currently pursuing potential opportunities in Carthage and South Fairmount, both located in the Lower Mill Creek watershed. The focus of Communities of the Future is to provide the biggest public benefit for the financial investment made in sewer improvements.

Advisory Committee

Advises, provides technical assistance & partnerships to the Communities of the Future Strategy

Organized into three sub-groups:

1. Policy: Develops and suggests policy initiatives and strategies for integration of Communities of the Future with other planning efforts
2. Economic Development: Advises on tactics to make Communities of the Future catalysts for Community revitalization
3. Inform & Influence: Identifies and advises on strategies to include all stakeholders
    - Currently focusing on Lick Run basin
    - Attention will turn to other basins as those develop

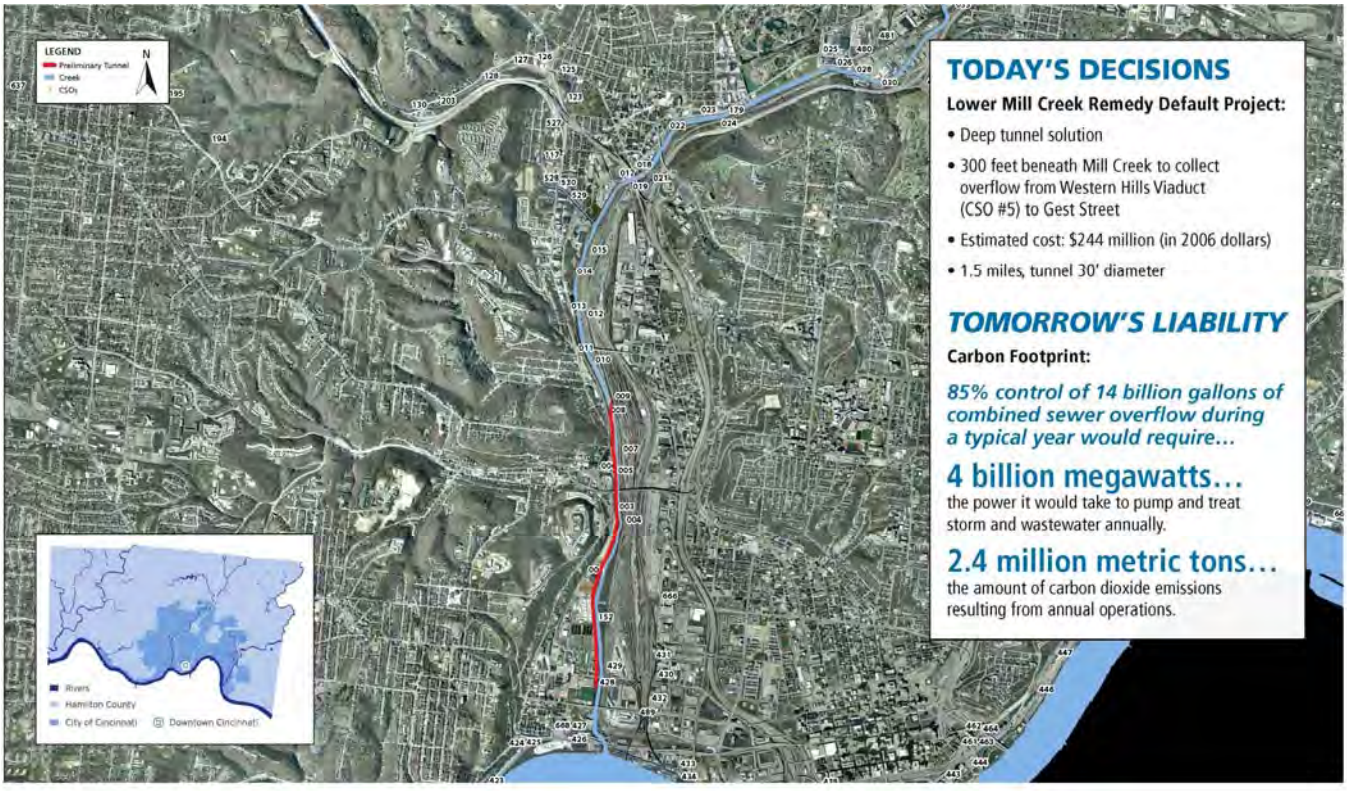
- Doing much of the work of planning the upcoming Lick Run Open House
- CFAC's primary purpose is to add community engagement and revitalization to MSDGC's expertise, or: Turning sewer fixes into Communities of the Future

Communities of the Future Working Group Focus Areas

Inform and Influence
Identifying Community Stakeholders
Developing Communication Plan for Ratepayers, and affected Communities
Preparing for Community Outreach Opportunities

Policy
Integration with on-going planning efforts
Expanding green infrastructure use into the private sector
Analyzing the effectiveness of City and County Stormwater Regulations
Compliance with Regulators

Economic Development
Brownfield restoration and redevelopment
Property Acquisition
Identifying investment opportunities
Business Case Evaluation
Identifying possible sources of funding for streetscape enhancements



Techniques

Stream Daylighting

MSD is exploring ways to remove large volumes of storm water from the combined sewer system. Examples include controlling runoff from hillsides, separating or "daylighting" streams that were turned into combined sewers, and bioretention basins. Much of this effort is focusing on the Lower Mill Creek watershed area, which is slated for a $244 million special tunnel project mandated under Phase 1 of Project Groundwork.

The deep tunnel (about 1.2 miles long and 30 feet in diameter), along with an enhanced high-rate treatment facility, would be used to store and treat excess sewage and storm water during high-flow periods, preventing about two billion gallons of annual combined sewer overflows. MSD hopes to replace or supplement the tunnel with less expensive and potentially more sustainable solutions such as stream daylighting or a more comprehensive "Communities of the Future" approach.

"Daylighting" describes projects that deliberately expose the flow of a previously covered river, stream or stormwater drainage. Daylighting projects liberate waterways that were buried in culverts or pipes, or otherwise removed from view. Daylighting re-establishes a waterway in its old channel where feasible, or in a new channel threaded between the buildings, streets, parking lots, and playing fields now present on the land. Some daylighting projects recreate wetlands, ponds, or estuaries.

Stream daylighting projects can be applied to:

- Relieve choke points and flooding from under-capacity culverts;
- Increase hydraulic capacity over that provided by a culvert, by recreating a floodplain;
- Reduce runoff velocities and erosion, as a result of natural channel meandering and the roughness of the stream bottom and banks;
- Replace deteriorating culverts with open drainage that can be more easily monitored and repaired;
- Divert urban runoff from combined sewer systems before it mixes with sewage, reducing combined sewer overflows and burdens on treatment plants;
- Improve water quality by exposing water to air, sunlight, vegetation, and soil, all of which help transform, bind up, or otherwise neutralize pollutants;
- Recreate aquatic habitat and improve fish passage;
- Recreate valuable riparian habitat and corridors for wildlife movement;
- Provide recreational amenities, such as a challenging new water hazard on a golf course, a place for children to play, or a streamside bench for people to relax upon;
- Create or link urban greenways and paths for pedestrians and bicyclists;
- Beautify neighborhoods, perhaps serving as a focal point of a new park or neighborhood revitalization.

Excerpted from Daylighting: New Hope for Buried Streams, Rocky Mountain Institute, http://www.rmi.org

Permeable Surfaces

In most non-urban landscapes, rainwater percolates into the ground where it falls, slowly making its way through plant roots and soil to the groundwater reservoirs and aquifers which hold much of our drinking water. In cities and suburban areas, millions of square feet of concrete, asphalt, roofs, and other impermeable surfaces create enormous quantities of runoff which can overwhelm natural drainages, over saturate the areas where water does collect, and divert water away from groundwater reservoirs.

Working to manage rainwater where it falls by promoting rain gardens and green roofs, and encouraging landscaping of areas not essential for hard pavement serves to keep the water clean, and allows it to soak directly into the ground. Increasing and improving permeable surface in the urban landscape means less water running across the land, bringing less pollution to our rivers and streams.

Bioretention Basins
Bioretention basins are landscaped depressions or shallow basins used to slow and treat on-site stormwater runoff. Stormwater is directed to the basin and then percolates through the system where it is treated by a number of physical, chemical and biological processes. The slowed, cleaned water is allowed to infiltrate native soils or directed to nearby stormwater drains or receiving waters. Typically bioretention practices are best suited to small sites and highly urbanized spaces. The use of bioretention practices is possible given adaptations to specific site usage conditions are followed, these include:

- Areas where little pervious surface exist, such as parking lots, large buildings or sheds, are ideal candidates for use of bioretention practices such as a bioretention basin. These systems require a relatively large area of land- about five percent of area drained however, they can be fit into existing parking lot islands and adjoining landscaped areas.
- Areas with highly contaminated runoff, like gas stations and convenience store parking lots, must have the bottom of bioretention basin lined with impermeable liner to prevent egress of contaminated water to nearby stormwater drains, groundwater sources and receiving waters.
- Areas where existing developments are being required to retrofit with stormwater management practices to improve on negative impacts of stormwater will find bioretention a suitable option that can be implemented by modifying present landscape or adding to a parking lot that is being resurfaced. Remember bioretention is best employed for small sites and becomes expensive (land and development costs) when trying to apply to large areas.

Bioswales
Bioswales are landscape elements designed to remove silt and pollution from surface runoff water. They consist of a swaled drainage course with gently sloped sides (less than six percent) and filled with vegetation, compost and/or riprap. The water's flow path, along with the wide and shallow ditch, is designed to maximize the time water spends in the swale, which aids the trapping of pollutants and silt. Depending upon the geometry of land available, a bioswale may have a meandering or almost straight channel alignment. Biological factors also contribute to the breakdown of certain pollutants. A common application is around parking lots, where substantial automotive pollution is collected by the paving and then flushed by rain. The bioswale, or other type of biofilter, wraps around the parking lot and treats the runoff before releasing it to the watershed or storm sewer

Plans and Partnerships

The Green Partnership for Greater Cincinnati
The Green Partnership for Greater Cincinnati (GPGC) is a collaboration between five major regional institutions: City of Cincinnati, Hamilton County, Cincinnati Public Schools, University of Cincinnati and Duke Energy. The partnership's goal is to encourage and support efforts that will measurably improve environmental performance, save money for the GPGC partners, and demonstrate commitment and leadership to the Greater Cincinnati community.

Together the GPGC partners employ and educate tens of thousands of people, operate thousands of buildings and motor vehicles, and manage tens of thousands of acres of land. All five institutions already engage in a broad range of environmental programs, and each institution has specific expertise and resources in such areas as education, energy efficiency and recycling. GPGC has formed project teams comprised of employees from all of the partners to address eight priorities that will increase the sustainability of the partner organizations.

These priorities are:

- Communication and outreach
- Comprehensive recycling initiative
- Green buildings and energy use reduction
- Use of mass transit and alternative transportation options
- Environmentally preferred purchasing
- Comprehensive environmental education
- Fleet vehicle options
- Land and water management best practices

Each team will develop specific projects to be implemented over the next 1-3 years. These projects will apply directly to the operations, programs and facilities owned and managed by the partner institutions. More than 100 people from the partner organizations helped set the project agenda and develop the specific team objectives to be shared at the partnership launch.

Project I—Mass Transit and Alternative Transportation Options
This project will encourage a partner coordinated approach to mass transit and alternative transportation use by partner employees and students (and others). Partners will combine efforts to evaluate programs and will work with SORTA to increase ridership and make easy use options are readily available.

Project II—Communication and Outreach
Efforts for this project are targeted at GPGC communications both internally and externally. Internally the purpose will be to develop a structure that promotes easy communication among the members of each project team, among the various teams and between the teams and the steering committee.

Project III—Comprehensive Recycling Initiative
This project will develop specific goals and targets for improving waste diversion within the partner institutions through coordinated efforts and better use of existing resources. The efforts will be focused on ways to improve compliance, more efficiently manage and collect recyclables, improve program targets at difficult-to-recycle materials, promote reuse of surplus equipment and supplies, and divert waste streams to more productive uses.

Project IV—Green Buildings/Energy Reduction
The purpose of this project is to encourage and support partner efforts to improve energy efficiency and performance of buildings currently in the partner inventory, most of which are older and were built when different standards were applicable. The focus will be on professional level audits, scaled up meet the ambitious requirements of climate changes initiatives.

Project V—Environmentally Preferred Purchasing
This project will encourage and support green purchasing efforts of the partners by taking advantage of economies of scale, effective information sharing and education about acquisition and use of green products and services.
Project VI—Comprehensive Environmental Education
This project will link partner interests and resources to help the environmental educators both within the schools and in allied programs.

Project VII—Fleet Vehicle Options
This will be tightly targeted initiative to accelerate the greening of partner fleets and internal fleet/transportation polities. Partner climate change commitments require serious evaluations of fleets and vehicle/transportation choices and conversion to greener options whenever feasible. Policies governing use of fleets can also have impact and reduce fossil fuel use.

Project VIII—Land and Water Management Best Practices
Partners will work with the Metropolitan Sewer District of Greater Cincinnati (MSDGC), the Hamilton County soil Conservation Service and others to implement storm water best practices on public and other lands owned or managed by the partners, especially focused on reducing storm water impacts that contribute to combined and separate sewer overflows.

Green Cincinnati Plan
The Green Cincinnati Plan (formerly Climate Protection Action Plan), as part of Mayor Mallory's Green Cincinnati Initiative, is a roadmap for how Cincinnati can become a national leader in addressing global climate change and thus make Cincinnati a healthier place to live.

Cincinnati is one of more than 1,000 U.S. Cities that has committed to reducing its contribution to global climate change. According to the Office of Environmental Quality (OEQ), the more we learn about how to combat climate change, the more we realize that climate protection measures are mostly things that we have good reason to be doing anyway. Climate protection measures can help conserve scarce natural resources, save money, enhance the local economy, improve air quality, create jobs, and improve public health. But as with so many things, there is more than one way to do

it, and whether climate protection work helps or hurts our community depends on the paths that we choose.

The Green Cincinnati Plan does the following:

- Identifies over 80 specific recommendations for how to reduce contributions to global climate change. The recommended actions generally share several characteristics:
  - Effectively reducing green house gas emissions.
  - Reducing dependence on non-renewable energy sources
  - Saving more money than the recommended actions cost
  - Supporting local job creation and the local economy
  - Helping clean Cincinnati's air, land, and water
  - Relying on voluntary rather than regulatory approaches
- Quantifies annual contributions to global climate change at 8.5 million tons of carbon dioxide equivalent (CO2e) for the City of Cincinnati, and 432,000 tons of CO2e for Cincinnati City Government.
- Establishes green house gas emission reduction goals of 8% within 4 years, 40% within 20 years, and 84% by 2050 (42 years).
- Presents a strategy to implement the Plan's recommendations

The full text of the Climate Protection Action Plan can be viewed on the City's website at http://www.cincinnati-oh.gov/cmgr/downloads/cmgr_pdf18280.pdf

Green Cincinnati Plan Implementation - City Government Energy Management

In the Green Cincinnati Plan process, it was determined that Cincinnati city government produced 432,179 tons (392,000 metric tonnes) of greenhouse gas emissions. The Green Cincinnati Plan commits to reduce greenhouse gas emissions by 2% per year.

State of Ohio enabling legislation introduced in 1994 allows municipalities to fund capital improvements with energy and operational savings through a performance-based approach. The installation of energy saving measures can be financed by Ohio municipalities over a term up to the average useful life of the equipment, typically 15 years, and is not included in the calculation of the municipality's net indebtedness. Cincinnati entered into contracts with two energy services performance contractors in June 2008 and energy efficiency building audits have been completed at approximately 39 buildings to date, including City Hall and the Convention Center. Additional building audits at several facilities managed by various departments are currently ongoing.

To date, nearly $5.6 million worth of energy efficiency updates have been proposed and contracts are final. The lighting, heating and air conditioning, building automation, and building envelope upgrades proposed to date will reduce energy use by 3,290,539 kWh, generate 45,817 kWh of renewable energy, and reduce greenhouse gas emissions by 3,413 metro tonnes. The majority of the project work will be self-funded with guaranteed energy savings and energy rebates and are expected to be completed by the end of 2009. Only $351,675 of Energy Efficiency Community Block Grant (EECBG) funds are needed for the gap financing to make these first-round projects happen. The City owns and operates more than 400 facilities. The remaining EECBG funding will be administered by the City's Energy Management Team and used at additional facilities to fill the gap for additional energy efficiency projects that are not fully self-funded from the energy savings. Additional audits are already underway, city processes to pay down the debt services are in place, and baseline contracts have been negotiated. Future contracts can be finalized quickly once the facility audits are completed and the scope of work is identified. The Energy Management Team will include an EECBG discussion on the regularly scheduled monthly meeting agenda to track the progress of the projects.

Based on the findings from the first projects, we expect that the full $1,139,600 EECBG project budget will create and retain a total of 12 jobs and generate over $18 million of energy efficiency upgrades. This work is expected to result in total energy reduction of 10,062,959 kWh, energy generation of 148,470 kWh, and reduction of greenhouse gas emissions by 11,060 metric tonnes

Source: Office of Environmental Quality

Green Technologies

The mayor and city administration promote new green technologies which sustain the environment as well as supporting existing and new jobs in the City of Cincinnati, Hamilton County, and the region. The most prominent program is the collaborative effort being implemented by MSD called "Villages of the Future". Other notable City green initiatives include green building construction, site design, LEED, green roofs, geothermal, GHG reductions, green infrastructure and sustainable design, and certified diesel emission reduction.

Appendix I Lick Run Technical Report (MSD 2009)

Report

Lick Run Technical Report

Metropolitan Sewer District of Greater Cincinnati, OH

August 2009

SECTION 1
INTRODUCTION

1.01 PROJECT BACKGROUND

As one of the top five combined sewer overflow (CSO) dischargers in the country, the Metropolitan Sewer District of Greater Cincinnati (MSD) is under a Consent Decree to minimize overflows from their combined sewer system (CSS). The United States Environmental Protection Agency (USEPA) has mandated that MSD develop solutions to control the 14-billion gallons of CSOs that annually discharge from MSD's CSS. The solution to this problem is a two-phased, multiyear initiative comprised of hundreds of improvement projects throughout MSD's service area, identified as Project Groundwork. As a means to maximize the social, economic, and environmental benefits for our communities through Project Groundwork, MSD has developed a philosophy to CSO control called Communities of the Future. While the primary goal of Communities of the Future is to reduce the CSO volume discharging from MSD's CSS, it also focuses on garnering support for economic development and urban renewal. The innovative approach to identifying CSO solutions that maximizes the benefits to the community is a four-step process known as the Sustainable Watershed Evaluation Process (SWEP).

As one of MSD's largest CSO's, CSO 005, known as Lick Run, discharges approximately 1.7-billion gallons of overflow annually based on a typical rainfall analysis utilizing the collection system model. This single CSO accounts for about 10 percent of Cincinnati's total overflow volume. The 2,700-acre Lick Run watershed, located in the Mill Creek Valley on the west side of Cincinnati, is primarily comprised of the South Fairmount neighborhood, an area that has struggled economically for decades and faces tremendous challenges for economic development and urban renewal. Currently the Lick Run Watershed drains into a 19.5-foot-diameter pipe and is used to convey the sewage and stormwater runoff from the watershed. During dry weather, the sewage is transported to the Mill Creek treatment plant by the Auxillory Mill Interceptor 1.

The approach that MSD uses in identifying CSO solutions that maximize the benefits to the community is a four-step process known as the SWEP. The multifaceted solution for CSO 005, which is presented throughout this technical report, represents a concept level strategy for CSO control aimed at achieving maximum overflow volume reduction with a blend of grey and green infrastructure. Further refinement of the technical components of this strategy is necessary to confirm the feasibility and constructability of the watershed strategy.

1.02 DEFINITIONS

AECOM	AECOM Technology Corporation (formerly ERA)
CAGR	compound annual growth rate
cf	cubic feet
CSO	combined sewer overflow
CSS	combined sewer system
DOTE	Department of Transportation Engineering
ESRI	Environmental Systems Research Institute
GIS	geographical information system
Human Nature	Human Nature, Inc.
LID	Low Impact Development
LTCP	long-term control plan
MSD	Metropolitan Sewer District of Greater Cincinnati

NRCS	National Resource Conservation Service
ODOT	Ohio Department of Transportation
RDII	rainfall derived inflow and infiltration
RPC	Regional Planning Commission
Strand	Strand Associates, Inc.®
SWEP	Sustainable Watershed Evaluation Process
SWM	System Wide Model
USEPA	United States Environmental Protection Agency
WWTP	wastewater treatment plant
XCG	XCG Consultants, Inc.

SECTION 2
WATERSHED INVENTORY AND ANALYSIS

2.01 INTRODUCTION

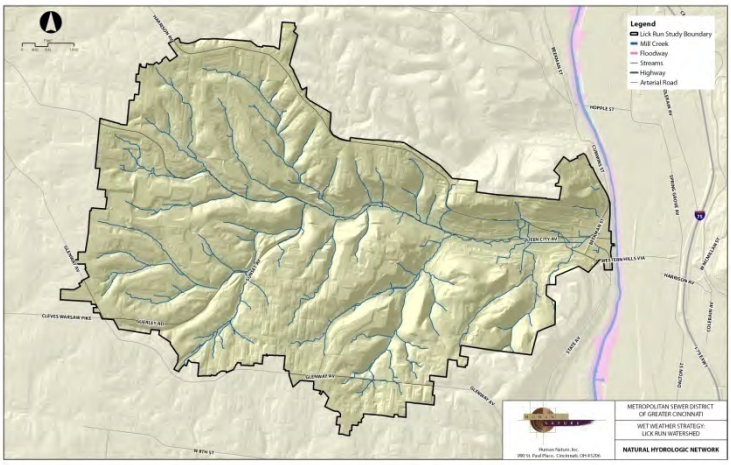
The initial phase of the SWEP involves compilation of relevant and available information necessary to gain an understanding of existing conditions and allow for a comprehensive evaluation of alternative solutions to CSO control. This includes an evaluation of natural systems, built systems, historical assets, and demographics.

2.02 NATURAL SYSTEMS

The Lick Run Watershed covers approximately 2,720 acres. The geographical information system (GIS) inventory of natural systems investigated the watershed's hydrologic network, topography, soil characteristics, geology, and tree canopy cover. Larger versions of these maps can be found in Appendix A.

A. Hydrology

The predevelopment hydrologic network (see Figure 2.02-1) shows an extensive system of creeks and streams within the watershed. At one point, the hydrologic network included almost 31 miles of streams within the Lick Run watershed. This network naturally conveyed stormwater runoff to Lick Run and, eventually, to the Mill Creek. Today underground sewer systems have replaced this stream network. The sewer system ultimately drains to a 19.5-foot-diameter pipe on the east side of the watershed, which is directly connected to CSO 005–Lick Run Regulator.

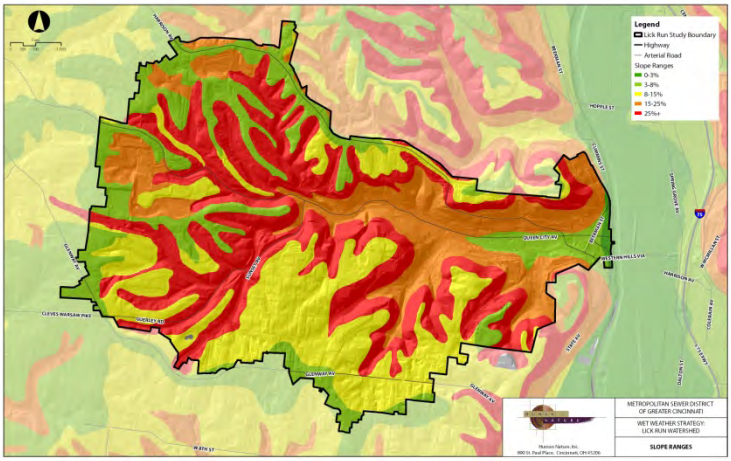


Source: Human Nature, Inc.

Figure 2.02-1 Predevelopment Hydrologic Network in the Lick Run Watershed

B. Topography

The topography of the landscape influences hydrologic patterns, vegetation and habitat, and can even constrain land uses. As shown in Figure 2.02-2, the project area was characterized in regard to slopes, allowing for a quick assessment of areas where stormwater can collect (flat areas), versus areas where stormwater will rapidly runoff (steep areas). Slopes were classified into five ranges: 0 to 3 percent, 3 to 8 percent, 8 to 15 percent, 15 to 25 percent, and over 25 percent. Wet weather strategies vary depending on the type and extent of slopes throughout the project area.



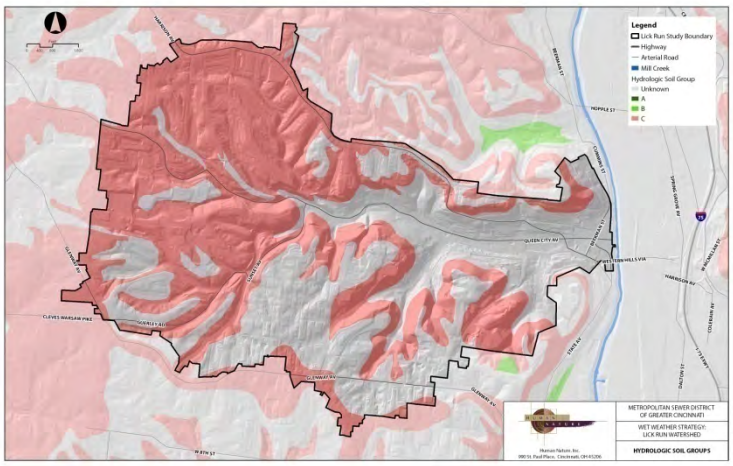
Source: Human Nature, Inc.

Figure 2.02-2 Slope Ranges in the Lick Run Watershed

Steep hillsides, defined as areas with slopes of 15 percent or greater, can exacerbate the volume of stormwater runoff entering sewer infrastructure. There are 1,345 acres that are classified as steep slopes, representing almost 50 percent of the total project area. Throughout the watershed, there are no natural waterways that flow naturally into the Mill Creek. All surface flow drains into a sewer network.

C. Hydrologic Soil Groups

As shown in Figure 2.02-3, the Lick Run watershed contains hydrologic soil groups C and D. Water transmission through group C and D soils is highly restricted. Therefore, the low infiltration rates associated with such soil conditions limit the opportunities for significant infiltration of stormwater runoff.



Source: Human Nature, Inc.

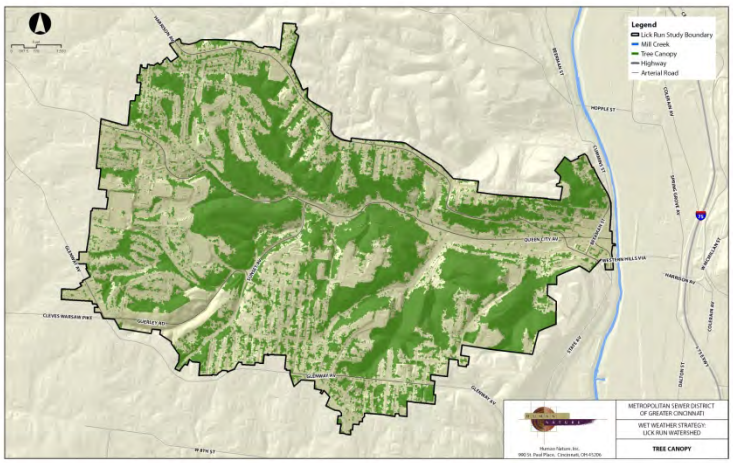
Figure 2.02-3 Hydrologic Soil Groups in the Lick Run Watershed

D. Surficial Geology

The nature of subsurface rock (geology) helps to determine not just the nature and chemistry of the soil above, but also the rate at which it forms. This in turn strongly affects the vegetation that will grow naturally and the type of agriculture or horticulture that can be sustained. Geologic formations of alluvium, sand, and gravel provide the greatest opportunities for natural infiltration, as they can allow for greatest subsurface transmission and conveyance of water; however, as shown in Figure 2.02-4, geology in the Lick Run watershed is primarily limestone and clay-loam till, with small deposits of alluvium near the Mill Creek basin.

E. Tree Canopy Cover

Tree canopy cover is an important component of natural systems. In addition to improving air quality, native trees cover can intercept, absorb, and filter stormwater. As shown in Figure 2.02-5, there are 1,261 acres of canopy cover in the project area, representing slightly more than 46 percent of the project area.

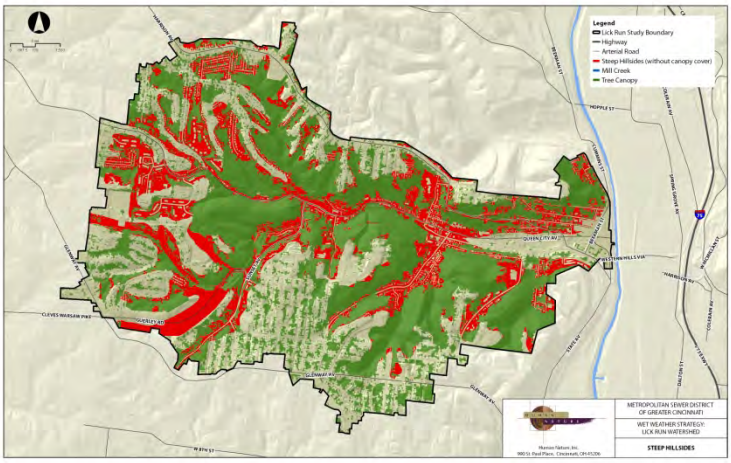


Source: Human Nature, Inc.

Figure 2.02-4 Tree Canopy in the Lick Run Watershed

F. Steep Hillsides and Tree Canopy

As previously mentioned, there are 1,345 acres of steep hillsides (areas with slopes of 15 percent or greater) in the watershed, 34 percent of which does not have tree canopy cover. These "canopy-deficient" hillsides are shown in Figure 2.02-6. Barren slopes can contribute to sedimentation of waterways, erosion problems, landslides and an increased rate of stormwater runoff.



Source: Human Nature, Inc.

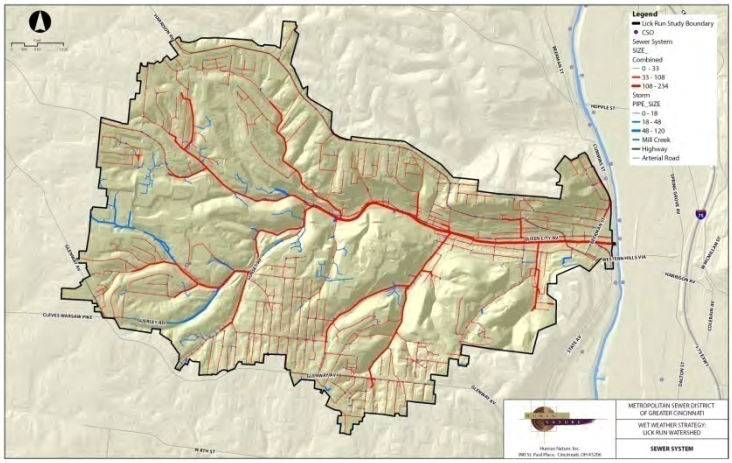
Figure 2.02-5 Canopy-Deficient Hillsides in the Lick Run Watershed

2.03 BUILT SYSTEMS

The GIS inventory of built systems investigated the watershed's sanitary and stormwater infrastructure, land use, impervious surfaces, neighborhood boundaries, and road right-of-way. Descriptions of and maps for these built systems are listed below. Larger versions of these maps can be found in Appendix B.

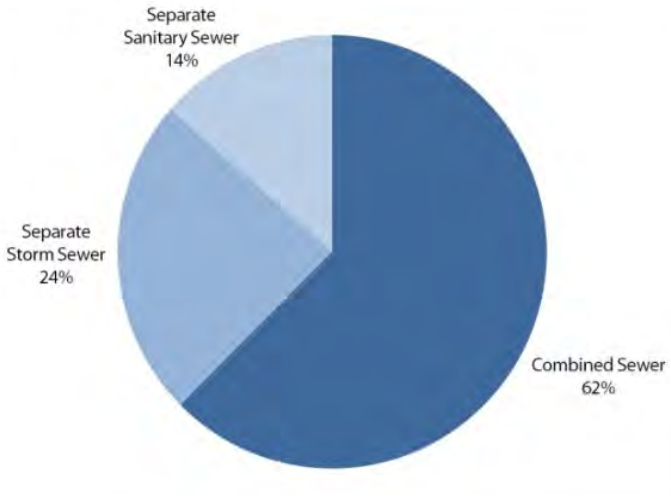
A. Sanitary and Storm Infrastructure

There are 88 miles of combined sewer, separate sanitary sewer, and separate stormwater sewers in the watershed. As shown in Figure 2.03-1, combined sewer infrastructure follows the predevelopment hydrologic network. Figure 2.03-2 shows the distribution of the underground sewer network by type (combined, separate sanitary, or separate storm sewer). As noted previously, the sewer network captures all the natural runoff from the watershed.



Source: Human Nature, Inc.

Figure 2.03-1 Sanitary and Stormwater Infrastructure in the Lick Run Watershed

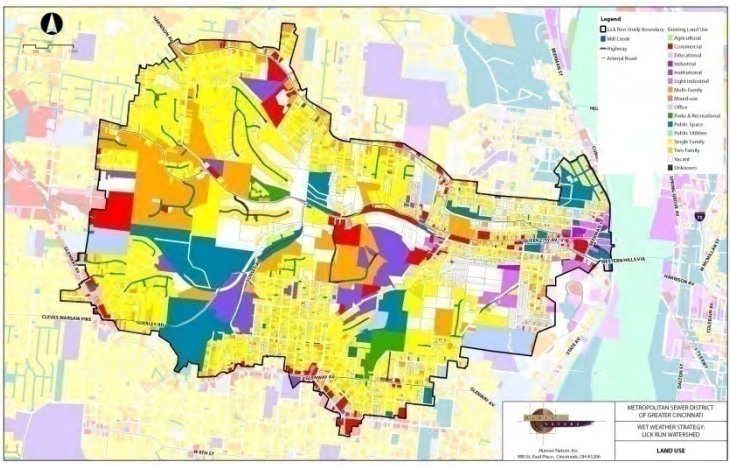


Source: Human Nature, Inc.

Figure 2.03-2 Distribution of Underground Infrastructure by Type

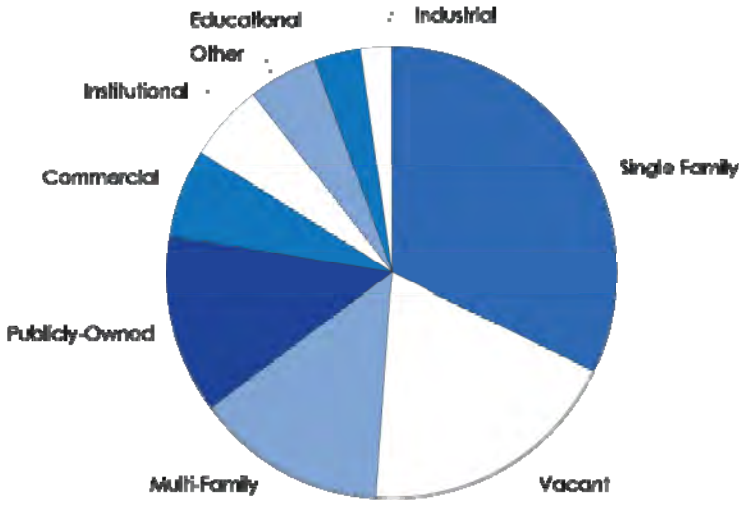
B. Land Use

Land use is the documentation of human uses of the landscape. Land use within the Lick Run Watershed is primarily residential (both single-family and multifamily). Vacant and commercial properties also comprise a significant portion of the watershed. Vacant is defined as empty parcels that do not have large-scale structures on the premises, as categorized by the Hamilton County Auditors database. Figure 2.03-3 shows distribution of land use within the watershed. Figure 2.03-4 summarizes the distribution of land use by area.



Source: Human Nature, Inc.

Figure 2.03-3 Existing Land Use in the Lick Run Watershed

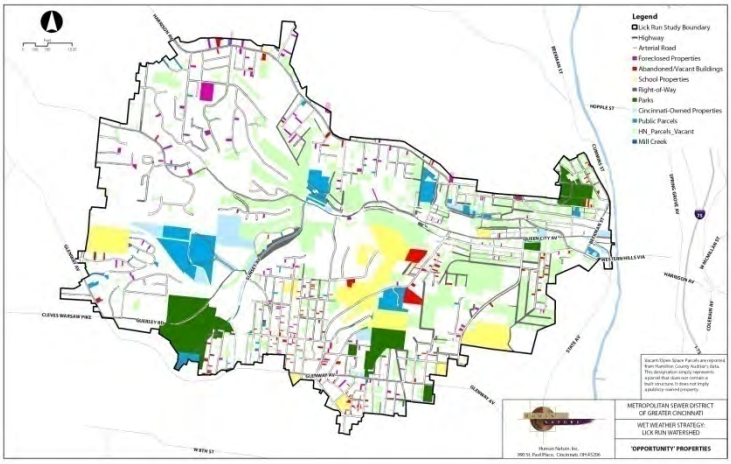


Source: Human Nature, Inc.

Figure 2.03-4 Distribution of Existing Land Use by Area

C. Opportunity Properties

Data for land uses were sorted based on type (institutional or vacant properties) and owner (public versus private). This provided a list of "opportunity properties," or land uses that may present opportunities for infrastructure partnerships and collaboration. Opportunity properties include schools, parks, open spaces, institutional properties, road right-of-way, and vacant and abandoned properties. As potential areas for public-private partnerships, these land uses can integrate multiple stakeholders, thereby increasing public involvement and improving public perception of infrastructure projects. For example, forging partnerships with institutional and educational properties can create highly-visible projects within the community, and foster long-lasting, interagency relationships. Figure 2.03-5 shows distribution of opportunity properties within the watershed.

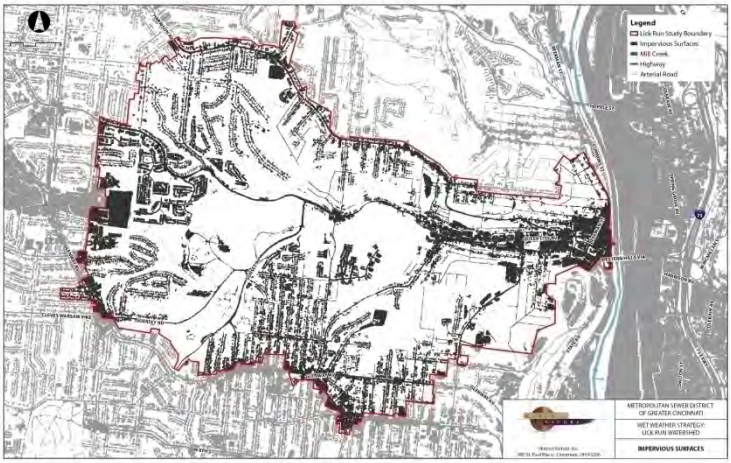


Source: Human Nature, Inc.

Figure 2.03-5 Opportunity Properties in the Lick Run Watershed

D. Impervious Surfaces

Impervious surfaces include buildings, pavement, roadways and highways, and bridges. These areas can greatly increase the rate of stormwater runoff by reducing or even preventing the natural infiltration of stormwater into soils. As shown in Figure 2.03-6, impervious surfaces cover 827 acres, or 30 percent of the total project area. The greatest concentration of impervious surfaces is along the Westwood/Queen City corridor in South Fairmount.

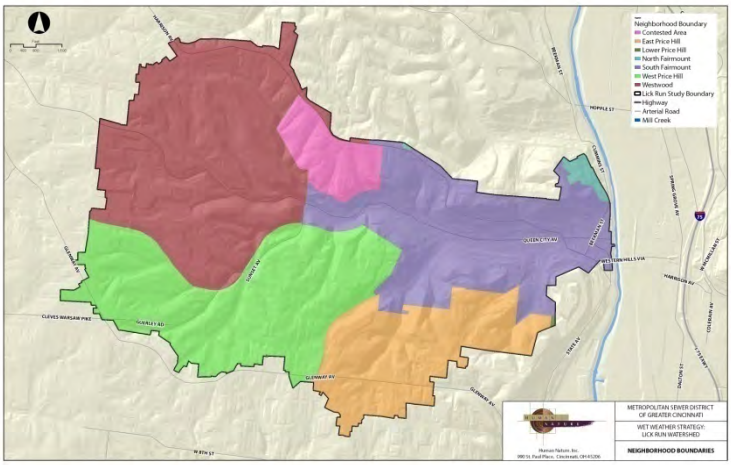


Source: Human Nature, Inc.

Figure 2.03-6 Impervious Surfaces in the Lick Run Watershed

E. Neighborhood Boundaries

The Lick Run Watershed covers approximately 2,720 acres and overlaps six of Cincinnati's western neighborhoods, including South Fairmount, Westwood, West Price Hill, East Price Hill, and a section of North Fairmount. As shown in Figure 2.03-7, there is also a contested boundary between Westwood and South Fairmount.

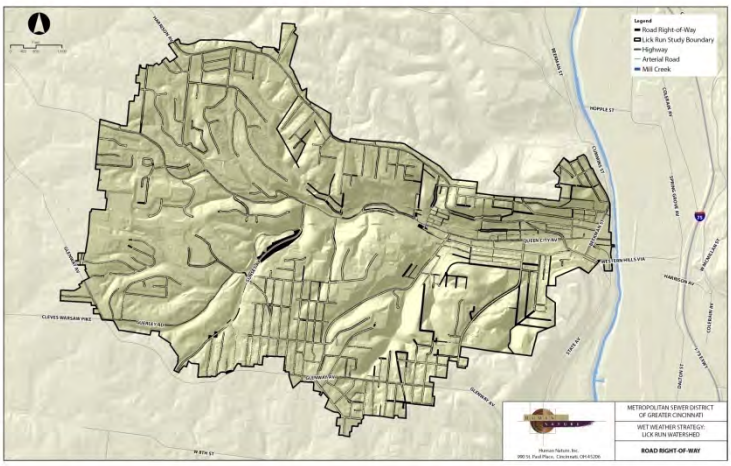


Source: Human Nature, Inc.

Figure 2.03-7 Cincinnati Neighborhoods in the Lick Run Watershed

F. Road Right-of-Way

Right-of-way includes publicly-owned land adjacent to interstates and roadways. Right-of-way can often be integrated with green infrastructure controls to capture stormwater runoff from impervious surfaces (roadways, sidewalks, rooftops). There are 214 acres of road right-of-way in the project area, the distribution of which is shown in Figure 2.03-8.

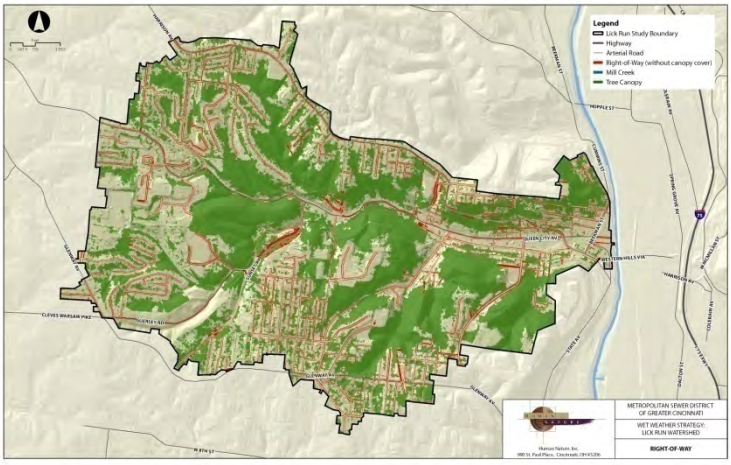


Source: Human Nature, Inc.

Figure 2.03-8 Road Right-of-Way in the Lick Run Watershed

G. Road Right of Way and Tree Canopy Cover

Road right-of-way can provide readily-available, publicly-owned land that can be reforested for stormwater benefits. There are 214 acres of road right-of-way in the project area. Of this amount, 176 acres (or 82 percent) does not have tree canopy cover. Figure 2.03-9 below shows the distribution of canopy-deficient right-of-way in the Lick Run watershed.



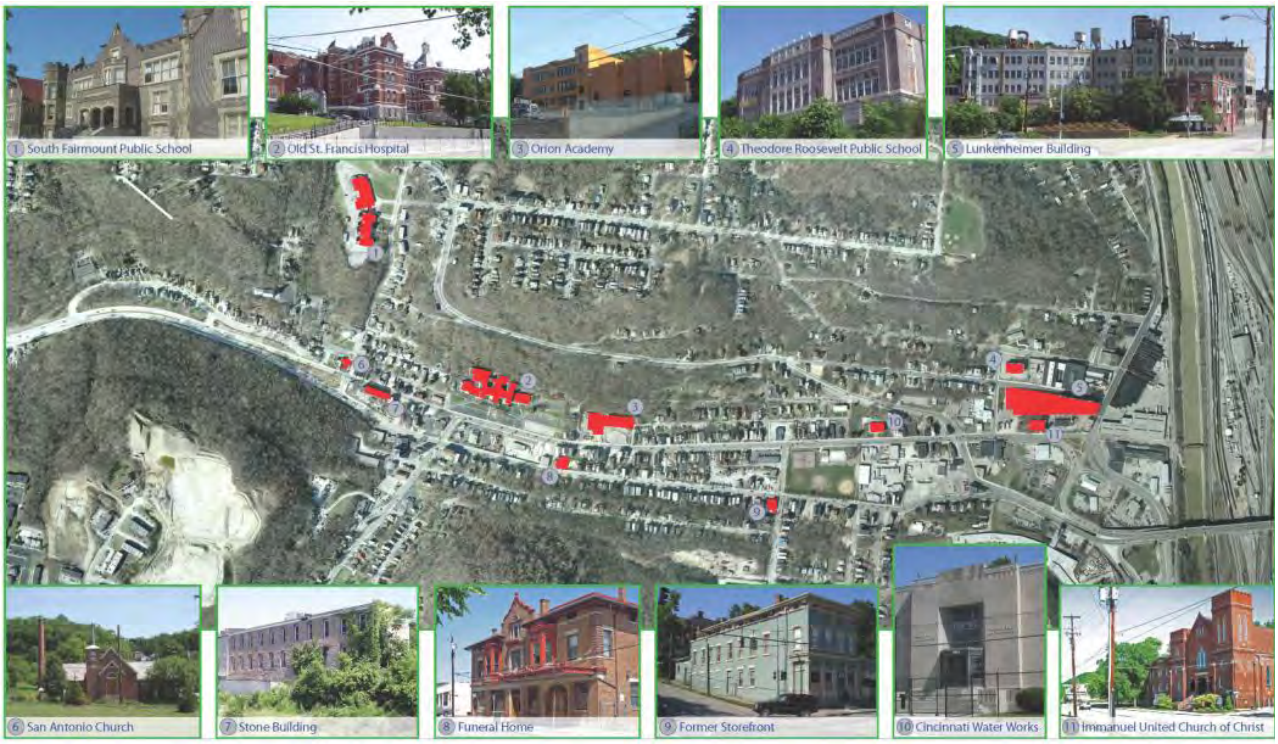
Source: Human Nature, Inc.

Figure 2.03-9 Canopy-Deficient Road Right-of-Way in the Lick Run Watershed

2.04 HISTORICAL COMMUNITY ASSETS, DEMOGRAPHICS, AND URBAN AUDIT

A. Historical Anchor Buildings

South Fairmount was a primary focus during the inventory and analysis of the Lick Run watershed. This neighborhood benefited from a strategic location in Cincinnati, adjacent to the city's primary traffic corridor, and serving as a gateway into Cincinnati's west side neighborhoods. This strategic location created a diverse economic base (including agriculture, lumber yards, flour mills, breweries, and machinery), which in turn created a unique stock of architectural styles. Figure 2.04-1 highlights some of these styles, which are referred to as historical anchor buildings. This is by no means a complete inventory of historically significant buildings in the watershed, but rather helps to characterize potential for redevelopment of a more vibrant community for the future.



Source: Human Nature, Inc.

Figure 2.04-1 Historical Anchor Buildings in the South Fairmount Neighborhood

B. Demographics of Focus Area

AECOM Technology Corporation (AECOM, formerly ERA) was engaged by MSD to provide a Lick Run watershed demographics study. Work efforts included a current demographic perspective for the South Fairmount neighborhood, covering population, income, household structure, housing vacancy, educational attainment, and employment concentrations. This includes information for 2000, as well as forecasts for 2008 and 2013.

This section describes the local area demographics of the South Fairmount neighborhood, the city of Cincinnati, and the state of Ohio. The data source is the United States Census from 2000 and estimates for 2008 and forecasts for 2013, generated by Environmental Systems Research Institute (ESRI). The reader should note that the demographics for noted years were extracted from a geographic information system base using boundary files from the Hamilton County GIS system. For this reason, noted estimates may vary from past reports based on slight variations in boundaries. In the tables below, the term compound annual growth rate (CAGR) 00/08 indicates the estimated CAGR between 2000 and 2008. The CAGR measures growth based upon growth over a period of years. (For example, a metric growing at 1 percent, compounded annually, over 5 years grows at an average of 1 percent the first year; then the new, higher figure grows at 1 percent the second year, and so on.)

1. Population

South Fairmount represents approximately 1 percent of the city's population and is estimated to have declined from a population of 3,251 to 2,842 between 2000 and 2008, based on past trends. The City of Cincinnati, meanwhile, is estimated to have decreased slightly by about 1 percent per year; however, more recent estimates by the Census Bureau, released July 1, 2009, indicate that the population may have actually increased by about 2,000 residents. While neither study area is experiencing sharp population changes, it does appear that South Fairmount has been struggling to retain residents more than the city as a whole (see Table 2.04-1).

	2000	2008	2013	CAGR 00/08
South Fairmont	3,215	2,842	2,669	-1.7%
Cincinnati	331,692	305,988	294,545	-1.0%
Ohio	11,366,392	11,645,739	11,817,922	0.3%

Source: AECOM

Table 2.04-1 Total Population

2. Households

The average household size in South Fairmount is higher than in the city as a whole. It is common for urban areas to have much lower household sizes than their corresponding states or regions. City housing units—houses and apartments—tend to be smaller than the average housing unit in other areas (see Table 2.04-3).

	2000	2008	2013
South Fairmont	2.49	2.44	2.42
Cincinnati	2.16	2.11	2.09
Ohio	2.49	2.45	2.43

Source: AECOM

Table 2.04-2 Average Household Size

However, within Cincinnati, South Fairmount has a higher average household size of about 2.44, compared with a city average of just 2.11. In the specific case of South Fairmount the number of four-or-more person households is 24 percent, compared with 16 percent for Cincinnati. In addition, the percentage of single family dwellings is higher in South Fairmount (42 percent) than for the city as a whole (38 percent) as shown in Table 2.04-4.

	2000	2008	2013
South Fairmont	54.2%	51.5%	50.0%
Cincinnati	49.4%	47.0%	45.5%
Ohio	67.3%	66.0%	65.1%

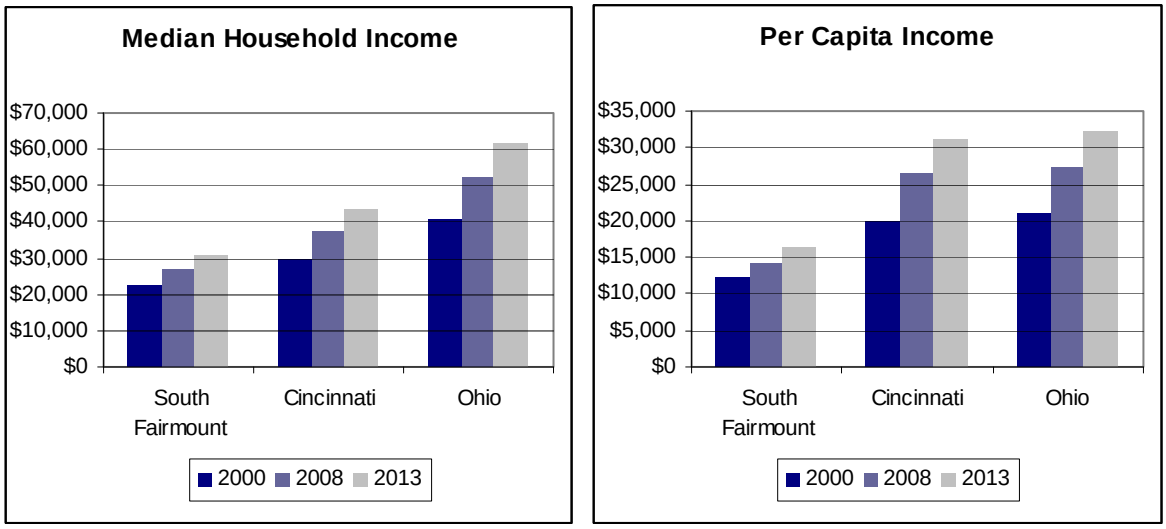
Source: AECOM

Table 2.04-3 Percent of Households that are Families

The percentage of households that are families is higher in South Fairmount than in the city as a whole, potentially reflecting fewer one- and two-person nonfamily households than in the city. It is also noteworthy that while South Fairmount and the state have almost identical average household sizes, 66 percent of the state's households are families, while just 52 percent of South Fairmount's households are families.

3. Income

As shown in Figures 2.04-5 and 2.04-6, South Fairmount is struggling by two common measures; median household income and per-capita income. The median household is estimated to have earned $27,197 in South Fairmount in 2008, compared with $37,209 in the city and $52,367 in the state.



Source: AECOM

Figure 2.04-2 Median Household Income and Per Capita Income

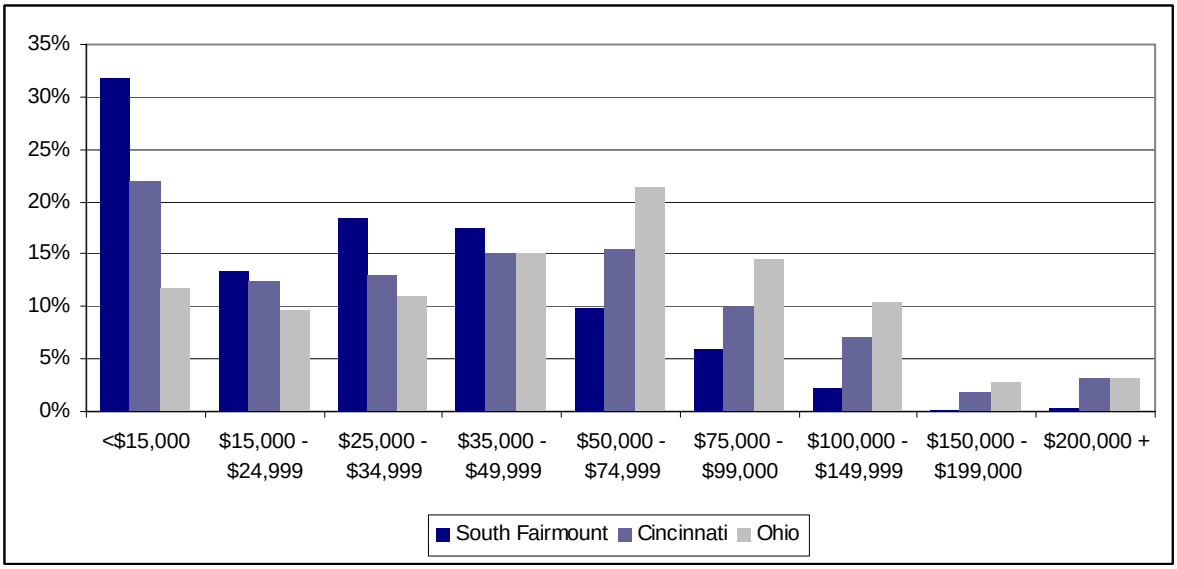
The disparity is even greater when considering per-capita income: the per-capita income in South Fairmount is just over half what it is in Cincinnati as a whole. Moreover, among the three study areas in this analysis, South Fairmount's household and per-capita incomes are growing the slowest.

	2000	2008	2013	CAGR 00/08
South Fairmont	$22,393	$27,197	$30,949	2.5%
Cincinnati	$29,684	$37,209	$43,753	2.9%
Ohio	$40,971	$52,367	$61,982	3.1%

Source: AECOM

Table 2.04-4 Median Household Income

In addition to the averages, it is possible to bracket households by income level. Figure 2.04-7 shows that almost 32 percent of South Fairmount households take home less than $15,000 per year, as of 2008. Just 2.8 percent earn $100,000 or above, compared with 12.1 percent and 16.3 percent in the city and state, respectively.



Source: AECOM

Figure 2.04-3 Population by Household Income

4. Age

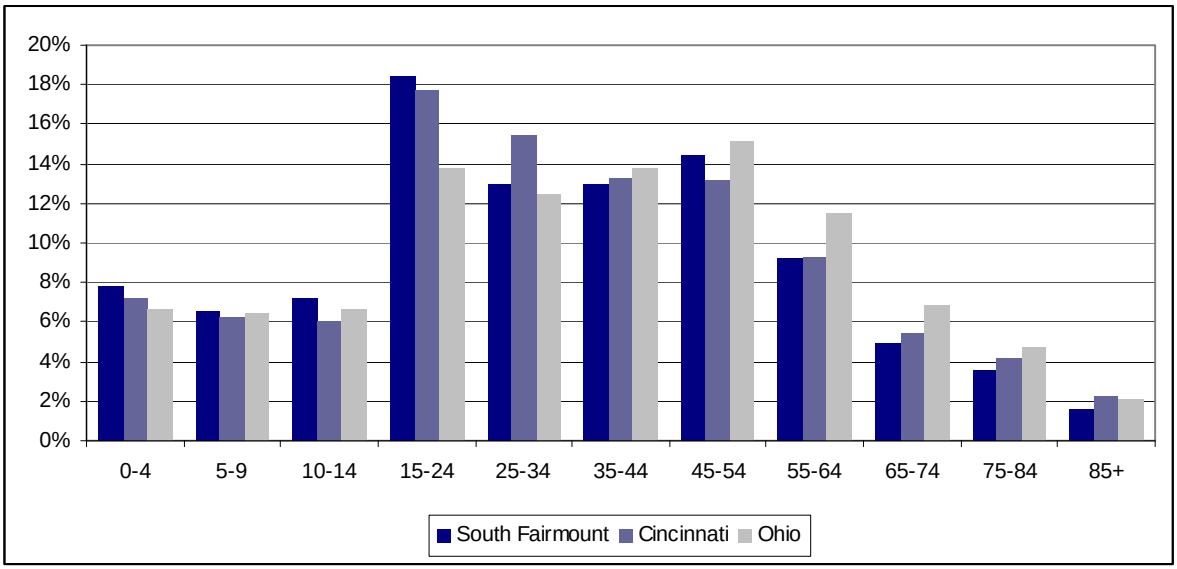
At 32.2, the average age in South Fairmount is slightly lower than for the city and well below the average age for the state (see Figure 2.04-8).

	2000	2008	2013
South Fairmont	31.1	32.2	32.6
Cincinnati	32.3	33.3	33.5
Ohio	36.2	38.1	39.1

Source: AECOM

Table 2.04-5 Average Age

As compared with the city and state, South Fairmount has a greater percentage of residents in each age bracket under age 24 and the lowest percentage in each age bracket over age 55 (see Figure 2.04-9).

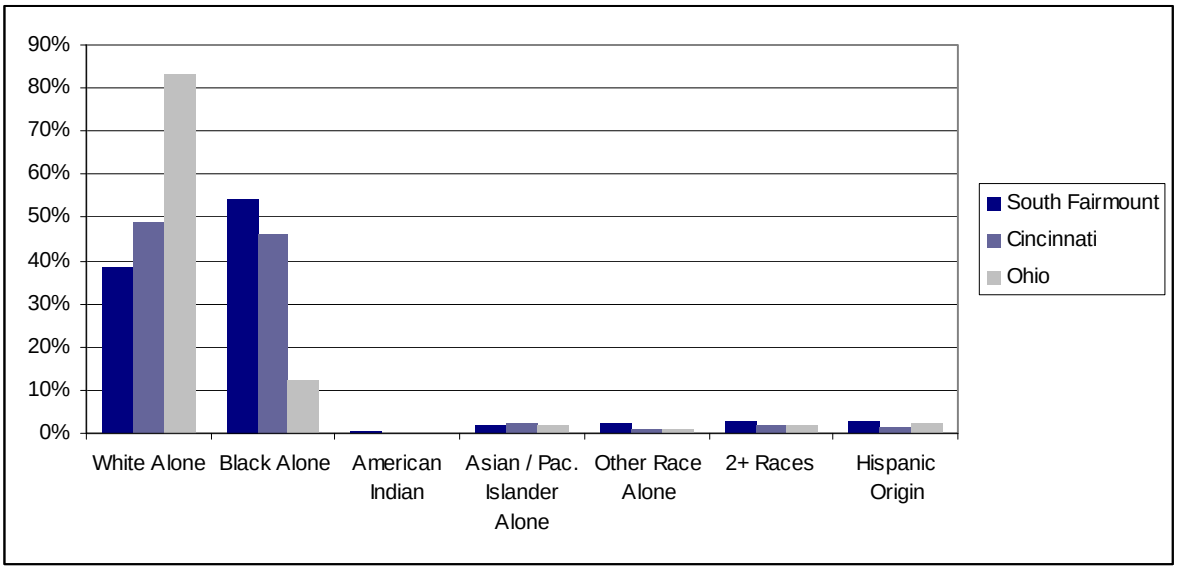


Source: AECOM

Figure 2.04-4 Population by Age

5. Race and Ethnicity

Figure 2.04-10 shows the race and ethnicity breakdowns for the three study areas.



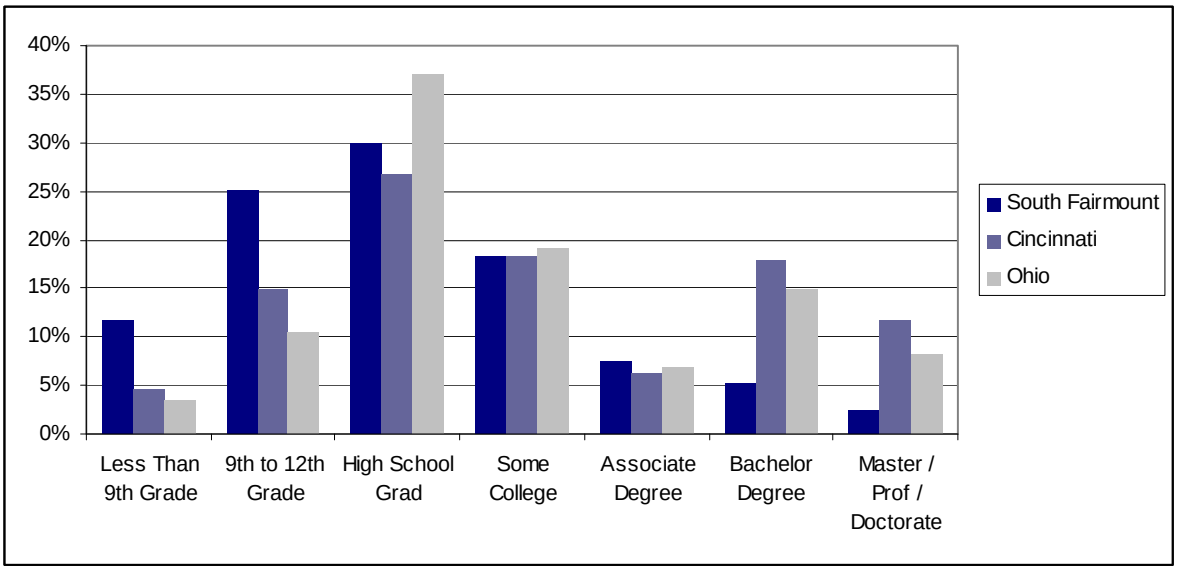
Source: AECOM

Figure 2.04-5 Population by Race and Ethnicity

The proportions of black and white are approximately reversed from the city average, though neither the city nor the neighborhood is dominated by one race. Although the proportion of residents of Hispanic Origin is almost twice as high in South Fairmount as for the city, that proportion is still very low (2.6 percent), considering the United States average is estimated to be around 12 percent. Cincinnati is fairly evenly split between those responding White Alone and Black Alone: they are 49 and 46 percent, respectively, compared with 38 and 54 percent in South Fairmount.

6. Educational Attainment

As shown in Figure 2.04-11, there are significant educational achievement gaps between South Fairmount and the city and state. Thirty-seven percent of South Fairmount adults over the age of 25 have not completed high school, compared with 19 percent for the city and 14 percent for the state. Just 5 percent of South Fairmount has a bachelor's degree; almost 18 percent of Cincinnati residents.

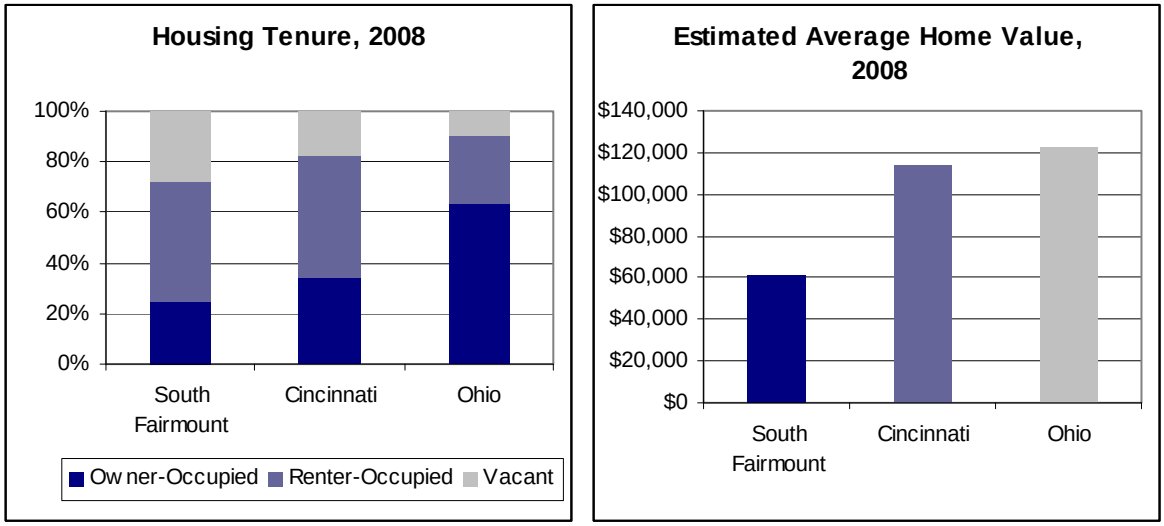


Source: AECOM

Figure 2.04-6 Population Over Age 25 by Highest Educational Attainment

7. Housing

According to information extracted from ESRI, housing in South Fairmount has more vacancies; more renters; and lower home values for owner-occupied units than for the city as a whole (see Figure 2.04-12).

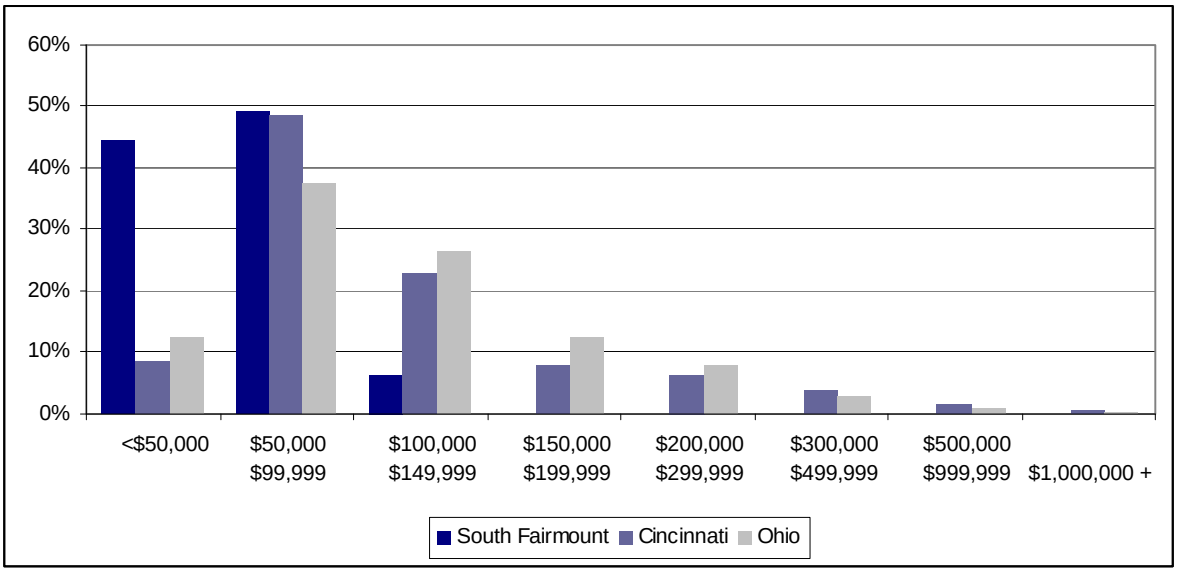


Source: AECOM

Figure 2.04-7 Housing Tenure and Estimated Home Value, 2008

Census estimates show that approximately 27 percent of housing units are likely to have been vacant in 2008. However, several extenuating circumstances could make that number higher in reality. Nationally, many low-income neighborhoods with previously low home values evolved into areas of concentration for high loan-to-value (sometimes 100 percent) subprime mortgages, which have high rates of default and foreclosure in other markets. The events of 2007 and 2008 would not be included in the estimates above, so aggressive mortgages sold in low-income neighborhoods may have exacerbated a significant trend toward vacant housing.

The biggest discrepancy is the value of owner-occupied housing units. In South Fairmount, a majority of owner-occupied homes are estimated to be worth less than $150,000; 94 percent are estimated below $100,000. At the bottom of the spectrum, 44 percent are estimated be worth less than $50,000. This compares with 8.5 and 12.3 percent in Cincinnati and Ohio respectively (see Figure 2.04-13).



Source: AECOM

Figure 2.04-8 Estimated Value of Owner-Occupied Housing Units, 2008

It should be noted here that the data source for Figure 2.04-13 is from the United States Census survey data taken in 2000 and adjusted using national and regional trends. Because it is survey based, it captures the owner-occupant's expectation of what his or her house is worth. ERA also evaluated home value breakdowns within the smaller target area, supplied by the Hamilton County Auditor. This analysis confirmed the overall breakdown of values, with a majority of property currently valued below $10,000 (land and improvements), and a total market value of about $11 million.

C. Urban Audit

Based on the demographic data gathered, MSD engaged the Hamilton County Regional Planning Commission (RPC) to conduct an urban audit of the Lick Run Watershed focusing on the blocks of buildings in South Fairmount abutting Queen City Avenue and Westwood Avenue (see Figure 2.04-9). Hamilton County Regional Planning is also evaluating the use of form base zoning, planned unit development, and other zoning options for areas of South Fairmount. The urban audit, which is expected to be complete in mid September, includes a building by building inventory and records the following data for each building:

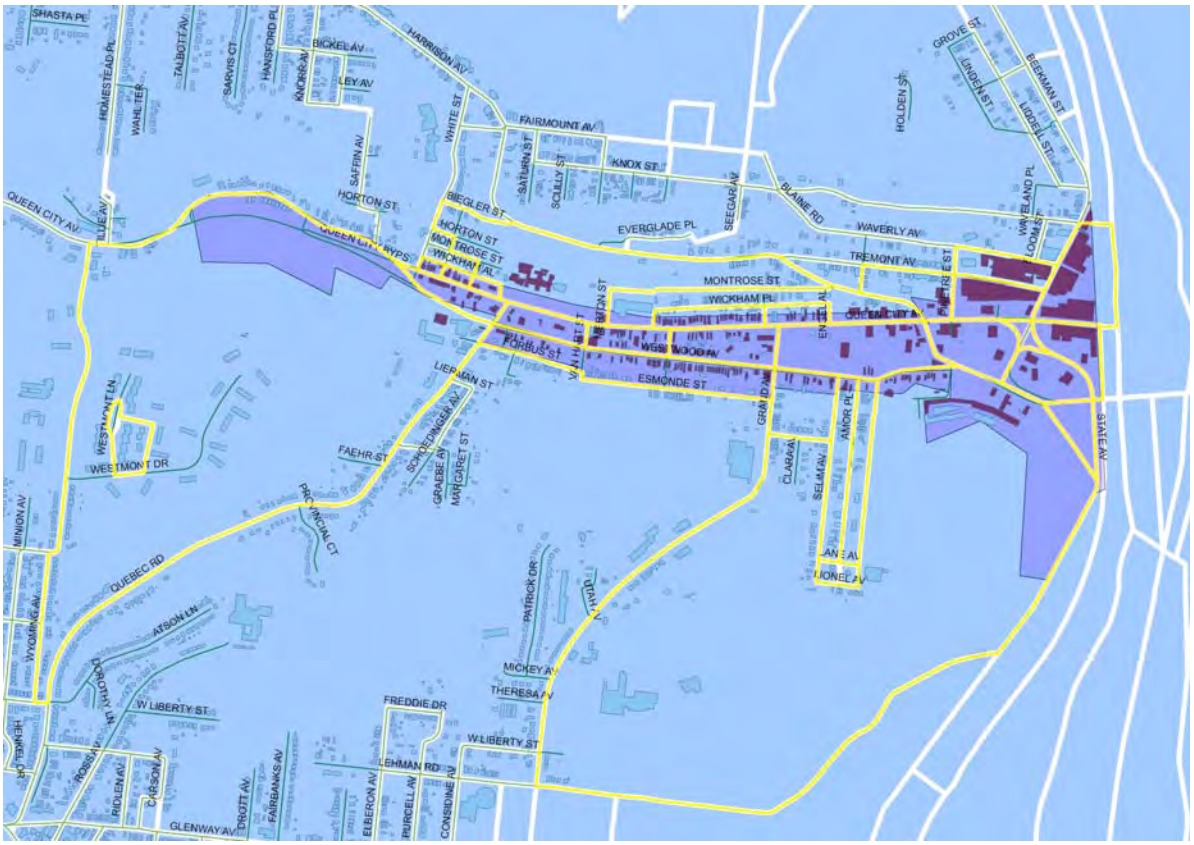
1. Property Location (Block number, street address, Auditor's book, page, parcel data).
2. Property size.
3. Owner's name and mailing address.
4. Description of property use (as classified by County Auditor).
5. Property value (land and improvements).
6. Land Use.

7. Building age and condition:
    a. Foundation.
    b. Walls.
    c. Roof.
8. Overall Building Rating.
9. Special Comments, for example: for sale, business, accessory buildings, and junk vehicles.
10. Foreclosure status.
11. Blighting Influences:
    a. Age.
    b. Obsolescence.
    c. Deterioration.
    d. Dilapidation.
    e. Abandonment/Excessive Vacancies.
    f. Periodic Flooding.
    g. Faulty Lot Layout/Overcrowding/Inadequate Loading/Parking.
    h. Deleterious/Incompatible Land Use/Site Conditions.
    i. Inadequate Facilities/ROW.
    j. Diversity of Ownership.
    k. Illegal Use/Code Violation.
    l. Unsuitable Soils Conditions.
    m. Unused Railyards or Service Stations-Landfill/Junkyard.
    n. Other Factors Inhibiting Sound Private Investment.
12. Historic designation (if any)

The RPC staff developed a ARC GIS 9.2 Urban Audit tool, creating a data layer that includes entry lines for all the data described above. RPC developed a Building/Housing Survey Form for use in the field for identifying property data (see Appendix C). Within the database contains photographs taken of the properties and special comments.

RPC staff completed the majority of the audit for CSO 005 Lick Run in late August 2009. Data evaluation is underway and will be available soon. RPC will query data for status of buildings (Sound, Requires Minor Repair, Requires Major Repair, In Critical Condition)for Building Use, Building Rating, and also for Blighting Influences.

After compilation of this data is complete, a report by block as well as for the total study area will be prepared. This report will identify the major land holders, total assessed value, overall vacancy rate, and a detailed description of property conditions as well as any other essential facts about the study area or specific parcels of interest.



Source: Hamilton County Regional Planning Commission

Figure 2.04-9 Estimated Value of Owner-Occupied Housing Units, 2008

SECTION 3
OPPORTUNITIES AND CONSTRAINTS

3.01 INTRODUCTION

Currently MSD's customer base within Lick Run watershed includes approximately 5,500 sewer users. As part of the evaluation of the 1.7 billion gallon overflow, MSD was challenged to determine the most cost-effective solution for the watershed as well as develop the best solution that will enhance future and existing customer base. The MSD management team engaged the Wet Weather Strategy Team to develop control scenarios that would reduce average annual overflow volumes by 800 million gallons.

Utilizing the outcomes from the data compilation and inventory analysis phase, the Lick Run Wet Weather Strategy Team (Strand Associates, Inc.® (Strand), Human Nature Inc. (Human Nature), and XCG Consultants, Inc. (XCG) and MSD) developed a range of wet weather strategies and redevelopment alternatives. This began with a refinement of XCG's existing hydrologic and hydraulic model of the CSS and concluded with a cost-benefit assessment of multiple wet weather strategies, including sewer separation, stream daylighting, downspout disconnection, reforestation, and real-time control.

3.02 HYDROLOGIC AND HYDRAULIC MODELING

XCG quantified the potential benefits from proposed watershed projects through hydraulic modeling. Specifically, XCG modeled the reduction in stormwater runoff and the corresponding reduction in CSO volume for various control alternatives being considered for the Lick Run watershed.

A. Original Model

For the Long-Term Control Plan (LTCP) and the Capacity Assurance Program Plan, the combined and sanitary collection system tributary to the Mill Creek Wastewater Treatment Plant (WWTP) was modeled. This model is known as the System Wide Model (SWM). The SWM included manholes, pipes, outfalls, and pumps. The flows in the system were developed using surface runoff to combined sewers, rainfall derived inflow and infiltration (RDII) in sanitary sewers, and dry weather flow throughout the system.

In August 2007, a model of Lick Run was developed for the Low Impact Development (LID) Assessment investigation. For this effort, the first step was to isolate the Lick Run watershed from the SWM to reduce the time required to perform multiple model runs. As part of this isolation, the catchment delineation and model parameters (i.e., slope, percent impervious) were adjusted to improve calibration and ease modeling of LID.

B. Catchment Realignment

Working with other team members, XCG updated the August 2007 Lick Run mode. The runoff parameters (area, percent impervious area, width, and slope) were revised to reflect the realigned catchments. The infiltration parameters of the catchments were kept the same as the original model.

One change to the August 2007 model was the restriction of the flow to the Auxillary Mill Creek Interceptor 1 to the WWTP to 10 cubic feet per second (cfs) as modeled in the LTCP.

Using flow data collected for the 2007 study, the realigned model results were compared with three observed storms to validate calibration. The results are shown in the Appendix D and are summarized in Table 3.02-1.

Storm	Observed Peak Flow (cfs)	Model Peak Flow (cfs)	Difference	Total Volume Observed (MG)	Total Volume Model (MG)	Difference
Oct 16-17, 2006	515	694	35%	105	106	1%
Oct 26-27, 2006	450	521	16%	117	106	-10%
Dec 31, 2006	419	440	5%	46	47	3%

Source: XCG Consultants, Inc.

Table 3.02-1 Validation of Model Calibration

3.03 MULTIFACETED WET WEATHER SOLUTIONS

After completing the watershed inventory analysis of the Lick Run watershed, the Lick Run Wet Weather Strategy Team explored and identified an array of wet weather strategies for the Lick Run watershed. The approach included strategic storm sewer separation, daylighting the historical Lick Run stream along Queen City Avenue and Westwood Avenue, downspout disconnection. Other strategies considered include: reforestation, detention, and real-time control. In addition, the team identified priority areas as well as redevelopment opportunities throughout the watershed. The priority areas were defined as those where the largest amount of stormwater could be removed for the least amount of cost through system separation.

A. Strategic Storm Sewer Separation

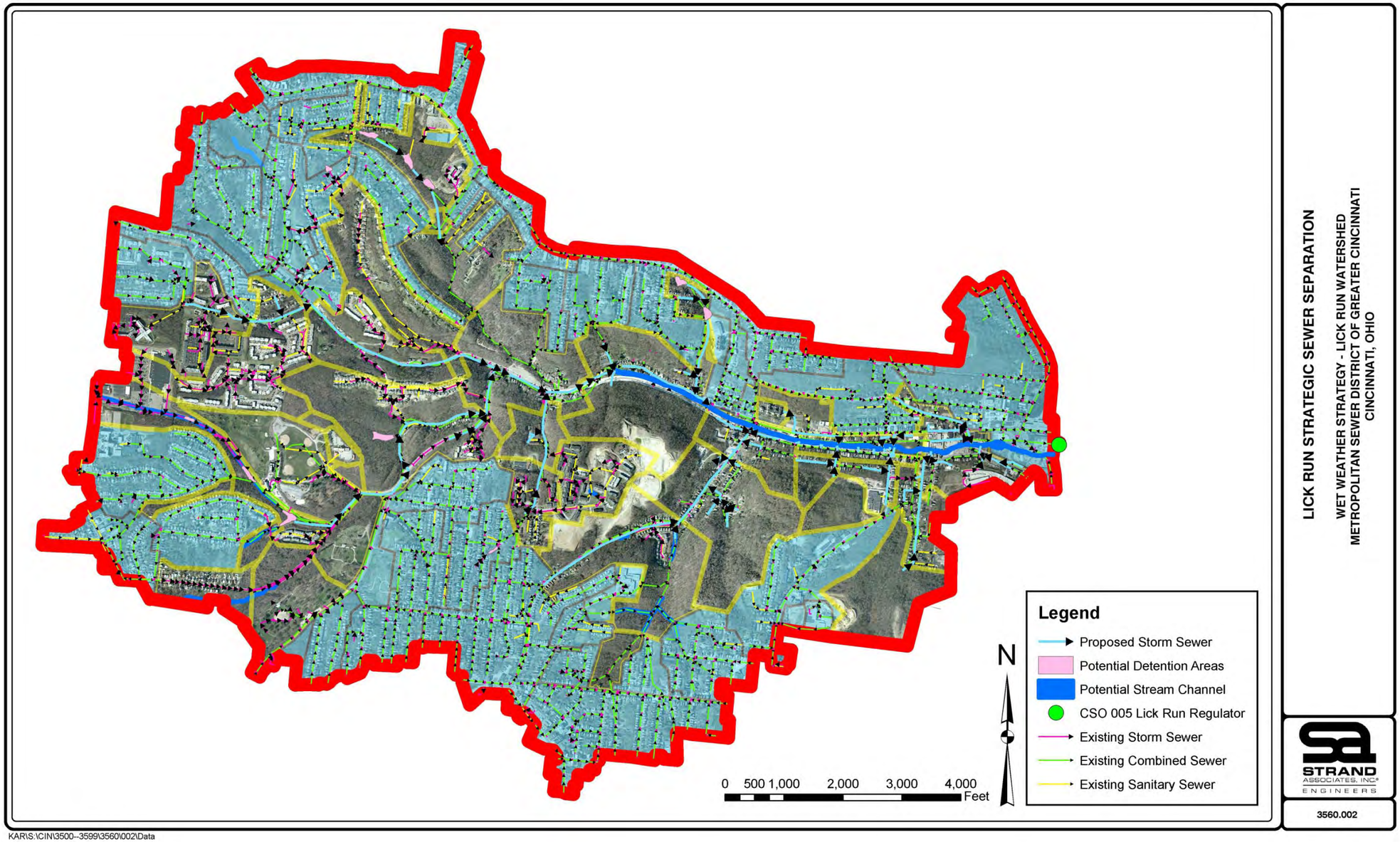
The first step in the sewer separation evaluation included identification of “priority” subcatchments where the proposed storm sewer could be cost-effectively installed. The plan is to construct a new storm sewer system and allow the existing combined sewer to serve the sanitary needs of the priority subcatchments. The priority subcatchments were strategically determined with the goal of capturing as much stormwater as possible while constructing the least amount of new storm sewer.

The strategic sewer separation approach targeted stream entry points, large undeveloped hillsides, and areas that were already separated but eventually discharged into the CSS. Essentially, highly-developed areas that would require extensive separation were avoided.

Based on GIS information, the strategic sewer separation in priority basins would require approximately 46,000 linear feet of new storm sewer, and approximately 1,040 new or retrofitted catch basins. Assuming that a manhole would be installed for every 400 linear feet of proposed storm sewer, an estimated 115 manholes would be necessary. This new storm sewer would ultimately discharge into the proposed, daylighted stream channel on the east end of the basin. Figure 3.03-1 illustrates the priority basins and proposed storm sewer.

FIGURE 3.03-1

LICK RUN STRATEGIC SEWER SEPARATION



1. Stormwater Benefits

In order to determine the reduction in CSO, Strand worked with XCG to incorporate the separation strategy into the CSO 005 model. Each basin was given a percent effective number that was applied to the model. Percent effective numbers were based on existing GIS information including impervious area, land use, topography, and soils. A high percent effective number was used in undeveloped areas, while lower percent effective numbers were used in developed areas where downspouts may be connected or buildings may be internally drained. Table 3.03-1 shows the percent effective assigned to each of the priority basins.

Catchment	Percent Effective		Catchment	Percent Effective
LMC001C0044x	90%		LMC01AC0047	85%
LMC001C0094	75%		LMC01AC0048	85%
LMC001C0167	90%		LMC01AC0050	75%
LMC001C0177	70%		LMC01AC0050U	95%
LMC001C0177C	70%		LMC01AC0053	85%
LMC001C0191	90%		LMC01AC0101Cx	95%
LMC001C0192	85%		LMC01AC0171x	90%
LMC001C0192PO	95%		LMC01AC0195	95%
LMC001C0194	80%		LMC01AC0205	85%
LMC001C0225	60%		LMC01AC0207	90%
LMC001C0225U	95%		LMC01AC0208x	95%
LMC001C0236	75%		LMC01AC0209x	85%
LMC001C0236U	95%		LMC01AC0213xc	75%
LMC001C0266	75%		LMC01AC0213xd	80%
LMC005C0290PBx	90%		LMC01AC0213xe	90%
LMC005C0290x	85%		LMC01AC0241	95%
LMC01AC0017x	95%		LMC01AC0251x	90%
LMC01AC0025	80%		LMC01AC0252	90%
LMC01AC0025PO	90%		LMC01AC0265	85%
LMC01AC0031x	95%		LMC01AC0290x	85%

Source: Strand Associates, Inc.® and XCG Consultants, Inc.

Table 3.03-1 Priority Basins Percent Effective

2. Cost Analysis

Since the project is in the conceptual stage and detailed engineering evaluations have not been performed, multiple assumptions were made to determine preliminary opinions of probable costs. It was assumed that the proposed storm sewer will be the same size as the adjacent

combined sewer (Alternative A). For comparison purposes the cost analysis also involved an alternative that sized the storm sewer one standard pipe size smaller than the existing, adjacent combined sewer (Alternative B).

For planning purposes the team used the following set of cost assumptions:

a. For storm sewer installed in grass, a unit cost of $7 per inch-diameter foot was used, and for storm sewer installed under pavement, a unit cost of $11 per inch-diameter foot was used. Therefore, the planning level construction cost of a 12-inch-diameter sewer was $132 per linear foot under pavement.

b. The planning level construction cost for proposed catch basins was $2,000 per catch basin.

c. The planning level construction cost for manholes varied depending on the size of storm sewer. The following costs were used for manholes:

   (1) $2,500 per manhole for 12- to 18-inch-diameter pipes
   (2) $4,000 per manhole for 21- to 54-inch-diameter pipes
   (3) $10,000 per manhole for 60- to 168-inch-diameter pipes

Per the PMC/MSD costing manual titled *Metropolitan Sewer District of Greater Cincinnati Capacity Assurance Program Plan–Project Cost Estimate Reference Document,* total capital costs were derived by multiplying estimated construction costs by a factor of 1.67 to account for such things as program management, administration, field engineering and inspection, construction contingency, and funding. The opinion of probable cost for Alternative A was $41 million and the opinion of probable costs for Alternative B was $36.5 million. These scenarios are represented in Figure 3.03-2. See Figure 3.03-3 for a map of storm sewer sizes throughout the watershed.

FIGURE 3.03-2

STRATEGIC SEWER SEPARATION COST ANALYSIS

STRATEGIC SEWER SEPARATION COST ANALYSIS

Alternative A: Pipe Size is Equal to Adjacent Combined Pipe

New Storm Sewer & Manholes - Grass

Storm Sewer Pipe				Manholes		
Diameter (in)	Length (ft)	Unit Cost	Cost	Manholes	Unit Cost	Cost
12	5,959	$ 84	$ 501,000	15	$2,500	$37,244
15	181	$ 105	$ 19,000	0	$2,500	$1,131
18	507	$ 126	$ 64,000	1	$2,500	$3,169
21	0	$ 147	$ -	0	$4,000	$0
24	408	$ 168	$ 69,000	1	$4,000	$4,080
27	427	$ 189	$ 81,000	1	$4,000	$4,270
42	206	$ 294	$ 61,000	1	$4,000	$2,060
48	1,586	$ 336	$ 533,000	4	$4,000	$15,860
54	0	$ 378	$ -	0	$4,000	$0
60	1,645	$ 420	$ 691,000	4	$10,000	$41,125
78	0	$ 546	$ -	0	$10,000	$0
84	190	$ 588	$ 112,000	0	$10,000	$4,750
156	151	$ 1,092	$ 165,000	0	$10,000	$3,775
168	466	$ 1,176	$ 548,000	1	$10,000	$11,650
Sub Totals:	11,726	-	$ 2,840,000	29	-	$129,114

New Storm Sewer & Manholes - Pavement

Storm Sewer Pipe				Manholes		
Diameter (in)	Length (ft)	Unit Cost	Cost	Manholes	Unit Cost	Cost
12	11,694	$ 132	$ 1,544,000	29	$2,500	$73,088
15	1,003	$ 165	$ 165,000	3	$2,500	$6,269
18	2,312	$ 198	$ 458,000	6	$2,500	$14,450
21	239	$ 231	$ 55,000	1	$4,000	$2,390
24	669	$ 264	$ 177,000	2	$4,000	$6,690
27	1,738	$ 297	$ 516,000	4	$4,000	$17,380
42	189	$ 462	$ 87,000	0	$4,000	$1,890
48	306	$ 528	$ 162,000	1	$4,000	$3,060
54	2,570	$ 594	$ 1,527,000	6	$4,000	$25,700
60	4,041	$ 660	$ 2,667,000	10	$10,000	$101,025
78	2,097	$ 858	$ 1,799,000	5	$10,000	$52,425
84	5,672	$ 924	$ 5,241,000	14	$10,000	$141,800
156	940	$ 1,716	$ 1,613,000	2	$10,000	$23,500
168	784	$ 1,848	$ 1,449,000	2	$10,000	$19,600
Sub Totals:	34,254	-	$ 17,460,000	86	-	$489,266

Additional Pipe to Connect Inlets to System			
12	12,950	$ 132	$ 1,709,000

Storm Inlets

Storm Inlets	Unit Cost	Cost
1036	$ 2,000	$ 2,072,000

Assumptions

Cost/in-diameter-feet (pavement)	$ 11
Cost/in-diameter-feet (grass)	$ 7
Cost for inlet replacement	$ 2,000
Manhole spacing (ft)	400
Pipe to Connect Inlets to System:	
Sewer installed in center of roadway	
Average road width (ft):	25
Additional pipe needed per inlet (ft):	12.5
Percent contingency	66%

Strategic Separation Costs

Sub Total:	$ [illegible]
Contingency:	$ 16,301,591
Total Separation Cost:	$ 41,000,971

Alternative B: Pipe is One Size Smaller than the Adjacent Combined Pipe

New Storm Sewer & Manholes - Grass

Storm Sewer Pipe				Manholes		
Diameter (in)	Length (ft)	Unit Cost	Cost	Manholes	Unit Cost	Cost
12	5,959	$ 84	$ 501,000	15	$2,500	$37,244
15	688	$ 105	$ 72,000	2	$2,500	$4,300
18	0	$ 126	$ -	0	$2,500	$0
21	408	$ 147	$ 60,000	1	$4,000	$4,080
24	427	$ 168	$ 72,000	1	$4,000	$4,270
27	206	$ 189	$ 39,000	1	$4,000	$2,060
42	1,586	$ 294	$ 466,000	4	$4,000	$15,860
48	0	$ 336	$ -	0	$4,000	$0
54	1,645	$ 378	$ 622,000	4	$4,000	$16,450
60	0	$ 420	$ -	0	$10,000	$0
78	190	$ 546	$ 104,000	0	$10,000	$4,750
84	151	$ 588	$ 89,000	0	$10,000	$3,775
156	466	$ 1,092	$ 509,000	1	$10,000	$11,650
168	0	$ 1,176	$ -	0	$10,000	$0
Sub Totals:	11,726	-	$ 2,530,000	29	-	$104,439

New Storm Sewer & Manholes - Pavement

Storm Sewer Pipe				Manholes		
Diameter (in)	Length (ft)	Unit Cost	Cost	Manholes	Unit Cost	Cost
12	11,694	$ 132	$ 1,544,000	29	$2,500	$73,088
15	3,315	$ 165	$ 547,000	8	$2,500	$20,719
18	239	$ 198	$ 47,000	1	$2,500	$1,494
21	669	$ 231	$ 155,000	2	$4,000	$6,690
24	1,738	$ 264	$ 459,000	4	$4,000	$17,380
27	189	$ 297	$ 56,000	0	$4,000	$1,890
42	306	$ 462	$ 141,000	1	$4,000	$3,060
48	2,570	$ 528	$ 1,357,000	6	$4,000	$25,700
54	4,041	$ 594	$ 2,400,000	10	$4,000	$40,410
60	2,097	$ 660	$ 1,384,000	5	$10,000	$52,425
78	5,672	$ 858	$ 4,867,000	14	$10,000	$141,800
84	940	$ 924	$ 869,000	2	$10,000	$23,500
156	784	$ 1,716	$ 1,345,000	2	$10,000	$19,600
168	0	$ 1,848	$ -	0	$10,000	$0
Sub Totals:	34,254	-	$ 15,170,000	86	-	$427,755

Additional Pipe to Connect Inlets to System			
12	12,950	$ 132	$ 1,709,000

Storm Inlets

Storm Inlets	Unit Cost	Cost
1036	$ 2,000	$ 2,072,000

Assumptions

Cost/in-diameter-feet (pavement)	$ 11
Cost/in-diameter-feet (grass)	$ 7
Cost for inlet replacement	$ 2,000
Manhole spacing (ft)	400
Pipe to Connect Inlets to System:	
Sewer installed in center of roadway	
Average road width (ft):	25
Additional pipe needed per inlet (ft):	12.5
Percent contingency	66%

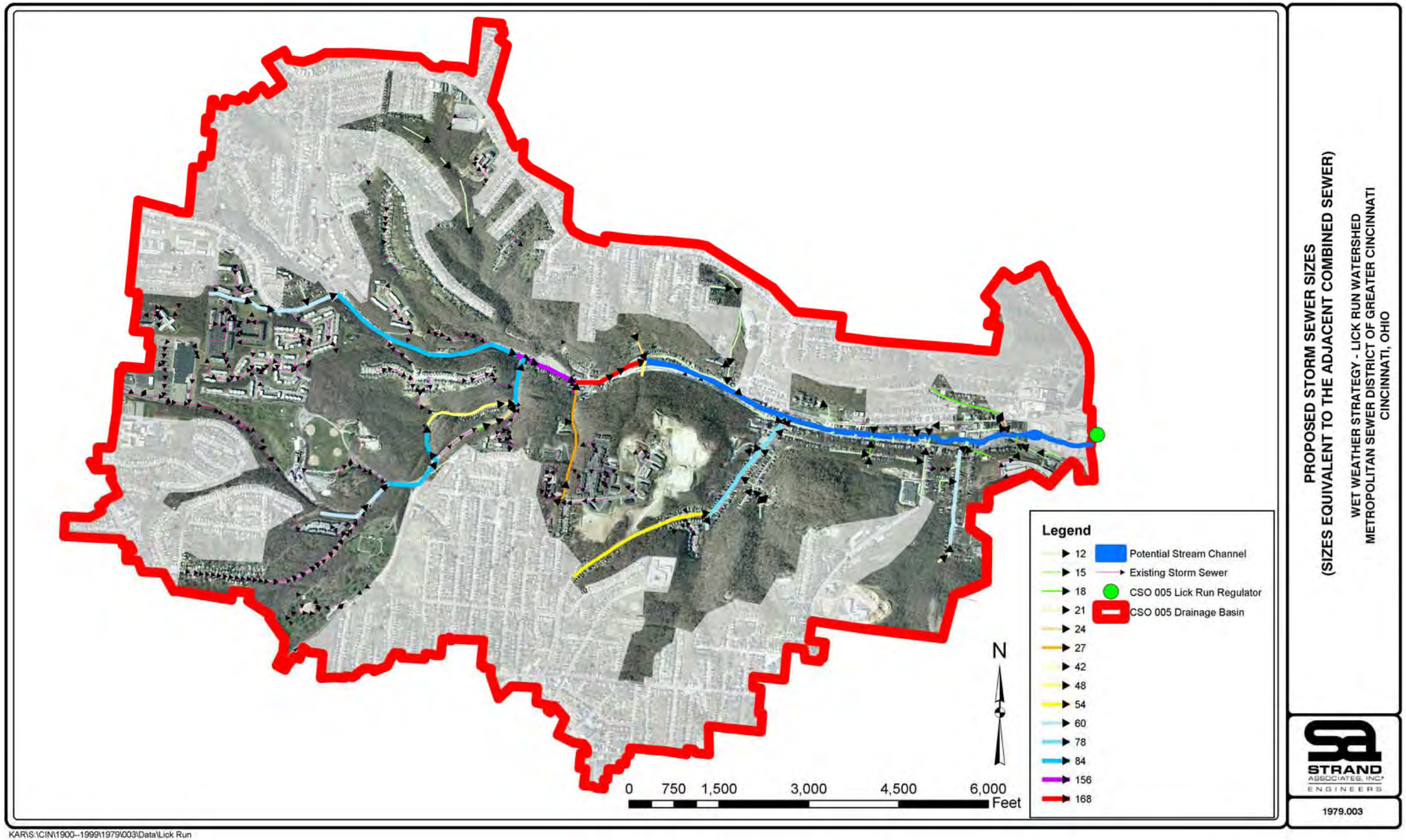
Strategic Separation Costs

Sub Total:	$ [illegible]
Contingency:	$ 14,528,708
Total Separation Cost:	$ 36,541,902

DRAFT
Strand Associates, Inc
July 2, 2009

FIGURE 3.03-3

STORM SEWER SIZES THROUGHOUT WATERSHED



B. Stream Daylighting

The proposed storm sewers will discharge into a proposed restored stream channel along Queen City Avenue and Westwood Avenue. This stream channel iis proposed to extend from the intersection of the Old Queen City Avenue with the New Queen City Avenue to Mill Creek on the east end of the basin, and will be approximately 8,000 feet long.

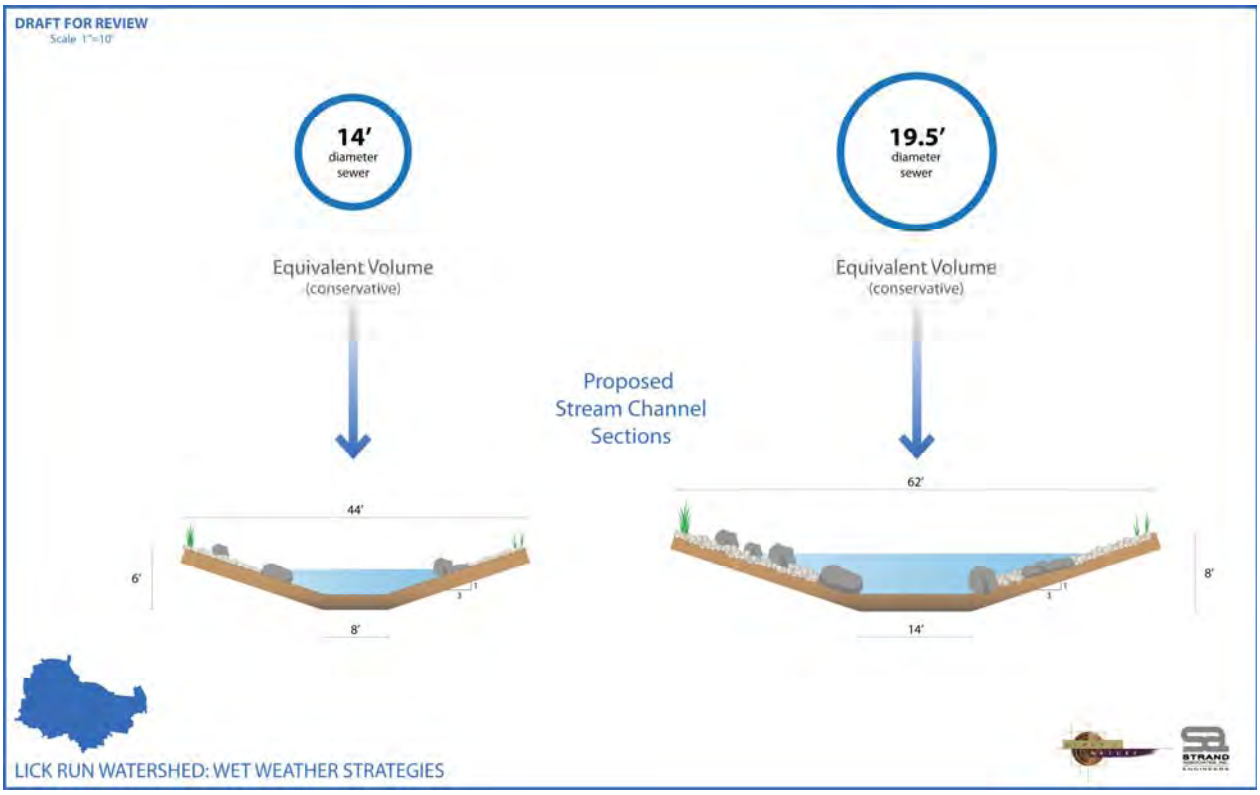
1. Stormwater Water Quality Benefits

Water quality and quantity benefits are achieved by removing stormwater from the combined sewer and returning it to a new, redeveloped urban stream channel. When stormwater is removed from the combined system, it frees up capacity in the system for sanitary flow. The additional capacity in the combined sewer can accommodate the sanitary flow and fewer overflows will discharge into the Mill Creek. Water that flows through the urban stream channel will improve the quality of the Mill Creek and the diversity of fish and other aquatic life that live in the streams.

The stream will convey stormwater runoff that has been removed from the CSS and will directly discharge into Mill Creek. The channel will be sized to provide the community with an equivalent or greater level of flood protection than exists today.

2. Preliminary Stream Channel Cross Sections

A preliminary analysis of the existing level of service that the Lick Run sewer currently provides indicates that adequate space exists between Queen City and Westwood to daylight the Lick Run stream and provide flood protection. The cross sections represented in Figure 3.03-4 show that a trapezoidal channel with a bottom width of 8-feet, depth of 6-feet, and 3 to 1 side slopes will convey an equivalent volume to the 14-foot diameter sewer located upstream of the 19.5' diameter sewer that currently outfalls into Mill Creek during storm events. Similarly, a trapezoidal channel with a bottom width of 14-feet, depth of 8-feet, and 3 to 1 side slopes will convey an equivalent volume to the 19.5-foot diameter sewer. The space between Queen City and Westwood Avenue amounts to approximately 150 feet on the west end of the proposed stream channel near Quebec Avenue and approximately 350 feet on the east end where the proposed stream discharges into Mill Creek. A more detailed condition assessment of the 19.5 foot sewer and identification of utilities must be completed to confirm the technical feasibility of the proposed daylighted channel and provide an adequate level of service for flood protection.



Source: Strand Associates, Inc.® and Human Nature

Figure 3.03-4 Preliminary Stream Channel Cross Sections

3. Cost Analysis

Based upon experience with similar projects, a preliminary opinion of probable costs was developed for the construction of the stream channel. Preliminary costs were developed for two scenarios: a basic channel and an enhanced channel. The enhanced channel includes greater amenities and an upgraded level of "fit and finish".

The following elements were included in the basic channel cost:

a. Basic channel construction (6-foot deep; 93-foot wide on the east end and 45-foot wide on the west end of the channel).

b. Nine cast-in-place clear span bridges.

c. Water main relocations for crossing the new channel.

d. Sanitary sewer relocation for crossing the new channel.

The following elements were included in the enhanced channel costs:

a. Enhance Restoration: bike paths, restored sidewalks, aeration feature, concrete overlook at bridges with canopies, enhanced lighting, blue light emergency telephones, interpretive signs, benches, trash receptacles, enhanced landscaping, active recreation area, amphitheater with landscaped sitting area, sheltered gathering spaces, security lighting and cameras, and drinking fountains.

b. Roadway improvements: Westwood reconstruction with streetscaping; Queen City reconstruction with streetscaping; and three roundabouts.

c. Enhanced Conspan architectural multicell bridges.

d. Level control facility.

e. Pond area with landscaping.

f. Low-flow channel with concrete bottom and cut stone lined sides.

g. Water main and water service replacements (Westwood and Queen City).

h. Sewer main and sewer service replacements (Westwood and Queen City).

The preliminary opinion of probable cost for the base construction of the channel was $13.5 million and the enhanced construction cost would add another $44.5 million. Therefore, for planning and budgeting purposes the $58 million value has been utilized in developing total project cost values.

C. Reforestation

A watershed's tree canopy provides valuable benefits in regard to natural stormwater management, air quality improvement, habitat, and quality of life. Reforestation can be an effective tool at reducing the quantity of stormwater runoff and improving the quality of runoff. A CITYgreen™ evaluation was performed for the Lick Run watershed. CITYgreen™, a GIS-based tool that analyzes the ecological and economic benefits of tree canopy cover, was developed by American Forests, Inc., a pioneer in the science and practice of urban forestry. In addition to computing air pollution removal and carbon storage, this tool calculates storm water runoff using the Natural Resource Conservation Service (NRCS) model (TR-55 method). With this model, it was necessary to delineate and classify land cover types throughout the watershed. Figure 3.03-5 shows the type and distribution of land cover classes.

Source: Human Nature, Inc

Figure 3.03-5 Land Cover Map

Based on the CITYgreen™ analysis, the existing canopy cover provides approximately 56.8 million gallons of storage volume in the Lick Run watershed during a 2-year, 24-hour storm event of 2.86 inches. This storm event was obtained from Table 8, Page 184 of the *Rainfall Frequency Atlas of the Midwest*[1]. This value for storage volume (56.8-million gallons) represents the volume of additional stormwater to be managed if the trees were removed from the landscape.

Human Nature also investigated tree canopy benefits in terms of annual rainfall using the 1970 typical year precipitation dataset. Table 3.03-2 summarizes the annual benefits from existing canopy cover based on the seven rain event categories. In a typical year, the existing tree canopy provides an annual benefit of approximately 1.21-billion gallons.

[1] Huff, Floyd A., and James R. Angel. 1992. *Rainfall Frequency Atlas of the Midwest*. Midwestern Climate Center (MCC) and Illinois State Water Survey. MCC Research Report 92-03. Champaign, Illinois.

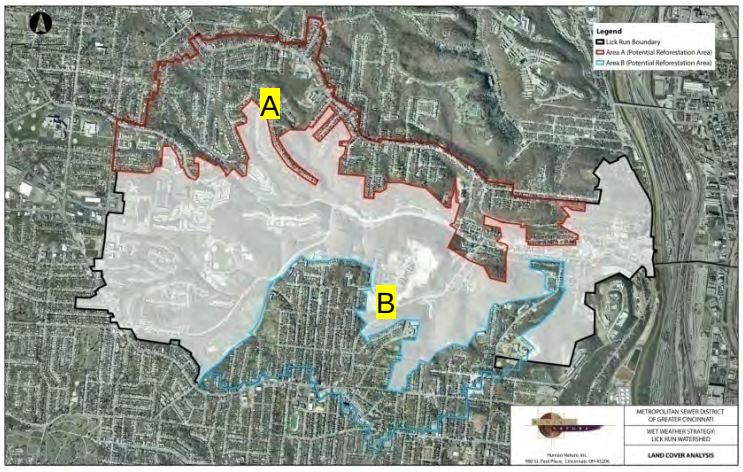
Rain Event (in)	Annual Benefit (MG)
0.25	8
0.50	239
0.75	283
1.00	364
1.50	132
2.00	55
2.50	125
TOTAL:	1,207

Source: Human Nature, Inc

Table 3.03-2 Summary of Annual Benefits from Existing Canopy Cover

1. Reforestation Scenario

The Lick Run watershed covers approximately 2,720 acres. With such a large area, it would be unrealistic to recommend reforestation for all canopy-deficient areas; additionally, with the installation of separate storm sewers in the center of the watershed, a strategic focus was placed on areas where the combined system would remain. therefore the watershed was divided into two separate, potential reforestation areas: Area A and Area B. Area A covers approximately 675 acres in the northern portion of the watershed, and Area B covers 450 acres in the southern portion. These areas were chosen because they were classified as combined sewer/nonpriority catchments, and because reforestation could supplement or replace more costly wet weather strategies. Figure 3.03-6 shows the boundaries for the two potential reforestation areas.



Source: Human Nature, Inc

Figure 3.03-6 Potential Reforestation Areas

Integrating the results from the CITYgreen™ analysis in areas A and B, Human Nature quantified the potential annual benefit from reforestation. Reforesting a total of 135 acres would capture 64.1-million gallons of stormwater runoff annually. The annual benefit from proposed reforestation in the Lick Run watershed is summarized in Table 3.03-3. Note that this value does not represent a direct correlation with reduction in annual CSO volume.

Rain Event (in)	Annual Benefit (MG)
0.50	6
0.75	13
1.00	21
1.50	9
2.00	4
2.50	10
TOTAL:	64

Source: Human Nature, Inc

Table 3.03-3 Summary of Annual Benefits from Proposed Reforestation

4. Retrofitted/Proposed Detention Basins

The team identified and evaluated existing detention basins and the opportunity to retrofit these basins to reduce CSOs. The team also evaluated potential areas in which new detention facilities could be installed. This evaluation led to the identification of fifteen low-lying areas which could serve as detention basins. Nine of these areas were located in the priority basins and the other six were located in combined sewer/nonpriority basins. At this point in the evaluation process, the team decided to include the nine detention basins located in priority basins as part of our multipronged solution. This coarse evaluation for detention basin opportunities will be further defined as more opportunities are identified during the feasibility study. Figure 3.03-7 shows the fifteen proposed detention areas throughout the watershed.

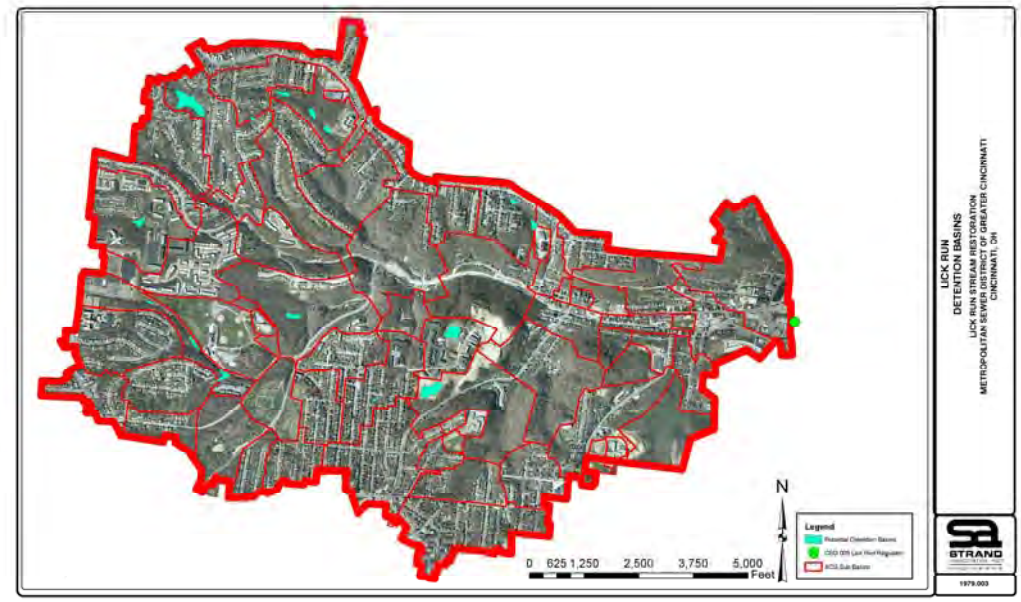


Figure 3.03-7 Potential Detention Opportunities

5. Downspout Disconnection

Utilizing GIS data, the total square footage of single and multifamily (2 or 3 family dwellings) rooftops was calculated for each combined sewer/nonpriority basin. The results of this effort indicated that, approximately 4,996,000 square feet or residential rooftop is connected to the combined system in the combined sewer/nonpriority area. Therefore, single and multifamily rooftops account for 96 percent of the impervious area within the Lick Run Basin combined sewer/nonpriority areas. By disconnecting roof downspouts, a significant portion of this impervious area can be removed from the combined system.

In estimating the potential stormwater reduction from disconnecting downspouts, each basin was assigned an effectiveness and participation rating. The “effectiveness” rating was based on criteria such as soil conditions, lot size, and density of the homes. This variable is intended to provide an estimate of the percentage of the stormwater removed through the disconnection that somehow flows back into the CSS through either direct or indirect means. Even if a downspout is disconnected from the CSS, some of the redirected runoff still may have the potential to reenter the CSS. The “participation” rating was based on local knowledge of the neighborhoods and willingness to participate in the disconnection program.

For the purpose of the Lick Run combined sewer/nonpriority basin downspout disconnection evaluation an effectiveness rating of 60 percent and a participation rating of 50 percent was applied to the residential rooftop area of each basin. For example, if a particular sewershed had 100,000 square feet of residential roof, 50 percent or 50,000 square feet would be disconnected from the combined system. However based on the 60 percent effectiveness rating only the runoff from 30,000 square feet would be removed from the CSS.

In order to determine the total number of downspouts within each basin the team evaluated the residential buildings throughout the watershed and estimated that approximately 200 square feet of impervious rooftop area drains to a typical downspout. Based on the total number of downspouts and participation rate, the program estimates assume that 12,000 downspouts will be disconnected.

Based on an evaluation of anticipated administrative and reimbursement costs, $250 per downspout was used to establish a program budget. In order to determine the estimated benefit of the disconnection program, typical year rainfall data was used to calculate the estimated runoff that could be removed from the CSS.

Using conservative estimates for each program variable, shown in Table 3.03-4, it has been estimated that once fully implemented the downspout disconnection program will remove approximately 38 million gallons of stormwater annually, from the Lick Run basins that remain combined sewer, and cost approximately $3 million.

Roof area that drains to a typical downspout:	200 sf
Cost to disconnect one downspout:	$250
Typical year rainfall:	41.17 in
Percent Effective:	60%
Percent Participation:	50%

Table 3.03-4 Downspout Disconnect Assumptions

See Tables 3.03-5 and 3.03-6 for a full listing of downspout disconnection evaluation results for each basin to remain as combined sewer.

Catchment	Residential Building Area (sf)	Total Downspouts Connected	Impervious Area Removed (sf)	Gallons Removed from System	Total Cost
LMC001C0014	526,899	2634	263,400	4,055,994	$329,250
LMC001C0043	95,226	476	47,600	732,974	$59,500
LMC001C0043PB	98	0	-	0	$0
LMC001C0043PO	0	0	-	0	$0
LMC001C0044a	65,496	327	32,800	505,074	$41,000
LMC001C0044b	69,016	345	34,600	532,792	$43,250
LMC001C0066	154,700	774	77,400	1,191,852	$96,750
LMC001C0072	367,532	1838	183,800	2,830,264	$229,750
LMC001C0093	121,541	608	60,800	936,235	$76,000
LMC001C0093PB	0	0	-	0	$0
LMC001C0093PO	0	0	-	0	$0
LMC001C0123	121,403	607	60,800	936,235	$76,000
LMC001C0136	62,445	312	31,200	480,437	$39,000
LMC001C0159	131,924	660	66,000	1,016,308	$82,500
LMC001C0195	113,804	569	57,000	877,721	$71,250
LMC005C0290	223,775	1119	111,800	1,721,565	$139,750
LMC005C0290PB	0	0	-	0	$0
LMC005CNortheast	131,769	659	65,800	1,013,228	$82,250
LMC01AC0010	130,247	651	65,200	1,003,989	$81,500
LMC01AC0017	235,620	1178	117,800	1,813,956	$147,250
LMC01AC0025POx	0	0	-	0	$0
LMC01AC0031	195,923	980	98,000	1,509,064	$122,500
LMC01AC0053R	111,790	559	55,800	859,242	$69,750

Table 3.03-5 Downspout Disconnect Evaluation

Catchment	Residential Building Area (sf)	Total Downspouts Connected	Impervious Area Removed (sf)	Gallons Removed from System	Total Cost
LMC01AC0065	169,324	847	84,600	1,302,722	$105,750
LMC01AC0073	194,096	970	97,000	1,493,665	$121,250
LMC01AC0101	173,568	868	86,800	1,336,599	$108,500
LMC01AC0101C	3,913	20	2,000	30,797	$2,500
LMC01AC0125	58,855	294	29,400	452,719	$36,750
LMC01AC0126	222,903	1115	111,400	1,715,405	$139,250
LMC01AC0126x	17,387	87	8,600	132,428	$10,750
LMC01AC0136	175,070	875	87,600	1,348,918	$109,500
LMC01AC0136x	40,448	202	20,200	311,052	$25,250
LMC01AC0171	105,478	527	52,800	813,047	$66,000
LMC01AC0178	50,245	251	25,200	388,045	$31,500
LMC01AC0208	135,191	676	67,600	1,040,946	$84,500
LMC01AC0209a	18,074	90	9,000	138,587	$11,250
LMC01AC0209b	42,847	214	21,400	329,530	$26,750
LMC01AC0209c	40,057	200	20,000	307,972	$25,000
LMC01AC0213	136,036	680	68,000	1,047,105	$85,000
LMC01AC0213xa	32,495	162	16,200	249,457	$20,250
LMC01AC0213xb	76,658	383	38,400	591,307	$48,000
LMC01AC0251	212,100	1061	106,000	1,632,253	$132,500
LMC01AC0269	138,109	691	69,000	1,062,504	$86,250
LMC01AC0290	94,123	471	47,000	723,735	$58,750
TOTALS:	4,996,185	24,981	2,498,000	38,465,726	3,122,500

Table 3.03-6 Downspout Disconnect Evaluation (continued)

3.04 MODEL RESULTS

Once the watershed alternatives were evaluated and refined, Strand prioritized the alternatives that provided the most benefit to CSO 005 and worked with XCG to incorporate these wet weather solutions into the Lick Run Model.

A. Stormwater System

XCG added a parallel pipe network to the model for the stormwater captured from the newly-separated catchments and directed those pipes toward the proposed daylighted stream. To reduce the processing time required to simulate the various control alternatives being considered, the storm network was modeled as an identically-sized parallel system to the CSS proposed. The elevations, lengths, and diameters of the stormwater pipes are the same as the combined system with the roughness adjusted to match the presumed concrete of the stormwater system.

In evaluating the stormwater reduction, to be addressed through separation, it was assumed that some stormwater would continue to enter the combined system. Through means such as incompleteness, leaks in the combined sewers, and hidden connections such as abandoned downspout connections.

To model this condition, catchments were assigned a percent effective based on estimated likelihood of problems. Priority catchments were split into two subcatchments so one subcatchment flowed to the stormwater system and a second flowed to the combined system. The areas of the split subcatchments were proportional to the percent effectiveness. The two subcatchments were identical except for the area and the width (area divided by flow-path length).

B. Downspout Disconnection

Disconnection of downspouts was examined to see the impact on the combined sewer outside the stormwater system. For modeling purposes, a decrease in impervious area for the affected catchments was made proportional to the percent effectiveness of downspout disconnection. A value of 30 percent effectiveness was assumed for downspout disconnection based on previous experience by the Lick Run Wet Weather Strategy team.

C. Detention Storage

Detention of stormwater was examined to see the impact on the combined sewer. Six detention areas were modeled in combined sewer/nonpriority areas. The volume of each detention area was found using the topography of the site. The outflow was assumed to be a small pipe (6 inch or 12 inch) flowing into the combined system.

D. Results

Based on the calibration storms modeled using the updated catchments, the existing conditions model was considered reasonably calibrated for the level of effort of this study. The existing conditions were modeled for the 2-year 24-hour, 10-year 24-hour, and the 1970 Typical Year rainfalls. The dry weather flow from the Lick Run basin entering the Auxillary Mill Creek Interceptor 1 was found to be 8.5 cfs or 5.5 million gallons per day. The wet weather volume was found by subtracting the dry weather flow volume from the total flow volume reaching the CSO regulator. The volumetric percent control of the event was the overflow volume divided by the wet weather volume.

In addition to the existing condition, five control alternatives were modeled and evaluated for the reduction in CSO volume from the Lick Run watershed. The results are summarized in Table 3.04-1.

1. Scenario One–Existing conditions.

2. Scenario Two–Separate stormwater system parallel to the existing combined sewer in priority areas.

3. Scenario Three–Separate stormwater system in priority areas with disconnected downspouts in combined sewer/nonpriority areas.

4. Scenario Four–Separate stormwater system in priority areas with detention basins routed to the existing combined sewer.

5. Scenario Five–Separate stormwater system in priority basins with detention basins routed to the proposed stormwater system.

6. Scenario Six–Separate stormwater system in priority basins with detention basins routed to the proposed stormwater system and disconnected downspouts in combined sewer/nonpriority areas.

Scenarios	Typical Year		2-Yr Storm		10-Yr Storm	
	Overflow (MG)	% Control	Overflow (MG)	% Control	Overflow (MG)	% Control
1. Existing	1,784	2.5%	160	0.6%	215	0.5%
2. Parallel Pipe	1,109	39.4%	108	33.0%	157	27.6%
3. Parallel Pipe and Downspout Disconnect	1,049	42.7%	104	35.4%	151	30.1%
4. Parallel Pipe with Detention Routed to Existing System	1,105	39.5%	108	32.8%	158	27.1%
5. Parallel Pipe with Storage Routed to Parallel Pipe	1,043	43.0%	105	35.0%	152	29.6%
6. Parallel Pipe with Storage Routed to Parallel Pipe and Downspout Disconnect	987	46.1%	98	39.1%	143	34.1%

Source: XCG Consultants, Inc.

Table 3.04-1 Model Results

With an existing annual overflow volume of 1,784 million gallons, the model indicates that if the projects identified in Scenario 6 is implemented, the annual overflow could be reduced by 797 million gallons. This does not include the additional benefits provided by real-time control and reforestation.

SECTION 4
COMMUNITIES OF THE FUTURE OPPORTUNITIES

4.01 COMMUNITIES OF THE FUTURE-CONCEPTUAL REDEVELOPMENT

One of the primary wet weather strategies during the conceptual exploration phase was strategically removing stormwater from the combined sewer network via a daylighted stream. Stream daylighting is one wet weather strategy that can not only effectively reduce CSOs, but also create a centerpiece for economic and community redevelopment. Stream daylighting refers to separating a once-existing stream from a combined sewer and constructing an exposed, flowing waterway. In this case, the wet weather strategy involved separating the historical Lick Run from the combined sewer, and allowing water (stormwater runoff and base flows) to flow naturally to Mill Creek.

This wet weather strategy focused on South Fairmount's primary transportation corridor, which consists of westbound Queen City Avenue and eastbound Westwood Avenue. The former is an arterial roadway into Cincinnati's western neighborhoods, and the latter is an arterial roadway connecting the west to Interstate 75, the Mill Creek valley, and downtown Cincinnati. Stormwater flowing through sewers in this corridor contribute to more than one billion gallons annually of CSOs into Mill Creek.

In response to the potential for daylighting a stream in this corridor, Human Nature explored three alternative redevelopment opportunities: an Urban Ravine/Canal alternative, a Green Spine/Central Park alternative, and a Green Street/Main Street alternative. These alternatives represent a spectrum of redevelopment scenarios, from one that closely mimics existing conditions (Alternative 1), to one that represents a complete transformation of the corridor (Alternative 3). Common to each is a centralized, daylighted stream and opportunities for a mix of redevelopment and community improvements.

A. Alternative 1: Urban Ravine/Canal

The Urban Ravine/Canal alternative, shown in Figure 4.01-1, involves slightly reconfiguring the existing Queen City Avenue/Westwood Avenue alignments. Queen City Avenue is better integrated with Harrison Avenue, another main thoroughfare into the city's western neighborhoods. This alternative encourages mixed-use redevelopment (including commercial, office, and residential uses) where purple blocks are shown. Stream-side building frontage would include terraces, outdoor seating, and/or patios overlooking the stream or canal. Larger-scale, mixed-use redevelopment (industrial, institutional, and/or commercial) is proposed at the eastern end of the corridor, and historical anchor buildings, shown as black blocks in plan, are preserved. Because of steep slopes south of Westwood Avenue, this alternative includes smaller-scale redevelopment in this area. In addition to a ravine-like daylighted stream, the central area contains opportunities for trails and pathways, active recreation, and other amenities. This eastern section of the corridor would be the primary interactive, civic, and celebratory space for the neighborhood, contain pathways and promenades, and celebrate the connection of the stream to Mill Creek.

Source: Human Nature, Inc.

Figure 4.01-1 Urban Ravine/Canal Alternative

B. Alternative 2: Green Spine/Central Park

Figure 4.01-2 shows the Green Spine/Central Park alternative, which would maintain current traffic configuration (the existing Queen City/Westwood alignments). This alternative also encourages mixed-use redevelopment (including commercial, office, and residential uses) where purple blocks are shown, and larger-scale mixed-use redevelopment (industrial, institutional, and/or commercial) at the eastern end of the corridor. Historical anchor buildings, shown as black blocks in plan, are preserved. Due to steep slopes south of Westwood Avenue, smaller-scale redevelopment is proposed in this section of the corridor. The keystone of this alternative is a central greenspace, which becomes the "Central Park" for South Fairmount. This area would contain opportunities for active and passive recreation. The primary interactive, civic, and celebratory space for the neighborhood is at the eastern end of the corridor, where the connection of the stream to Mill Creek is celebrated with several large-scale detention areas. In addition to providing additional water quality benefits, these areas would integrate opportunities for recreational uses (fishing, paddle boats), and contain civic spaces and/or plazas.

Source: Human Nature, Inc.

Figure 4.01-2 Green Spine/Central Park Alternative

C. Alternative 3: Green Street/Main Street

As shown in Figure 4.01-3, the Green Street/Main Street alternative combines Queen City and Westwood Avenues into one, multilane parkway with street trees and improved traffic flow. This would integrate well with recent improvements to Queen City Avenue. The former Queen City Avenue would be transformed into a "Main Street," with an improved pedestrian realm (traffic-calming elements, street trees, and street planters). This alternative encourages mixed-use redevelopment (including commercial, office, and residential uses) where purple blocks are shown. Buildings face the Main Street, and the stream-side buildings include terraces, outdoor seating, and/or patios. Historical anchor buildings, shown as black blocks in plan, are preserved. This alternative also promotes larger-scale mixed-use redevelopment (industrial, institutional, and/or commercial) at the eastern end of the corridor, and creates a central greenspace with a daylighted stream, trail/path opportunities, active recreation, and other amenities. The primary interactive, civic, and celebratory space for the neighborhood is at the eastern end of the corridor, where the connection of the stream to Mill Creek is celebrated with a large-scale pond/detention area.

Source: Human Nature, Inc.

Figure 4.01-3 Green Street/Main Street Alternative

D. Synthesis Plan

The synthesis plan represents the recommended alternative for the South Fairmount corridor. As shown in Figure 4.01-4, this plan adopts most of the components of Alternative 3: Green Street/Main Street, and contains the following components:

1. Combine Queen City and Westwood avenues into one, multilane parkway with street trees and improved traffic flow, which integrates well with recent improvements to Queen City Avenue.

2. Transform the former Queen City Avenue into a Main Street, with an improved pedestrian realm (traffic-calming elements, street trees, and street planters).

3. Preserve architecturally-significant buildings (shown as black blocks in plan).

4. Encourage mixed-use redevelopment (including commercial, office, and residential uses) where purple blocks are shown. Buildings face the Main Street, and the stream-side buildings include terraces, outdoor seating, and/or patios.

5. Promote larger-scale mixed-use redevelopment (industrial, institutional, and/or commercial) at the eastern end of the corridor.

6. Create a central greenspace with a daylighted stream, trail/path opportunities, active recreation, and other amenities.

7. Celebrate the connection of the stream to Mill Creek with a large-scale pond/detention area, which would be the primary interactive, civic, and celebratory space for the neighborhood.

It should be noted that this plan is preliminary, as it was proposed prior to a detailed feasibility study.

Source: Human Nature, Inc.

Figure 4.01-4 Synthesis Plan

Figure 4.01-5 shows the distribution of redevelopment opportunities for the Preliminary Synthesis plan. The majority (30 acres) of the corridor is devoted to green space with active and passive recreation opportunities and civic spaces. There are 24 acres devoted to mixed-use redevelopment (industrial, institutional, and commercial uses), and slightly more than 16 acres proposed for pedestrian-oriented redevelopment (commercial, office, and residential uses).

Mixed-Use Redevelopment
(Industrial, Institutional, Commercial)
24 acres

Pedestrian-Oriented Redevelopment
(Commercial, Office, Residential)
16.3 acres

Green Space
(Active and Passive Recreation, Civic Spaces)
30 acres

Source: Human Nature, Inc.

Figure 4.01-5 Distribution of Redevelopment Opportunities for Synthesis Plan

4.02 TRAFFIC IMPROVEMENTS

Strand did a cursory review of the traffic counts provided by Ohio Department of Transportation (ODOT) and Cincinnati Department of Transportation Engineering (DOTE). This preliminary evaluation indicated that roundabouts could improve the flow of traffic for the Synthesis Plan. Figure 4.02-1 represents the current circulation of traffic in the project focus area.

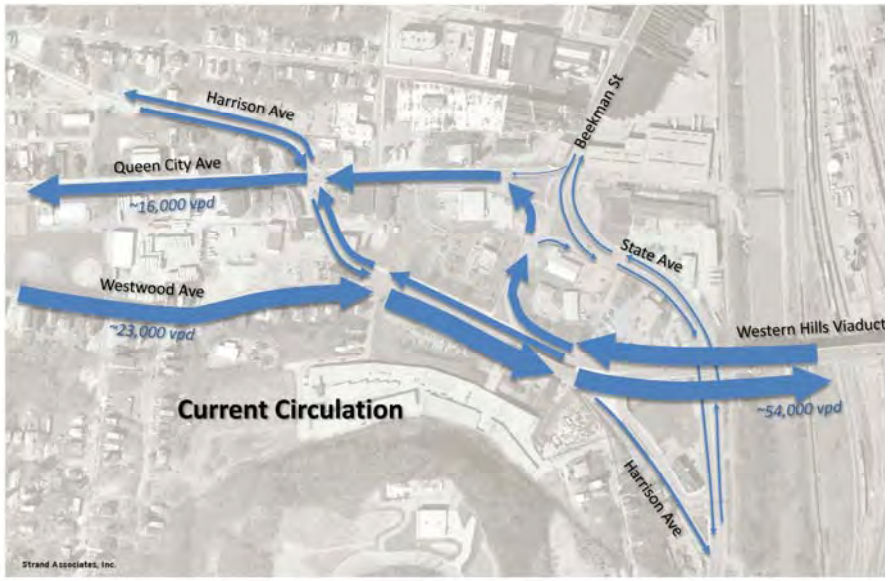


Figure 4.02-1 Existing Traffic Flow Patterns

Roundabouts provide significant benefits to the community including:

1. Improved safety.
2. Reduced traffic congestion.
3. Reduced pollution and fuel use.

Figure 4.02-2 shows a potential opportunity to improve traffic circulation with the installation of three roundabouts. Figure 4.02-3 shows an aerial view of the three proposed roundabouts.

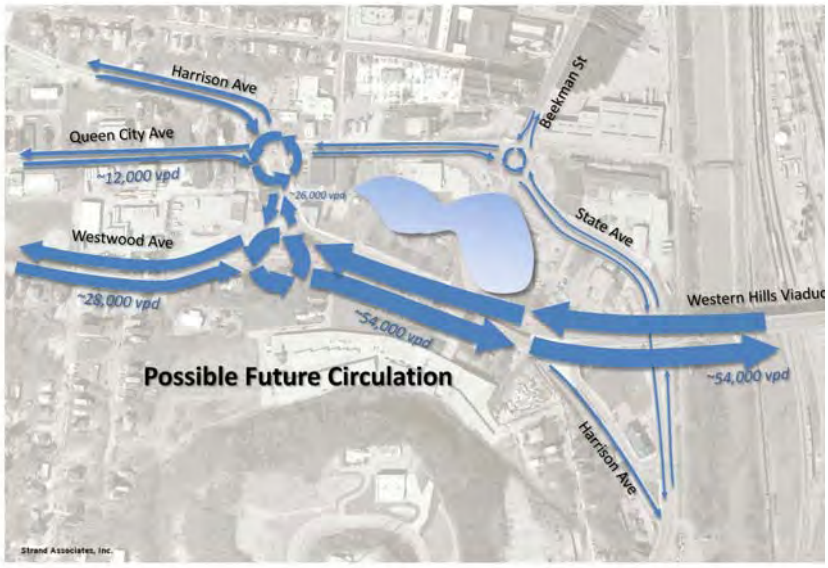
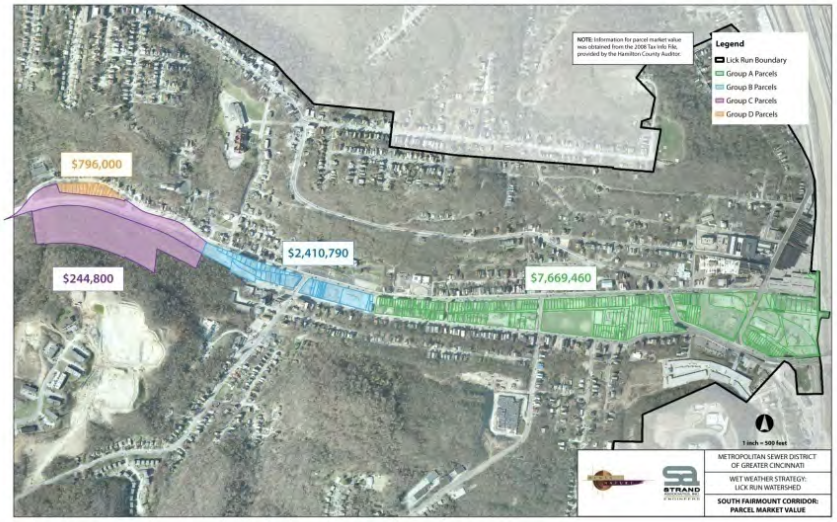


Figure 4.02-2 Possible Future Traffic Circulation

Figure 4.02-3 Possible Future Traffic Control: Roundabouts

4.03 PROPERTY MARKET VALUE

Daylighting Lick Run through such a large corridor requires significant coordination among existing property owners and local government agencies; therefore, Human Nature and Strand completed a coarse assessment of property in South Fairmount. Specifically, the consultant team identified property ownership, the number and area of parcels, and the current market value of the property, which is based on the Hamilton County Auditor's Tax Information Dataset. In response to different types of daylighting strategies, the corridor was divided into four groups (A, B, C, or D). Figure 4.03-1 shows the boundaries of the four different property groups in the South Fairmount corridor, and Table 4.03-1 summarizes the number of parcels, total area, and market value for each property group. As of June 2009, the total market value for properties in the corridor is approximately $11.1 million. The 65-acre corridor contains 349 parcels, 257 of which are privately owned and 92 of which are publicly-owned. In terms of area, however, publicly-owned parcels account for more than half of the total corridor.



Source: Human Nature, Inc., Strand Associates, Inc.®

Figure 4.03-1 Property Value Assessment

SECTION 5
COST-BENEFIT ANALYSIS

5.01 COST-BENEFIT ANALYSIS

In conjunction with MSD, the Lick Run Wet Weather Strategy Team evaluated a variety of alternatives for the overall project cost. Figure 5.01-1 indicates that the total project cost could range from $67.4 to $152.6-million dollars.

FIGURE 5.01-1

COST-BENEFIT ANALYSIS

LICK RUN COSTING ALTERNATIVES - DRAFT

PROJECT ELEMENT	PROJECT ELEMENT COST (Million$)	ALTERNATIVES A	B	C	D
Strategic Sewer Separation					
Pipe Size of Separate System is Equivalent to Adjacent Combined System (66% contingency)	$41.0				X
Pipe Size of Separate System is Downsized from Combined System (66% contingency)	$36.5	X	X		
MSD Cost Estimating Group Unit Costs Strategic Sewer Separation (10% contingency)	$75.2			X	
Daylighting Stream Channel					
8,000 Feet of Open Stream Channel Enhanced Cost (66% contingency)	$96.0				X
8,000 Feet of Open Stream Channel Base Cost (66% contingency)	$22.1				
8,000 Feet of Open Stream Channel Enhanced Cost (40% contingency)	$80.9				
8,000 Feet of Open Stream Channel Base Cost (40% contingency)	$18.6				
8,000 Feet of Open Stream Channel Enhanced Cost (25% contingency)	$72.3		X		
8,000 Feet of Open Stream Channel Base Cost (25% contingency)	$16.6	X		X	
Property Acquisition					
Property Acquisition Areas A, B, C, & D (Hamilton County Auditor - Market Value)	$11.1			X	X
Property Acquisition - Without Public Properties (Hamilton County Auditor - Market Value)	$9.7	X	X		
Other					
Detention	$1.5	X	X	X	X
Downspout Disconnect Non Priority Basins	$3.0	X	X	X	X

ALTERNATIVE:	A	B	C	D
TOTAL PROJECT COST FOR EACH ALTERNATIVE:	$67.3	$123.0	$107.4	$152.6
COST PER GALLON OF OVERFLOW REDUCED:	$0.08	$0.15	$0.13	$0.19

DRAFT
Strand Associates, Inc
July 15, 2009

Base Channel Project:

Basic channel construction
- 6' deep, 93' top width, 45' bottom width

Nine cast-in-place clear span bridges
Water main relocations for crossing the new channel
Sanitary sewer relocations for crossing the new channel

Enhanced Channel Project:

Enhanced restoration:
- Bike paths, restored sidewalks, aeration feature, concrete overlook at bridges with canopies, enhance lighting, blue light emergency telephones, interpretive signs, benches, trash receptacles, enhanced landscaping, active recreation area, amphitheater with landscaped sitting area, sheltered gathering spaces, security lighting and cameras, and drinking fountains

Roadway improvements:
- Westwood reconstruction with streetscaping
- Queen City reconstruction with streetscaping
- Three roundabouts

Enhanced Conspan architectural multi-cell bridges
Level control facility
Pond area with landscaping
Low flow channel with concrete bottom and cut stone lined sides
Water main and water service replacements (Westwood and Queen City)
Sewer main and sewer service replacements (Westwood and Queen City)