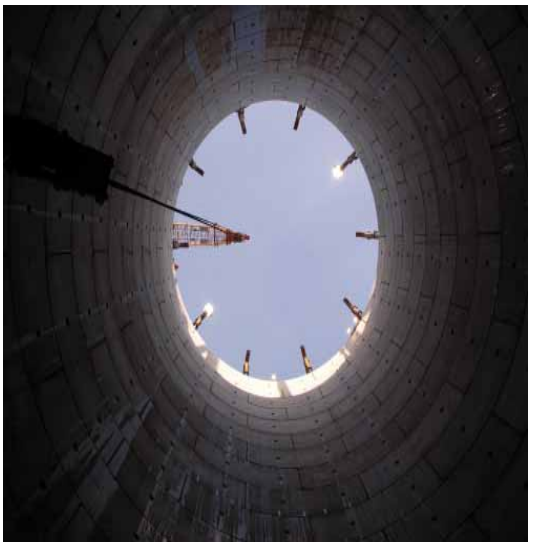
Lower Mill Creek Partial Remedy



Lower Mill Creek Partial Remedy (LMCPR) Study Report

December 18, 2012

METROPOLITAN SEWER DISTRICT of greater CINCINNATI

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1. Executive Summary

The Lower Mill Creek Partial Remedy (LMCPR) Study Report (Report) is a submission required under the approved Final Wet Weather Improvement Program (WWIP) pursuant to the two federal Consent Decrees entered into by Board of County Commissioners of Hamilton County (County) and the City of Cincinnati (City) (collectively, the Defendants) and U.S. EPA, Ohio EPA and the Ohio River Valley Water Sanitation Commission (ORSANCO) (collectively, the Regulators). The Metropolitan Sewer District of Greater Cincinnati (MSD), which is a County sewer district owned by the County and operated and solely managed by the City, has prepared this Report.

This Report includes a summary of planning, design and evaluation conducted on, the Original LMCPR (a deep tunnel with related treatment equipment)) and an Alternative, Revised Original LMCPR, contemplated in the WWIP. The Report includes technical, policy, public communication and legal-related information and analysis. The Report identifies and proposes the Revised Original LMCPR to achieve an integrated watershed solution for the Lower Mill Creek, which will achieve significant volumetric reductions in combined sewer overflows (CSOs), and provide water quality benefits. The Regulators are formally requested to modify the WWIP to approve the Revised Original LMCPR as a substitute and replacement for the Original LMCPR. The Report in Exhibit 1 includes proposed modified Attachments to the WWIP in order to make this change effective.

The WWIP required a LMC Study to evaluate the Original LMCPR costs, logistics, and feasibility and allowed for the proposal of an Alternative, with certain conditions. The WWIP specifies that a Revised Original LMCPR must: (1) control a significant annual volume of Lower Mill Creek CSO (identifying a volume of 2 billion gallons (BG) based upon modeling available in 2009); and (2) be completed by the applicable WWIP Phase 1 end date. The Regulators subsequently provided informal written guidance criteria regarding key issues that this Report should include regarding an Alternative.

As contemplated by the WWIP, MSD has conducted initial planning and design of projects which are proposed in the Report as the Revised Original LMCPR. In the LMC Study, MSD utilized a systematic sustainable watershed evaluation planning process (SWEPP) to achieve the necessary volume of CSO volume control and meet the substantial construction milestone of December 31, 2018, the end of WWIP Phase 1. In its work, MSD has followed regulatory guidance, communicated frequently with the Regulators and since July 2012 held weekly technical conference calls with the Regulators to discuss the technical elements of the Revised Original LMCPR.

The alternatives analysis performed for the Lower Mill Creek Study is essentially the same, but greatly enhanced, as that performed in the preparation of the Final WWIP. The extensive WWIP project selection work set the groundwork for the cost analyses that have been performed for this Report. Costs are reported in 2006 dollars to enable direct comparison with the WWIP costs. However, the cost of the Alternative will also be converted to current dollars, which would be 2012 dollars at this time.

The suite of projects included in the Revised Original LMCPR include projects within the Lick Run, Kings Run, West Fork and Bloody Run watersheds where MSD has taken a source control approach to achieve

CSO reductions while also utilizing right-sized conveyance and storage solutions. The Revised Original LMCPR is estimated to achieve a CSO volume reduction of 1.78 BG, based 2011 modeling using the typical annual rainfall, at a cost of $244.3 million (2006$). Converting third quarter 2006 to third quarter 2012 dollars using the multiplier of 1.129914, the cost of the Revised Original LMCPR is $276.0 million (2012$).

Each of the watershed projects within the Revised Original LMCPR has unique attributes that contributes to the overall significance of this comprehensive project.

- Lick Run measures reduce CSO volume by an estimated 624 million gallons (MG) while addressing the largest CSO in the MSD system by installing strategic separation and detention and creating an urban water/valley conveyance system interconnected with various best management practices to improve water quality prior to flow entering the Mill Creek, while also reducing localized flooding and improving community conditions.

- West Fork measures reduce CSO volume by an estimated 173 MG to address the largest overflow within the West Fork Watershed and remove significant volumes of natural drainage from the largest park in the City.

- Kings Run measures reduce CSO volume by an estimated 156 MG by detaining stormwater entry utilizing detention basins to reduce peak flow into the combined, strategically separate flow and repurpose existing infrastructure that is better sized for stormwater and construct a new wet sanitary line.

- Bloody Run measure reduces CSO volume by an estimated 93 MG by installing real time control within the existing interceptor with capacity.

The LMC Study has taken a very comprehensive review of the complex interconnections of manmade and natural systems in the Mill Creek basin in order to identify the best watershed-based solutions. The Revised Original LMCPR will benefit the environment by returning natural drainage to tributaries and streams. The pollutant loading discharges should decrease when compared to existing conditions given the differences between combined sewer overflow and stormwater characteristics. Directing natural drainage and stormwater to water bodies should result in additional base flow to support aquatic life. MSD has invested considerable time and resources to support improvement of water quality in Mill Creek, and will continue to do so with recognition of the cost implications to ratepayers. MSD will continue to collaborate with multiple governmental, nonprofit and other entities to find the best and lowest cost initiatives to achieve compliance and make improvements to the health of our rivers and streams.

Planning and coordination on other complementary efforts such as coordination projects with Ohio Department of Transportation with the re-construction of I75 as well as enabled impact projects and policy changes to improve the land development practices that could help reduce future stormwater from sites and reduce volume entering the combined system are also being advanced, though at a strategic level as opportunities arise – these projects are specifically advanced and coordinated as opportunities arise to fit

within the context of the LMC Final Remedy. The sustainable infrastructure in the Revised Original LMCPR can leverage actions by non-MSD partners and private entities for additional water quality improvement.

The LMC Study also enabled MSD to invest considerable time and expertise into the advancement of its hydraulic and hydrologic model that provides better accuracy in calculating estimated volumes and has improved its overall understanding of the system. Modeling has been vetted through industry experts on a peer review panel to ensure accuracy and best practices are developed and advanced in model updates. Updated modeling and system information has also identified WWIP projects which are no longer needed, which are identified on Table 10-2 and Revised Attachment 2 in Exhibit 1.

The Revised Original LMCPR provides a comprehensive, sustainable solution to major CSOs in the Lower Mill Creek. It does so at costs in line with the original WWIP planning estimate and significantly less than the costs of a tunnel solution such as the default project. Through the advancement of integrated watershed planning efforts, MSD is confident that water quality within the Mill Creek watershed will continue to improve as it has shown marked improvement over the last 15 years.

2. Introduction

The federal District Court approved the Final Wet Weather Improvement Plan (WWIP) which required the construction of the tunnel (Original LMCPR) in the LMC, a 40,000 acre watershed, by December 31, 2018. The WWIP also required a LMC Study to evaluate the tunnel costs, logistics, and feasibility and allowed for the proposal of an alternative, with certain conditions such as equal or greater control of CSO annual volume as the Original LMCPR and is completed by the end of Phase 1 End Date. The LMC Study is due by December 31, 2012.

2.1 LMC Study Area and Approach

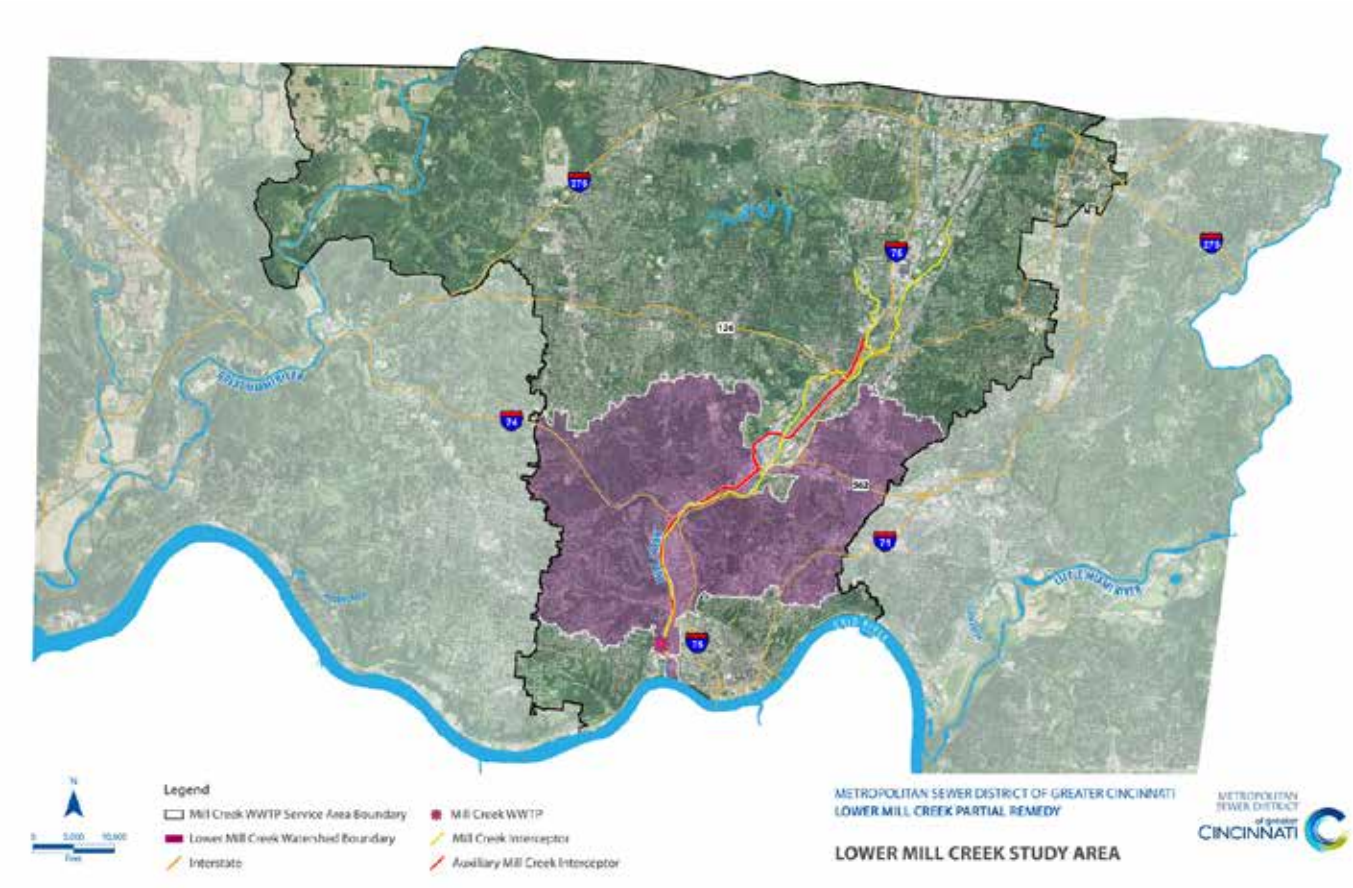
Because of the integrated nature of the interceptor system within the Mill Creek basin, this LMC Study was integrated with analysis of the entire Mill Creek WWTP service area including the potential control measures in the SSO 700 Final Remedial Plan. Figure 2-1 presents the LMC Study Area.

MSD has evaluated two approaches to elimination of a substantial volume of the overflows in the LMC, including:

- A traditional "grey" approach that includes an underground storage tunnel and enhanced high-rate treatment facility to capture and treat CSOs before they reach Mill Creek, a tributary of the Ohio River; this is the tunnel, identified as the “default” approach and the Original LMCPR in the Final WWIP.

- A sustainable approach that primarily seeks to control CSOs by reducing the amount of stormwater entering combined sewers; examples include new storm sewers, stormwater detention basins, and restoration of existing or defunct streams; this is the alternative.

Figure 2-1 Lower Mill Creek Study Area



2.2 Default Tunnel Evaluation

The Original LMCPR consists of a 7,600 feet long, 30-foot diameter deep tunnel; 84 mgd dewatering pump station; 84 mgd Enhanced High Rate Treatment (EHRT) Facility; and four Real Time Control (RTC) facilities. The Original LMCPR was projected to have a capital cost of $244.3 million (2006$) (exclusive of the RTCs) and to remove a CSO volume of 2 BG in a typical year. The four RTCs have been constructed and remain as components of the LMCPR.

As the LMC Tunnel design and the LMC Study have progressed, two important changes have occurred: LMC Tunnel costs have increased significantly and the projected CSO volumetric reduction has decreased. The net effect is that the Original LMCPR is no longer cost-effective in comparison to the sustainable alternative described in this document. Changes that have occurred to the Original LMCPR are briefly described below, with references to more detailed documents that contain supporting information.

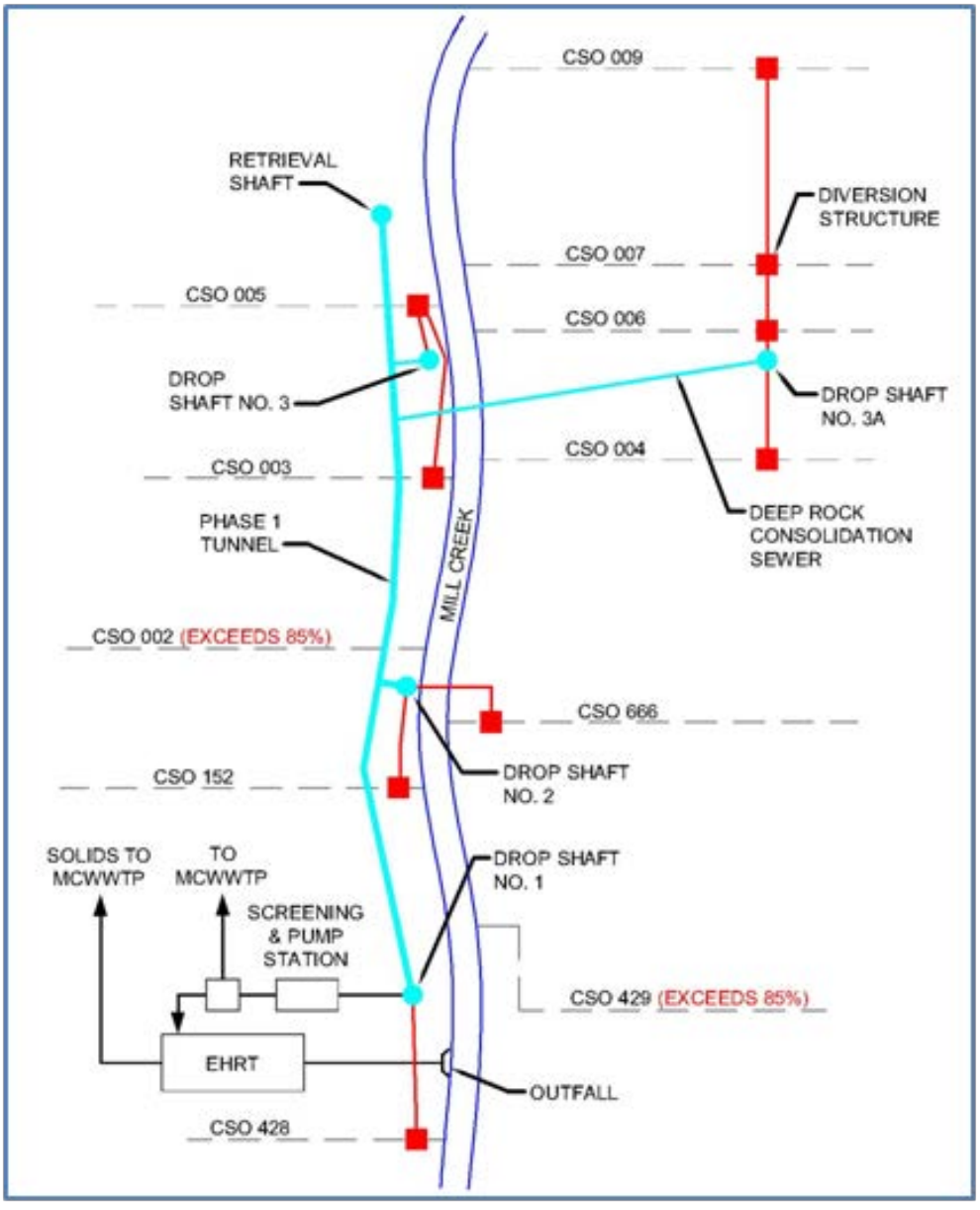
LMCPR Default Plan Cost Revisions

Estimates of total project costs for the Original LMCPR have been revised from $244.3 million (2006$) to $414.4 million (2006$) from the WWIP Project of Record (February 2009) to the "LMCPR Draft Revised Concept Report" (May 2011, Black & Veatch/CH2M Hill). The reasons for the increase in costs are numerous, but are mostly due to the following:

- Changes in facility locations to facilitate overlapping construction schedules to complete the project on time
- Constructability and accessibility details that greatly increased the scope and costs of CSO consolidation sewers and diversion structures
- Resizing of consolidation sewers to convey typical year peak flows in lieu of flows associated with 85 percent control, in conjunction with new peak flow projections from the updated Mill Creek System Wide Model (SWM)
- Recommendation of a cavern-style dry pit pump station in lieu of a submersible pump station for hydraulic and safety reasons
- Addition of a deep shaft screening structure prior to tunnel dewatering pumps
- Slight increase in tunnel length to facilitate construction of a potential future tunnel extension

A detailed accounting of the Default Plan cost revisions is contained in the following: *Default Plan & Modified Default Plan Costs*, December 2012, and MSD's *Preliminary Findings Results Report*, July 2012. The updated design concept that was evaluated for the LMC Tunnel is shown on Figure 2-2.

Figure 2-2 Conceptual Tunnel System Layout Schematic



Original LMCPR CSO Volumetric Control Revisions

System Wide Model (SWM) updates are more fully described in Section 4. Based upon those updates, CSO volumetric control values changed for the Lower 11 CSOs tributary to the LMC Tunnel and for the RTC facilities. The revised values are shown in Table 2-1. The WWIP Attachment 1C CSO volumetric control value for the Default Plan has been reduced from 2.01 BG to 1.78 BG.

Table 2-1 Original LMCPR Default Tunnel Metrics

CSO	SWM Version 3.2		SWM Ver. 4.2 Detailed Revised Concept Default Tunnel	
	Inflow Volume (MG)	Overflow Volume Remaining (MG)	Overflow Volume Removed (MG)	Overflow Volume Remaining (MG)
9	116	60	43	17
7	44	22	15	7
6	30	10	6	5
5	1844	1454	1177	277
3	13	3	1	2
4	30	20	16	5
2	7	1	0	1
666	283	283	241	42
152	9	4	3	1
429	3	0	0	0
428	50	10	3	8
RTCs at Badgeley, Ross Run & Mitchell	NA	NA	282	NA
Overall Totals	2,429	1,867	1,785	364

2.3 Analysis and Public Engagement

The approaches are detailed and compared in the LMCPR Alternatives Evaluation Preliminary Findings Report, dated July 2012, which was provided to the public and Regulators as a preliminary report on the on the LMC Study.

On September 26, 2012, MSD recommended the sustainable approach to the County Commissioners and City Council, and that Recommendation report has also been delivered to the Regulators and made available to the public.

MSD sponsored a formal public comment period on the LMCPR from June 26, 2012 to September 4, 2012 to obtain feedback from the community on their preferred solution. MSD also sponsored two community "town hall" meetings during the comment period to provide the public with technical and cost details on the gray and sustainable approaches.

In addition to the MSD-sponsored public comment period, the Hamilton County Commissioners sponsored their own public comment period from September 26 – October 26, 2012. During that period, the

commissioners sponsored four public hearings on September 26, October 3, October 8 and October 10. The October 8 hearing was held at the MSD Administration Building. MSD Executive Director Tony Parrott presented his recommendation for the sustainable approach at each hearing, and then answered questions from the commissioners. The public gave oral comment following the Q&A session.

With the submission of this LMC Study Report, MSD and the Defendants have refined the recommended sustainable approach and proposes a Revised Original LMCPR. The specific suite of projects includes a mix of green and grey projects in the Lick Run, West Fork, Bloody Run and Kings Run watersheds.

The sustainable infrastructure projects selected for the LMCPR are a result of a detailed analysis and community outreach over the last three years, represent the lowest cost solution among the two LMCPR approaches studied by MSD, and comply with project selection guidance from the Regulators. This analysis follows USEPA's Integrated Framework issued as final policy guidance in June 2012. The projects once constructed are estimated to reduce annual combined sewer overflows by 1.78 BG at a cost of $244.3 million (2006$). MSD is prepared to implement these projects for substantial construction completion by December 31, 2018 and will report on their advancement to the Regulators and the public to ensure transparency and timely project completion.

3. Revised Original Lower Mill Creek Partial Remedy

After three years of detailed analysis and evaluation, MSD recommends the use of a sustainable approach for the proposed Revised Original LMCPR in the WWIP, as this represents the lowest cost solution among the LMCPR approaches studied by MSD and complies with project selection and policy guidance from the Regulators issued in October 2011 (Appendix C). The Revised Original LMCPR conforms to Regulator requirements, is designed to provide equal control of annual CSO volumes as the tunnel using the revised modeling, and will be constructed by December 31, 2018. Equivalent control of annual CSO volumes is defined as an estimated 1.78 BG based on results from the 2011 revised baseline system wide model (SWM) (which was compared to the figure an estimated 2 BG under previous modeling referenced in Attachment 1C to the WWIP). The projects are estimated to cost $244.3 million (2006$).

Table 3-1 summarizes the project descriptions of the Revised Original LCMPR. This suite of proposed projects provides flexibility for the Defendants to consider various Lower Mill Creek Final Remedy (LMCFR) alternatives which will be evaluated in accordance with the WWIP. Other projects which were evaluated but not included in this proposed alternative can be considered for the LMCFR. This proposal is a cost effective and long term sustainable alternative that is based on the principles of EPA's Integrated Planning Framework.

Table 3-1 Project Description of the Revised Original LMCPR

Lick Run Separation & Channel Conveyance	Kings Run Separation & Wooden Shoe Storage
• 54,300 feet of storm sewer • 3,600 feet of relocated combined • 8 SW detention basins/floodplain enhancements; approximately 22 acre feet of storage • 4 Vortech Units • 8,700 feet of valley conveyance system with approximately 5,600 linear feet daylighting as partial open conveyance system • 9,900 feet of natural conveyance, inlet sealing and stream restoration	• 5,700 feet of storm sewer • 7,200 feet of combined sewer converted as SW only pipe and new combined sewer • 1.5 million gallons combined storage at CSO 217 • 4 SW detention basins; approximately 21 acre feet of storage • Stream bank Stabilization and restoration measures
West Fork Separation and Detention	**Bloody Run Real Time Control**
• 500 feet of storm sewer • 7,600 feet of basin discharge pipe • 2 stormwater detention basins; approximately 23 acre feet of storage	• RTCs at CSOs 5, 482, 485, 125 and raising of the West Fork channel grates (already constructed) • Bloody Run (CSO 181) watershed RTC

Note: Individual project statistics and descriptions listed above, for example 'length of feet of sewer,' are estimated and subject to ongoing detailed design and do not constitute specific performance criteria or design criteria.

The projects in the Revised Original LMCPR were selected from a pool of candidate projects based on relative comparisons between projects for several critical factors. A simple process decision matrix helped communicate the qualitative status (average, above average, strong) by factor for each project. These relative factors are defined below and provided in Table 3-2 for the recommended suite of projects.

- **Community Engagement** – community has been engaged and involved in project understanding and development.
- **Regulatory Buy-in** – project has been reviewed by the Regulators and favorable feedback was received.
- **Stormwater BMPs** – stormwater management best management practices are incorporated into the watershed evaluation.
- **Urban Water Enhancement** – project improves the urban water inventory of natural systems in the Lower Mill Creek.
- **EPA Integrated Planning** – project utilizes an approach that is in agreement with USEPA's Integrated Policy Framework.

- **Construction Opportunities** – project has opportunities for construction coordination with other public or private entities to achieve CSO volume control.

- **Design at or above 30%** - design stage of project meets the required schedule (completion by December 31, 2018).

Table 3-2 Process Decision Matrix for Revised Original LMCPR

Revised Original LMCPR													
Subbasin	CSO Reduction (MG)	Capital Cost (2006$)	Cost/ gallon	No. of CSOs	CSOs	Community Engagement	Regulator Buy-in	Stormwater BMPs	Urban Water Enhancement	EPA Integrated Planning	Construction Opportunities	Design at or above 30%
Lick Run	624	$192,696,000	$0.31	1	5	¤	¤	¤	¤	¤	¤	¤
Kings Run (Wooden Shoe)	156	$34,850,000	$0.22	2	217, 483	¢	¤	¢	¤	¢	Ÿ	¢
Bloody Run RTC	93	$3,607,000	$0.04	1	181	Ÿ	¤	Ÿ	Ÿ	Ÿ	¢	Ÿ
West Fork Detention/ Separation	173	$13,214,000	$0.08	3	125, 127, 128	¢	¤	¤	¢	¤	Ÿ	Ÿ
4 RTCs & Grates (installed)	737	--	--	--	5, 482, 485, & 125	¤	¤	Ÿ	Ÿ	Ÿ	Ÿ	¤
	1783	*$244,367,000*		*7*								

As compared to the MSD Recommendation Report dated September 26, 2012, the following refinements were made to finalize the Revised Original LCMPR:

- Two separation projects (Grand & Selim and Westwood) were removed from the Lick Run watershed project. These two projects are stand alone, therefore not impacting the overall watershed solution in Lick Run. The projects may be part of the LMCFR.

- The West Fork projects focus on stream separation for CSOs 125, 127 and 128 which provides a large benefit of overflow reduction at a low cost per gallon. The CSO reduction is prioritized for the largest CSO within the West Fork watershed and immediate/simple disconnections of hillside from Mt. Airy forest. These Phase 1 projects fit into the overall watershed solution for West Fork. The projects not included at this time within West Fork watershed may be part of the LMCFR.

- CSO 488 storage tank was removed from Phase 1 and may be part of the LMCFR.

- Kings Run (Wooden Shoe) and the Bloody Run RTC projects remain the same as presented in the Recommendation Report. The costs for Kings Run were updated to match the current model.

The analysis of alternatives included an evaluation of project compatibility with the Phase 2 LMCFR. As the Revised Original LMCPR was evaluated and developed, the projects recommended for consideration have qualities that make them compatible with multiple, potential LMCFR proposals. The LMCPR Study demonstrated that each LMCPR project fits into a conceptualized LMCFR strategy. The conceptualized LMCFR strategy was evaluated as part of the LMCPR study and summarized in the *MSD's Preliminary Findings Results*, dated July 2012. As summarized in that report, the sustainable alternative is compatible with a wide range of final remedy solutions between the green/grey spectrums. Additional SWEPPs have started (e.g., CSO 488 in the South Branch Mill Creek watershed) or will be performed in the watershed of the remaining Mill Creek WWTP service area to provide a basis for sustainable alternative evaluation.

3.1 Integrated Watershed Approach

In June 2012, USEPA finalized the "Integrated Wastewater and Stormwater Policy Framework" to assist communities in developing and prioritizing Clean Water Act obligations and solutions in a more cost effective and environmentally sound way based on community priorities. In that policy, USEPA affirmed that it has "*increasingly embraced integrated planning approaches to municipal wastewater and stormwater management."* The policy also explains that integrated planning can *"facilitate the use of sustainable and comprehensive solutions, including green infrastructure, that protect human health, improve water quality, manage stormwater as a resource, and support other economic benefits and quality of life attributes that enhance the vitality of communities."*

The development of the integrated approach came out of a growing body of research and case studies on the use of green infrastructure to address wet weather discharges. In 2007 USEPA issued a memorandum (USEPA, 2007) supporting the "development and use of green infrastructure in water program implementation."

The following subsections summarize MSD's overall philosophy regarding the sustainable and source control approach, which is the foundation of the Recommended Revised Original LMCPR. Section 3.2 provides detailed descriptions of the specific projects included in the Revised Original LMCPR. Section 3.3 discusses the how the Revised Original LMCPR fits into the future LMC Final Remedy. Section 3.4 provides information of other direct projects, enabled impact projects, and community coordination within the LMC study area outside of the Revised Original LMCPR.

3.1.1 Sustainable Watershed Evaluation and Planning Process (SWEPP)

In 2007 Hamilton County led an effort to develop a conceptual outline of a green infrastructure program to address CSOs. That approach was rejected by the Regulators because it relied primarily on municipal code changes and their impacts on redevelopment in relevant areas, as opposed to large-scale purchases and control of real estate. In 2008 Hamilton County pursued changes to the Ohio Revised Code 6117 to allow sewer districts to fund stormwater mitigation projects to reduce CSOs. The County also provided MSD with policy direction supporting the use of green/sustainable infrastructure. The changes in law and continued policy direction allowed for a watershed-based approach that could include green infrastructure, or other methods, to eliminate, control, or reduce stormwater impacts to the combined sewer system. The

Defendants submitted a new plan that was conditionally approved by the Regulators in 2009, and formally approved as the Revised WWIP in 2010, which included a 3 year LMC Study to develop alternatives to the default solution.

In 2009, mirroring EPA's shift toward integrated planning approaches in wastewater and stormwater management, MSD began developing what is now the Sustainable Watershed Evaluation and Planning Process (SWEPP) to identify the most cost-effective, sustainable, and beneficial combination of infrastructure types for a given watershed. Many of the LMC's eight watersheds were part of SWEPP evaluations, all of which helped to formulate the Revised Original LMCPR.

The SWEPP itself is a formal planning process that provides an integrated decision support system to support the following goals:

- Prioritizing and determining wastewater collection or treatment needs,
- Developing CSO volume reduction solutions that use a hybrid of both grey and green infrastructure
- Facilitating examination of local community and economic benefits, and
- Meeting desired performance objectives.

Originally developed as a four step process, MSD has enhanced the SWEPP process with six broad steps to develop and implement integrated watershed-based master planning shown in Figure 3-1.

Figure 3-1 Steps for the Sustainable Watershed Evaluation and Planning Process

Similar to comprehensive planning, the SWEPP identifies and analyzes the important relationships among the environment, infrastructure, economy, transportation corridors, and communities/neighborhoods on a watershed-wide basis. MSD has developed a SWEPP manual to provide guidance to engineers, planners, consultants, staff and community stakeholders of MSD's current integrated planning approach (*MSD Integrated Sustainable Watershed Management Manual*, prepared by MSD, October 2012).

3.1.2 Source Control Approach

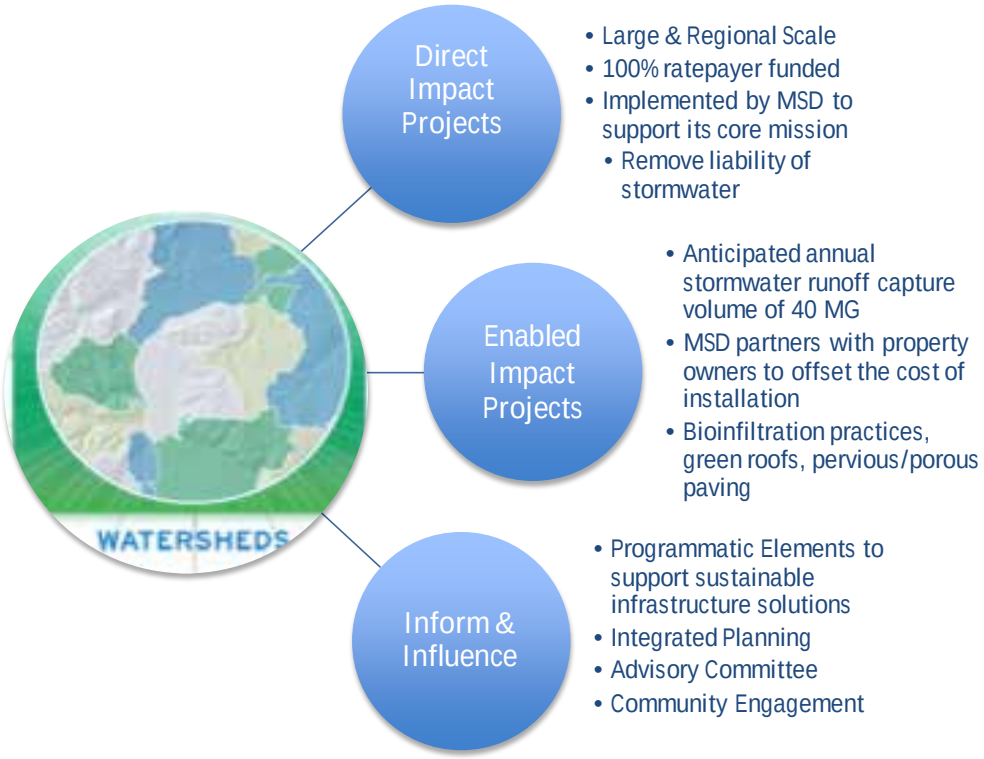
Along with integrated planning approach MSD has determined that source control is an integral step in achieving the long-term goals and solutions outlined in the WWIP. Source control is a foundational priority MSD uses to look for watershed solutions because a large volume of flow within the combined system is natural drainage and hillside run off and other extraneous stormwater. The Mill Creek watershed served by MSD has grown from small developer built systems to an interconnected regionalized system which includes limited capacity interceptors, many CSOs and particularly SSO 700 which create numerous challenges that necessitates a watershed approach. Today under the current economic climate, it is imperative that utilities work with a "regional" perspective and consider projects, infrastructure needs, and system operations holistically through cost-effective integrated watershed planning.

The first step in reducing MSD's combined sewer overflows is removing the natural drainage and cleaner stormwater from the combined sewer system. Over the last 100 years, natural drainage features have been replaced with hard-piped combined sewers. When considered from a source control perspective, stormwater is a resource to be utilized for much broader sustainability purposes, instead of the problem it becomes when combined with sanitary sewage. In the development of source control solutions, aboveground investments are considered to convey and improve the quality of stormwater removed from the combined system. In this way, source control solutions are developed to add greater value to the community and urban water systems through the CSO reduction solution.

MSD's approach is consistent with the integrated framework policy direction of USEPA. Using a watershed approach to identify areas to control or limit natural drainage and stormwater from entering the combined system, the MSD has vetted and developed alternative source control solutions that reduce CSOs, utilize bioengineered systems that mimic natural systems, and provide opportunities for more sustainable community redevelopment. Additionally, source control solutions help prepare communities for climate change effects of greater intensity and more frequent storms, promote energy efficiency, and improve air quality, thereby making communities more livable and desirable. Controlling the flow of source waters is often significantly more cost effective than end-of-pipe controls not only from a capital perspective but also on a life cycle basis and they have been proven to effectively alleviate combined sewer overflows.

Figure 3-2 shows three distinct types of source control projects from a programmatic perspective, which MSD has developed over the past three years through SWEPP evaluations and programmatic considerations.

Figure 3-2 Types of Source Control Projects Identified Using SWEPP



The projects identified in the Revised Original LMCPR are direct projects that will be owned by the County and would be operated and managed by MSD. If ownership transfers it would be to another public entity. Direct source control projects are planned and designed to achieve CSO reduction goals, but they may also address other community priorities, such as water quality and/or public health. These issues are taken into account to develop projects within the context of the existing community and watershed conditions.

MSD incorporated stormwater best management practices (BMPs) in developing specific source control strategies and recommended several for use in the Revised Original LMCPR projects. These BMPs constitute controls of stormwater to the "maximum extent practicable" as contemplated under the Clean Water Act and its standards for municipal stormwater discharges. Design criteria for the new separate storm sewers utilize applicable stormwater rules and regulations for the local jurisdiction; in the case of the LMCPR the City of Cincinnati SMU local requirements were used. These sustainable source control strategies include the following BMPs (in addition to the six minimum stormwater controls required by MS4 permit).

STRATEGIC SEPARATION: Strategic sewer separation is a targeted or prioritized approach to partial sewer separation within a watershed. Where strategic separation is used, typically there may be two different watershed zones – Tier 1 (direct project area) and Tier 2 (non-direct areas with an emphasis on enabled impact and inform & influence projects). For MSD, strategic separation emphasizes disconnecting existing storm sewers from the combined sewer system and creating a new storm only system – using both green and grey components to convey and filter water to receiving streams. It

does not necessarily involve separating stormwater from private properties via downspout disconnections or roof drain redirection. Proposed stormwater infrastructure is sized to accommodate separation of Tier 1 areas only, which then promotes development of near and long-term stormwater controls, which will cost-effectively meet the pre-established WWIP targets and give priority to approaches that best reflect sustainability and selected community preference. Strategic separation provides an opportunity to also integrate the use of small, regional or large-scale stormwater BMPs in Tier-2 areas where direct separation projects are not pursued (i.e. non-separated /enabled impact opportunities) to achieve wet weather reduction and community goals. The approach represents an opportunity to target investment in new backbone of a network of separate stormwater infrastructure and lay the foundation for future sustainable infrastructure in an integrated watershed-based solution.

Strategic separation involves characterizing watershed conditions, identifying volumes to redirect through an alternative stormwater offloading conveyance system. Source control volumes are determined, modeled and potential alignment identified, relative cost and risks determined and considered. Strategic separation may also involve stream daylighting, or the diversion of streams tributary to the combined sewer system through restoration of natural channels or new bioengineered urban water conveyance systems, which convey natural drainage and stormwater flows to the downstream receiving water body. By focusing on strategic separation, MSD anticipates increases in the capacity of combined sewers which will also alleviate/prevent downstream flooding in sewers. Stream daylighting also improves stormwater quality, and may reduce flooding along downstream waterways (open channel systems bioengineered have greater sinuosity and higher roughness to slow flow velocity).

As part of strategic separation, several items are considered including on-site storage, enhanced floodplain which incorporate wetland features, or regional detention basins are evaluated based on existing utilities, vertical alignment of storm sewers, potential for natural conveyance, maximum excavation depths/extents, bedrock and groundwater depths revealed through geotechnical borings, environmental site conditions, access for construction and maintenance, alternative inlet/outlet structures, and maximum side slopes based on safety and geotechnical considerations.

GREEN STREET FEATURES: Also known as curb extensions, these features extend into existing parking lanes. Stormwater collected in the gutter flows into and through the bump-out. The bump-out serves as a temporary wet weather storage, filter, and infiltration. Additionally, it introduces green space and calms the traffic. These features offer the benefit of reducing peak impacts of small storms.

PERVIOUS PAVEMENT: This BMP replaces the existing impervious surface with high rate infiltration pervious materials (pervious asphalt or pervious concrete). The pervious pavement system is comprised of two layers: bottom layer is comprised of gravel to allow water to drain quickly and the top layer of is comprised of pervious material. Stormwater infiltrates through the surface as it flows over parking lanes.

PERMEABLE PAVERS: This BMP replaces the impervious parking and walking surfaces with pervious material such as paving blocks. The paving blocks are laid across a surface with spaces left in

between (interlocking) to allow water to infiltrate. The pervious pavement system is comprised of three layers: bottom layer of gravel storage; middle layer of compacted leveling sand; and top layer of pavers. These pavers are typically used in low traffic areas.

EXTENDED DETENTION WETLANDS: These features are recognized as stormwater storage BMPs. They provide treatment, habitat and eliminate permanent pooling of stormwater. Wetland systems can be designed to recharge local groundwater sources. They provide the benefit of storing water over time and preventing downstream flooding while enhancing pollutant removal capacity.

DETENTION BASINS: A detention basin is a stormwater BMP structure that stores the water over a short period of time (if it is partially filled and always containing some water, then it is called retention) and then the water gets released slowly back into the system. Detention basins offer benefits of reducing peak flows, potentially reducing proposed storm sewer sizes, and providing stormwater quality benefits. Factors to consider include existing terrain and features, existing basins and depressions, and estimated pollutant loadings. MSD considers supplementing the detention basins with bio-enhanced features to provide maximum benefits from the basin to provide more favorable environmental and community benefits.

OPEN CHANNEL CONVEYANCE: Locations having an existing ravine traversing the project limits or where an open channel system previously existed. Consideration for reconstruction of an open channel system requires a bioengineered-approach where there is an opportunity to create an urban waterway and community preference in support may be favorable for open channel conveyance. Factors to consider include geotechnical conditions, existing vegetation or land uses, disturbance limits, required property/easements, inlet sealing, stability and construction cost and impacts.

REFORESTATION: Reforestation in stormwater management is important because it increases the capture of stormwater which reduces the intensity of rain over the surface. This results with reduced stormwater runoff and prevents sediment erosion. Additionally, reforestation is essential to the restoration of many natural habitats. Forested buffers that lie between land and water are an essential part of the ecosystem. Reforestation programs attempt to preserve and restore forested buffers and natural forests. Through reforestation, MSD has focused such efforts in partnership with other entities to target areas for reforestation within existing right-of-way where canopy is deficient and partners can advance reforestation goals through several opportunities, including park improvement, neighborhood and highway beautification, and the planting of shade trees in parking and pedestrian areas.

SEDIMENT FOREBAY: A sediment forebay is a small pool located near the inlet of a storm basin or other stormwater management facility. These devices are designed as initial storage areas to trap and settle out sediment and heavy pollutants before they reach the main basin. Installing an earthen berm, gabion wall, or other barrier near the inlet to cause stormwater to pool temporarily can form the pool area. Sediment forebays act as a pretreatment feature on a stormwater pond and can greatly reduce overall pond maintenance requirements. Forebays also make basin maintenance easier and less costly by trapping sediment in one small area where it is easily removed, and preventing sediment buildup in the rest of the facility.

Strategic separation and large-scale source control measures, such as creation of new urban waterways, are the hallmark of the Revised Original LMCPR. This plan is adaptable and other features and measures can be added in the future to improve CSO mitigation, stormwater management and other overall benefits. Source control solutions serve to increase local capacity and provide a higher level of service because they achieve the following results:

- Provide parallel, separate stormwater conveyance
- Reduce sewer surcharging
- Decrease sewage in basement issues
- Minimize localized flooding
- Reduce energy costs and carbon footprint

3.2 Summary of LMCPR Study and Revised Original LMCPR Projects

The Revised Original LMCPR has undergone significant analysis and review during its development over the last three years. MSD reviewed and updated past WWIP modeling and costing standards with industry standards and protocols. These changes incorporate recent local data (i.e., flow monitoring, model updates, actual project costs), and promote consistency in the comparison of alternatives and the implementation of the Revised Original LMCPR.

The first step of the LMC Study was to perform SWEPP assessments to identify a pool of candidate projects that substantially reduce CSO volumes within the LMC watershed. Then detailed evaluations and as-needed updates of costing assumptions, performance objectives, and modeling methodologies were performed across the various projects to lay the groundwork for consistent system-wide evaluations. Lastly, the various candidate projects were combined into several system-wide alternative project suites, which were assessed based on the critical factors defined in Section 3.1. These factors include community-wide engagement, regulatory buy-in, use of stormwater BMPs, urban water enhancement features, application of integrated planning approaches, opportunities for construction coordination, and project design at or above 30%.

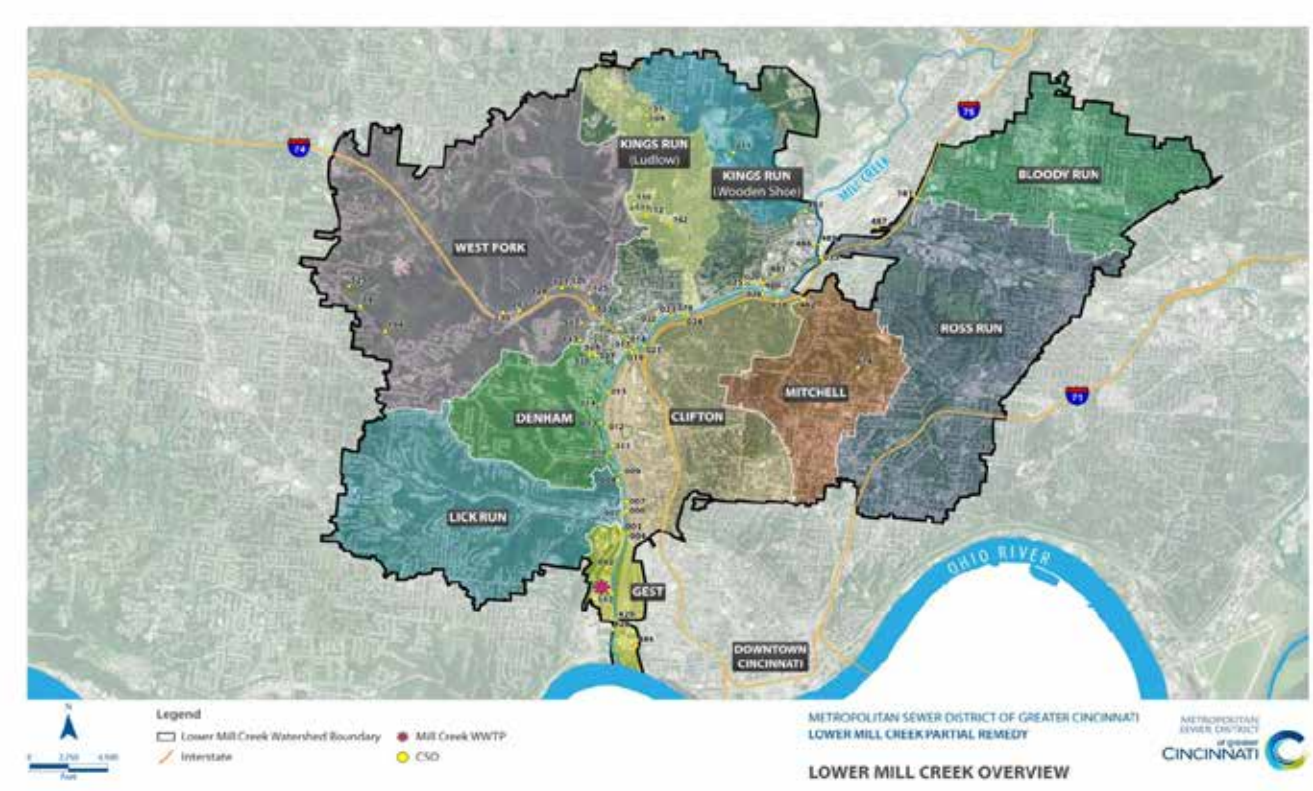
The LMC contains nine sub-basins of interest within the eight sub-watersheds, where previous planning and design studies through MSD's SWEPP identified candidate sustainable infrastructure projects which substantially reduce CSO volumes. The Mill Creek and the Auxiliary Interceptors convey flows from the upper portions of the Mill Creek which may trigger overflows within the LMC (see Figure 2-1 above for LMC Study Area). Figure 3-3 shows the nine sub-basin locations within the LMC watershed, which include Bloody Run, Clifton, Denham, Lick Run, Kings Run (Ludlow), Kings Run (Wooden Shoe), Ross Run, Mitchell and West Fork. The Kings Run sub-watershed contains two sub-basins: the Kings Run sub-basin upstream

of CSOs 217 and 483, and the Ludlow Run sub-basin upstream of CSO 24. Thus, there are nine sub-basins of interest.

Since the tributary areas for the Lower Mill Creek CSOs differ somewhat from the LMC sub-watersheds, the term “sub-basin” is used when referring to combined sewer system (CSS) tributary areas. In short, a sub-basin is the area draining to single or multiple CSOs, where flow patterns are driven by both topography and sanitary or combined or storm pipe network connections.

All sub-basins were evaluated for source control and alternative CSO reduction and most presented viable direct opportunities for consideration.

Figure 3-3 Lower Mill Creek Watershed



The sustainable projects from the nine sub-basins were evaluated for initial consideration in the LMC Study Sustainable Alternative analysis. Costing methodology and modeling methodology were reviewed against protocols and standards developed for the LMC Study to ensure that the projects could be compared to the tunnel (Original LMCPR) and other alternatives. Three of the nine sub-basins were not considered in the analysis in the LMC Study. Clifton (CSO 12) had technical and easement issues regarding the storm sewer or combined sewer crossing of the railroad yard; Ross Run (CSO 485/487) was deemed not as cost-effective in comparison with the other sustainable projects. Mitchell did not present a large-scale direct CSO

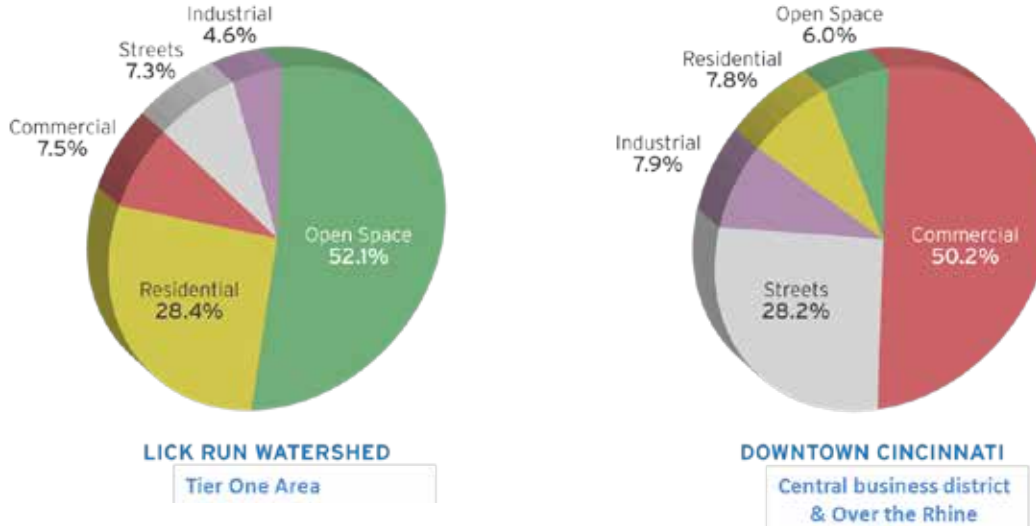
reduction opportunity but rather focuses on enabled impact projects such as those advanced in partnership with the Cincinnati Zoo.

For the remaining six sub-basins, modifications were made to the system-wide model, costing protocol and to a lesser degree, the technical components of the projects, to establish and maintain consistency for the LMC Study. The Revised Original LMCPR was then defined and further evaluated based on the candidate sustainable projects from these six sub-basins: Bloody Run, Denham, Kings Run, Lick Run, Ludlow, and West Fork. Projects within the Denham and Ludlow sub-basins were not selected for Phase 1 but may be part of the potential LMCFR. The following sections present more details regarding the projects in the sub-basins included in the Revised Original LMCPR including Lick Run, Kings Run, West Fork, and Bloody Run.

3.2.1 Lick Run Separation, Detention and Valley Conveyance System Projects

The Lick Run sub-basin serves the South Fairmount, Westwood, West Price Hill and East Price Hill neighborhoods on the west side of Cincinnati. The Lick Run sub-basin drains approximately 2,900 acres of steep hillsides and residential land use in the South Fairmont neighborhood. Land use in the sub-basin includes a mixture of residential and commercial development, woodland, and small scale farmland with steep slopes and a distinct valley corridor with the majority of the land use being open space and undeveloped. Such non-urban characteristics of this watershed make it particularly attractive to remove natural drainage and stormwater flows from the combined system, separating it. Figure 3-4 shows Lick Run land use compared to a typical urban watershed using the downtown business district to illustrate the highly open space, natural land use of the Lick Run watershed.

Figure 3-4 Lower Mill Creek Watershed



The Lick Run sub-basin includes approximately 70 miles of combined and sanitary sewers discharging into a 19.5 foot diameter trunk sewer that was constructed over 100 years ago. Previously, the Lick Run sub-basin

had over 55 miles of streams and natural drainage ways that currently flow into the combined sewer system making the overflow volume nearly 75% natural drainage and stormwater. What little natural drainage does not get mixed with combined sewage has no natural watercourse to the Mill Creek without going through the combined sewer network where it is conveyed through CSO 5 to Mill Creek. CSO 5 represents one of the largest combined sewer overflow locations throughout the entire MSD service area. The Lick Run project offers an opportunity to make a significant reduction in CSO volume at an affordable cost. The solution for Lick Run a preferred alternative to a conventional, deep tunnel solution, is an integration of both green and grey infrastructure that combines strategic sewer separation, natural stormwater detention basins, and an urban waterway valley conveyance system.

Lick Run Strategic Sewer Separation

Figure 3-5 shows that approximately 56% of the Lick Run sub-basin is targeted for Tier 1 strategic sewer separation. The majority of the infrastructure will be storm sewers and open channel conveyance such as bioswales and restored creeks. Some of the existing combined pipes will be converted to storm systems with new combined sewer pipes being installed because it was determined this was more cost-effective.

Lick Run Stormwater Detention

The eight proposed and enhanced detention basins/depressions will improve stormwater infiltration and reduce total runoff volume. MSD conducted a separate analysis of the Lick Run Watershed to evaluate water quality improvement opportunities using a stormwater quality model to estimate water quality characteristics associated with existing land uses and stormwater capture areas along with estimated pollutant load reductions associated reductions from potential best management practices included within the Lick Run watershed solution. This analysis assisted in prioritizing specific detention basins to advance as well as determine the most favorable best management practices to incorporate into the preferred solution as presented in Figure 3-5. This analysis is summarized in the *Lick Run Watershed Phase 2 Stormwater Modeling and Assessment*, prepared by LimnoTech in October 2011.

Lick Run Valley Conveyance System

The valley conveyance system conveys natural drainage and stormwater from strategic separation projects to the Mill Creek, thus removing significant water volumes from the combined sewer system. The urban valley conveyance system is a hybridized box conduit and above ground naturalized channel system. Because this integrated system will receive stormwater runoff captured and conveyed from the strategic sewer separation areas, as well as overland flow that is expected to occur during large storm events, the valley conveyance system will be designed to provide both quality and quantity features as necessary parts of this CSO reduction project. These features may also help incorporate the project into the neighborhood while addressing water quality, maintenance, and safety needs of the project. Figure 3-6 presents the water quality features of the Valley Conveyance System.

Figure 3-5 Lick Run Revised Original LMCPR

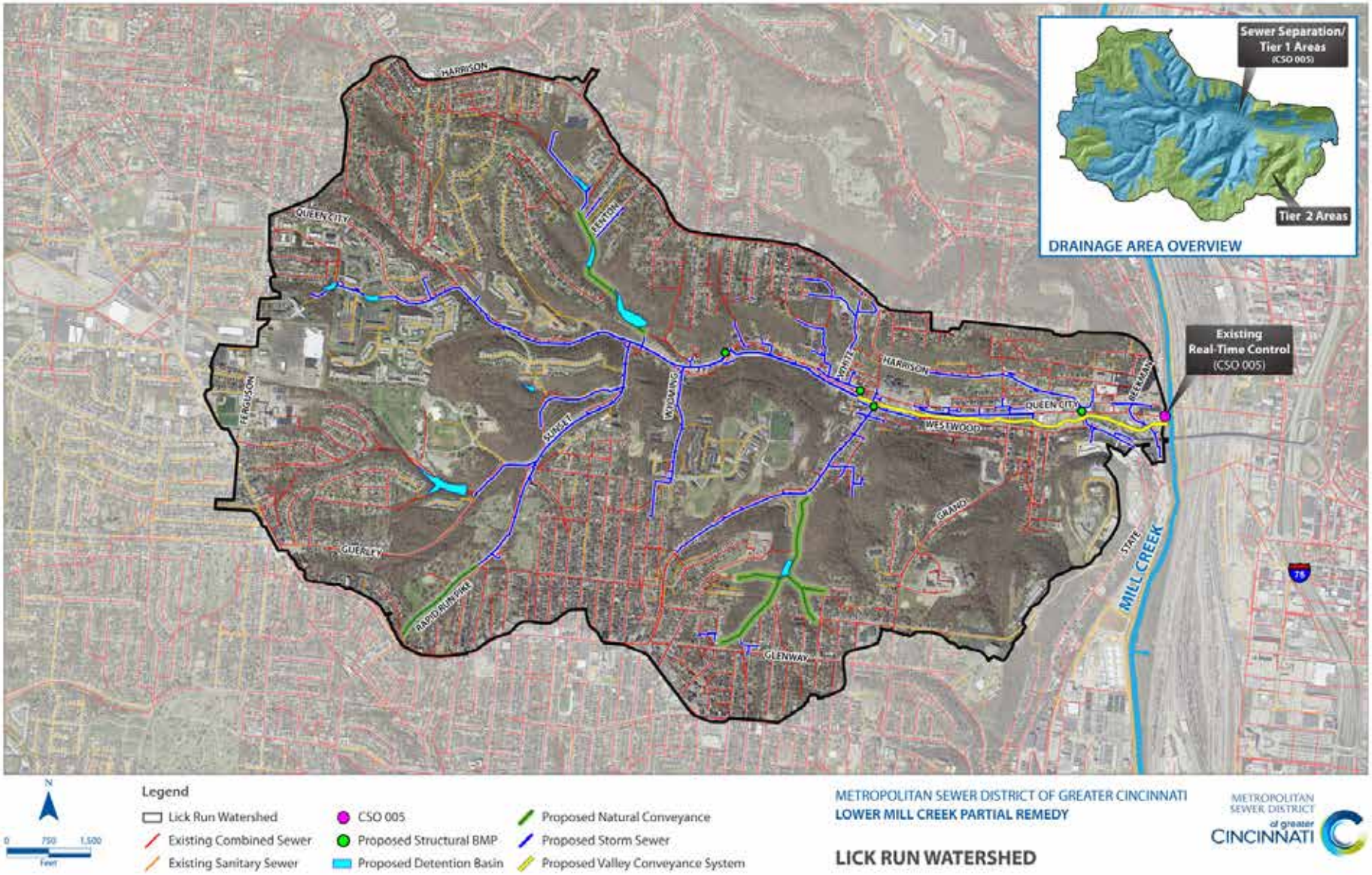


Figure 3-5 above shows the proposed alignments of the new storm sewers and conveyance channel, which will ultimately convey captured stormwater and natural drainage to Mill Creek. Table 3-3 presents the detailed components of the individual Lick Run Revised Original LMCPR projects.

Figure 3-6 Lick Run Urban Waterway Valley Conveyance System Integrated with Water Quality Features

Table 3-3 Lick Run Revised Original LMCPR Projects Summary

Project	Description of Improvements
Sunset Avenue	10,400 ft of separate storm sewers 0.5 ac-ft detention basin (DB 21)
Rapid Run Park Source Control	2,000 ft of separate storm sewers 1,400 ft of natural conveyance along Rapid Run Park
Wyoming and Minion Avenues	2,600 ft of separate storm sewers 1,400 ft combined sewers
Harrison Avenue Phase A (in CONSTRUCTION)	3,900 ft of separate storm sewers Structural separator BMP (vortech unit)
Harrison Avenue Phase B	1,900 ft of separate storm sewers
State Avenue	2,800 ft of separate storm sewers 300 ft combined sewers
White Street	6,200 ft of separate storm sewers 400 ft combined sewers structural separator BMP (vortech unit)
Quebec Road	8,500 ft of separate storm sewers structural separator BMP (vortech unit)
Queen City Avenue Phase 2	6,200 ft of separate storm sewers 1,500 ft combined sewers structural separator BMP (vortech unit)

Project	Description of Improvements
Queen City & Cora Avenues	2,600 ft of separate storm sewers 2,800 ft of natural conveyance system 2.5 ac-ft detention basin (DB 7) 4.0 ac-ft detention basin (DB 9) 8.6 ac-ft detention basin (DB 10)
Quebec Heights Phase 1	1,300 ft of separate storm sewers 5,600 ft of natural conveyance through Glenway Woods 2.4 ac-ft detention basin (DB 17)
Quebec Heights Phase 2	1,500 ft of separate storm sewers
Queen City Avenue Phase 3	4,500 ft of separate storm sewers
Queen City Phase 1	2,800 ft of separate storm sewers and 1.6 ac-ft forebay to Valley Conveyance System (DB 14)
Valley Conveyance System	8,700 ft of hybrid SW conveyance system of open channel & subsurface box conduit 5,600 ft daylighting as partial open conveyance system Enhanced floodplain features Water quality features Waterway outfall feature at Mill Creek

Note: Individual project statistics and descriptions listed above, for example 'length of feet of sewer,' are estimated and subject to ongoing detailed design and do not constitute specific performance criteria or design criteria.

3.2.2 Kings Run Separation, Detention, and CSO Storage Projects

The Kings Run (or Wooden Shoe) sub-basin serves the College Hill, Winton Place, and Winton Hills neighborhoods on the west side of Cincinnati. Located within the larger Kings Run sub-watershed along with Ludlow Run, the Kings Run sub-basin drains approximately 1,100 acres through CSOs 217 and 483. Land use in the sub-basin includes a mixture of residential and commercial development, woodland, and small scale farmland with steep slopes and rolling hills.

Serving the northwest portion of the sub-basin, CSO 217 serves approximately half of the overall sub-basin's drainage area with overflows discharging into King's Run and underflows directed to through the downstream CSS to CSO 483. Historically, the King's Run stream flowed southeastward to Mill Creek; however, the King's Run stream is now intercepted by an existing 14-foot by 8-foot combined sewer that eventually enters CSO 483 before continuing on to Mill Creek. As such, stormwater runoff contributing to overflows at CSO 217 causes overflows at both locations. Downstream of CSO 483, the Auxiliary Mill Creek Interceptor conveys flow from the King's Run sub-basin to the Mill Creek WWTP for treatment.

The Kings Run project is an integration of both green and grey infrastructure that combines strategic sewer separation, natural stormwater detention basins and one combined overflow storage tank at CSO 217. With the construction of this project, the CSO 217 will not be nested above CSO 483 which will remove the double handling of flow. Originally an EHRT was planned for CSO 217, but based on the addition of

strategic separation upstream of CSO 217, treatment versus storage was re-evaluated. The storage tank at CSO 217 provides more protection of the downstream run at a lower cost, because overflows are held and then dewatered back into the combined system.

Kings Run Strategic Separation

Figure 3-7, below, shows the portion of the sub-basin undergoing Tier 1 strategic sewer separation, which includes approximately 56% of the sub basin area tributary to CSOs 217 and 483. New sewers will be sized to convey peak flows from CSO 217 to downstream interceptors relative to specific CSO control objectives. In addition to strategic sewer separation, the Kings Run project includes separating portions of the Kings Run stream flow from the combined sewer.

Kings Run Stormwater Detention

Figure 3-7 also shows the proposed location/alignment of the storm sewer pipes and the four proposed detention basins. Ponds 1, 2 and 3 discharge back to the combined system, while Pond 4 discharges to the storm system. All four ponds will improve stormwater infiltration and reduce total runoff volume. The combined sewer system storage tank at CSO 217 will reduce peak flow rates in the combined system.

The Pond 3 detention basin in Kings Run is upstream of CSO 217 and its purpose is to detain surface run-off and it discharges back into the combined sewer system. The intent of the sustainable projects is to design detention basins that are not classified as dams or that minimize dam impacts. The existing basin called Pond 3 has been reviewed by ODNR and would currently be classified as a Class 1 Dam.

The size of the Pond 3 will be evaluated in the next phase weighing the size and complexity of the detention basin requiring a dam permit against the downstream flooding benefit and size of the CSO storage tank. The size of the Pond 3 basin affects the sizing of the downstream CSO storage tank located at CSO 217. MSD desires to increase the size the detention basin to 20 ac-ft to minimize CSO storage tank size and to reduce surface flooding downstream. This cost needs to be balanced with the additional costs associated with a Class 1 dam. For the purpose of the LMC Study, the LMC Study team maintained the smaller planning level size of 5.2 ac-ft which provided a corresponding larger CSO storage tank size of 1.5 MG. If the detention basin is sized to be 20 ac-ft, then the CSO tank size would be 1.3 MG. The large size of the CSO storage tank was preferred to account for the worst case scenario of not being able to construct the larger detention basin. These are estimated tank and basin sizes that may change during planning and design.

The Engineer will perform an alternative analysis on the Pond 3 detention basin: Retrofitting the existing basin or building a new basin upstream of the existing. Both would be classified as a dam but the type of classification (1, 2, 3, or 4) will be a part of the analysis. Even though a conservative approach was applied to the sizing of the 217 CSO storage tank, costs for the larger dam construction and dam permit requirements were also included.

Kings Run CSO Storage

The current WWIP includes a 75 MGD EHRT at CSO 217 to achieve the desired level of CSO reduction and percent control. As part of the LMC Study, MSD evaluated various alternatives for addressing CSO 217 in lieu of an EHRT. The LMC Study determined that strategic separation combined with detention and CSO storage would result with a more cost effective solution. Therefore, the Revised Original LMCPR includes a new 1.5 MG storage tank for control of remaining overflow to maximize CSO reduction at existing CSO 217. The new storage tank will hold the overflow and release it back into the combined sewer system. It will not discharge stored water into the stream. CSO 217 cannot be brought into compliance without this improvement measure, but is greatly reduced in size and cost compared to the EHRT grey only alternative. The combined sewer system storage tank will reduce peak flows in the system.

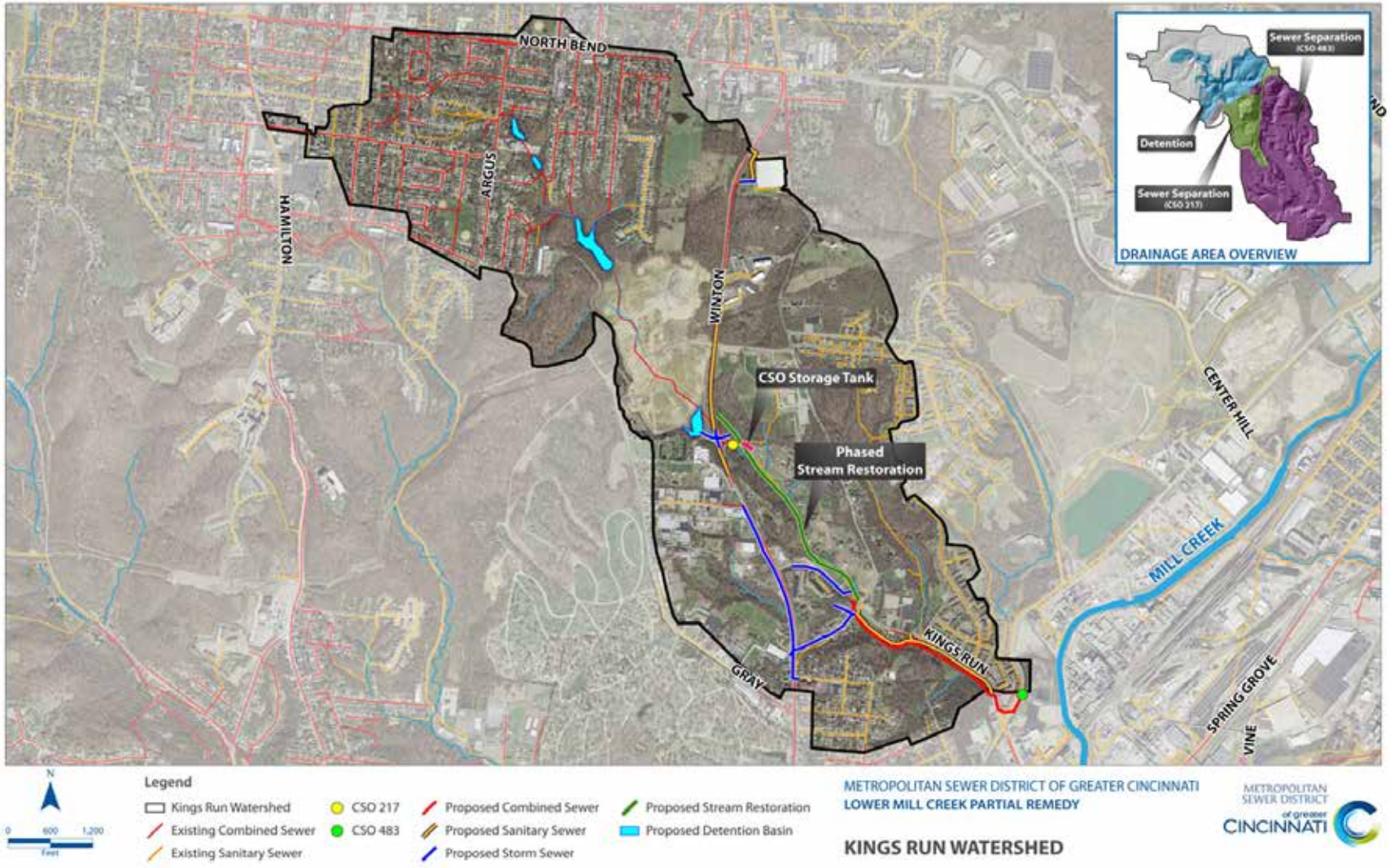
Table 3-4 presents the detailed components of the Kings Run sub-basin projects: Phase A focuses on strategic separation (including stream separation) and detention projects and Phase B involves the combined storage tank at CSO 217.

Table 3-4 Kings Run Revised Original LMCPR Projects Summary

Project	Description of Improvements
Phase A Separation and Detention	8,400 ft of separate storm sewers 3,300 ft of combined sewers 4,600 ft sanitary sewers 3,400 ft restored streams 2.3 ac-ft detention basin (Pond 1) 1.0 ac-ft detention basin (Pond 2) 5.4 ac-ft detention basin (Pond 3) 12 ac-ft detention basin (Pond 4 (formerly Measure 15)) 610 ft of discharge storm pipe
Phase B (former Measure 26)	1.5 MG storage tank at CSO 217

Note: Individual project statistics and descriptions listed above, for example 'length of feet of sewer,' are estimated and subject to ongoing detailed design and do not constitute specific performance criteria or design criteria.

Figure 3-7 Kings Run Revised Original LMCPR



3.2.3 West Fork Separation and Detention Projects

The West Fork watershed is located in the western portion of the Lower Mill Creek watershed and includes portions of Cincinnati neighborhoods of Northside, Mt. Airy, Westwood, South Cumminsville, Fay Apartments, and Green Township, with Mt. Airy Forest comprising a significant portion of the drainage basin (1,459 acres). The watershed includes approximately 6,000 acres of primarily open space with areas of residential development. Approximately half of the watershed area drains directly to the West Fork channel, while the other half enters combined or storm systems. Fifteen CSOs in the watershed overflow into the West Fork Branch of Mill Creek, which bisects the watershed. The CSOs in the system include CSO 525, CSO 194, CSO 195, CSO 131, CSO 203, CSO 128, CSO 127, CSO 126, CSO 125, CSO 123, CSO 117, CSO 527, CSO 528, CSO 529, and CSO 530. The CSOs in the West Fork Basin are consolidated in the existing interceptor, which was originally constructed beneath the channelized West Fork channel in 1929. The existing interceptor is also hydraulically connected to the existing channel through 18 grated openings. These grates allow stream flow to enter directly into the interceptor and for combined sewage to surcharge out of the interceptor and into the channel during wet weather conditions. Furthermore, the concrete stream bed and bank prevents the stream from attaining minor water quality objectives.

The West Fork sustainable watershed project includes multiple projects that have been evaluated and prioritized for inclusion in Phase 1 with the remainder available for consideration in the LMCFR.

The West Fork watershed was evaluated in full but only three CSO sewersheds were prioritized for the proposed Revised Original LMCPR . In summary, CSO 125 is the largest CSO in the West Fork Watershed and includes stream separation and detention projects. Once the basin discharge pipe from the detention basins reaches capacity, the emergency overflow discharges to the combined sewer. In addition to addressing CSO 125, two other partial separations will be completed (CSO 128 & 127) to help redirect flow from Mount Airy Forest area to the West Fork Branch.

Figure 3-8 shows the portions of the sub-basin undergoing Tier 1 strategic sewer separation; that is, the streams that discharge into the combined system upstream of CSOs 125, 127, and 128. Figure 2-6 also shows the proposed locations and alignments of the detention basins, the basin discharge pipe, and storm sewer pipes. The new storm sewers and basin discharge will convey captured stormwater and natural drainage to Mill Creek. The proposed and enhanced detention basins/depressions will improve stormwater infiltration and reduce total runoff volume.

The proposed projects are directly associated with separation of streams from the combined system upstream of CSO 125, CSO 127 and CSO 128. Because of the independencies of the CSO overflows on the surcharged West Fork interceptor, the reduction of inflows at these three CSOs causes a decrease in the overflows at the existing West Fork grates and a slight increase in overflows at CSO 126 although no improvements are being made at the grates nor CSO 126 at this time. Therefore, to properly document the benefit of the West Fork Phase 1 projects, post construction monitoring needs to evaluate the partial remedy on a watershed basis so the model results could provide a representative comparison at the three CSOs, CSO 126, and the grates.

Figure 3-8 also shows the non-LMCPR projects in the West Fork watershed such as the Westwood Northern Bundle (Phase 1 project) and two asset management projects: the Mt. Airy Sewer Replacement and the Mt. Airy Receiving Sewer Upgrade. These projects were analyzed with the overall sustainable solution for West Fork.

Table 3-5 presents the detailed components of the two West Fork Phase 1 projects: CSO 125 Separation and Detention, and the CSO 127 and 128 Stream Separation.

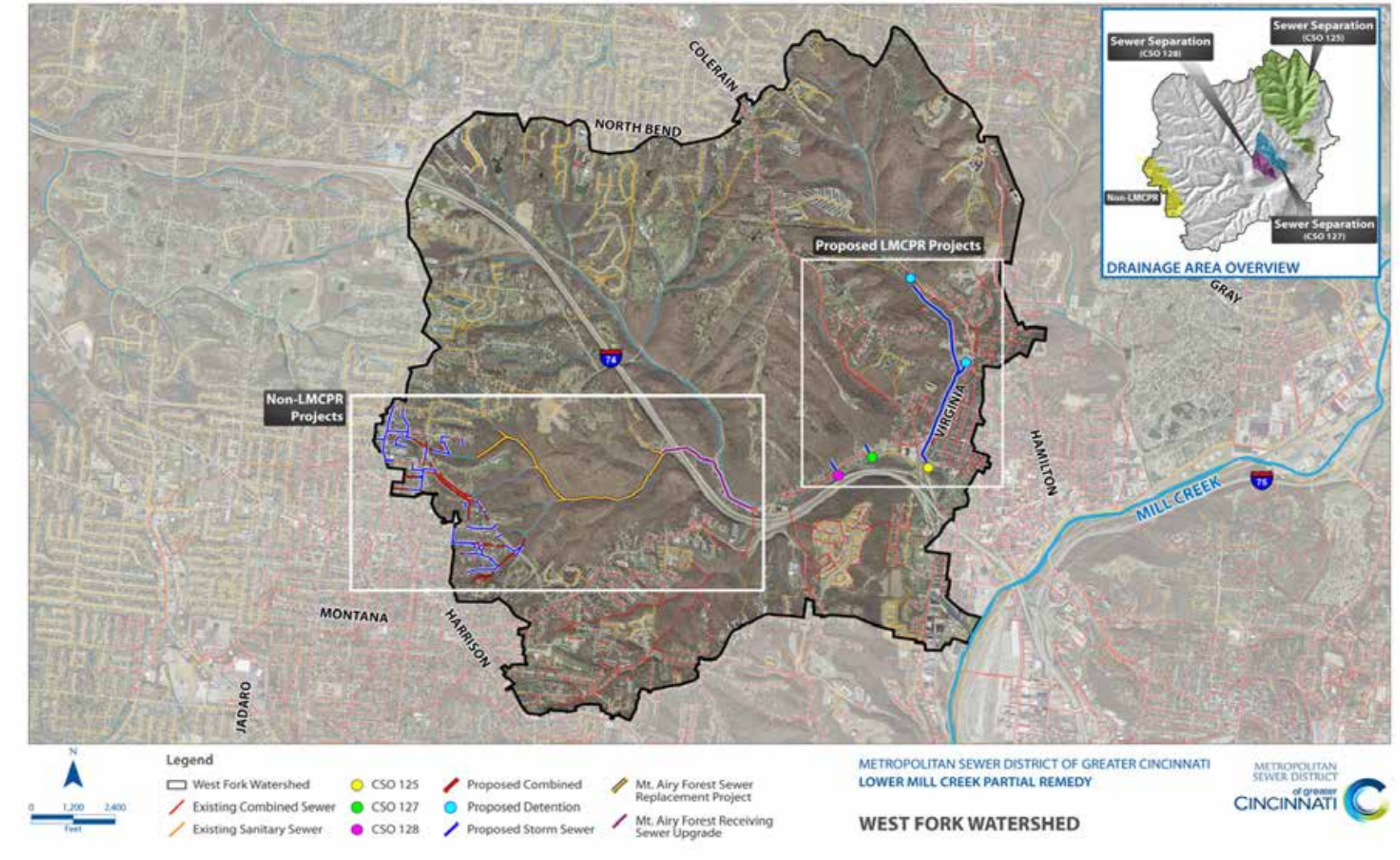
Table 3-5 West Fork Revised Original LMCPR Projects Summary

Project	Description of Improvements
CSO 127 and 128 Stream Separation	250 feet of separate storm sewers for CSO 127 250 feet of separate storm sewers for CSO 128
CSO 125 Separation and Detention	7,620 feet of basin discharge pipe 2.2 ac-ft detention basin (Martha) 21.2 ac-ft detention basin (North)

Note: Individual project statistics and descriptions listed above, for example 'length of feet of sewer,' are estimated and subject to ongoing detailed design and do not constitute specific performance criteria or design criteria.

Under the Revised Original LMCPR, certain work associated with offloading the Mt. Airy stream from CSO 128 will be completed in Phase 1, and certain other work may be part of the LMCFR. However, the benefit of performing the smaller Phase 1 project (4 MG) outweighs the additional cost of phasing ($333,000). The project elements which may be considered as part of the LMCFR would be the balance of the West Fork project discussed in the *West Fork Sustainable Watershed Alternatives Analysis Report*, July 2012.

Figure 3-8 West Fork Revised Original LMCPR



3.2.4 Bloody Run Real Time Control Project

The Bloody Run sub-basin is located at the northern end of the Lower Mill Creek watershed and contains one combined sewer overflow, CSO 181. The sub-basin encompasses approximately 2,200 acres of predominately residential land with some commercial development and undeveloped areas. The sub-basin includes portions of these Cincinnati neighborhoods: Amberley Village, Bond Hill, Golf Manor, Roselawn, Pleasant Ridge, Columbia Township, and City of Norwood.

Approximately 57 miles of combined, sanitary, and stormwater sewers serve the Bloody Run sub-basin with combined sewers draining approximately 40 percent of the area. In addition, separate storm and sanitary sewers that discharge to the combined sewer system serve extensive areas within Bloody Run. Most of the separated sewers are located in the eastern portions of the sub-basin, especially in Norwood, Roselawn, parts of Golf Manor, Pleasant Ridge, and the northeastern part of Bond Hill. At the downstream end of the sub-basin, the combined sewers discharge into a 15-foot wide by 10-foot high rectangular trunk sewer conveying flow to the CSO 181 regulator. Flows directed south to the Mill Creek WWTP are conveyed to the Auxiliary Mill Creek Interceptor. If the downstream system does not have sufficient capacity, then sewage and storm flows overflow to the Bloody Run stream, a tributary to Mill Creek.

The Bloody Run Revised Original LMCPR project consists of a Real Time Control (RTC) facility near CSO 181. Coupled with regulator improvements at CSO 181, the RTC facility, as shown in Figure 3-9, will take advantage of available in-system storage within the existing 15 ft x 10 ft combined trunk sewer while maximizing the interception rate and conveyance through the 42-inch underflow to the Auxiliary Mill Creek Interceptor.

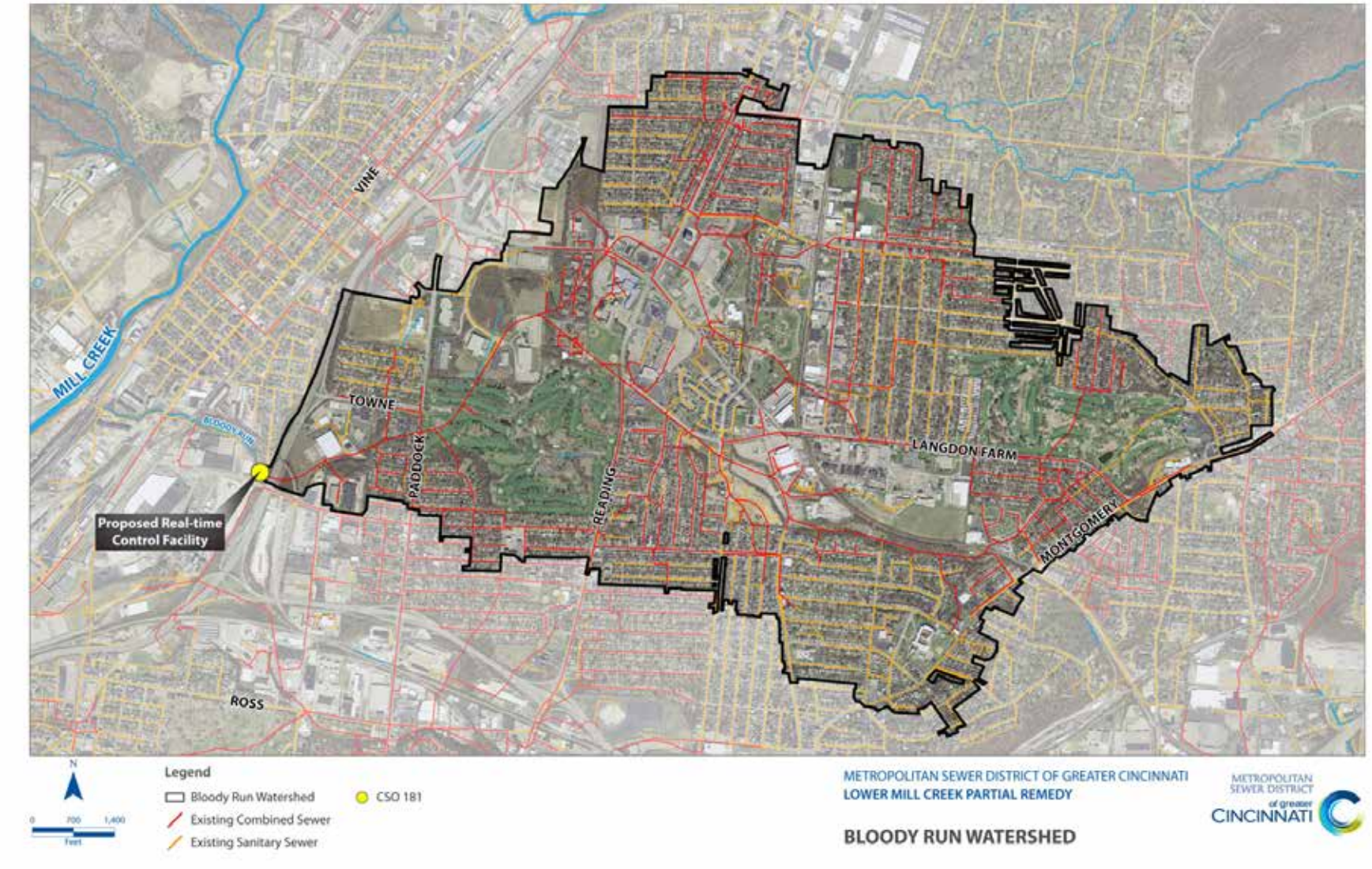
There are two methods in which the RTC would be retro-fitted within the existing combined sewer system through the use of (1) bending weirs or inflatable dams and (2) regulator improvements. Bending weirs offer a more simple facility that is a less expensive option to MSD's current inflatable dam RTC facilities but also provide less flexibility to potential control strategies once the facilities are constructed.

Siting of the RTC facility will depend on the results of on-going stakeholder coordination with ODOT, the timeframe in which I-75 improvements are made, and the potential improvements to the Bloody Run open channel between the CSO outfall and Mill Creek. Retro-fitting of the combined sewer with the RTC would occur at and in the vicinity of the existing CSO outfall just west of I-75 at Prosser Avenue or just east of I-75 on either side of the existing railroad line. Final siting of an RTC facility was not performed as part of the SWEPP. Figure 3-9 shows the RTC just west of I-75.

The conceptual analysis of the RTC was incorporated near the end of the Bloody Run SWEPP assessment. Additional flow monitoring is occurring in the Bloody Run basin currently, and a more detailed alternative analysis for the RTC will be performed in 2013.

The Bloody Run LMCPR project has the potential to be expanded as part of the LMCFR, including potential strategic separation of storm water within the sub-basin, as described in the *Bloody Run Watershed Strategic Separation Project Report,* Project No. 11240020 June 2012.

Figure 3-9 Bloody Run Revised Original LMCPR



3.2.5 Potential Flooding Impacts from the Revised Original LMCPR

With the implementation of the Revised Original LMCPR, concerns regarding "flooding" and "water in basement" were identified in public comments as a potential risk with the construction of new conveyance systems through sewer separation. Specific concerns articulated for the South Fairmount Corridor in the Lick Run watershed, but may also be applicable to the Kings Run and West Fork watersheds, were the questions of "could localized flooding occur which could threaten real property and human life…:

- If the proposed design storm is exceeded?"
- If the model flow projections are incorrect?"
- Because of other hydraulic issues, such as backwater caused by elevated stage levels at Mill Creek or Ohio River?"

MSD has demonstrated the likelihood of localized flooding will not increase under the Revised Original LMCPR. The following subsections describe the analyses conducted for the Lick Run watershed to address potential flooding impacts from the Lick Run Watershed projects. Further details are provided in the *Lick Run Preliminary Engineering Analysis – Hydrology and Hydraulic Report and Appendices*, prepared by Strand in November 2009. The proposed stormwater infrastructure improvements in the Revised Original LMCPR utilized current and applicable stormwater design standards (such as SMU) and best management practices; for example, the Lick Run Valley Conveyance System (VCS) was specifically designed for the 100-year storm condition.

Similar flooding evaluations were also performed for the Kings Run and West Fork watersheds. These evaluations were not nearly as extensive, since the proposed storm infrastructure conveys the separated flows to the same discharge locations in existing open channel corridors tributary to Mill Creek.

Surface Flooding

Stormwater and natural drainage from the Lick Run watershed currently flow into the combined sewer system. During 100-year flooding conditions, Mill Creek can and likely does back up into the combined sewer system at CSO 5. Stream flows mixed with sewage can then exit into the neighborhood from upstream manholes, inlets and sewer laterals, causing flooding within the South Fairmount corridor.

The Federal Emergency Management Agency (FEMA) has not defined or mapped a floodplain boundary within the Lick Run watershed. To illustrate projected flood conditions in the South Fairmount corridor, the design team conducted a coarse modeling exercise investigate impacts from overland flows for the 100-year storm condition from the Lick Run watershed.

Figure 3-10 illustrates existing conditions for surface flooding within the South Fairmount corridor. The darker blue suggests depths of water ranging from 0-1 foot of water during the 100-year storm, light blue

being approximately 3 feet of water and green being between 5 – 7 feet of water. During events up to the 100-year storm condition, the CSS is the only conveyance system for such flood waters to exit the South Fairmount corridor. Existing ground elevations at the railroad corridor and Beekman Street act as barriers, essentially damming up the flow so that flows cannot be conveyed overland into Mill Creek from the South Fairmount corridor. Also, as previously noted, when Mill Creek hits flood stage, it is actually 5 feet above the catwalk of CSO 5 and has the ability to backflow up into the CSS and enter the South Fairmount corridor through manholes, inlets and sewer laterals.

Figure 3-10 Projected Existing Surface Flooding in the South Fairmount Corridor for 100-year Storm (25-year CSS capacity assumed)

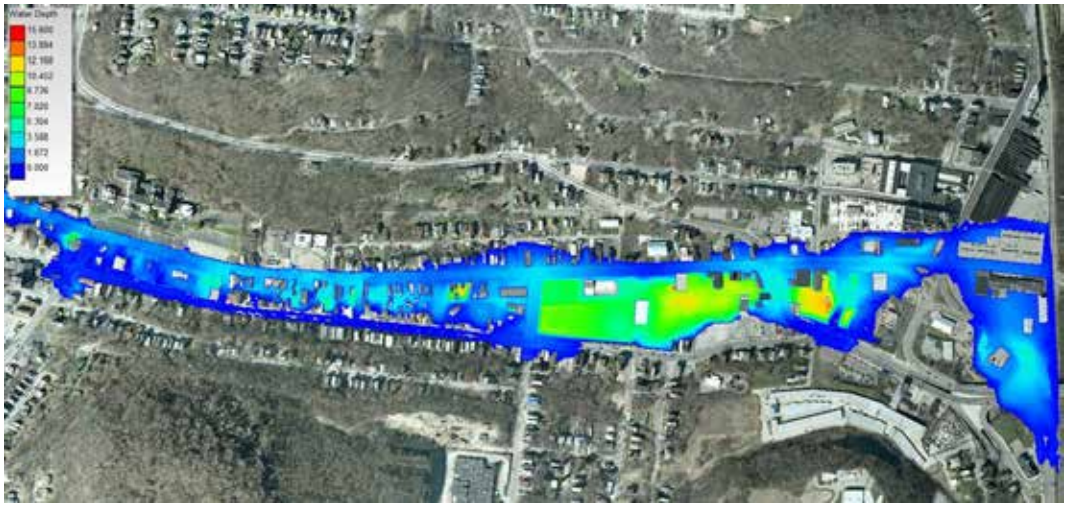


Figure 3-11 below illustrates the anticipated future flooding conditions with 1-foot of freeboard, once the VCS is constructed as currently conceptualized as outlined in the *Lick Run Flooding Evaluation* dated October 2012. The flow entering the VCS is stormwater and natural drainage from the Tier 1 sewer separation areas as defined in the overall Lick Run Watershed solution, as well as overland flow from the rest of the Lick Run watershed. The difference between the pre and post conditions shown is significant, illustrating that flooding risks following the construction of the VCS will be significantly reduced. The flooding depths shown in red at the downstream end of the VCS correspond to the downstream pond, which reduces pollutant loads before the flows discharge into Mill Creek.

Figure 3-11 Projected Surface Flooding in the South Fairmount Corridor during Future Conditions for 100-year Storm

Surcharging of Combined Sewers

The proposed separate stormwater conveyance system serving the Tier 1 areas of Lick Run provides numerous benefits, with the one of greatest significance being that of reduced surcharging and localized flooding from the combined sewers throughout the watershed.

MSD is not establishing new flow routes but rather augmenting stormwater conveyance capacity along existing flow routes. The proposed strategic sewer separation projects are expected to provide a significant increase in the current level of service provided by the existing combined sewer system. By installing a new parallel stormwater conveyance system sized to convey up to the 25-year stormwater flows from the Tier 1 areas, MSD is providing significant improvement to the overall stormwater and combined sewer drainage systems serving this community. The Tier 1 areas account for approximately two-thirds of the Lick Run watershed area.

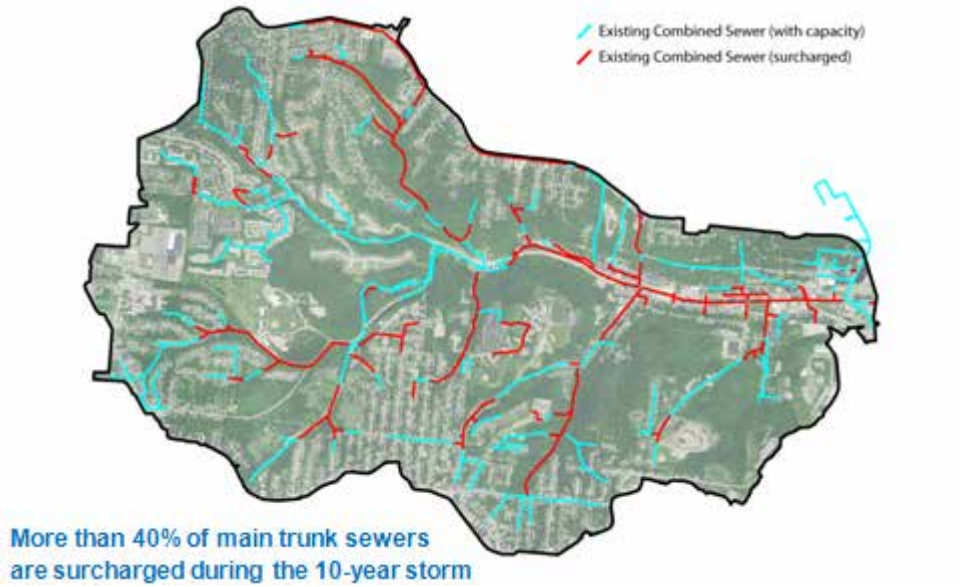
Surcharged conditions in the combined sewer system were evaluated pre- and post- sewer separation in the Lick Run watershed during conceptual planning. Table 3-6 and Figures 3-12 and 3-13 indicate that greater than a 50 percent increase in combined sewer system level of service can be expected for all modeled storm events greater than a six-month return period. This result further translates to an anticipated decrease of localized flooding.

Table 3-6 Lick Run Percent Modeled Combined Sewer System Surcharged

Critical Duration Storm Events (Percent Modeled CSS Surcharged)					
Description	**6 Month**	**2 Year**	**5 Year**	**10 Year**	**25 Year**
Pre-Sewer Separation CSS Surcharging	8%	28%	36%	42%	46%
Post-Sewer Separation CSS Surcharging	5%	9%	14%	19%	21%
Percent Reduction in CSS Surcharging	**35%**	**67%**	**60%**	**55%**	**54%**

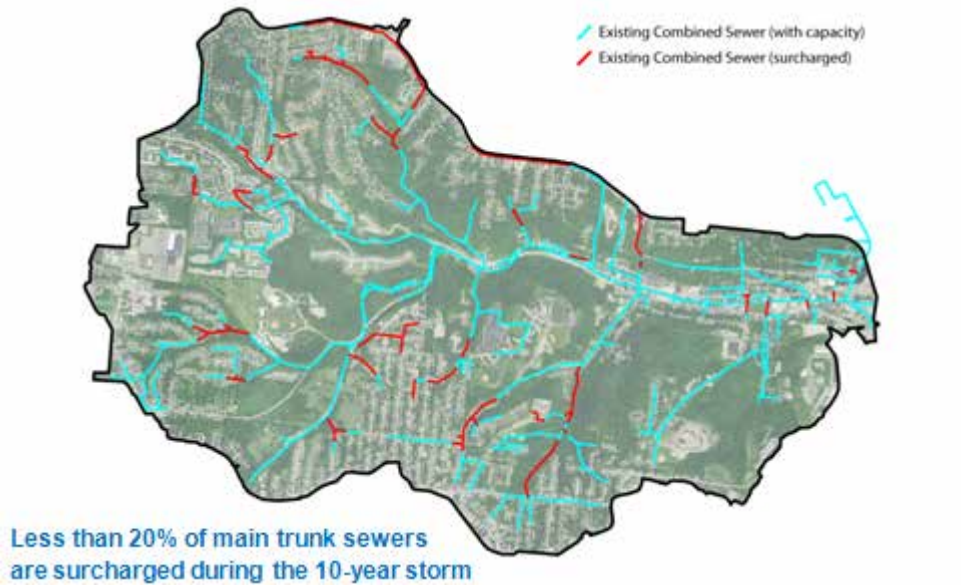
Note: The above combined sewer surcharging results are based on the original Lick Run project as described in the MSD Recommendation Report includes a number of Tier 1 sewer separation projects.

Figure 3-12 Lick Run Surcharged Sewers - Existing Conditions



1. Analysis developed during conceptual planning in 2009. Subcatchment boundaries were subsequently revised to include areas tributary to Beekman sewer in northeast.

Figure 3-13 Lick Run Surcharged Sewers - Proposed Conditions



Notes:

1. Analysis developed during conceptual planning in 2009. Subcatchment boundaries were subsequently revised to include areas tributary to Beekman sewer in northeast.
2. The above combined sewer surcharging results are based on the original Lick Run project as described in the MSD Recommendation Report includes a number of Tier 1 sewer separation projects. The proposed conditions for Grand & Selim and Westwood Avenue areas would be similar to the existing conditions Figure above.

The location of the VCS is at the lowest point in the watershed where all wet weather flows that are not currently able to get into the surcharged combined sewer system travel overland from the remainder of the Lick Run watershed. These flows currently have no established overland route to Mill Creek once they reach the South Fairmount corridor and result in localized flooding of stormwater likely mixed with sewage until they are eventually drained through the existing combined sewer system. The projected levels of flooding during these existing conditions are as shown previously in Figure 3-12.

As such, with construction of the proposed VCS, localized flooding and (lack of) overland flow routes currently existing in this area will be controlled to a much higher level. Further, the 100-year capacity of the VCS will provide increased reliability in the performance of the tributary storm sewer connections up to their design limitations.

Impact of Peak Flows

It is anticipated that impacts to Mill Creek associated with peak flows from Revised Original LMCPR projects would be relatively minor in comparison to existing conditions. System-wide modeling efforts have indicated that a significant portion of the combined sewer system is inundated during storm events in excess of a 6-month return period, and existing CSOs provide discharges to Mill Creek for storm events on a similarly

frequent basis. So, in actuality the majority of the stormwater volume already gets into Mill Creek but it is mixed with sewage as a CSO. In Lick Run specifically, annual CSO volumes discharged to Mill Creek during the typical year are estimated at approximately 1,000 MG (SWM Version 4.2). After implementation of the Lick Run LMCPR projects (net of the two projects removed), the CSO volume discharged to Mill Creek in the typical year is estimated to be approximately 375 MG, and the separated stormwater volume discharged to Mill Creek in a typical year is estimated to be approximately 860 MG. There is a net difference of approximately 230 MG. Accordingly, the changes in wet weather volumes tributary to Mill Creek pre- and post- LMCPR project construction are anticipated to be relatively insignificant but water quality is anticipated to be improved because less combined overflow is reaching the Mill Creek.

MSD does not include the Mill Creek or the Ohio River as part of the system-wide collection system model or SWM. The drainage area of the Ohio River is so large that the water level in the river is generally independent of storms impacting MSD's service area. The lower Mill Creek water level is impacted by the water level in the Ohio River either through backwater or the operation of the Barrier Dam. The Mill Creek is a flood control waterway and the City/MSD operates and manages the levels of the Mill Creek with its operation of the Barrier Dam.

Specific tributaries located in the combined sewer area, which are independent of Mill Creek and the Ohio River, were included within the SWM. Specific examples include the West Fork Channel (minor influence of the Mill Creek), Kings Run, and the ponds and channels in Spring Grove Cemetery within the Ludlow Run watershed.

3.3 LMCPR Coordination with Potential LMCFR

As the Revised Original LMCPR was evaluated and developed, MSD evaluated the potential for coordination between the partial remedy and the LMCFR. The LMCPR Study demonstrated that the Revised Original LMCPR fits into a conceptualized strategy for the LMCFR. The conceptualized LMCFR strategy was evaluated as part of the LMCPR study and summarized in the *MSD's Preliminary Findings Results*, dated July, 2012. As summarized in that report, the sustainable alternative is compatible with a wide range of final remedy solutions between the green/grey spectrums. Additionally, because of the complex interdependencies of the system, an integrated watershed approach will be necessary as part of the LMCFR.

The Final WWIP also requires Defendants to submit a *SSO 700 Final Remedial Plan* (SSO 700 FRP) by December 31, 2012. The Final WWIP requires the SSO 700 FRP to be coordinated with the work of the Lower Mill Creek Study, to achieve the goal of a plan to eliminate sanitary sewer overflow from the outfall at SSO 700, in accordance with the scheduling provisions of Phase 2 of the WWIP. It is clear from the analysis of the Mill Creek system undertaken in this LMC Study that SSO 700 is inextricably intertwined with the LMCFR and Phase 2 projects that will address the capacity issues in the East Branch Mill Creek Interceptor and extend analysis of watershed-based solutions across the Mill Creek basin. The SSO 700 FRP provides more detail on the potential remedial actions and alternatives for SSO 700. The SSO 700 FRP also sets forth the measures for achieving that goal in accordance with the Final WWIP, the Consent Decree, EPA's "Integrated Planning Framework," the National CSO Policy and the Clean Water Act.

LMCPR study projects that were determined to be viable, but which were not included in the Revised Original LMCPR may be considered as part of the sustainable approach for the LMCFR , but would be subject to future verification since they were developed based upon the best available information at the time of the LMCPR Study. Additional SWEPPs have started (e.g., CSO 488 in the South Branch Mill Creek watershed) or may be performed in the remaining Mill Creek WWTP service area watershed to provide a basis for sustainable alternative evaluation.

As discussed below in Section 3.4, MSD's strategy of sustainable infrastructure and source control is being applied at many levels in a proactive approach – such as working with ODOT to ensure I-75 corridor improvements implemented today allow for a final remedy solution to implementing enabled impact projects to engage the community at the local level.

The Revised Original LMCPR is viewed as an opportunity to utilize adaptive management to formulate the Final Remedy for the Lower Mill Creek watershed. As they become available, performance metrics obtained through the LMCPR implementation will inform future decisions regarding the Final Remedy.

3.4 Additional Lower Mill Creek Projects

Beyond the WWIP Phase 1 projects (e.g., Westwood Northern Bundle) and those projects identified for the Revised Original LMCPR, MSD is coordinating with or implementing other projects within the Lower Mill Creek watershed to assist in helping the Original LMCPR fit within the context of Final Remedy needs. These projects are generally partnership projects developed or identified through the SWEPP or through construction coordination with ODOT for the I-75 reconstruction projects.

3.4.1 ODOT I-75 Projects

MSD has been working closely with Ohio Department of Transportation (ODOT) to address CSO reduction needs associated with highway reconstruction and to specifically coordinate stormwater management infrastructure and strategic separation projects to reduce flows to CSOs. This coordination also offers the integrated planning opportunity to make water quality improvements as well as perform asset management in the highway corridor. With regards to CSO mitigation, there are several locations along I-75 where separation pipes are being designed and constructed under I-75 with ODOT's active construction projects that will provide CSO reduction benefits, both short term and long term. The primary benefit of coordinating with ODOT is the additional reductions that can occur in the future once the separation barriers are eliminated through the coordination efforts along the highway. These benefits have not been included in the LMCPR estimates. Planning and coordinating projects today will help facilitate a sustainable final remedy in Clifton, Mitchell and Bloody sub-basins. With the exception of short sections of I-75 these areas lack a separate conveyance under I-75 to the Mill Creek. The design and construction coordination efforts in Phase 1 are conservatively estimated to provide approximately 10 MG of CSO reduction. However, post 2018, when future projects could strategically separate flows within Clifton, Bloody or Mitchell sub-basins, additional reductions can reasonably be expected to be much higher.

Advancing coordination opportunities with ODOT and others is critical for watersheds to the east of the highway. This proactive approach assists MSD to set the stage for a Final Remedy by prioritizing and advancing design stormwater conduits under the interstate that are sized for ultimate flows from the watershed. Currently, ODOT construction is planned to occur in 2013 and beyond. As part of this coordination, both MSD and ODOT are currently contributing funds to enlarge the project that include the upsizing of the highway culverts to ensure that the interstate crossings do not become future system hydraulic restrictions. Based on ODOT's current schedule, projects to be initiated by 2016 that offer CSO reduction potential include the following CSOs: 6, 7, 9, 12, 15, 19, 21, 28, 33, 179, 181, 487, 488, and 490.

3.4.2 Enabling Additional Benefits through Integration of Enabled Impact Projects

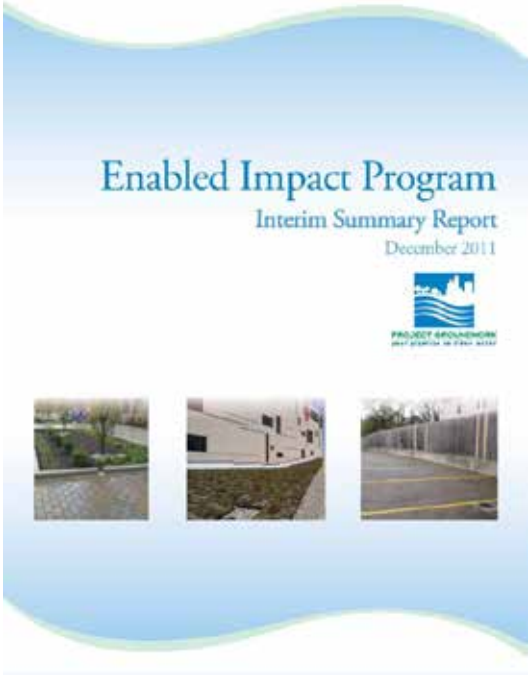
Large regional-scale direct source control solutions have been developed in Lick Run, West Fork, and Kings Run for the Recommended Revised Original LMCPR. But source control at a small scale offers additional flexibility to engage the private sector and other public partners through Enabled Impact Projects (EIPs), which could provide a significant reduction opportunity for the Final Remedy. While most individual EIPs will not reduce large volumes of CSO, these projects over time and within the context of a Final Remedy will be beneficial. As such, projects have been and can continue to be implemented with other public and private partners. As EIPs are implemented in greater numbers overtime, they could contribute significant volume reductions.

Using an integrated approach of direct and enabled impact projects could drive market forces to incentivize the private sector to implement source control solutions to reduce runoff from entering the combined system. As redevelopment of new or old sites occurs, MSD, local policies or codes could enable a developer to implement additional source controls on their sites at costs born partially by them. Enabled impact projects could be additionally incentivized and influenced by polices set by the City or County, or local other governments within their jurisdictions, as part of land development codes or form based codes. MSD is developing site development analysis tools to help private land owners consider the potential savings and site development benefits of implementing green infrastructure on sites to help create added value for private investments. Figure 3-14 is an example of a completed project showing large rain gardens installed at Cincinnati State Technical and Community College.

The EIP program has evolved to more broadly to target Early Success Projects within priority watersheds to identify partners and opportunities through the SWEPP process that can be integrated with future MSD direct projects but potentially be implemented in advance for early implementation to help inform and influence the community as a whole. The program has matured beyond demonstration, and Early Success Projects are advanced with MSD cost participation if there is a business case. In return, EIP partners agree to maintain the sites and stormwater reduction benefits in perpetuity.

Figure 3-14 Project Example: Cincinnati State Rain Gardens

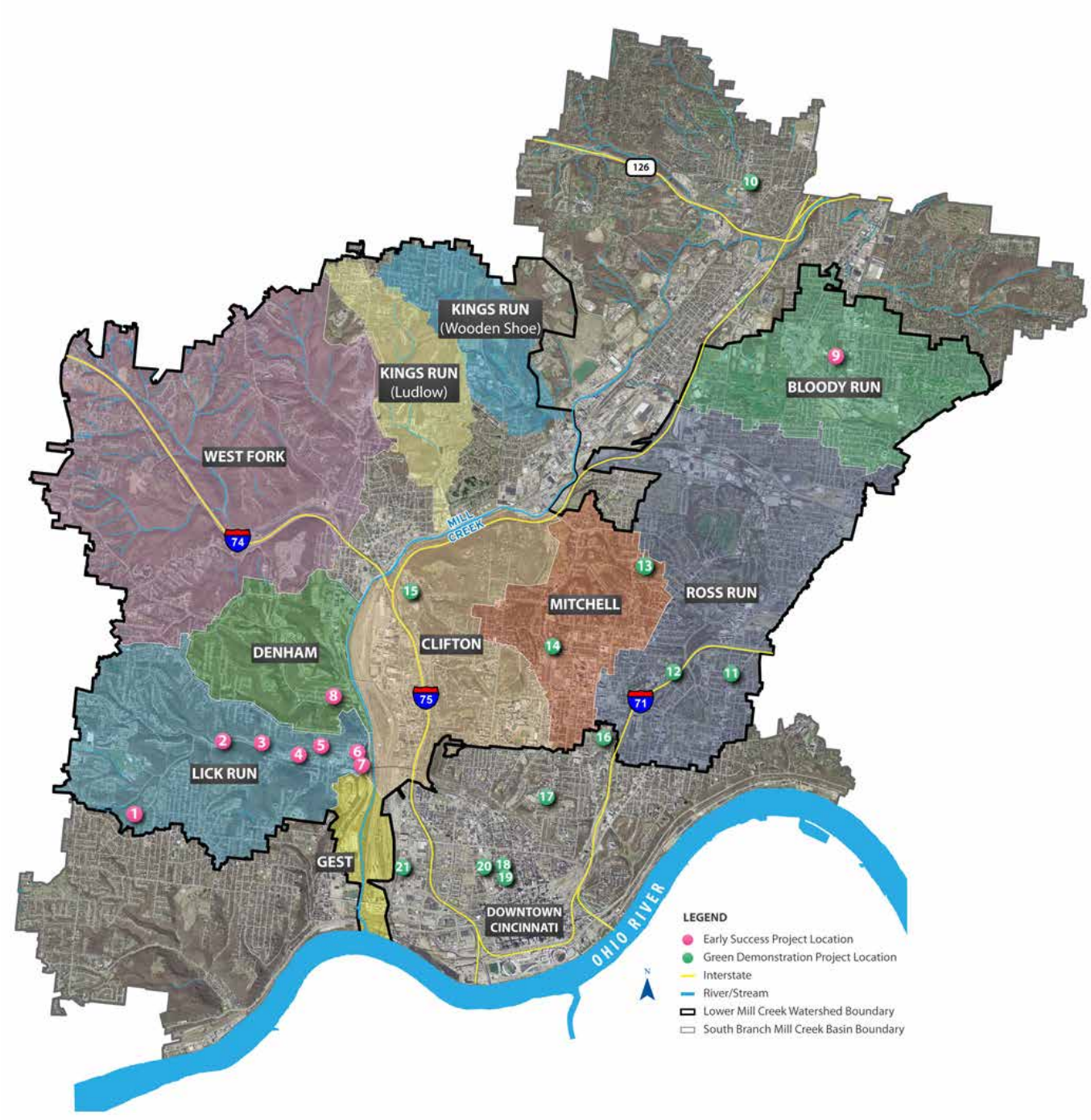
These market-driven efforts are part of what make source control attractive for both the project sponsor and MSD. With an intentional strategy to capture reductions from enabled impact projects each year, over 20-30 years, there will be considerable benefits for MSD, its ratepayers and the community at large to close the gap more cost effectively than through traditional solutions. Figure 3-15 illustrates the numerous enabled impact projects identified and considered throughout the Lick Run watershed; and Figure 3-16 illustrates all the EIPs (Green Demonstration and Early Success Projects) throughout the Lower Mill Creek Watershed. In December 2011, MSD completed an interim report on its Enabled Impact Program.



To date, MSD's Enabled Impact Program has successfully developed projects with approximately 30 public and private entities. In total the projects capture over 86 MG of stormwater annually from the combined system. Of the projects identified in Figure 3-16, 64 MG stormwater is removed from the combined system within the Lower Mill Creek watershed. In December 2011, MSD published an Enabled Impact Project Interim Report, which provides more detail on these projects and anticipates updating this report in February 2013. Through current enable impact program, MSD provides cost participation and in return, the enable impact partners agree to maintain the sites and stormwater reduction benefits in perpetuity. These market-driven efforts are part of what make source control attractive for both the project sponsor and MSD.

Figure 3-15 Lick Run Watershed Enabled Impact Projects

Figure 3-16 Lower Mill Creek Watershed Enabled Impact Projects



3.4.3 Enabling Additional Benefits Policy Updates and Improvements

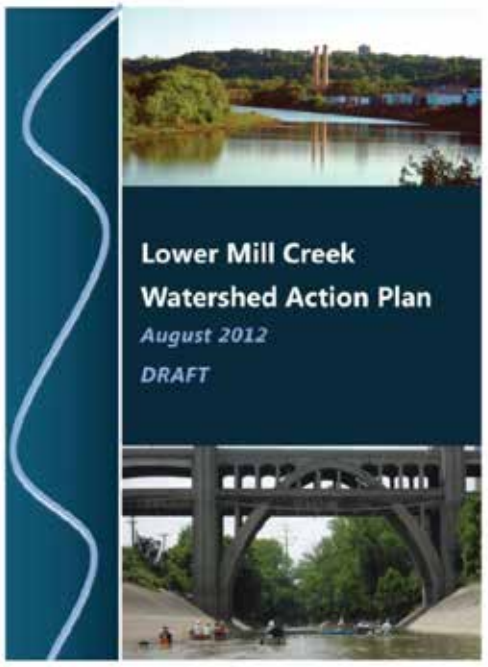
In January 2012, MSD in collaboration with the Communities of the Future Advisory Committee (CFAC) Policy Subcommittee, Hamilton County Planning and Development, and the City of Cincinnati Planning Department completed a *Sustainable Infrastructure Policy Gap Analysis*. The purpose of the Policy Gap Analysis was to analyze the current rules and regulations, codes, policies, and incentives that regulate sustainable infrastructure practices and determine how they may either impede or encourage their widespread use and minimize the degradation of water resources in Cincinnati and Hamilton County. Development of partnerships in priority watersheds with both public and private entities has been a key success factor in the identification and advancement of Enabled Impact projects. The key finding from the analysis was that while the codes and ordinances allow the installation of innovative technologies, MSD's EIP program has shown that there are opportunities to enhance the building municipal codes and other city regulations and permitting authorities to help incentivize or encourage the use of sustainable stormwater practices on private property and within other public investments where opportunity exists.

As a follow up to the Policy Gap Analysis, MSD has been working with project partners to recommend policy changes to both governing bodies and work with other agencies to develop guidance manuals or other associated information to help support the City's efforts to create an updated Land Development Code. Progress on these efforts continue and will assist other public and private entities to make sustainable infrastructure improvements as part of site development and land use changes over time. Table 3-7 summarizes the findings and status from the *Sustainable Infrastructure Policy Gap Analysis.*

Table 3-7 Findings and Status from the *Sustainable Infrastructure Policy Gap Analysis*

Sustainable Infrastructure Policy Gap	Identified Corrective Action	Status
Lack of design specifications	Develop a Stormwater Design Manual	Collaborative process initiated and underway with Hamilton County Stormwater District
NPDES Compliance	Draft and submit City Ordinance Revisions	Approved on March 28, 2012 at Livable Communities Council Meeting
Water quality volume reduction requirement	Draft and submit City Ordinance Revisions & updated SMU Rules and Regulations	Approved on March 28, 2012 at Livable Communities Council Meeting
Parking Code does not consider impervious cover reduction as goal	Land Development Code	• LDC underway, • Lick Run Master Plan as Guide for LDC and form based codes efforts

3.4.4 Lower Mill Creek Watershed Action Plan Development



The creation of the Lower Mill Creek Watershed Action Plan (LMC WAP) has been a collaborative effort between MSD, Hamilton County Planning & Development, the Ohio Kentucky Indiana Regional Council of Governments (OKI), the City of Cincinnati's Office of Environmental Quality, Parks Department, and Planning Department, the Mill Creek Watershed Council of Communities, Groundwork Cincinnati: Mill Creek, and numerous other local, state, and federal organizations and individuals; the Watershed Council and Groundwork Cincinnati are co-leading this effort. The draft LMC WAP is a comprehensive effort to prioritize the multiple causes of water quality impairment in the Lower Mill Creek and develop holistic, watershed-based, integrated solutions to address those impairments. The plan utilizes water quality data collected by the MSD/Midwest Biodiversity Institute (MBI) Mill Creek Bioassessment in 2011 and outcomes from MSD's Sustainable Watershed Evaluation and Planning Process (SWEPP). The process of developing watershed action plans is well-established in Ohio, but the LMC WAP would only be the second such plan in this region, following the creation of a similar plan for the Upper Mill Creek Watershed in 2005. It is also one of the first WAPs that address an urban water systems, thus another example of an integrated approach, following USEPA's integrated planning framework.

The inspiration for the LMC WAP occurred in 2009 following the completion of MSD's Lower Mill Creek Coarse Evaluation, which identified potential projects that MSD could undertake to reduce combined sewer overflow (CSO) volumes to the Mill Creek. In November of 2012, the LMC WAP workgroup hosted an all-day technical charette at MSD to utilize the expertise of 43 local environmental professionals to help prioritize the water quality impairments in the Lower Mill Creek and to suggest solutions that will be incorporated into the final version of the WAP. Feedback from the charette is currently being incorporated into the plan, and a draft will be sent by the LMC WAP workgroup to the Ohio EPA for review and comment early spring of 2013.

Photo: LMC WAP Technical Charrette (November 5, 2012)

4. Hydraulic and Hydrologic Modeling

The LMC Study required MSD to undertake detailed analysis of the default LMCPR as well as detailed evaluation of alternatives. As part of that further investigation, MSD leveraged the improvements in computing technology, modeling science and MSD's additional experience in monitoring, investigation project implementation experience as part of its continuing, iterative process of model refinement. This report provides a summary of the hydraulic and hydrologic modeling, which developed the proposed Revised Original LMCPR projects. Section 4.1 through 4.3 discuss model history, define terminology, and provide details on the development of the updated baseline models. Sections 4.4 through 4.5 summarize the modeling assumptions supporting the development of the Alternative. Section 4.6 documents projected system performance for the Revised Original LMCPR Plan, including potential CSO volume reductions, flooding impacts, and water quality impacts. Section 4.7 discusses flow monitoring issues associated with pre- and post-construction monitoring.

MSD's use of modeling for development and ongoing refinement of the Final WWIP, and will continue into the future as new technologies, new modeling software, post construction monitoring, and improved information is made available nationally and locally. As such, the volume capture target may be refined in the future if more modern and more accurate monitoring and modeling information become available.

4.1 Model History

The Lower Mill Creek Study project has involved a comprehensive review and updating process of the Mill Creek System Wide Model (SWM). The goal of the model updating processes always isto improve the ability of the model to predict overflows and support the development of alternative solutions to reduce overflow volumes, and ultimately to serve as a guide for design of those solutions.

In 2004 MSD was using the Storm Water Management Model (SWMM) Version 4 software for modeling the sewer system. State-of-the-art for the time, the SWMM Version 4 model was used to develop MSD's Capacity Assurance Program Plan (CAPP). Subsequently, the SWMM 4 model was converted to the SWMM Version 5 Beta G software and used to develop MSD's 2006 Long Term Control Plan (LTCP).

Approved for use by the Regulators, the SWMM Version 5 Beta G software uses the kinematic wave solution method, which greatly reduced simulation times for full system model runs. While the hydrology of the separated and combined areas remained the same, the hydraulics of the sewer system were simplified with the kinematic wave solution. Instead of CSOs occurring because of surcharge or backwater from downstream conditions, overflows occurred when influent flows to the CSO regulator exceeded a specific cut-off value. MSD's modeling team performed assessments at 200 CSO locations to identify the specific cut-off values used for each overflow point. The kinematic wave type of model also has significant limitations, since the assumptions do not match actual system operations. The kinematic wave solution does not recognize surcharge or backwater, conditions which occur in the interceptors and CSOs every time it rains.

In 2009 MSD took advantage of faster computers by converting its SWMM Version 5 Beta G kinematic wave model to SWMM version 5.0.013 dynamic model. MSD moved to a dynamic solution in order to support alternatives planning and design of WWIP project bundles. More recent flow monitoring and calibration to support WWIP project bundles also improved the model's ability to predict overflows.

The change from the kinematic wave to the dynamic solution method substantially increased confidence in the resulting model results, because the dynamic model more realistically models the system components and overflow occurrences. Unlike the kinematic wave model, the dynamic model simulates surcharge and backflow conditions within the interceptors by solving the full Saint Venant Equations. The dynamic model also accounts for the inherent storage present in the interceptors and collection system. While this consideration is not helpful for the larger storms; for the smaller storms, system storage prevents or reduces overflows.

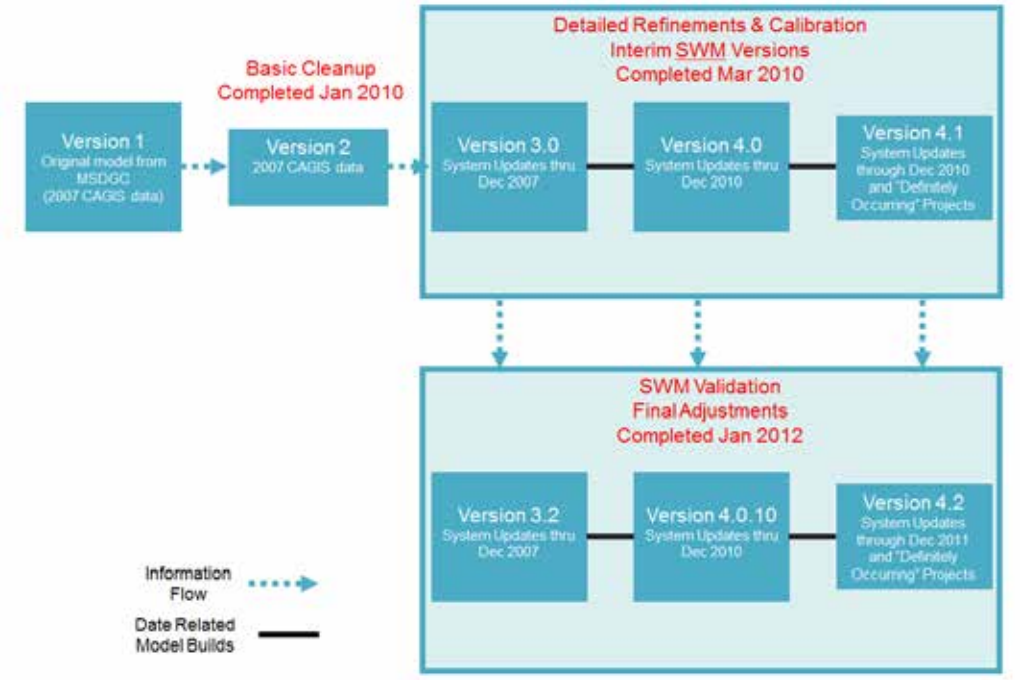
Focusing on the Lower Mill Creek Study, the SWM updating process began in 2009 with an in-depth review of the combined sewer areas, which overflow to the Mill Creek. Numerous activities improved system knowledge and the resulting model inputs, such as flow monitoring, field investigations, and reviews of as-built drawings, Geographic Information System (GIS) data, and operational records. The model update also incorporated infrastructure improvements including real time control facilities, new sewers, pump station eliminations, treatment plant upgrades, and the high water/dry weather projects completed by MSD's Wastewater Collections Division. Many of these projects helped minimize the volume of stream flow entering the combined sewer system, and improve MSD's ability to measure flow at diversion dam locations.

Following the extensive model updates to the SWM, a detailed system-wide calibration effort established that the LMC SWM accurately replicates sewer system performance during wet weather conditions based on the best available information. Additionally, the SWM was validated using an independent data set not used for calibration to demonstrate that model results are credible and reliable. Sections 4.2 and 4.3 provide further specifics regarding the model update, calibration, and validation efforts completed for the LMCPR project.

4.2 Model-Related Terminology

During the course of updating the SWM, multiple model versions were developed. Figure 4-1 illustrates the system-wide model update process, starting from the Version 1 model file received from MSD in October 2009 to the final suite of system-wide model files, which formed the basis for the LMCPR alternatives. Blue dashed arrows show the direction of information flow, while the black solid lines identify the three "date-related" model files, which reflect sewer system configurations in 2007, 2010, and 2011. The model versions referenced during the LMC Study and in this Report are defined below for clarity.

Figure 4-1 LMCPR Project - Mill Creek System-Wide Model Update Process



WWIP BASELINE MODEL: The WWIP was based upon MSD's system-wide model in effect from 2004 through 2006. In 2004 MSD's SWM model was originally constructed using SWMM 4.0 software as a detailed hydraulic model using the EXTRAN solution to simulate complex hydraulic conditions. The primary application of the SWM was for capacity assessment and single event analysis. The complexity of the SWM based in EXTRAN made it impractical for CSO planning and long-term simulations. Therefore, the SWMM 4.0 was converted into the newly available (at the time) SWMM 5.0 Beta Version G and converted into a TRANSPORT or kinematic wave model. This version of the model was utilized for development of MSD's LTCP Update.

SYSTEM MODEL VERSION 1: The kinematic wave solution does not recognize surcharge or backwater conditions. As such, MSD converted the SWMM 5.0 version from a kinematic wave model to a fully dynamic model using the SWMM 5.0.013 software. Version 1 was the starting point for the comprehensive system-wide model update process performed for the LMCPR Study. Last updated by MSD in 2008 using CAGIS data, this model file (MSDGC MILL_CREEK_UPDATED_MODEL_2008.inp) represents the Mill Creek sewer system as of December 2007 (similar to Version 3.2).

UPDATED BASELINE MODEL VERSION 3.2: Version 3.2 represents MSD's Mill Creek sewer system and installed infrastructure as of December 2007, after completion of the comprehensive SWM update process. It is intended to be the updated model of record for use in studying the system response and developing alternatives. The update was a result of reviewing runoff catchment parameters, weir and orifice settings, regulator functions, etc. Dry and wet weather flows were calibrated with flow and level data collected from 2004 – 2011.

UPDATED BASELINE MODEL VERSION 4.0.10: Version 4.0.10 reflects the Mill Creek System as of December 2010. This model includes all applicable Version 3.2 changes plus all sewer infrastructure projects constructed after December 2007 through December 2010. These projects include the four RTC facilities (Ross Run – CSO 487, Badgeley Run – CSO 125, Lick Run – CSO 5, and Mitchell – CSO 482), grating changes to CSO 191 and CSO 111, West Fork Channel grate modifications, and removal of sediment/sewer cleaning of the Mill Creek Interceptor.

CURRENT SYSTEM MODEL VERSION 4.2: Version 4.2 represents the Mill Creek system as of December 2011. This model includes all applicable Version 3.2 changes, all sewer infrastructure projects that were constructed after December 2007 through December 2010 (as documented in Version 4.0.10). These changes include the construction of four RTC facilities, grating changes to CSO 191 and CSO 111, West Fork Channel grate modifications, and removal of sediment/sewer cleaning of the Mill Creek Interceptor. Version 4.2 also accounts for projects in design or construction during 2011 that will be constructed by 2014. However, evaluation of performance is always done in comparison to Version 3.2.

The following completed projects were included in model Version 4.2:

- 10240065 = CSO 37 Maple St. Diversion Dam Improvements
- 10240075 = CSO 39 64th St. Diversion Dam Improvements
- 10240136 = Spring Grove Ave and Clifton Ave Sewer Separation (CSO 25)

The following planned projects were included in model Version 4.2:

- 10141080 = Ludlow Run (CSO 179)
- 10142020 = Daly Road to Compton Road Sewer Improvements
- 10143220 = CSO 179 Scarlett Oaks Sewer Separation
- 10143960 = CSO 525 Mt. Airy Grating Sewer Separation, Contract 1 only
- 10180900 = Cincinnati State Detention System
- 10180900 = Cincinnati Zoo Sewer Separation
- Stream Separation for CSOs 127 & 128 (Although included in Version 4.2, the stream separation is incorporated into the Revised Original LMCPR)

The details regarding the evolution of the model from Version 1 to the suite of system-wide models (Versions 3.2, 4.0.10, and 4.2) are detailed in the *"LMC-SA System Wide Model Restructuring Version 3.2,*

Version 4.0.10, and Version 4.2" Report prepared by XCG Consultants, Inc. in June , 2012. Additional terminology related to the SWM and its results are further defined below:

ALTERNATIVE MODELS: Future condition models were developed for the alternatives considered for the LMCPR and LMCFR. These proposed solutions were added into model Version 4.2. The CSO statistics were calculated by comparing the results from the alternative model to model Version 4.2.

COMBINED SEWER SYSTEM INFLOW: The system inflow is defined as the volume (MG) of flow entering the system consisting of sanitary base flow and storm water inflow. This value is calculated by the SWMM 5.0.013 model software based upon the system input parameters and hydrology.

STORM WATER SEPARATED: The amount of storm water (MG) redirected away from the combined system through partial separation projects represents a quantity of storm water that is not being directed to the Mill Creek WWTP for processing. It is calculated from the model as the existing system combined system inflow (as of December 31, 2007,Version 3.2) minus the alternative's combined system inflow (Version 4.2 + Alternative).

REMAINING OVERFLOW VOLUME: The amount of combined sewer overflow remaining (MG) for an Alternative model is determined from the simulation outputs for that input file.

OVERFLOW MITIGATED OR OVERFLOW REMOVED: The amount of overflow removed from the combined system (MG) is calculated as the remaining overflow volume in the existing system (as of December 31, 2007, Version 3.2) minus the alternative's remaining overflow volume (Version 4.2 + Alternative).

PERCENT CONTROL: The percent control is calculated as the (existing system's inflow volume {as of December 31, 2007, Version 3.2} minus the Alternative's remaining overflow volume {Version 4.2+ Alternative}) divided by the existing system's inflow volume. It represents the percent of wet weather flow that has been either removed or not allowed to overflow (captured in the system) from the baseline model condition.

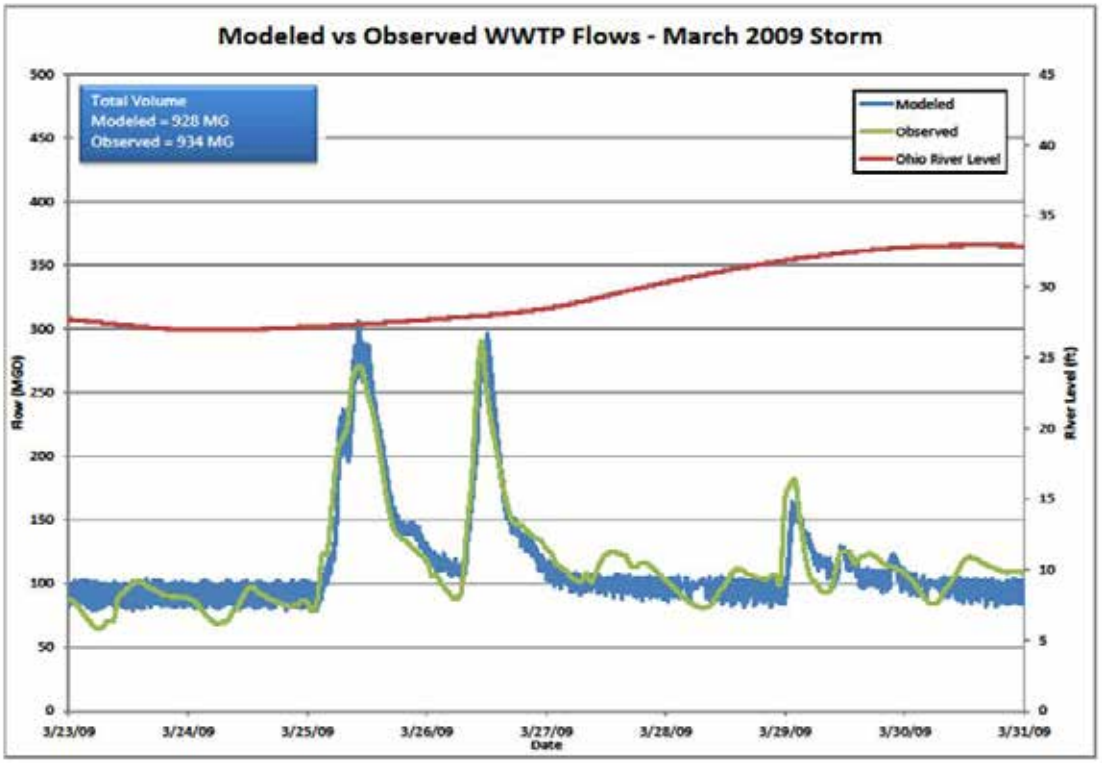
FLOW TREATED AT WWTP: The volume of flow treated at the Mill Creek WWTP is represented by the underflow volume (MG) reflected in the model. The amount of flow receiving primary treatment is calculated from model time-series results. The amount of flow receiving secondary treatment is calculated by subtracting the Alternative's primary treatment flow from the Alternative's flows treated at the WWTP.

4.3 Updated Baseline System-Wide Model and Phase 1 Goal

The updating process necessitated changes to components of the original hydrologic and hydraulic SWM based on the availability of new information collected by MSD since development of the Wet Weather Improvement Program in 2006. Given the changes made to the SWM, a detailed calibration process was undertaken to ensure the model is representative of system performance based on the best available information. Additionally, the model was subjected to a rigorous validation exercise utilizing independent data sets not used in the calibration. The purpose of the validation exercise was to verify the calibration

process had successfully and effectively adjusted the SWM to simulate conditions within the collection system as compared to available data. An example model validation hydrograph is shown in Figure 4-2. Details are provided in report titled *"Lower Mill Creek Partial Remedy System Wide Model Validation Report"* prepared by XCG Consultants, Inc. dated January 2012. Figure 4-2 demonstrates the accuracy in which the updated model results compares to the observed data for flow entering the Mill Creek wastewater treatment plant. Similar hydrographs were provided for other key locations including CSOs and major interceptors in the January 2012 XCG report.

Figure 4-2 Example Model Validation Hydrograph



The MSD Modeling Guidelines and Standards were consulted to evaluate whether the peak flow and total volume amounts for the calibration and validation storms were within acceptable ranges. These guidelines suggest an acceptable difference between observed and model values for each storm with good quality data is -15% to +25% of observed values for the peak flow, -10% to +20% of observed values for the total flow volume, and -15% to +15% of observed values for the peak depth. The goal for the LMCPR validation effort was for 60% of the simulated versus measured values (peak flows, volumes, and depths) to be within the desired ranges.

To calculate percent control and CSO volume reductions for proposed and actual projects, all statistics are generated relative to the December 2007 sewer system, which represents baseline conditions. For the WWIP, the WWIP Baseline Model was used. For the LMC study, MSD used the updated Baseline Model Version 3.2, which is an updated, calibrated, dynamic model that reflects system conditions as of December

2007. Table 4-1 summarizes the resulting inflow, intercepted, and overflow volumes generated under baseline conditions (Version 3.2) and for the current system (Version 4.2). As expected, converting a kinematic-wave model to a fully dynamic model significantly changed the inflow and overflow volumes for the modeled system. Version 4.2 model is the current model that MSD manages. MSD ensures new construction is added to the model and that it's properly maintained. It's the starting point of new investigations and evaluation such that revisions made the the current system model could, if applicable, be also included in future updates of the baseline model..

Table 4-1 Model Versions Comparison

Model Version	Inflow (MG/year)	Intercepted (MG/year)	Overflow (MG/year)
2006 WWIP Baseline (Kinematic – LTCP Update)	13,282	4,995	8,286
2007 LMC Updated Baseline (Dynamic – Version 3.2) [1]	10,159	5,017	5,231
2011 LMC Current System (Dynamic – Version 4.2) [1]	8,702	4,384	4,421

1. Values may be subject to change as updated modeling results become available.

Two significant conclusions emerge based on the more accurate modeling. First, total inflow volumes are far less than estimated in the simplified WWIP Baseline Model. Second, total overflows are far less than previously estimated. These new results were not available when the Final WWIP was proposed and accepted, but they should now be used to evaluate the Revised Original LMCPR as they are far more accurate estimates.

In fact, the Updated Baseline Model's information should be used to determine what constitutes "equivalent or greater annual volumetric control" in the evaluation of a Revised Original LMCPR. Using the old WWIP Baseline Model, the Original LMCPR's significant overflow reduction was estimated to be approximately 2 BG. Updating the volume equivalent of the 2 BG estimated for Original LMCPR (based on old modeling) to reflect the new modeling can be performed in multiple ways. For example, if updated based on the percentage of inflow generated by the Updated Baseline Model, the new modeling equivalent CSO volume reduction would be 1.25 BG. If updated as a percentage of overflow generated by the Updated Baseline Model, the new modeling equivalent CSO volume reduction would be 1.54 BG. Both calculations are reasonable approaches.

The Defendants and Regulators have also reviewed the new modeling equivalent CSO volume reduction generated using a method from Final WWIP discussions. The details of this calculation were provided to the Regulators on August 9, 2012, and the result is an estimated 1.78 BG CSO reduction. A volume reduction of 1.78 BG represents a *much higher percentage of overall LMC volume capture than the WWIP Baseline Model numbers*, and therefore is a more "significant volume reduction." Under the new modeling, 1.78 BG reduction represents a 34% reduction of total LMC overflow volumes, while the original 2 BG reduction estimate represented a 24% reduction, as shown in the equations below.

Original Default LMCPR Overflow Reduction:

$$\frac{\mathbf{2.01\ BG}}{\mathbf{8.253\ BG}} = \mathbf{24\%\ reduction\ in\ overflow}$$

Revised Alternative LMCPR Overflow Reduction:

$$\frac{\mathbf{1.78\ BG}}{\mathbf{5.231\ BG}} = \mathbf{34\%\ reduction\ in\ overflow}$$

With multiple, different and reasonable estimates of equivalent CSO volume reduction arising from the Updated Baseline Version 3.2 Model, the County and City have chosen to use the 1.78 BG annual CSO volume reduction control. This reduction goal is attainable with the Revised Original LMCPR for the original budgeted cost of approximately $244.3 million (2006$) with construction complete by the original Phase 1 milestone date of December 31, 2018.

MSD's use of modeling is consistent with the best practices was for development and ongoing refinement of Long-Term Control Plans and Capacity Assurance Plans, and will continue into the future as new technologies, new modeling software, post construction monitoring, and improved information is made available nationally and locally. As such, the model will be refined in the future when additional monitoring and modeling information becomes available and based on the post construction monitoring results.

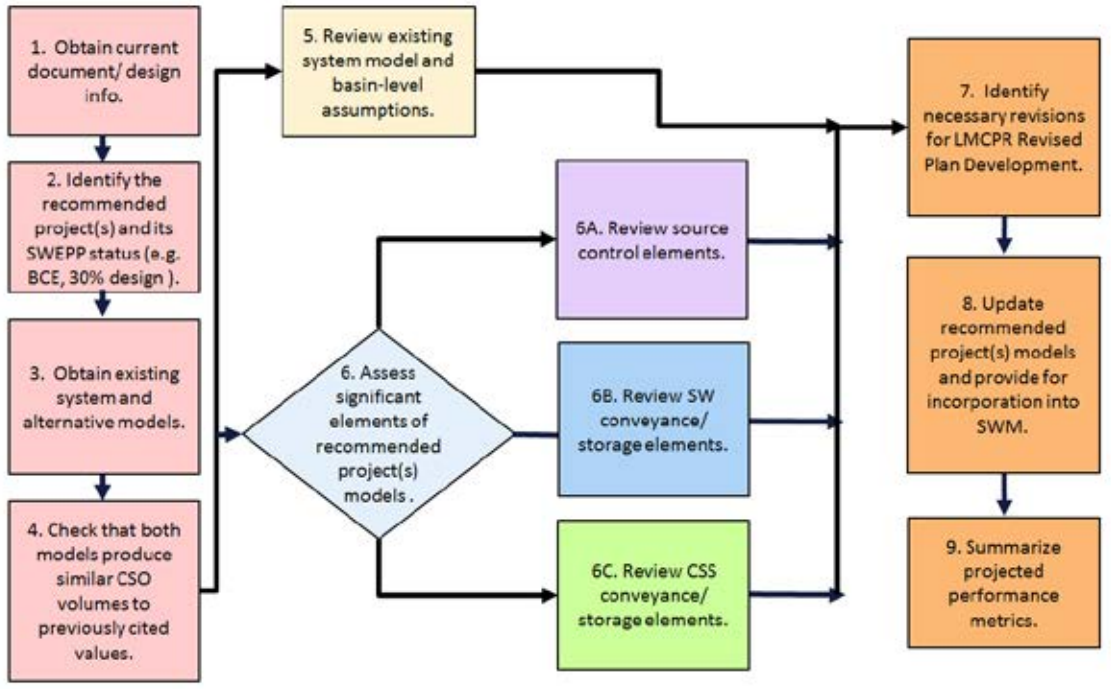
4.4 Alternative Models

4.4.1 Model Review Approach

Originating from MSD's Sustainable Watershed Evaluation Planning Process, sustainable projects from six sub-basins were assessed to identify solutions for use in the development of system-wide alternatives for the Revised Original LMCPR. These alternative evaluations used MSD's SWM to establish benefits from the sustainable projects with the overall alternative targeting equal or greater control of annual CSO volumes as the Default Plan by the end of Phase I. The six sub-basins of interest included Bloody Run, Denham, Kings Run, Lick Run, Ludlow, and West Fork.

The model review approach includes detailed evaluations of the existing system and alternative models for the sustainable projects within the sub-basins of interest. Figure 4-3 below shows the overall model review process, which focused on reality and consistency checks regarding the magnitude of potential CSO and stormwater runoff volume reductions across the various projects and consistency with the WWIP.

Figure 4-3 Candidate Sustainable Projects - Model Review Process



The model review included the following consistency checks:

- Evaluating input data (level of detail, hydraulic and hydrologic inputs, etc.) within the existing system model, relative to assessing the benefits of the proposed sustainable projects;
- Evaluating if implementation and performance assumptions for source control sustainable projects are realistic;
- Confirming that model inputs for the source control sustainable projects comply with MSD/industry standards modeling guidance;
- Documenting sizing criteria, and confirming that storm sustainable projects, where explicitly modeled, divert stormwater flows correctly and appropriately.

Following the model reviews, meetings were held with the SWEPP consultant teams to document the performance assumptions and methodology. As necessary, modifications were made to the Alternative sub-basin models to promote consistency with the SWM and across the various candidate sustainable projects. Further details are provided in the *Sustainable Projects Lower Mill Creek Partial Remedy Study Report*, prepared by Malcolm Pirnie/ARCADIS in December 2012.

4.4.2 Modeling Software

Modeling for source control projects, especially related to sizing of proposed separation improvements, is an iterative process involving use of different software from both hydrologic and hydraulic models. Potential CSO reductions from source control projects were assessed using the previously-mentioned Alternative models and the SWMM 5 software.

HYDROLOGIC MODELS: Hydrologic models were used to generate flows given topographic and hydrologic parameters. SWMM, Hydro CAD and HEC-HMS were used to varying degrees. These hydrologic flows were used as inputs for hydraulic models in many cases.

HYDRAULIC MODELS: The proposed storm sewer projects are modeled using XPSWMM, SWMM, CDSS or StormCAD to determine appropriate pipe sizes, slopes, and invert elevations necessary to meet local design requirements and avoid existing utility conflicts. Input parameters include the following: existing ground surface, preliminary storm sewer alignments and profiles, pipe material, and structure size information. The peak flows, as determined from the hydrologic model results, are entered at each anticipated change in flow (inlet, catch basin, headwall, and detention basin outfall). Modeling was completed based on Stormwater Management Utility (SMU) Rules and Regulations and specific guidance provided by SMU. Stream systems were modeled using HEC-RAS.

4.4.3 Modeling Methods for Separation

In the Updated Baseline Version 3.2 Model, the surface runoff (stormwater) and any added RDII were calibrated based on observed data. In the separation alternatives, the surface runoff volume is maintained in both volume and hydrograph shape by splitting each subcatchment into two new subcatchments and adjusting the widths. The fraction of the original subcatchment that is routed to the storm sewer is the percent effectiveness of the separation. If the percent effectiveness is 75%, then three quarters of the original subcatchment is routed to the proposed storm sewer and the remaining 25% is routed to the combined sewer.

Along with surface runoff in the combined system, RDII was added to the existing conditions SWM, if the flow monitoring data and the calibration adjustments indicated the need for additional flows. The surface runoff subcatchments were adjusted to match the rising limb, the peak, and the early recession limb of the observed hydrographs. If the later portions of the recession limb of the hydrograph or subsequent peak flows needed additional flows to achieve calibration, RDII was then added to the combined sewer flows.

Using the RTK method of three RDII hydrographs (short term, intermediate term, long term), short term RDII was assumed to be included in the modeled surface runoff and was not added to the combined sewer modeling. Short term RDII is the direct connections to the sewer such as downspouts, yard and driveway drains, etc. The RDII added to the SWM based on the flow monitoring was assumed to originate from slower infiltration sources such as leaking laterals and mains. In the Alternative models, which simulated separation projects, the intermediate and long term RDII was generally assumed to remain in the existing

sewer. For most separation projects, RDII remained on the existing combined sewer, which was converted to sanitary flows only, while the new storm sewer was installed as a tight pipe with only surface runoff.

The actual occurrence of RDII in gravity sewers is influenced by a number of factors, including depth of groundwater, condition of structures, manhole casting type and condition, condition of pipe, pipe joint type and condition, porosity of surrounding soils, topography, flooding susceptibility, sewer hydraulic capacity and cross connections, among other things. For combined sewers and storm sewers, RDII is generally not a significant concern other than it could be an indicator of advanced deterioration of a piping segment.

The addition of a storm sewer system that operates in parallel with a combined sewer will significantly reduce the occurrence of inflow into the combined sewer, by capturing the storm water runoff that previously had entered the combined sewer. This reduction presumably will reduce the overall hydraulic loading on the combined sewer, to the point where it will see fewer episodes of surcharged operation.

In certain situations, the elimination of surcharged conditions could lead to increased RDII. If groundwater conditions are below the top of the pipe, under surcharged conditions, infiltration of this groundwater into the pipe cannot occur. However, if the surcharged conditions are relieved the opposite is true, and infiltration can occur- when groundwater is present.

For the Revised Original LMCPR, infiltration is not expected to occur as groundwater conditions throughout the project areas are typically well below the existing combined sewers. Groundwater elevations from over 300 borings that were completed by MSD's soil consultant for the various sustainable projects provide documentation of these conditions. The terrain, soils, and steep slopes of the Tier 1 areas also provide for well drained conditions that minimize the potential for groundwater infiltration, in turn also minimizing the groundwater available for pipe infiltration. With these conditions in place, a reduction in surcharged pipe conditions in the combined sewer is unlikely to produce any meaningful changes in the occurrence of RDII.

4.5 Implementation Assumptions for Alternative Models

With separation a significant part of the Revised Original LMCPR, confirming realistic implementation assumptions is an essential step in reality-checking the magnitude of potential CSO volume reductions. However, identifying realistic and achievable performance goals is challenging because of the large number of often site-specific factors, which influence CSS separation success. These factors which are considerations within integrated planning include:

- Distribution of stormwater source type (streets, roofs, etc.)
- Public vs. private sources
- Tributary sewer type (storm only, CSS, etc.)
- Tributary sewer age and condition

- Location and age of nearby existing sewers
- Land use
- Impervious area
- Topography
- Soils
- Proposed separation technology
- Implementation practices during construction

Guiding questions for review of the implementation assumptions included:

- What were the separation assumptions?
- As stated, were they implemented correctly within the model?
- Are these assumptions realistic for the selected separation area?
- Are these assumptions consistent with assumptions used across all candidate separation projects?
- Is additional conservatism in the performance assumptions desired for the LMC Study?
- How significant an impact will the proposed changes have on projected annual CSO volume reductions?

4.5.1 Separation Performance Assumption Reviews and Revisions

For the sustainable separation projects, initial implementation and performance assumptions (i.e. percent effective statistics) were assigned based on sub-basin specific evaluations, where the level of detail in those evaluations varied with the project's status (i.e., conceptual planning through preliminary/detailed design) in the SWEPP. These percent effective statistics were subsequently revised in order to ensure a consistent methodology across all sub-basins. The revision process included application of threshold values for percent effectiveness to confirm realistic assumptions for separation success in each sub-basin. Assessing the implementation and performance assumptions is an essential step in reality-checking the magnitude of potential CSO reductions, since approximately 66% of the CSS drainage area in the six sub-basins was targeted for separation in the development of candidate LMCPR sustainable projects.

The Mill Creek SWM uses RTK unit hydrographs for representing RDII flows in the CSS for several sub-basins; therefore, the evaluations of the implementation and performance assumptions used percent reductions in wet-weather volume as the metric for percent effectiveness. This metric is appropriate for RTK models, as it integrates the effectiveness of a potentially large set of model RTK parameters into a single measure. The explicit definition for "Percent Wet-Weather Volume Reduction" is provided below:

$$\text{Percent Wet-Weather Volume Reduction} = \frac{\text{Total runoff volume and RDII volume re-directed to the SW system}}{\text{Total runoff volume and RDII volume in the CSS for pre-separation conditions}} \times 100$$

Table 4-2 below provides the wet-weather volume reduction statistics for the three proposed LMCPR separation projects by sub-basin along with the CSS runoff drainage area and the total area targeted for separation (Tier 1 areas). Open space Tier 1 areas with percent wet-weather volume reduction values at or near 100% constitute significant portions of all three sub-basins. These areas are dominated by large-scale opportunities to remove stream flow and/or existing local separate storm systems from the CSS.

Table 4-2 Revised Percent Wet-Weather Volume Reduction Averages for Revised Original LMCPR

Sub Basin	Separation Type Technology	Modeled Drainage Area Tributary to CSS (acres)[1]	Tier 1 Area/ Drainage Area Targeted for Separation (acres)[1]	Initial Percent Wet Weather Volume Reduction Averages[1]			
				Tier 1 Open Space/ Transportation (O/T) Areas	Tier 1 Developed (D) Areas	Weighted Average over Tier 1 Areas	Weighted Average over Entire Sub Basin
Kings Run	Partial sewer and stream separation with conversion of CSS sewers to storm sewers	1,145	641	92%	70%	78%	45%
Lick Run	Partial separation with new storm infrastructure	2,878	1,621	92%	78%	83%	50%
West Fork	Stream separation and new storm infrastructure	2,973	1,365	94%	71%	90%	38%

1. Values may be subject to change as updated modeling results become available.

The implementation and performance assumptions review began by comparing the initial percent wet-weather volume reduction statistics for the two land use/development categories within the Tier 1 areas with threshold metrics, summarized below:

- Open space/ Transportation Areas (O/T): Maximum 95% reduction in wet-weather volumes with routing to storm systems, and

- Developed Areas (D): Maximum 50% reduction in wet-weather volumes with routing to storm systems, averaged across the Tier 1 areas and subject to local impervious cover estimates/ separation implementation choices.

The land use/development categories of "Open Space/Transportation" and "Developed" were assigned to each Tier 1 subcatchment based on reviews of recent digital aerial photos and CAGIS. The term "Developed" was applied quite broadly and includes both low density suburban areas and high density urban development. The threshold value for open space/transportation areas was selected to provide a level of conservatism, even for areas that are easily separated. Five percent of the pre-separation drainage area remains on the CSS to account for situations where stormwater runoff from damaged pipes and manholes may continue flowing into the CSS.

For developed areas, values less than 50% are typical conceptual planning assumptions for projects involving separation of streets and sidewalks draining into the public right of way in dense urban areas; therefore, the threshold metric of 50% is reasonable. These assumptions are high-level and do not include site visits or extensive topographic analysis. Higher percent reductions in dense urban areas typically require private property inflow removal programs (i.e., separation of sump pumps, downspouts, area or driveway drains from the CSS) supported by field reconnaissance investigations.

Values in the original models above the threshold values then triggered more detailed reviews and meetings with MSD and the SWEPP consultant teams to document the specific situations and evaluations which support those implementation/performance assumptions. In many cases, higher values were appropriate based on the targeted stormwater sources (i.e., streets, roofs, already separated mini-systems, stream day lighting), level of field investigations, the location of nearby existing sewers, and the proposed separation technology, etc. In other cases, the review led to a reduction in the initial values to ensure consistency across project areas. Table 4-3 summarizes the updated implementation assumptions for the selected Revised Original LMCPR separation projects by sub-basin. The two main reasons for the reduced percentages include:

- Maintaining private property connections on the CSS, if they are currently assumed to drain to the CSS (e.g. roof downspouts), since the LMCPR separation projects do not assume costs of private property separation.

- Implementing a 95% reduction cap (by area) for open space and transportation areas on average.

Table 4-3 Revised Implementation Assumptions Summary for Revised Original LMCPR

Sub Basin	Separation Type Technology	Implementation Details within Sub Basin
Kings Run	Partial sewer and stream separation with conversion of CSS sewers to storm sewers	• Open space/Transportation – Max 95% removal of SW runoff (by area) • Developed - Impervious area remaining on CSS = CAGIS roof fraction; Pervious area in same proportion • No RTK for CSS in separated areas
Lick Run	Partial separation with new storm infrastructure	• Removal of SW runoff in proportions shown in Table 4-4 • No RTK required
West Fork	Stream separation and new storm infrastructure	• Open space/Transportation – Max 95% removal of SW runoff (by area) • Developed – Various (no change) • RTK to CSS/SW – separation technology dependent

While the average wet weather volume reduction percentages for developed areas do exceed the threshold values, these values are typically applied for conceptual planning in dense urban areas. As shown in Table 4-4, most of the sustainable projects draw on site-specific assessments to some degree in the predictions of sewer separation success, which allows a lower level of conservatism. Map-based reviews of individual subcatchment values correlating land use, development type, impervious area, topography, and the location of nearby existing sewers (both combined/sanitary and separate storm sewers) were also used to identify when specific values were appropriate based on the targeted stormwater source.

Table 4-4 Separation Assessment Summaries and Implementation Assumption Reviews

Sub Basins	Separation Assessment Level of Detail	Implementation Details Initial Models	Comments
Kings Run	**Low** Aerial photos/ CAGIS	Removal of all SW runoff sources	Model revised with roofs staying on CSS; Pervious area in same proportion. OK to exceed thresholds, since model consistent with project implementation choices/costs to capture cost-effective private sources RTK not added to CSS for new combined sewers near CSO 483 (RDII flows much less than remaining CSS flows).

Sub Basins	Separation Assessment Level of Detail	Implementation Details Initial Models	Comments
Lick Run	**High** Windshield surveys, aerial photos/ CAGIS during conceptual planning; Field investigations of 5 representative subcatchments - 2011 Parcel-level assessments for all Tier 1 subcatchments – 2012 (several days of field visits; aerial photos, and newly digitized impervious surfaces shapefile)	Removal of all SW in the public ROW, and private pervious & impervious surfaces which drain to/near to public ROW Values not explicitly connected to removal of specific SW sources, but rather based on estimated percent area reductions assigned by subcatchment;	No changes in separation assumptions, although effects of downspout disconnect in Tier 2 areas were removed. Separation assumptions are slightly more aggressive than other sub-basins; however, assessment level of detail is high. Model assumptions consistent with removal of all public ROW, private pervious & impervious surfaces, and reasonable percentage of roof drains. OK to exceed thresholds, since these values were confirmed through field reconnaissance during design. No RTK required in existing system model
West Fork	**Westwood Northern Bundle (WNB) CSOs - High** Parcel level-assessment **Remaining CSOs - Low** Windshield surveys; short field walks, aerial photos/ CAGIS	**All CSOs –** Removal of all SW runoff from public ROW & private pervious / impervious surfaces which drain to/near to public ROW. **WNB CSOs –**Roofs/depressed driveways remain connected to CSS. **Remaining CSOs-** Roofs remain connected to CSS, except where buildings are in floodplain (to be removed) or drain to defined connection point.	No changes in separation assumptions. **WNB CSOs -** Model assumptions consistent with removal of all public ROW, private pervious & impervious surfaces and small percentage of roof drains). OK to exceed thresholds, since these values were confirmed through field reconnaissance during design. **Remaining CSOs-** Model assumptions consistent with removal of all public ROW, private pervious & impervious surfaces, and reasonable percentage of roof drains). RTK to CSS/SW – separation technology dependent ;

4.5.2 Detailed Parcel-Level Separation Assessments in Lick Run

The Lick Run watershed provides an example of the increasing level of detail in the separation assessments, as a project proceeds from planning into design. Initial estimates of percent effectiveness were developed during conceptual planning based on windshield surveys and reviews of aerial photos and CAGIS data. In 2011 the percent effectiveness estimates were reviewed based on field investigations for five representative subcatchments. Then, as part of design in 2012, MSD conducted parcel-level separation assessments to update the percent effectiveness values for all Tier 1 subcatchments.

These parcel-level separation assessments included the following steps:

1. Digitizing the impervious areas and identifying the different impervious area source types (i.e., buildings, roadways, driveways and sidewalks, parking lots, and misc impervious areas) for all SWM subcatchments in the Lick Run watershed based on new 2011 digital aerial photos.

2. Performing extensive field investigations of the Tier 1 subcatchments, including identifying where downspouts, parking lots, driveways, and other stormwater sources discharge their stormwater loads:

    - Downspouts were checked on buildings to identify those that appeared to be disconnected from the combined sewer system.

    - Large parking lots were investigated to identify drainage patterns (whether areas would enter proposed storm system or remain on the combined system).

    - Driveway slopes were observed to determine if stormwater runoff was directed toward the street or the building.

3. Updating the detailed impervious area shapefile with a percent removed factor, which estimates the area proportion entering the proposed storm sewer system for each shape. For example, if a parking lot had a separate storm system that was being rerouted to the proposed storm sewer system, it was assigned a percent removed factor of one. A percent removed factor of zero was used for all areas that would stay connected to the CSS.

4. In cases where stormwater runoff from an impervious area enters both the proposed storm sewer system and the combined sewer system, the shape was split to accurately reflect the drainage area split to each conveyance system.

These detailed values were then compared to the original percent effective values and any changes were incorporated into the combined sewer model to determine impacts on potential CSO reductions. While some differences did exist for individual subcatchments, the overall percent effectiveness values averaged across the sub-basin were consistent, confirming the logic of the original values. Further details are provided in the *Lick Run Percent Effectiveness Technical Memo*, prepared by Strand in April 2012.

4.6 Revised Original LMCPR Metrics

Following the development of the Updated Baseline Model (Version 3.2) and the reviews leading to the development of the proposed Revised Original LMCPR, which incorporates a sustainable approach to CSO control, system-wide model simulations were performed to quantify performance benefits from the proposed projects. None of these values constitute Performance Criteria under the WWIP unless expressly stated.

For the Revised Original LMCPR volume reduction and percent control values are based on comparisons of inflow and overflow volumes from the Updated Baseline Model (Version 3.2), in the “Maximum Sustainable

Infrastructure + Real Time Control" results tables dated June 8, 2012. Table 4-5 compares the resulting CSO reduction for the Revised Original LMCPR in comparison to the Updated Baseline Model version 3.2. Overall, the Revised Original LMCPR is estimated to control LMC system-wide overflow volumes by 1.78 BG annually as compared to the Updated Baseline Model version 3.2.

Table 4-5 Revised Original LMCPR Metrics

Performance Metrics	Updated Baseline Model [1] (Version 3.2)	Revised Original LMCPR[1, 2, 3]
Combined System Inflow (MG)	10,159	7,343
Stormwater Separated (MG)	0	2,680
Overflow Mitigated (MG)	0	1,783
Flows Treated at EHRT (MG)	0	0
Flows Treated at WWTP (MG)	5,071	4,140
Remaining Overflow (MG)	5,231	3,448
Watershed % Control	49%	67%
Number of CSOs Eliminated	4	4
Number of CSOs > 85% Control	26	29
Number of CSOs < 85% Control	71	68
No. of CSOs >100 MG overflow	12	10

1. Values may be subject to change as updated modeling results become available.
2. Revised Original LMCPR includes projects for the Lick Run and Kings Run (Wooden Shoe) watersheds, West Fork Separation and Detention, and RTC at Bloody Run.
3. CSO volume reductions: CSO volume reductions for Kings Run were calculated from the Maximum Sustainable Infrastructure + Real Time Control results tables (dated 6/8/2012) (Version 4.2 Detailed, Phase I Option A scenario). Values for Bloody Run RTC benefit are cited as 93 MG in the *Lower Mill Creek Partial Remedy Study Revised Plan Phase 1 Report*, June 2012 (Section 3.1.3.3). Values for Lick Run and West Fork were based on individual project runs in the Version 4.2 sub-basin model (dated 12/2012) and the Version 4.0.10 Consolidated model (dated 10/24/2012), respectively. For the Attachment 1C Existing Four RTCs, the corresponding model run reference is Appendix E, *LMC-SA System Wide Model Restructuring Version 3.2 Report,* June 1, 2012.

Table 4-6 summarizes the detailed overflow reduction benefits for the CSOs for the existing RTCs and raising of the West Fork Channel grates.

Table 4-6 CSO Overflow Summary for Existing RTCs and Raising of the West Fork Grates

CSO	SWM Version 3.2 [1]		SWM Ver. 4.2/4.0.10 Detailed Phase 1 Sustainable with Existing RTCs[1]	
	Inflow Volume (MG)	Overflow Volume Remaining (MG)	Overflow Volume Removed (MG)	Overflow Volume Remaining (MG)
Lick Run CSO 5 (Only RTC)	1,844	1,454	455	999

CSO	SWM Version 3.2 [1]		SWM Ver. 4.2/4.0.10 Detailed Phase 1 Sustainable with Existing RTCs[1]	
	Inflow Volume (MG)	Overflow Volume Remaining (MG)	Overflow Volume Removed (MG)	Overflow Volume Remaining (MG)
Mitchell CSO 482	485	219	34	185
Ross Run CSOs 485/487	828	346	151	195
Badgeley CSO 125 + Raising West Fork Grates	1,671	376	97	279
Totals	4,828	2,395	737	1,658

1. Values may be subject to change as updated modeling results become available.
2. For the Attachment 1C Existing Four RTCs and raising of the West Fork grates, the corresponding model run reference is Appendix E, LMC-SA System Wide Model Restructuring Version 3.2 *Report,* June 1, 2012.

Table 4-7 summarizes the detailed overflow reduction benefits for the CSOs of the proposed projects of the Revised Original LMCPR. The starting point or baseline summarized in the table is Version 3.2 for CSOs that have not had RTCs constructed, and is Version 4.2 for CSO 5 that has a constructed RTC, and Version 4.0.10 for CSO 125 that has a constructed RTC along with raising of the grates. The total 1.78 BG annual overflow removed is the sum of 737 MG reduction from the existing RTCs and raising of the West Fork grates plus anticipated 1,046 MG reduction of the proposed projects.

Table 4-7 CSO Overflow Summary for Revised Original LMCPR

CSO	SWM Version 3.2 or SWM Version 4.0.10/4.2 (for CSO 5, 125 & West Fork Grates)[1]		SWM Ver. 4.2 Detailed Revised Original LMCPR[1, 2, 3]	
	Inflow Volume (MG)	Overflow Volume Remaining (MG)	Overflow Volume Removed (MG)	Overflow Volume Remaining (MG)
5	1,853	999	624	375
217 [4]	*148*	*103*	156	13
483	280	193		24
181	1,294	595	93	502
125 [5]	279	188	138	50
West Fork Grates Impact of Partial Remedy [5]	26	91	17	74
126 Impact of Partial Remedy [5]	53	28	-2	30

CSO	SWM Version 3.2 or SWM Version 4.0.10/4.2 (for CSO 5, 125 & West Fork Grates) [1]		SWM Ver. 4.2 Detailed Revised Original LMCPR [1, 2, 3]	
	Inflow Volume (MG)	Overflow Volume Remaining (MG)	Overflow Volume Removed (MG)	Overflow Volume Remaining (MG)
127 [5]	26	16	16	1
128 [5]	14	6	4	3
Subtotal	3,825	2,116	1,046	1,072
RTCs at Lick Run, Ross Run, Mitchell, Badgeley & Raising West Fork Grates	NA	NA	737	NA
Overall Totals	3,825	2,116	1,783	1,072

1. Values may be subject to change as updated modeling results become available.
2. Revised Recommended Phase I Sustainable Alternative includes projects for the Lick Run and Kings Run (Wooden Shoe) watersheds, West Fork Separation and Detention, and RTC at Bloody Run.
3. CSO volume reductions: CSO volume reductions for Kings Run were calculated from the Maximum Sustainable Infrastructure + Real Time Control results tables (dated 6/8/2012) (Version 4.2 Detailed, Phase I Option A scenario). Values for Bloody Run RTC benefit are cited as 93 MG in the *Lower Mill Creek Partial Remedy Study Revised Plan Phase 1 Report*, June 2012 (Section 3.1.3.3). Values for Lick Run and West Fork were based on individual project runs in the Version 4.2 sub-basin model (dated 12/2012) and the Version 4.0.10 Consolidated model (dated 10/24/2012), respectively. For the Attachment 1C Existing Four RTCs, the corresponding model run reference is Appendix E, *LMC-SA System Wide Model Restructuring Version 3.2 Report,* June 1, 2012.
4. Totals for CSO 217 are treated differently in overall calculations since CSO 217 overflows to an open channel which enters the system at CSO 483. The sustainable solution removes the nested relationship of the two CSOs. Remaining volume of CSO 217 is accounted for in the Phase 1 sustainable results since it reaches the Mill Creek.
5. The West Fork partial remedy solution reduces overflows at CSO 125, 127, 128, and the grates in the West Fork Channel. Due to dynamic nature of the interceptor the overflows may increase slightly at CSO 126. Total overflow reduction is estimated to be 173 MG. Post construction monitoring needs to evaluate the partial remedy on a watershed basis so the model results could provide a representative comparison.

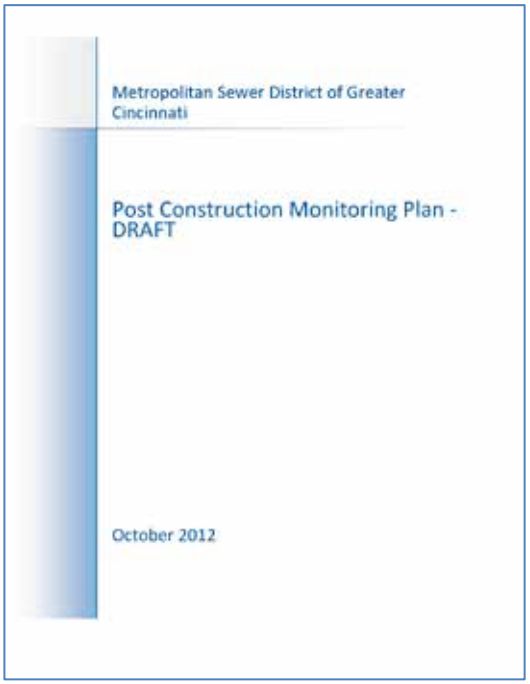
As discussed in the West Fork Revised Original LMCPR section above, the proposed projects are directly associated with separation of streams from the combined system upstream of CSO 125, CSO 127 and CSO 128. Because of the independencies of the CSO overflows on the surcharged West Fork interceptor, the reduction of inflows at these three CSOs causes a decrease in the overflows at the existing West Fork grates although no improvements are being made at the grates at this time. The dynamic nature also slightly increases overflows at CSO 126. Therefore, to properly document the benefit of the West Fork Phase 1 projects, post construction monitoring needs to evaluate the partial remedy on a watershed basis so the model results could provide a representative comparison at the three CSOs, CSO 126, and the grates.

4.7 Construction Monitoring Issues

MSD's approach to developing a flow monitoring plan is consistent with requirements provided by the USEPA. MSD's approach satisfies industry standards for CSO Wet Weather Programs. Every community

addressing wet weather sewer overflows faces challenging but unique conditions. As such, USEPA issued a draft guidance document for the LMC Study outlining the "industry standards" that need to be addressed for development of a suitable flow monitoring program.

> *"Unique issues that could arise in the context of developing the Post-Construction Monitoring Study required by Section X of the CSO Decree, in light of the source control/green infrastructure measures in the proposed Revised Original LMCPR (EPA Guidance-Draft for Discussion, October 2011)."*



The primary objective of pre- and post-construction monitoring is to obtain the flow data necessary to refine the Mill Creek SWM and generate pre- and post-construction typical year overflow volumes at a given CSO(s). The principal model elements to be refined are hydrologic parameters and RTK values. Seasonal changes in average dry weather flows will also be examined, as they influence the calculations of RTK values and overall wet weather volumes.

Comparisons between the remaining overflow volumes and percent control for post-construction conditions and the individual CSO requirements will be performed to determine if the reduction goal has been met. In addition, aggregate CSO volume reductions will also be tracked at the watershed level to confirm that the constructed projects meet the required Phase 1 reduction goal of 1.78 MG.

An overall concern might come from the fact that MSD is calibrating different portions of the model using flow monitoring data collected at different points of time. Ideally, using a consistent flow monitoring period across the entire CSO service area would be preferred. This approach was not feasible for MSD's system-wide model and is seldom viable from a practical standpoint. It will be important to note differences in the flow monitoring periods; to try to select a broad range of storms that are reflective of typical year storms; to ensure good seasonal coverage with selected storms; and to possibly compensate for particularly wet or dry periods in the final selection of model parameters.

4.7.1 Flow Monitoring Activities

MSD has collected flow-monitoring data from multiple locations throughout Lower Mill Creek over the past five years. During the LMC Study period, adverse field conditions resulted in the data collected from the Lick Run sub-basin to be unsuitable for the updated system-wide model. However, it is reasonable to expect MSD's system-wide model will correlate well with predictions regarding the flow conditions at CSO 5, because the model results for other key infrastructure (Mill Creek Wastewater Treatment Plant, Mill Creek Interceptor, and Mill Creek Auxiliary Interceptor) match available flow monitoring data from other locations.

MSD remains committed to updating its model with flow monitoring data collected from the Lower Mill Creek watershed and utilize this information in design to ensure the best, most sound engineering practices are taken into account to supplement the strategic separation approach.

The topography and existing infrastructure have posed unique challenges that continue to be overcome through an iterative process. Recognizing these challenges, MSD has pursued an iterative approach for verifying performance of CSO 5, including:

- Monitoring flow from larger diameter pipes
- Field verification of percent effectiveness criteria
- Monitoring flow from smaller diameter pipes
- Model refinement during design
- Post construction monitoring

MSD developed and has implemented a flow monitoring plan for Fall 2012 for Lick Run, which takes many of the Lick Run challenges into account – such as slope, debris, pipe size, velocity. The site selection criteria were based on smaller pipe sizes and slower velocities. Initial field inspections have been conducted. These inspections confirmed the suitability of the manholes with regard to crew safety and ability to install monitoring equipment. The flow meters measure flows and levels at locations more likely to produce useful data individually, and as a set of locations that can be used for providing greater confidence in the flows at CSO 005 outfall, confidence in the rainfall distribution and conditions of runoff attributed to land use, slope, infiltration, etc., as well as being able to serve as good pre-construction data flow data for many of the Lick Run separation projects. This additional monitoring data will help refine the design of the remainder of the projects and verify that the proposed projects will meet the overall reduction objectives. After improvements are made, a modified model will be developed for post-construction conditions. Following construction, a recalibration of the model based on the installed improvements and the post construction monitoring will proceed. The 1970 year storm will be run through the models and the difference will be the actual CSO reduction achieved.

The discussion of prior and current flow monitoring efforts throughout the Lower Mill Creek watershed, but specifically in Lick Run, demonstrates MSD's commitment to identify and resolve these unique issues. A one-size-fits-all approach is not appropriate for Consent Decree Programs. MSD has and continues to pursue every available action to collect useful and suitable flow monitoring data.

MSD has and continues to conduct flow monitoring to support the Revised Original LMCPR projects:

- Lick Run –11 flow monitors are in place to provide greater confidence in the flows at the CSO 5 outfall and in the modeled stormwater runoff distributions in the upstream system. These locations will also provide good preconstruction flow data for many of Lick Run's proposed separation

projects, which will help refine the design of the remaining projects and verify that overall the proposed projects will meet the desired overall reduction objectives.

- Kings Run – several flow monitors in place to provide additional baseline and pre-construction data along the influent and underflow sewers for CSOs 217 and 483.

- West Fork - flow monitoring occurred previously. No additional metering needed to document pre-construction conditions of Phase 1.

- Bloody Run – eight flow monitors are in place to confirm flow estimates, inform the RTC design, and better define cost effective measures maximizing strategic separation for the potential Phase 2 project. To better quantify the volume of RDII entering sanitary sewers and the runoff delivered from storm sewers, MSD is also performing targeted flow metering of paired sanitary/stormwater systems in the Norwood, Golf Manor, Roselawn, and Pleasant Ridge neighborhoods.

4.7.2 Unique Issues Regarding Post-Construction Monitoring Study

MSD understands source control projects present a unique opportunity to achieve CSO volumetric reduction in a cost effective approach. A post-construction monitoring study will be important to characterize the impacts of offloading stormwater from the combined sewer system. Post-construction monitoring for sustainable projects is anticipated to differ somewhat from traditional grey projects. MSD anticipates several issues will be addressed during development of a formal Post-Construction Monitoring Program including, but not limited to, the following:

- Accounting for both seasonal variations in base flows

- Determining the influence of back-to-back storm events

- Modeling the response of combined sewer system to changing conditions throughout the year

- Availability of larger numbers of storm events over extended periods with varying antecedent moisture conditions

- Establish multiple runoff surfaces for each sub-catchment, with each surface corresponding to a unique stormwater runoff source type with an associated flow path

- Verify that modeled stormwater project elements divert flows correctly and appropriately within the CSS during typical year simulations

5. Water Quality Benefits from the Sustainable Approach

In the development of the Revised Original LMCPR, MSD voluntarily initiated three primary water quality related efforts to incorporate and evaluate the water quality considerations in the Lower Mill Creek Basin. These evaluations were not required by the Regulators; however, MSD pursued this approach in alignment with the Integrated Planning Framework. The WWIP is based upon volumetric control in lieu of water quality improvement, because of a host of contributing factors (i.e., channelization, dry weather sources, upstream boundary loads from other jurisdictions, and stormwater sources) that impair water quality and limit attainment of water quality standards. These three primary approaches included development of a water quality model for the Mill Creek and Ohio River, evaluation of water quality best management practices proposed to be integrated within Lick Run, and a comprehensive biological and water quality assessment of the Mill Creek Watershed.

5.1 Environmental Fluid Dynamics Code (EFDC) Model for Mill Creek

The study specifically considered potential changes in water quality with implementation for two potential LMCFR scenarios: a grey scenario, which included a tunnel extending from Mitchell (CSO 482) to the Mill Creek WWTP; and a sustainable scenario, which included source control solutions within the Lick Run, Bloody Run, West Fork, Kings Run, and Ludlow sub-watersheds. *Lower Mill Creek Watershed Water Quality Evaluation Initial Results* was *p*repared by LimnoTech and CH2M Hill dated April 3, 2012. Fecal coliforms do not change under any modeled scenario until River Mile 8 at Bloody Run; at that point the sustainable scenario shows a better performance.

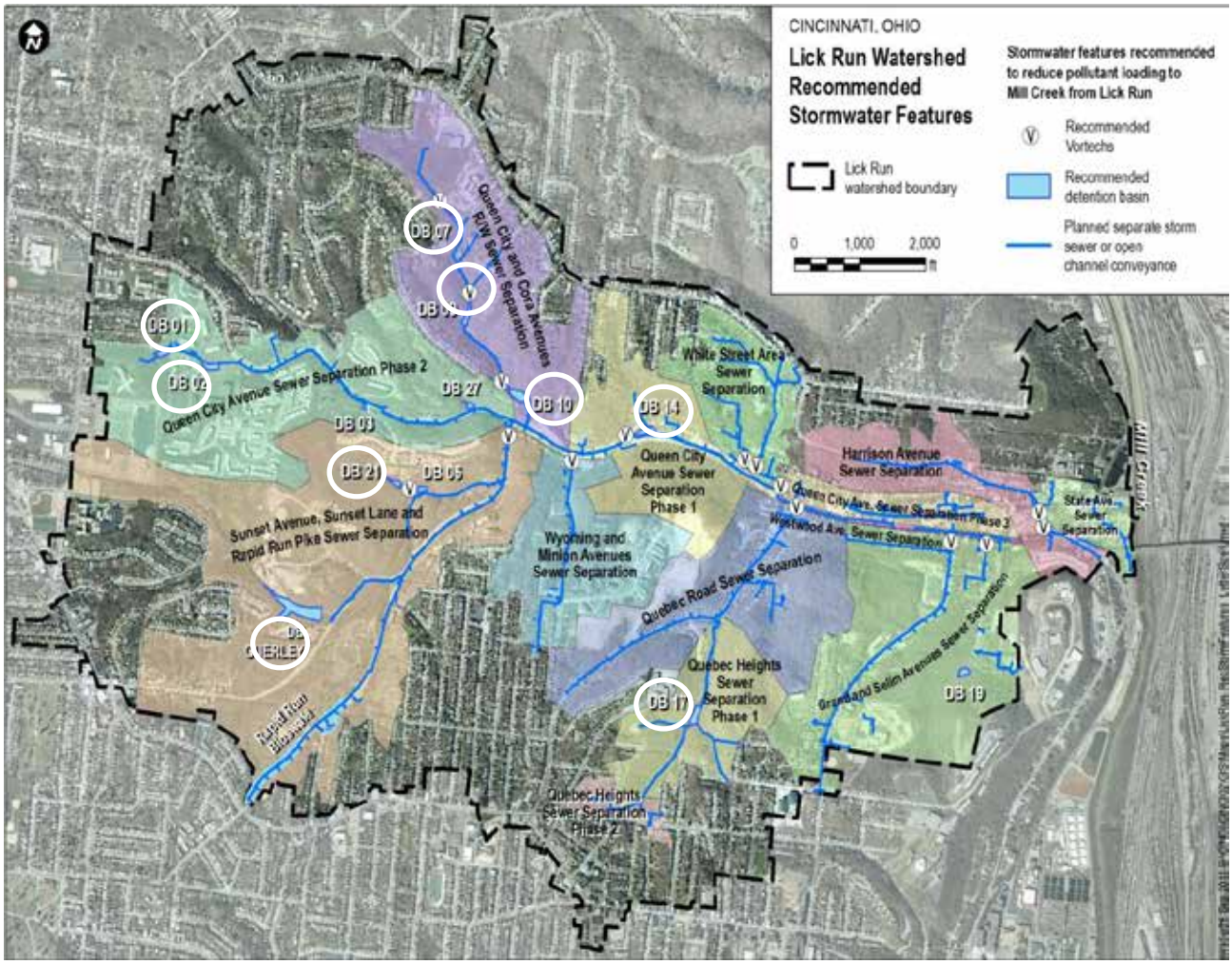
The integrated nature of the Mill Creek basin is evident from the results of the EFDC model. First, the EFDC shows the contribution of impacts to the Mill Creek from upstream of the MSD service area, above the Hamilton county line. Second, the EFDC has also shown that the SSO 700 STF demonstration facility has made an improvement in the water quality of the Mill Creek from the SSO 700 outfall all the way to the Mill Creek mouth at the Ohio River.

5.2 Lick Run Watershed Strategy Stormwater Quality Modeling and Assessment

Using the techniques and approaches outlined in the USEPA Integrated Wastewater and Stormwater Policy Framework, MSD conducted a separate analysis of the Lick Run Watershed to evaluate water quality improvement opportunities using a stormwater quality model to estimate water quality characteristics associated with existing land uses and stormwater capture areas along with estimated pollutant load reductions associated reductions from potential best management practices included within the Lick Run watershed solution. This analysis assisted in prioritizing specific detention basins to advance as well as determine the most favorable best management practices to incorporate into the preferred solution as presented in Figure 5-2. MSD has utilized an integrated watershed approach to incorporate the best management practices in the Revised Original LMCPR that constitute control of stormwater pollutants to the maximum extent practicable under applicable standards governing municipal stormwater discharges (e.g. six minimum measures of the MS4 program). This analysis is summarized in the *Lick Run Watershed Phase 2 Stormwater Modeling and Assessment*, prepared by LimnoTech in October 2011. Implementing

the recommended eight basins integrated within the base Lick Run strategic separation projects could result in estimated reductions of total phosphorus (30%), total nutrient (25%), total suspended solids (61%), and total bacteria (59%) as detailed in the *Lick Run Stormwater Phase 2 Modeling and Assessment Report*.

Figure 5-1 Lick Run Watershed Recommended Stormwater Features



5.3 2011 Mill Creek Bioassessment

The Lower Mill Creek is a challenged water body with multiple causes and sources and it had not been comprehensively assessed since 1992. In 2011 MSD contracted with the Midwest Biodiversity Institute (MBI) to conduct a comprehensive bioassessment of the biological and water quality study of the Mill Creek and its tributaries.

The 2011 Mill Creek bioassessment results show that the Mill Creek is a recovering system. In the 1992 OEPA assessment of the creek most of the sites were rated as poor or very poor. In the 2011 the condition improved to become fair to marginally good. Figure 5-3 shows the attainment status for the Mill Creek. The green color is full attainment, yellow is for partial, and red is for non-attainment.

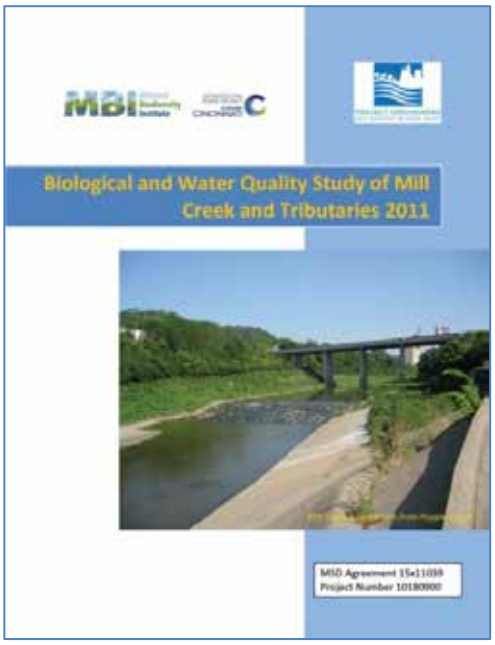


Figure 5-2 Aquatic Life Use Attainment Status of Mill Creek Watershed

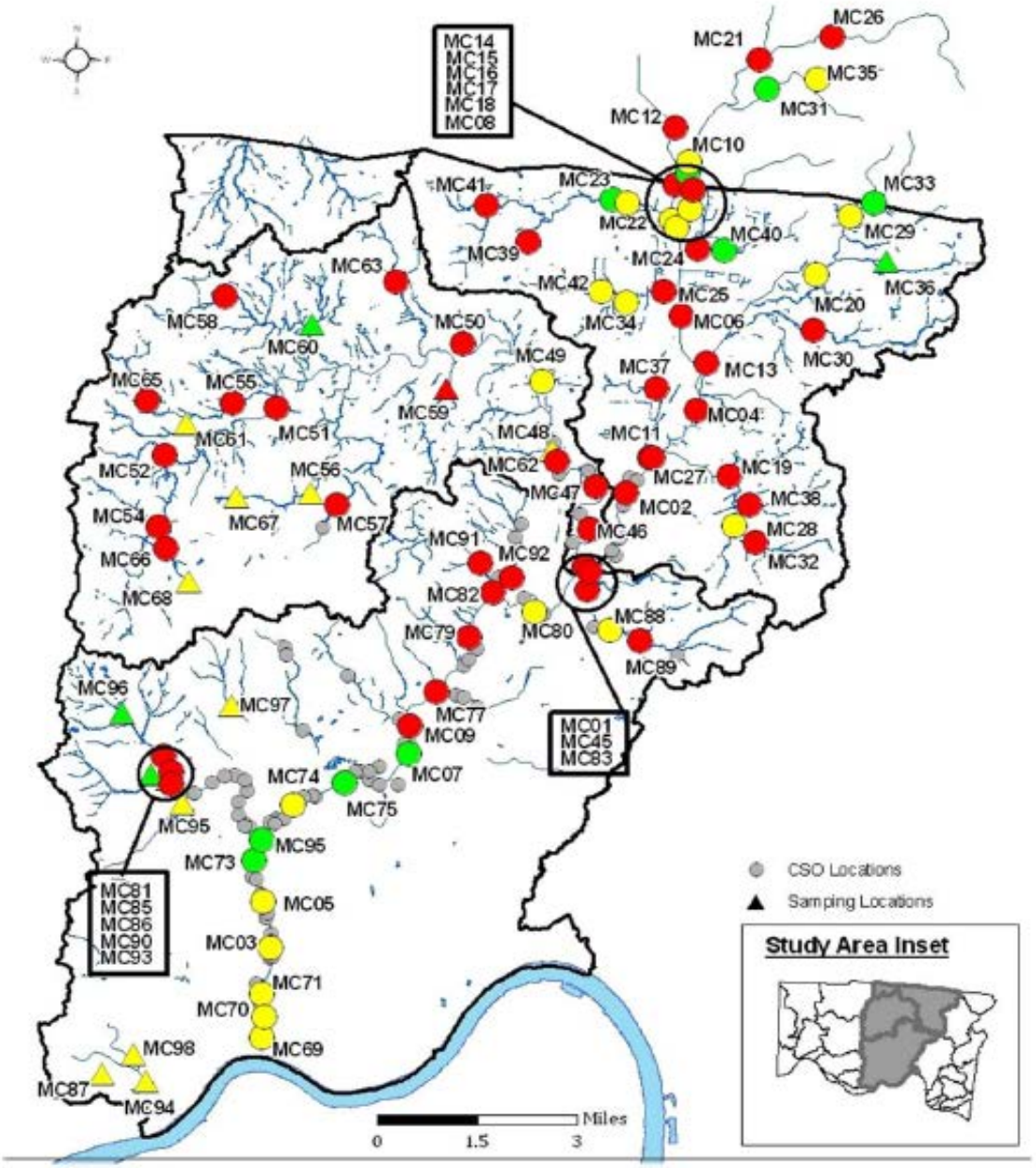
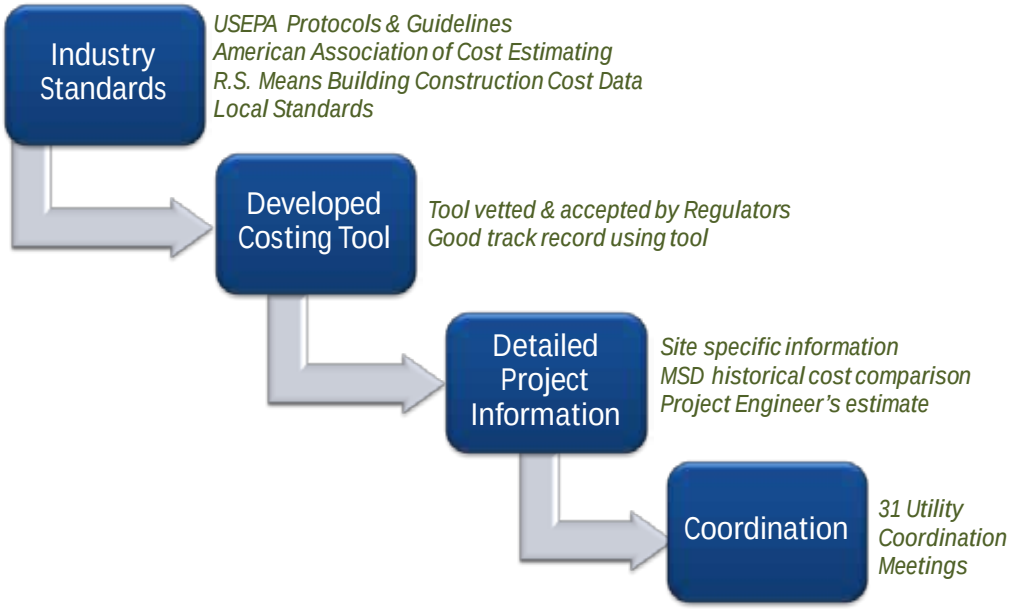


Figure 1. Aquatic life use attainment status for the Warmwater Habitat suite of use tiers in the Mill Creek study area during 2011. Green circles – full attainment of aquatic life use tier; yellow – partial attainment; red – non-attainment. Site codes correspond to those described in Table 5 of the study area description. Sites recommended for evaluation as Primary Headwater Habitat (PHWH) appear as triangles with their classification results. CSO locations appear as light grey circles.

6. Revised Original LMCPR Cost and Implementation Schedule

MSD has identified all the tasks required to implement the Revised Original LMCPR projects. Cost estimates and detailed project schedules have been developed for each project in a manner consistent with the approved WWIP. During the three-year LMC Study MSD input published industry data and cost estimating standards into a customized costing tool. Costs were further refined as site specific information was incorporated into the planning and design activities. This information was combined with historical cost documentation and utility coordination evaluations to produce the cost estimates used for the Revised Original LMCPR projects. This procedure is graphically shown in Figure 6-1 and represents an approach that is above and beyond a typical planning level analysis. The details regarding development and refinement of the customized costing tool are available in the *"Lower Mill Creek Partial Remedy Revised Plan, Task 107: Project Cost Estimating Protocols"* prepared by CH2M Hill, Inc. February 2012.

Figure 6-1 Procedure for Cost Estimating the Revised Original LMCPR Projects



6.1 Costing Methodologies

The cost estimating protocols for the LMC Study was designed to standardize and normalize alternatives for comparison purposes. The basis for the cost estimation was historical data from local MSD experiences; data collected from other municipalities with similar projects; and published USEPA costing data. The costs are estimated primarily on the basis of the size or capacity of the facility required, but they also include allowances for the features unique to the particular installation. For example, new sewer costs may be adjusted for expected construction difficulties through bedrock and storage costs may be adjusted to reflect extraordinary odor control needs.

Two primary methods were used to develop base construction costs for each discrete project: bottoms-up estimating and parametric estimating. Bottom-up estimating is the practice of developing detailed quantity take-offs for each material or component needed to construct an asset and applying widely accepted unit costs and factors to those quantities to arrive at construction estimates. Such estimates are unique to each project and require a higher level of project definition. Parametric estimating is the practice of using algorithms or cost of parametric costs relationships that are highly probabilistic in nature. An example would be the use of a storage facility's overall capacity to derive a construction cost from a cost curve. The algorithms or cost relationships are different for each type of asset and are developed from a wide range of resources. The estimating methodology used for the Revised Original LMCPR projects is identified in Table 6-1.

Table 6-1 Revised Original LMCPR Projects Method of Estimating

CSO	Project Name	Method of Cost Estimating
Lick Run Basin		
CSO 5	Sunset Avenue	Bottom-up
	Rapid Run Early Success Project	Bottom-up
	Wyoming Avenue	Bottom-up
	Harrison Avenue Phase A	Bottom-up
	Harrison Avenue Phase B	Bottom-up
	State Avenue	Bottom-up
	White Street	Bottom-up
	Quebec Road	Bottom-up
	Queen City Ave Phase 2 (Western)	Bottom-up
	Queen City and Cora Ave (Fenton)	Bottom-up
	Quebec Heights Phase 1 (Glenway Woods)	Bottom-up
	Quebec Heights Phase 2 (Wells Street)	Bottom-up
	Queen City Phase 3 (Eastern)	Bottom-up
	Queen City Ave Phase 1 (Central)	Bottom-up
	Valley Conveyance (Lick Run Channel)	Bottom-up
Kings Run Basin		
CSO 217/483	Stream Removal/Sewer Separation	Bottom-up
CSO 217	1.5 MG Combined Overflow Storage Tank	Parametric
West Fork Basin		
CSO 125	Stream Separation and Detention	Bottom-up
CSO 127/128	Stream Separation	Bottom-up
Bloody Run Basin		
CSO 181	Real Time Control	Parametric

After base construction costs are developed a design contingency and soft costs were applied to each project. Design contingency was calculated as a percentage of the base construction cost, dependent upon the stage of the project, to account for the accuracy of the construction estimate at the given stage of development. Application of the design contingency resulted with the project's total construction cost.

Capital costs were calculated by adding various soft costs to the total construction cost. Soft costs include such items as project administration, construction contingency, interest, real estate costs, field engineering and inspection, design and engineering services, as well as planning and preliminary design services.

Life cycle costs are reported in terms of the present worth (2006$) using an analysis period of 25 years and a discount rate of 4.2 percent. The life span on each asset type is taken into consideration when calculating equipment replacement costs and determining any remaining value in those assets at the end of the analysis period. The sources of data for developing the cost estimate components are presented in Table 6-2.

Table 6-2 LMC Study Cost Estimating Sources/Factors

Estimate Component	Source or Factor
Life Cycle Cost	
Present Worth of Residual Value	Straight-line Depreciation of Capital Cost over 25-year Period
Present Worth of Equipment Replacement	% of Capital Cost Replaced at 10, 20, and 30-year Intervals
Present Worth of Annual Operations and Maintenance	Unit Costs for Fixed Maintenance, Event Maintenance, Labor, Energy, and Chemicals for grey infrastructure and detention basins. Specific bottom-up assumptions for green infrastructure operations and maintenance was included outside of the parametric method.
Capital Cost	
Real Estate Costs	MSD
Administration Costs	Conveyance: 8.5%, Storage/Treatment: curve
Project Contingency	Maximum 10%
Construction Interest	0.5(i)(Y)(TCC) where i=4.2%
Miscellaneous	Curve (0.5% minimum)
Field Engineering & Inspection	Conveyance: 3.5%, Storage/Treatment: curve
Design & Engineering Services	Curve (6% minimum)
Planning and Preliminary Design	Curve (3% minimum)
Construction Cost	
Insurance	1%
Bonding	1%
Design Contingency	5% to 35%

Estimate Component	Source or Factor
Contractor Cost	
Contractor's Profit	5%
Contractor's Overhead	10%
Contractor's On-Site General Conditions	Parametric Curve or Detailed Estimate
Contractor's Base Cost	Parametric Curve or Detailed Estimate

6.2 Total Construction and Capital Costs of Revised Original LMCPR

The following Tables 6-3 through 6-7 present the total construction cost, capital cost and life cycle cost for the individual projects in the four watersheds in the Revised Original LMCPR. The costs are in 2006 dollars such that comparison with the WWIP could be performed. Costing summary of the Revised Original LMCPR is presented in Appendix D.

Table 6-3 Lick Run Revised Original LMCPR Costs (2006$)

Project	Total Construction Cost (2006$)	Capital Cost (2006$)	Life Cycle Cost (2006$)
Sunset Avenue SSA	$7,577,000	$10,906,000	$8,241,000
Rapid Run ESP	$1,326,000	$1,996,000	$1,496,000
Wyoming Avenue	$1,690,000	$2,707,000	$2,055,000
Harrison Avenue Phase A	$1,874,000	$2,800,000	$2,122,000
Harrison Avenue Phase B	$1,103,000	$2,006,000	$1,504,000
State Avenue	$2,056,000	$3,154,000	$2,365,000
White Street	$3,623,000	$6,030,000	$4,537,000
Quebec Road	$4,598,000	$7,680,000	$5,779,000
Queen City Avenue Phase 2 (Western)	$6,134,000	$9,387,000	$7,173,000
Queen City and Cora Avenue (Fenton)	$2,192,000	$4,613,000	$3,718,000
Quebec Heights Phase 1 (Glenway Woods)	$2,113,000	$3,569,000	$2,728,000
Quebec Heights Phase 2 (Wells Street)	$453,000	$860,000	$655,000
Queen City Phase 3 (Eastern)	$3,452,000	$5,186,000	$3,880,000
Queen City Avenue Phase 1 (Central)	$3,836,000	$5,552,000	$4,116,000
Valley Conveyance (Lick Run Channel)	$75,920,000	$126,250,000	$97,834,000
Total	**$117,947,000**	**$192,696,000**	**$148,203,000**

Table 6-4 Kings Revised Original LMCPR Costs (2006$)

Project	Total Construction Cost (2006$)	Capital Cost (2006$)	Life Cycle Cost (2006$)
Phase A – Separation and Detention	$15,862,000	$24,576,000	$18,976,000
Phase B – 1.5 MG Tank at CSO 217	$7,036,000	$10,274,000	$9,615,000
Total	**$22,898,000**	**$34,850,000**	**$28,591,000**

Table 6-5 West Fork Revised Original LMCPR Costs (2006$)

Project	Total Construction Cost (2006$)	Capital Cost (2006$)	Life Cycle Cost (2006$)
CSO 125 – Stream Separation and Detention	$7,955,000	$12,700,000	$10,034,000
CSO 127 – Stream Separation	$85,000	$181,000	$138,000
CSO 128 – Stream Separation	$184,000	$333,000	$247,000
Total	**$8,224,000**	**$13,214,000**	**$10,419,000**

Table 6-6 Bloody Run Revised Original LMCPR Costs (2006$)

Project	Total Construction Cost (2006$)	Capital Cost (2006$)	Life Cycle Cost (2006$)
Bloody Run Real-Time Control	$2,511,000	$3,607,000	$2,639,000

Table 6-7 Summary of Revised Original LMCPR Projects Costs (2006$)

Sub Basin	Total Construction Cost (2006$)	Capital Cost (2006$)	Life Cycle Cost (2006$)
Lick Run	$117,947,000	$192,696,000	$148,203,000
West Fork	$8,224,000	$13,214,000	$10,419,000
Kings Run (Wooden Shoe)	$22,898,000	$34,850,000	$28,591,000
Bloody Run	$2,511,000	$3,607,000	$2,639,000
Total	**$151,580,000**	**$244,367,000**	**$189,852,000**

Table 6-8 summarizes the overflow reduction in a typical year, capital cost in 2006 dollars and the resulting cost-benefit metric. The overflow reduction volumes were developed from subtracting the system-wide detailed Phase 1 Max Sustainability model results from the updated system-wide detailed model of record

version 3.2 results for all of the sub-basins except Lick Run and West Fork Branch. The full system-wide model 4.0.10 is used as the baseline for the Lick Run sub-basin which represents the system as of December 2010 after the RTCs were operational and the raising of the West Fork grates (CSO 5 RTC removed 455 MG in typical year; West Fork grates + CSO 125 RTC removed 97 MG in typical year). By using version 4.0.10 as the baseline, the benefits of the RTCs built before 2010 at Lick Run and West Fork are excluded from the cost benefit metric.

Table 6-8 Revised Original LMCPR Excluding Existing RTC Benefit and Cost (2006$)

Watershed/Project	Capital Cost [1] (2006$)	Overflow Gallons Reduction in Typical Year[2, 3] (gallons)	Cost per gallon (2006$/gal)
Lick Run	$192,696,000	624,000,000	$0.31
West Fork	$13,214,000	173,000,000	$0.08
Kings Run	$34,850,000	156,000,000 [4]	$0.23
Bloody Run RTC	$3,607,000	93,000,000	$0.04
TOTAL	**$244,367,000**	**1,046,000,000**	**$0.23**

1. Sustainable project costs have been reviewed and modified through the LMC Study for consistency and in accordance with MSD standards.
2. CSO volume reductions: CSO volume reductions for Kings Run were calculated from the Maximum Sustainable Infrastructure + Real Time Control results tables (dated 6/8/2012) (Version 4.2 Detailed, Phase I Option A scenario). Values for Bloody Run RTC benefit are cited as 93 MG in the Lower Mill Creek Partial Remedy Study Revised Plan Phase 1 Report, June 2012 (Section 3.1.3.3). Values for Lick Run and West Fork were based on individual project runs in the Version 4.2 sub-basin model (dated 12/2012) and the Version 4.0.10 Consolidated model (dated 10/24/2012), respectively. Note: values may be subject to change as updated modeling results become available.
3. Values in table are not performance criteria but are provided for information purposes. See Exhibit 1 for revised WWIP attachments.
4. Kings Run overflow reduction is equal to the existing system CSO 483 overflow volume minus the proposed system CSO 483 and CSO 217 overflow volumes. Since the CSO 217 will not be nested in the proposed solution, the remaining overflow must be taken into account.

6.3 Revised Original LMCPR Implementation Plan

The WWIP requires the LMCPR to reach substantial construction completion by December 31, 2018. MSD has determined that the Revised Original LMCPR can be substantially complete by December 31, 2018. MSD has developed project schedules for each discrete project that considers sequencing criteria, predecessor projects, construction duration, and issues unique to each project. This section discusses the schedule for work to be performed in each watershed. Appendix E presents the internal working Gantt chart to plan for implementation of the Revised Original LMCPR.

6.3.1 Overview of Implementation Plan

The milestones proposed to ensure completion of the LMCPR work and implementation of the projects are provided in Table 6-9.

Table 6-9 Anticipated Implementation Schedules for Revised Original LMCPR Projects

Project ID	Project Name	Design	Right of Way	Bidding & Award	Construction Start	Construction Finish
11240000	Lick Run Valley Conveyance System	Jan 2013 – Nov 2014	Jan 2013 – Nov 2014	Feb 2015 – Jun 2015	July 2015	July 2018
11243140	Kings Run Partial Sewer Separations	Jan 2013 – Jun 2014	Jan 2013 – Sept 2014	Mar 2015 – July 2015	July 2015	July 2016
11243141	Kings Run CSO Storage Facility	Jan 2013 – Dec 2014	Jan 2013 – Dec 2014	Jan 2015 – July 2015	August 2015	July 2018
11243840	West Fork Partial Sewer Separations	Jan 2013 – Apr 2014	Jan 2013 – Aug 2014	Oct 2014 – Feb 2015	May 2015	February 2017
11240020	Bloody Run Real Time Control Facility	Jan 2013 – Dec 2013	Sept 2013 – July 2014	Nov 2014 – Mar 2015	Apr 2015	August 2017

1. Values in table are not WWIP schedules but are provided for information purposes. See Exhibit 1 for revised WWIP attachments.

6.3.2 Lick Run Projects Phasing Plan

A preliminary project phasing plan has been developed for the Lick Run projects to be staged in a single watershed. The plan was initially conceptualized in late 2009 as part of the early planning for the watershed strategy. The watershed solution is comprised of numerous subprojects including the valley conveyance system. Approximately three or four projects would be started in any particular year and most have construction durations of one year or less. Construction phasing was selected based on minimizing interferences and coordination between adjacent projects, particularly as it relates to maintenance of traffic.

Since the early planning began for the watershed strategy in late 2009, a great deal of effort and coordination with local agencies and utilities has gone into the project sequencing, to minimize project costs and community disruption. Duke Energy, GCWW, MSD, CDOTE and ODOT all have capital improvement plans that have been taken into consideration for developing the schedule, sharing of construction costs (e.g. Harrison Avenue CDOTE project and Duke gas main rehabilitation program), and maintenance of traffic during construction. The sequencing needs and impacts were accounted for in the cost estimates presented for the Lick Run projects.

Construction of the proposed improvements will disrupt traffic movement throughout the entire urban VCS and sewer separation project areas. To minimize this disruption, it will be critical to maintain connectivity on Westwood and Queen City Avenues' one-way pair corridor during construction. This corridor provides an

important linkage between the west side of Cincinnati and the downtown area for nearly 55,000 vehicles per day using the Western Hills Viaduct. It will also be crucial to maintain local access to business and residences in the corridor wherever possible. To maintain adequate traffic flow during construction, major roadways such as Harrison Avenue, Sunset Avenue, Quebec Road and Grand Avenue, are schedule for construction in different phases.

It is important to note that details of maintenance of traffic plans are further defined during detailed design stages. CDOTE continues to provide detailed reviews of the preliminary maintenance of traffic requirements and arrangements and feedback on alternative approaches ranging from full road closures for short durations to one-lane closures during off peak hours. MSD will continue to work with CDOTE to address MOT issues to minimize traffic and community impacts.

The first project to be constructed is the Harrison Phase A Sewer Separation project, which was strategically designed and bid with the CDOTE Harrison Avenue Realignment Project as the first opportunity within the watershed to address MOT in the long term. With Harrison Avenue Realignment project under construction, Harrison Avenue will be closed to traffic for the summer months of 2013. CDOTE had requested that no other sewer separation projects be constructed that would affect the detour route on White Street or the alternate through route of Queen City Avenue during this time. Therefore, the remaining sewer separation projects have a start date that occurs after Harrison Avenue is reopened to traffic (expected Fall 2013). Specifically, Harrison Avenue Phase B, Queen City Avenue Phase 1 and White Street will advance next once Harrison Avenue is re-opened next Fall. Table 6-10 presents the Construction Phasing Plan for Lick Run Watershed.

Table 6-10 Anticipate Lick Run Watershed Construction Phasing Plan

Anticipated Construction Year	Anticipated Construction Start	Anticipated Construction End[1]	Project Name [2]	Project Status
2012	July 2012	September 2013	Harrison Avenue Sewer Separation Phase A[2, 4]	In Construction
	May 2013	July 2013	Harrison Avenue Early Success Project	100% Design
2013	June 2013	December 2013	Rapid Run Early Success Project	60% Design
	February 2014	August 2014	Harrison Avenue Sewer Separation Phase B	60% Design
	September 2014	September 2015	Quebec Heights Sewer Separation Phase 1	30% Design
	December 2013	July 2014	Queen City Avenue Sewer Separation Phase 1 [4]	60% Design

Anticipated Construction Year	Anticipated Construction Start	Anticipated Construction End[1]	Project Name [2]	Project Status
2014	July 2014	October 2015	Sunset Avenue Sewer Separation [4]	60% Design
	August 2014	August 2015	Wyoming Avenue Sewer Separation	30% Design
	August 2014	August 2015	White Street Sewer Separation [4]	60% Design
	February 2015	August 2016	Queen City Avenue Sewer Separation Phase 2 [4]	35% Design
	August 2014	August 2015	Queen City and Cora Avenues Sewer Separation	30% Design
	September 2014	September 2015	Quebec Heights Sewer Separation Phase 2	30% Design
2015	August 2015	August 2016	State Avenue Sewer Separation	30% Design
	January 2015	January 2016	Quebec Road Sewer Separation [4]	30% Design
	August 2016	August 2017	Queen City Avenue Sewer Separation Phase 3 [4]	30% Design
	July 2015	July 2018	Valley Conveyance System [4]	10% Design

1. Values in table are not WWIP schedules but are provided for information purposes. See Exhibit 1 for revised WWIP attachments.
2. Indicates end of active construction. This period is followed by up to one year of close out activities.
3. Represents CDOTE schedule for Harrison Avenue work and will be refined when detailed Contractor Schedule is submitted.
4. Project impacts major roadway.

7. Revised Original LMCPR Operations and Maintenance

MSD is committed to ensuring long-term performance of the Revised Original LMCPR assets just like any other asset that is constructed. The sustainable projects of the Revised Original LMCPR contain both grey infrastructure such as storm sewer pipes, as well as green infrastructure such as floodplain enhancements, bioswales and detention basins with natural systems features. Standard operating procedures and systems are in place at MSD to maintain grey infrastructure, and will be modified to account for the new assets of these projects. MSD is prepared to implement a comprehensive green infrastructure operations and maintenance program within the current framework of its current operations and under contract with other entities to assist in the operations and maintenance.

7.1 Operations and Maintenance Framework

The sustainable infrastructure operations and maintenance program focuses on the sustainable infrastructure (both grey and green) assets that MSD has built and will continue to build within its service area. The framework developed for the program reflects the organization's commitment to adopt beyond conventional maintenance practices to ensure the functionality, purpose and viability of these assets to perform as intended.

The framework for the operations and maintenance program outlines program goals, components, and resources:

- Program goals relate to regulatory requirements (e.g. Consent Decree, MS4), asset effectiveness (e.g. hydraulic performance), and community benefits (e.g. public education and outreach).

- Program components encompass structure, processes and other activities related to maintenance, monitoring, tracking and reporting, and enforcement mechanisms or policy considerations/changes. Roles and responsibilities, budget and other resources are defined to support these program components and ensure the long-term performance of this new asset class.

- The program resources are key to building up a viable and culturally sustainable system within MSD, leveraging both internal and external skill sets, experience and other resources. The program resources identified include asset inventory, staffing and resource building, facilities and equipment, standard operating/maintenance procedures, information management tools, and staff training. The resources available for the operations and maintenance program rely on cross divisional coordination to build and implement best approaches for MSD.

7.2 Legal Authority and Responsibility of the Revised Original LMCPR

Under Ohio law, MSD is a County sewer district, so its assets are legally titled in the name of the County. Assets acquired as part of the Revised Original LMCPR will either be titled in the name of the County or, in instances where title remains in the name of a third party (such as for an easement), legal control of the asset for use required under the Consent Decree rests with the County. This assures that the requisite government control exists over assets needed for the long-term performance of the Revised Original LMCPR. If relevant assets are transferred by the County it will be to another public entity, conservation trust, or acceptable authority that will be required to maintain the assets for the intended purpose for which it was purchased or constructed.

In accordance with the draft EPA guidance document, the anticipated maintenance schedule located in the Appendix F includes frequency of maintenance, annual operations and maintenance costs and assumptions, general type of maintenance, legal authority (i.e., ownership of land parcels, easements, or other agreement that provides permanent access and sufficient control of the parcels), anticipated responsible party for operations and maintenance, and if agreements are needed for operations and maintenance responsibility. Each watershed area is broken down into grey and green infrastructure components to ensure a thorough development of costs and responsibility.

Significantly, the Revised Original LMCPR is focused on the sustainable, watershed approach and the CSO control through control measures on public land owned by public entities. Though the components are sized to leverage and incorporate future wet weather measures on private property, the modeled volume controlled only “counts” separations that are within in public control. Therefore, the model targets include an

inherent conservative margin of safety while encouraging private owners and future development to extend wet weather improvements

7.2.1 Maintenance Schedule and Anticipated Frequency

Maintenance of the green infrastructure includes inspection, cleaning, trash removal, general repairs, and plantings and initially in the first three to five years, maintenance is more intensive than anticipated for subsequent years. The operations and maintenance assumptions of costs and frequency are summarized for each component. Annual operations and maintenance costs include labor, power, and materials. Frequencies are annualized to provide an anticipated annual operations and maintenance cost.

Sediment removal in the detention basins was estimated to be needed every five years. For the Lick Run basins, the sediment loading was modeled for each of the basins as reported in the *Lick Run Watershed Phase 2 Stormwater Modeling and Assessment Report*, prepared by LimnoTech, dated October 2011. It was anticipated that the basins would be dredged at a certain frequency; therefore, the volume of the material was estimated to be the assumed frequency times the annual total suspended solids loading. The sediment removal was annualized so it could be added to the annual maintenance costs. This method was extrapolated for the Kings Run and West Fork basin since sediment modeling was not conducted. Until the structures are installed and monitored the maintenance effort of sediment control will be estimated based on best available data.

At some point, all assets will reach its useful life whether it is grey or green infrastructure. Costs for replacement of such items such as pumps will be incorporated into MSD's program for asset management and have not been annualized in the operations and maintenance schedule in Appendix F, but these replacement costs were factored into the total life cycle cost of the alternatives analysis.

The project components are categorized into types of maintenance: hard system, living system, safety, access, and community. These categories of maintenance assist with understanding the type of maintenance and generally if the component is a grey or green infrastructure component.

- Hard system: More traditional grey infrastructure such as pipes, headwalls, combined storage tanks.
- Living system: Green infrastructure and low impact development features such as enhanced stormwater detention basins, rain gardens, and lawn maintenance.
- Safety: Improvements such as safety fencing and lighting.
- Access: Access paths for personnel, equipment, and vehicles to maintain the proposed infrastructure.

- Community: Maintenance activities which are necessary to be a good neighbor to the community such as trash and debris removal.

- Monitoring: Widening of illicit program for investigating and eliminating sanitary discharges into the new storm system that provides stormwater mitigation of combined systems.

7.2.2 Description of Legal Authority

As noted above, the County owns, or will have relevant legal rights of control over the Revised Original LMCPR assets. The County will either take title to real property or obtain legal rights to use such by contract (use agreement, easement, etc.). The County has or will hold title in real property needed for the construction of the Lick Run valley conveyance system. For the detention basins the County will hold title or permanent easements for the detention basins located in Lick Run, Kings Run and West Fork watersheds.

The preliminary master plan for the Valley Conveyance System has been developed with significant public input of the concept-plan, which is subject to further technical design and analysis. The proposed Lick Run urban waterway in South Fairmount requires approximately 41 acres of land for staging, installation, grading and construction. Figure 7-1 below graphically shows necessary property and parcels currently owned by the County (through recent real estate acquisitions for this project), or owned separately by the City for its local government functions, which represents approximately 23.5 acres or 58% of the impacted parcels, leaving approximately 17 acres remaining for acquisition within the main corridor.

Figure 7-1 Current Ownership of Parcels for the Lick Run Valley Conveyance System

Publicly-Owned property (City of Cincinnati)

Publicly-Owned property (Hamilton County)

Property acquisitions continue to proceed one on one with affected property owners. MSD is following the Federal Relocation guidelines for determining relocation benefits.

7.2.3 Maintenance Responsibility

Currently, MSD determines best course of action for the operations and maintenance of these improvements during conceptual planning and design, before new assets come on line as described in the framework section above. The operations and maintenance of these assets will be performed directly or via contracts with other entities.

Example of Cooperative Agreement

Beginning in 2010, Cincinnati Park Board (CPB) and the Metropolitan Sewer District of Greater Cincinnati (MSD) entered into a Memorandum of Understanding (MOU). The purpose of this MOU was for MSD to gain the assistance from CPB to review and evaluate the level of specialized planting, maintenance requirements, community outreach and other related support to meet the needs of MSD's Sustainable Programs, including utilizing CPB for installation of strategic green infrastructure in locations that provide mutual stormwater mitigation benefits.

The project installations advanced through the CPB/MSD MOU are those that specifically provide benefit for both MSD and CPB, 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 mitigation. Through the installation of these integrated features within MSD's LMC watersheds, MSD and Parks are working jointly to identify opportunities to install new or enhance existing natural water features within the park system.

Enabled Impact Program

MSD has utilized partnerships to implement sustainable solutions. The premise of the MSD's sustainable program is to enable impacts through these partnerships. Through monitoring and measuring of enabled impact projects, MSD has developed lessons learned on maintenance needs. Through its monitoring of the enabled impact projects, MSD has worked collaboratively with CPB, USEPA NRML and Universities to identify and evaluate monitoring options. Utilizing this approach, MSD has utilized these partnerships to performed qualitative monitoring through employment of seasonal site inspections and wet weather inspections. Specifically, routine site inspections are conducted on all completed enabled impact projects either annually, semi-annually or quarterly (depending on the type of controls present), with the property owners present to help inform and influence the owner on best management practices for long term sustainability of the green infrastructure. Site inspections are periodically conducted after high intensity wet weather events to assess performance of the controls and overflow structures. The purpose of these inspections is to record site conditions over the long term, assess long-term viability of the green controls, and to identify potential issues related to functional operation, maintenance, and vegetative success (where vegetation exists).

Inspection forms for each type of green infrastructure and site specific photo-documentation protocols have been developed for the Enabled Impact Program. A sample inspection form is presented in Figure 7-2. The inspection forms ensure that a thorough inspection is uniformly and consistently performed. The photo-documentation protocol allows direct comparison of conditions at each given location over time. All data collected during qualitative monitoring is entered into a Microsoft® Access-based database located on shared MSD/CPB servers. This database can generate site summaries, maintenance reports, and maintenance follow-up reports.

Currently, maintenance issues identified during either seasonal or wet weather site inspections and suggested corrective actions are shared with the property owner (who has the responsibility for addressing these issues) via a standardized form letter and correspondence. Follow-up inspections are scheduled with the property owner to ensure that maintenance has been performed. Quarterly reports are developed; and excerpts from select projects are included here as Figure 7-2 providing an example of the inspection forms and level of detail included with each site inspection.

Figure 7-2 Sample Project Inspection Forms

Evaluation Date: 09/27/2012
Name: Jess Truman
Data Entry Date: 10/09/2012

Post-Construction BMP Site Evaluation

BIOINFILTRATION

Property/Project Name: St. Francis
Address: 1860 Queen City Avenue Cincinnati OH 45214
Property Owner Present: No
Owner/Representative Name: Fax # or Email:
Type of Bioinfiltration: ☐ Rain Garden ☑ Basin ☐ Swale ☐ Other
Last Rain Event Date: 09/27/2012 Last Rain Event Duration: 5 hours
Last Rain Event Magnitude: 0.05" Location of Rain Gauge:
Current Weather Conditions: 71 F Overcast ☑ Dry weather evaluation ☐ Wet weather evaluation

BMP Element	Inspection Item	Yes, No, N/A	Comments
Contributing Drainage Area	Excessive trash, debris, sediment, landscape waste, or yard clippings	Yes	Litter, sediment
	Bare/exposed soil	Yes	
	Evidence of erosion	Yes	Sediment washing into biosoil
Pre-treatment, if applicable	Excessive trash/debris/sediment	N/A	
	Evidence of clogging	N/A	
	Evidence of erosion	N/A	
	Vegetation appears unhealthy	N/A	
	WET WEATHER: Ponding water depth		
Stormwater Entry Points to Feature	Evidence of flow impediment	No	
Vegetation	Plant cover less than 90% (3+ years after installation)	N/A	Less than 3 years

St. Francis
09/27/2012

Page 1 of 3

Figure 7-2 (Con't) Sample Project Inspection Forms

Vegetation	Dead plants (Include % of plant mortality, if appropriate)	Yes	60%
	Excessive growth of one plant species (overtaking other species)	No	
	Invasive plants and/or weeds	Yes	Weeds have taken over both basins; weeds are choking out plants. Weeds in tree cutouts in parking lot need to be sprayed.
Soil Media	Exposed/bare soil	Yes	Both basins and tree cutouts in parking lot need to be mulched
	Evidence of erosion	No	
	Excessive trash/debris/sediment	Yes	Litter
	WET WEATHER: Ponding water depth		
Underdrain, if applicable	Evidence of flow impediment	No	
Outlet/ Overflow spillway	Evidence of flow impediment	No	
	Excessive trash/debris/ sediment at outlet(s)	No	
	Evidence of erosion at/around outlet(s)	No	

	OVERALL CONDITION OF FACILITY:
☑ **Poor**	Immediate need for repair or replacement
☐ **Fair**	Poorly maintained, routine maintenance and repair needed
☐ **Good**	Adequately maintained, routine maintenance needed
☐ **Excellent**	Well maintained, no action required

GENERAL COMMENTS:

8. Tracking and Reporting

Tracking and reporting are important components of Revised Original LMCPR. This section provides an overview of how the source control projects and green infrastructure measures will be tracked during implementation, operation, and maintenance. MSD's plan for regular reporting of activities and accomplishments is also discussed in this section.

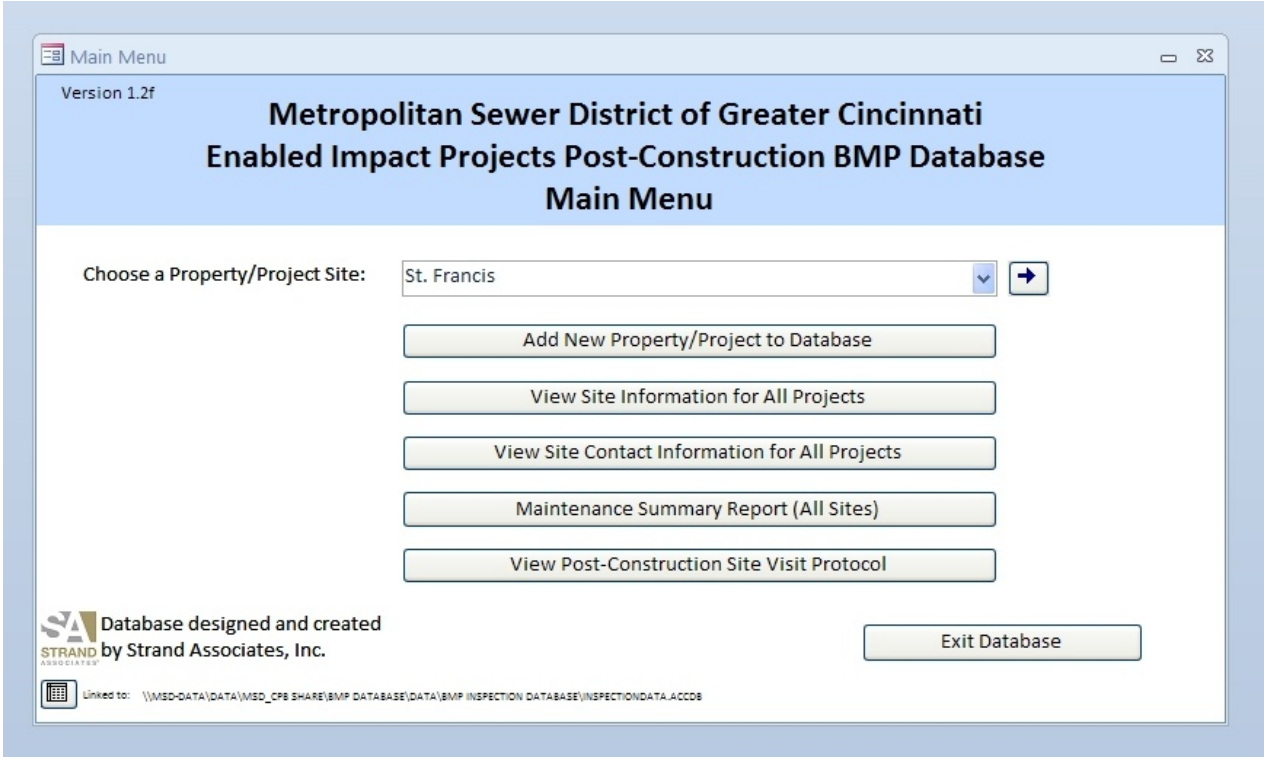
8.1 Tracking System

In an effort to track quarterly inspection results and maintenance issues at each of the constructed green infrastructure project sites, MSD developed a shared database to be utilized by both the Cincinnati Park Board and MSD. The process is simple:

- The Park Board performs quarterly inspections to check both form and function and compiles the findings in a brief report.
- Maintenance issues that require further attention are documented and compiled in a report.
- Both the inspection report and the maintenance report (if applicable) are uploaded to the database.
- MSD sends the inspection report and the maintenance report (if applicable) to the project contact.
- For sites with maintenance issues, a 15-day follow up phone call is made to the project contact to verify they received the reports and understand the issues, and to help answer any questions or concerns they may have.
- When appropriate, a representative from both the Park Board and MSD together will schedule a 30-day follow up visit to outline an action plan to remedy any outstanding maintenance issues.

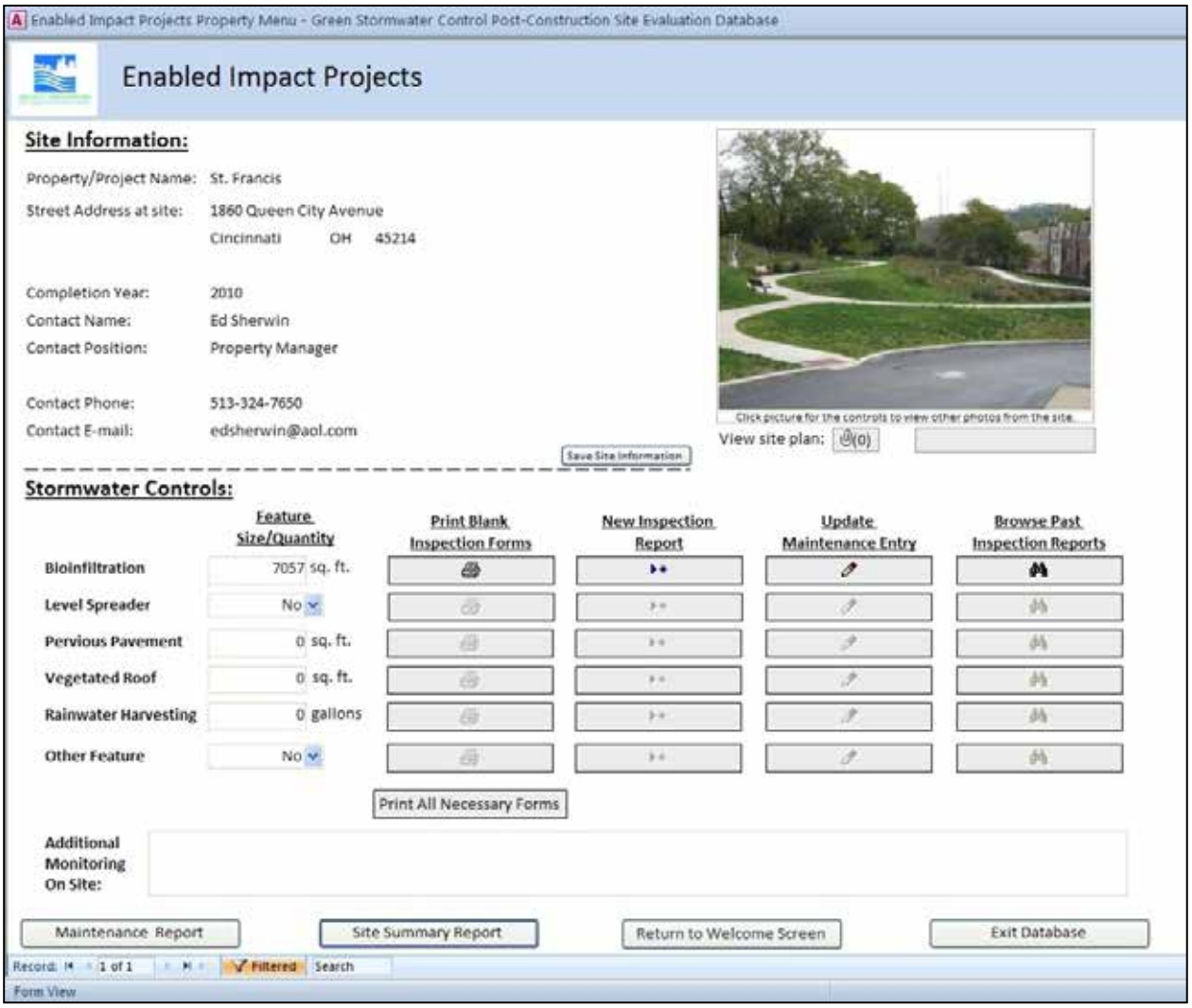
The database helps monitor and track the growth and establishment of each stormwater control and at the same time fosters a relationship with the surrounding communities. The database is MSD's mechanism for ensuring the sites receive the proper care and attention. A sample implementation tracking database is presented in Figure 8-1.

Figure 8-1 Sample Green Infrastructure Implementation Tracking Database



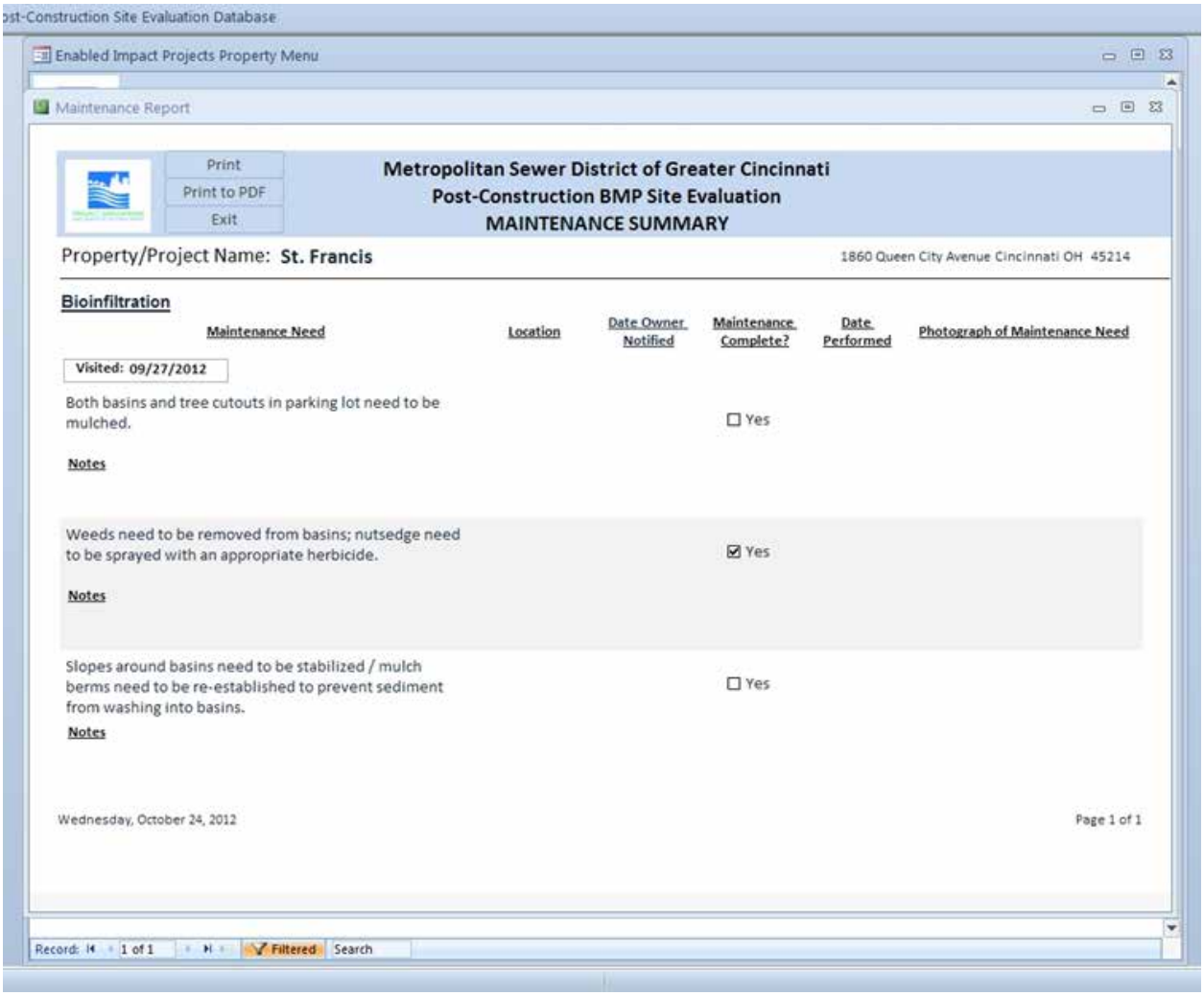
The database will provide project site information, contact info (with editing capabilities), stormwater control information including past inspection reports and access to pictures of project site. A sample project implementation tracking page is presented in Figure 8-2.

Figure 8-2 Sample Project Database Page



Maintenance activities would be tracked in a report format to include: maintenance needed, location of interest, date owner was notified, checkbox for when maintenance item is completed, date the follow up occurred, and pictures if applicable. A sample project maintenance report is provided in Figure 8-3.

Figure 8-3 Sample Project Maintenance Report



8.2 Reporting Structure: Planned Voluntary Supplementation

Pursuant to the Consent Decree, the County and City report quarterly, through MSD, on activities and progress under the WWIP, Global Consent Decree, and Interim Partial Consent Decree. The County and City plan to voluntarily supplement the required report with a section to the quarterly report to address progress made by MSD toward compliance with the requirements set forth in the approved LMCPR. The report will identify notable construction accomplishments, flow monitoring results, status of post construction monitoring program, and annual maintenance activities during each reporting period.

Reporting on quarterly progress as related to projects level activities would be accomplished by including Table 8-1 in each quarterly report. The information shown in Table 8-1 is reflective of the information provided on page 5-7 of MSD's Quarterly Consent Decree Status Summary Report under Section 2.B GCD/Final WWIP Reporting Requirements.

Table 8-1 Revised Original LMCPR Quarterly Progress Report - Example

CSO	Project Description	Basin	Status	Quarterly Progress
5	Harrison Avenue Sewer Separation Phase A	Lick Run		
5	Rapid Run Park Source Control	Lick Run		
5	Harrison Avenue Sewer Separation Phase B	Lick Run		
5	Quebec Heights Sewer Separation Phase 1	Lick Run		
5	Queen City Avenue Sewer Separation Phase 1	Lick Run		
5	Sunset Avenue Sewer Separation	Lick Run		
5	Wyoming Avenue Sewer Separation	Lick Run		
5	White Street Sewer Separation	Lick Run		
5	Queen City Avenue Sewer Separation Phase 2	Lick Run		
5	Queen City and Cora Avenues Sewer Separation	Lick Run		
5	Quebec Heights Sewer Separation Phase 2	Lick Run		
5	State Avenue Sewer Separation	Lick Run		
5	Quebec Road Sewer Separation	Lick Run		
5	Queen City Avenue Sewer Separation Phase 3	Lick Run		
5	Valley Conveyance System	Lick Run		
181	Real Time Control Facility	Bloody Run		
217	Combined Storage Tank	Kings Run		
483	Sewer Separations	Kings Run		
125	Separation and Detention	West Fork		
127	Stream Separation	West Fork		
128	Stream Separation	West Fork		

The quarterly Consent Decree report includes Section III Performance Measures Compliance Summaries. This table would be voluntarily expanded to include a section related to the Revised Original LMCPR. The planned reporting context is presented in Table 8-2. The information shown in Table 8-2 is reflective of the information provide on page 8-9 of MSD's Quarterly Consent Decree Status Summary Report under Section III Performance Measures Compliance Summaries.

Table 8-2 Revised Original LMCPR Measures Compliance Summary - Example

Measure Compliance	Summary Status (dates)
Green Demonstration Program	Provide a quarterly status report regarding the existing green demonstration and enabled impact projects.
Post Construction Monitoring Program	Provide a quarterly status report summarizing monitoring efforts throughout the Lower Mill Creek Watershed.

Measure Compliance	Summary Status (dates)
Source Control Infrastructure Operations and Maintenance Program	Provide a quarterly report summarizing operations and maintenance activities performed for specific source control assets.
Public Education Program	Provide a quarterly report summarizing public education efforts and feedback.

9. Community Engagement

MSD has worked since 2010 to provide information and seek input from the Cincinnati and Hamilton County community about the LMCPR. To ensure a well-considered and comprehensive effort, MSD updated its existing strategic Project Groundwork Communications Plan with a section tailored to the unique needs and issues of the Lower Mill Creek Watershed.

Appendix G contains a summary of the community engagement activities beyond that of the formal public comment periods, formal town hall meetings, and formal hearings summarized below. Additional detailed information regarding all facets of MSD's Community Outreach Program is included in MSD's *LMCPR Community Engagement Outreach Summary* dated December 2012.

9.1 Community Engagement Program Overview

The goal of this community engagement program was to engage Greater Cincinnati citizens in the process of selecting a preferred solution for the LMCPR. The objectives of the community engagement program were simple but strategic:

- To increase awareness of the LMCPR among Lower Mill Creek watershed residents, businesses, property owners and interested citizens, as well as city and county agencies and non-profit organizations.
- To increase awareness among ratepayers across MSD's service area.
- To increase opportunities for the community to provide input into the decision-making process for selecting a preferred solution.

The strategy for meeting these objectives was to employ multiple communication channels rather than rely solely on one outreach pathway such as a website. This strategy ensured that all voices within the community had the opportunity to be heard and considered, including traditionally hard-to-reach populations such as low-income households, concentrated minority areas and households without higher education.

Significant time and resources was dedicated to this endeavor, including ensuring all materials were written to a sixth-grade education level, mailing materials to homes, writing articles for hard copy community newsletters, providing a phone number to call for questions, concerns and feedback instead of just an email address or website URL, and ensuring a consistent presence in person of a community representative at local community meetings.

MSD also worked to align the communications plan, including key messages, information pathways and communication tactics, with recommendations made by the USEPA in their July 2011 *Lick Run Watershed Strategic Integration Plan*.

9.2 Formal Comment Period

MSD sponsored a formal public comment period on the LMCPR from June 26, 2012 to September 4, 2012 to obtain feedback from the community on their preferred solution. MSD also sponsored two community "town hall" meetings during the comment period to provide the public with technical and cost details on the gray and sustainable approaches.

The community was invited to provide public comment via several methods to ensure the widest representation as presented in Table 9-1:

- By calling MSD's customer service line at (513) 557-3594.
- By emailing MSD at MSD.Communications@cincinnati-oh.gov.
- By attending a "town hall" meeting and filling out a written comment card or by giving an oral comment and having it recorded by a stenographer.

Citizens were directed to visit the Lower Mill Creek website or to call MSD customer service for more information about the LMCPR. A copy of the *LMCPR Alternatives Evaluation Preliminary Findings Report*, which described the gray and sustainable approaches, was made available to the public electronically via the website and as a hard copy via other distribution channels.

To help publicize the public comment period, MSD conducted the following activities:

- A copy of a presentation on the LMCPR that MSD made to City Council on June 26, 2012 was posted on the Lower Mill Creek website.
- MSD made a presentation to the First Suburbs Consortium and informed attendees that presentations could be made upon request for those who will be unable to attend the Town Hall meetings
- MSD Director Tony Parrott appeared on the Newsmakers Program hosted by Dan Hurley on WKRC on Sunday, August 19, 2012, discussing the Consent Decree and the proposed solutions to achieve compliance, including the LMCPR.
- An email notification was sent to all who had attended a watershed open house or community design workshop notifying them of the public comment period and "town hall" meetings, and also notifying them of the preliminary findings report.
- An email was sent to CFAC members notifying them of the public comment period and "town hall" meetings, and also notifying them of the preliminary findings report.

- MSD used its Twitter account to "tweet" about the "town hall" meetings and the availability of the preliminary findings report.

- MSD sent out a media advisory on the "town hall" meetings and earned above the fold coverage in *The Enquirer* (the daily Cincinnati newspaper) the day prior to the first town hall.

- MSD mailed hard copy postcard invitations to the community notifying them of the public comment period and "town hall" meetings.

Table 9-1 Summary of MSD's Town Hall Meetings

Date	Participation	Discussion & Meeting Topics
August 16, 2012	125 attendees 12 verbal comments 1 written comment 25 exit surveys	Presentation of technical findings, cost estimates, regulatory requirements, and other information intended to fully inform the community on the options being presented to Hamilton County and the City of Cincinnati. A stenographer was on hand to document verbal comments.
August 23, 2012	93 attendees 16 verbal comments 6 written comment 24 exit surveys	
Other comments received	28 email comments	A compilation of the comments was posted to the Lower Mill Creek website, as were responses to questions asked verbally or in writing during the "town halls."

The Hamilton County Commissioners held four public hearings on September 26, October 3, October 8 and October 10 and sponsored a public comment period from September 26 through October 26, 2012. MSD presented its recommendation for the sustainable approach at each hearing, and then answered questions from the commissioners. The public gave oral comment following the Q&A session. Court reporter compiled transcripts from the hearing which were posted at Hamilton's County website along with the comments and MSD presentation materials. http://www.hamiltoncountyohio.gov/hc/MSDLowerMillCreek.asp

Table 9-2 Summary of County's Public Hearings

Date	Participation	Discussion & Meeting Topics
September 26, 2012	8 verbal comments	MSD presented its recommendation for the sustainable approach at each hearing, and then answered questions from the commissioners. The public gave oral comment following the Q&A session. Court reporter compiled transcripts from the hearing which were posted at Hamilton's County website1 along with the comments and MSD presentation materials.
October 3, 2012	7 verbal comments	
October 8, 2012	3 verbal comments	
October 10, 2012	11 verbal comments	
Other comments received	29 written comments	A compilation of the comments was posted to Hamilton County's website.

10. WWIP Attachment 1B and Attachment 2 Modifications

This section of the report identifies the specific grey infrastructure components listed in the approved WWIP that will be modified or eliminated with the Revised Original LMCPR. It also provides an analysis of how the downsizing or elimination of planned grey infrastructure projects could potentially affect other elements of the overall conveyance and treatment system.

The list of seventeen completed and six active projects is presented in Table 10-1. The reference column titled "WWIP Index" lists the row index as labeled in Attachment 1B and Attachment 2 of the approved WWIP. WWIP Index values less than 120 represent projects to be constructed during Phase 1 of the Program. Index values greater than 120 represent projects to be considered during Phase 2 of the Program.

Table 10-1 Completed and Active WWIP Projects

WWIP Index	Sub Basin	ID	CSO SSO	WWIP Project Description
Completed WWIP Projects in Mill Creek Watershed				
33	Lower 11	10144960	CSO 3	HW/DW Protection
26	Lower 11	10144920	CSO 4	HW/DW Protection
77	Lick Run	10145320	CSO 5	RTC to retain water in CSO with inflatable dam (approx 200 MG/yr)
467	Kings Run	10143160	CSO 25A	Separation Project completed
16	Kings Run	10145000	CSO 29	New sewer to eliminate CSO 29 and abandon siphon
440	Elmwood	10142620	CSO 37	Regulator Improvements - 6.2 cfs
441	Elmwood	10142720	CSO 39	Partial Separation
27	West Fork	10145020	CSO 89	New sewer & building connections to eliminate CSO 89
445	Spring Grove Lower	10143400	CSO 111	
75	West Fork	10145300	CSO 125	RTC to retain water in CSO with inflatable dam (approx 60 MG/yr)
38	Ludlow Run	10144900	CSO 151	Collector Upgrade CIP 83-10, Exhibit 1
76	Bloody Run	10145180	CSO 181	Bloody Run & Spring Grove Phase 2
67	Amberley Creek	10142440	CSO 191	Regulator Improvements - 0.20 cfs
74	Kings Run	10145280	CSO 482	RTC to retain water in CSO with inflatable dam (approx 100 MG/yr)
369	Kings Run Upper	10142940	CSO 485	
60	Kings Run Upper	10145220	CSO 487	RTC to retain water in CSO with inflatable dam (250 MG/yr)
61	Kings Run Upper	10145100	CSO 487	Aid in separation of existing combined sewer

WWIP Index	Sub-Basin	ID	CSO SSO	WWIP Project Description
Active WWIP Projects in Mill Creek Watershed				
111	Northside	10143220	CSO 179	Partial Separation
97	Trib to Winton Lake	10142240	CSO 180	Blue Rock Road Sewer Separation
106	Westwood Northern	10143920	CSO 194	Partial Separation
107	Westwood Northern	10143940	CSO 195	Partial Separation
381	West Fork	10143760	CSO 123	CSO being eliminated via separation under 102
108	Westwood Northern	10143960	CSO 525	Partial Separation

The updated baseline model more accurately reflects the hydraulic and hydrologic conditions of the MSD combined sewer system. A total of 26 CSOs have greater than 85 percent control or are eliminated in the Updated Baseline Model (Version 3.2), thereby eliminating the need to construct the 18 approved WWIP projects listed in Table 10-2. Revised Attachment 2 in Exhibit 1 has been updated to reflect the removal of these projects based on updated modeling.

Table 10-2 Eliminated WWIP Projects

WWIP Index	Sub-Basin	ID	CSO	WWIP Remaining Overflow (MG)	Updated Baseline % Control	Updated Baseline Remaining Overflow (MG)
Projects located within Lower Mill Creek Study Area - Updated Baseline Model >85% Control						
112	Lower 11	10145660	CSO 2	N/A	87%	1
375	Hopple Street	10142760	CSO 8	0.9	88%	0
438	Northside Upper	10143200	CSO 19	0.9	94%	1
423	Kings Run Lower	10142960	CSO 26A	0.0	100%	0
112	Lower 11	10145660	CSO 429	N/A	96%	0
291	Amberley Creek	10142460	CSO 505	0.0	97%	0
268	Reading Lower	10142100	CSO 511	0.0	98%	0
166, 230	Reading	10142120	CSO 512	0.2	93%	0
377	West Fork	10143680	CSO 527A	0.4	88%	0
378	West Fork	10143700	CSO 528A	0.2	96%	0
379	West Fork	10143720	CSO 528B	0.9	96%	1
380	West Fork	10143740	CSO 529B	0.1	95%	0
381	West Fork	10143760	CSO 123	0.0	100%	0
149,213	West Branch	10142380	CSO 539	1.3	91%	2
390	Elmwood	10142640	CSO 544	0.1	86%	1
391	Elmwood	10142660	CSO 653	0.4	96%	1
269	Reading Lower	10142140	CSO 670	2.2	100%	0
465	Lower Mill Creek	10143080	CSO 29	1.7	100%	0

Table 10-3 describes the revisions in Attachment 2 based on the selection of the Revised Original LMCPR. The Revised Original LMCPR changes various listed projects.

Table 10-3 WWIP Projects Changed Due to Revised Original LMCPR

WWIP Index	Sub-Basin	ID	CSO	WWIP Description	Revised Description
Changed Projects due to Revised Original LMCPR					
388	West Fork	10143900	CSO 117	Conveyance to Tunnel at Mill Creek, 12,600' of 84" sewer.	To Be Determined
386	West Fork	10143840	CSO 126	Conveyance to Tunnel at Mill Creek, 12,600' of 84" sewer.	To Be Determined
384	West Fork	10143860	CSO 130	Conveyance to Tunnel at Mill Creek, 12,600' of 84" sewer.	To Be Determined
387	West Fork	10143880	CSO 203	Conveyance to Tunnel at Mill Creek, 12,600' of 84" sewer.	To Be Determined
392	Bloody Run	10142700	CSO 181	EHRT - 230 MGD (NOTE 2)	To Be Determined
452	LMCFR	10145380	CSO 2, 3, 4, 6, 7, 9, 666, 152, 428	To Be Determined	To Be Determined - added CSOs 3, 4, 6, 7, 9, 666, 152, 428

The Revised Original LMCPR is based on sustainable approach of source control through strategic separation. Source control will ultimately impact the sizing and/or the need for future grey infrastructure required for conveyance, storage and treatment in the Mill Creek basin. The LMCFR will evaluate sustainable and grey projects to meet the applicable goals. It is evident that one of the benefits of source control is that it has the potential to lower operation and maintenance costs for remaining grey, treatment facilities.

11. Conclusion

The LMC Study has expanded the understanding of the Mill Creek's complex interconnections among topography, land use, development and the Mill Creek's interceptors, stormwater, sanitary and combined sewer systems. The LMC Study considered a range of potential control approaches across the basin, and further study of the watershed approaches has only just begun in many portions of the basin. The consideration of the innovative approaches, through advanced engineering and analysis, updated modeling, and extensive public outreach, were honed into a cost-effective Revised Original LMCPR, as described in Section 3.1.

The Defendants' Proposal for the Revised Original LMCPR, therefore, is in the Revised WWIP Attachments in Exhibit 1 to this LMC Study. Exhibit 1 provides the revised pages to replace the current WWIP Attachments; for convenience it also includes a comparison between Attachment 2 and Revised Attachment 2. Exhibit 1 includes the following Revised WWIP Attachments:

1. **Revised Attachment 1A**, which revises Attachment 1A as follows: the LMCPR PTI Milestone date is changed from 6/30/15 to 12/31/16; the Start Construction Milestone date is changed from 6/30/16 to 12/31/17. Individual projects of the Revised Original LMCPR will include PTI applications and begin construction at various dates in advance of the milestones.

2. **Revised Attachment 1B**, which revises Attachment 1B, Index Line 112, to include the description, design and performance criteria for the Revised Original LMCPR.

3. **Revised Attachment 1C**, which acknowledges that Attachment 1C is no longer operative.

4. **Revised Attachment 2**, which revises Attachment 2 to account for the changed approach in the Revised Original LMCPR and additional information developed during the LMC Study affecting listed projects.

Exhibit 1

Revised WWIP Attachment 1A
Revised WWIP Attachment 1B
Revised WWIP Attachment 1C
Revised WWIP Attachment 2
Strikethrough WWIP Attachment 2
December 2012

REVISED ATTACHMENT 1A

Phase 1 Milestone Schedule

PROJECT ID	PROJECT	PTI Submittal Milestone	Start Construction Milestone	End Construction Milestone
10130740	Werk & Westbourne	12/31/2013	12/31/2014	12/31/2017
10143960	Westwood Northern (Bundle)	6/30/2015	6/30/2016	6/30/2017
10142240	Blue Rock	12/31/2013	12/31/2014	12/31/2015
10171840	Lower Little Miami (Bundle)	12/31/2012	12/31/2013	12/31/2015
10120360	Pebble Creek WWTP			6/30/2009
10120420	Diamond Oaks		12/31/2009	12/31/2010
10120460	Towers East	12/31/2011	12/31/2012	12/31/2013
10130560	Muddy Secondary			6/30/2010
10130565	Muddy Pump Upgrade			6/30/2010
10130680	Harwinton			12/31/2010
10131220	Glenview	12/31/2013	12/31/2014	12/31/2015
10144441	1852 Columbia		12/31/2011	12/31/2012
10141440	Millbrook 1			6/30/2009
10141520	Arrowood			6/30/2009
10141540	Winton 1			12/31/2010
10141560	Winton 2			12/31/2010
10142020	Daly Road	12/31/2014	12/31/2015	12/31/2016
10142440	7601 Production			6/30/2009
10144880	Mill Grit		12/31/2010	6/30/2013
10144884	Mill Secondary	12/31/2009	12/31/2010	12/31/2014
10145180	Mill Diversion			12/31/2009
10145280	Mitchell RTC			11/1/2009
10145300	Badgely RTC			11/1/2009
10145320	Lick RTC			5/31/2010
10150012	Polk Phase 3B			6/30/2009
10160005	Sycamore 3			12/31/2010
10160010	Sycamore 4			12/31/2010
10170081	Montgomery		12/31/2011	12/31/2012
10170560	Woodruff			6/30/2009
10170780	LM WWTP Thickening			6/30/2010
10171900	Eastern Delta (Bundle)		12/31/2013	12/31/2015
10172090	Kenwood			6/30/2009
10180600	Mill Incinerator			12/31/2010
10145580	Mill Creek WWTP (Bundle)	12/31/2014	12/31/2015	12/31/2016
10131180	Muddy Creek WWTP (Bundle)	12/31/2013	12/31/2014	12/31/2015
10143220	North Side Upper (Bundle)	12/31/2016	12/31/2017	12/31/2018
10171620	Upper Duck All (Bundle)	12/31/2016	12/31/2017	12/31/2018
10145660	LMCPR	12/31/2016	12/31/2017	12/31/2018

REVISED WWIP ATTACHMENT 1B - DECEMBER 2012

INDEX			Project Completion	Sunk Costs	Remaining Costs	CSO SSO Identifier	Description/Design (NOTE 4)	Technology	Plan CAPP	Plan Remaining CSO (MG/year)
			Actual	2006 Dollars	2006 Dollars					
1	10141660	Norman Ave.	Jan-04	$ 137,501		SSO 585	Relief sewer to Elim. SSO 585 - 285 ft of 12"	CONV	2 yr	
2	10141480	Mill Rd. Sewer	Apr-04	$ 1,855,869			Phase 2 - Relief sewer to replace sewer - 2200 ft of 30"	CONV		
3	10142040	Compton Rd.	Apr-04	$ 210,603			Relieve WIBs w/sewer - 62 ft of 12"	CONV		
4	10144980	Ross Run Grit Pit	Apr-04	$ 523,746			Grit Pit	-		
5	10170040	SSO 570 & 1017 in Madeira	Jun-04	$ 3,357,676		SSO 570 & 1017	Elim. SSOs 570 & 1017 w/Sewer. 3800 ft of 24 - 30 inch	CONV	2 yr	
6	10141260	Springdale - Sharonville Sewer	Jul-04	$ 2,401,605		SSO 915	Contract 3 - Relief sewer to eliminate SSO 915 - 7842 ft of 8-30"	CONV	2 yr	
7	10141720	Goodman Ave.	Aug-04	$ 1,607,061		SSO 531, 577, 1002, 1005, 1024	Relief sewer to Elim. SSOs 531, 577, 1002, 1005, & 1024 - 1850 ft of 24", 860 ft of 18", & 600 ft of 15"	CONV	2 yr	
8	10145120	Eggleston & Bold Face	Sep-04	$ 64,109			HWDW – Tide Gate Replacement	HW		
9	10170820	Gungadin/Paddison Rd.	Sep-04	$ 3,126,594			Replace existing pipe - Approx. 2800 LF of 12-27"	CONV		
10	10141700	Mill Creek WWTP Aux. Air Supply	Oct-04	$ 215,096			Fulfillment of Need for Aux. Air Supply to Air Transfer Duct, connecting Incinerator Outlet to Scrubber Inlet to control pos. & neg. pressures in each unit.	WWTP	NOTE 1	
11	10141200	Northbrook SSO 628	Nov-04	$ 1,423,853		SSO 628	Phase 2 - Relief sewer to replace sewer near SSO 628 - 3500 ft of 12-15"	CONV	2 yr	
12	10145400	Samoht Ridge	Nov-04	$ 2,144			Solve WIB problems - 924 ft of 12-24"	CONV		
13	10141220	North College Hill	Dec-04	$ 5,391,761		SSO 530, 531, 567, 577, 634	Phases 2C &3 - Relief sewer to eliminate SSOs 530, 531, 567, 577, & 634 - 9980 ft of 12-42"	CONV	2 yr	
14	10141740	St. Clair Sewer	Dec-04	$ 1,454,250			Relief sewer to replace sewer on Elizabeth Ave. - 2638 ft of 8-24"	CONV		
15	10141580	Mill Creek WWTP Replacement Screens Ph1	Jan-05	$ 2,813,073			Phase I - Replace Screens	WWTP	NOTE 1	
16	10145000	Mitchell Ave.	Feb-05	$ 615,916		CSO 29	New sewer to eliminate CSO 29 and abandon siphon line under Mill Creek	RI		-
17	10141240	Sewer 155 Cooper Creek	Mar-05	$ 5,104,573		SSO 620	Contract 2B - Relief sewer to eliminate SSO 620 - 7410 ft of 8-36"	CONV	2 yr	
18	10141300	Camberly Acres PS	Mar-05	$ 321,573			PS Elim w/sewer - 659 ft of 8"	CONV		
19	10170020	SSO 1053 East Fork Ave. Grating	Mar-05	$ 3,410,084		SSO 1053 CSO 70, 200	Phase 2A, 2B, & 2C - Camargo Rd Sewer Improv. Elim. SSO 1053 and CSOs 70, 200 - 7088 ft of 8 - 36 inch	PS/CONV	2 yr	0
20	10141400	Deer Park	Apr-05	$ 2,076,612		SSO 1023, 600, & 601	Relief sewer to Elim. SSOs 1023, 600, & 601 - 3600 ft of 30" & 570 ft of 21"	CONV	2 yr	
21	10144940	Sawyer Point	Apr-05	$ 33,298			sewer, remove diversion dam, and plugging existing dry line conduit	-		
22	10141880	Laboiteaux Ave.	Jun-05	$ 181,725		SSO 597	Elim. SSO 597 w/sewer - 559 ft of 15"	CONV	2 yr	
23	10110300	Durango Green - Shadely Lane PS	Jul-05	$ 540,150			Elimination of PS w/Sewer - 2861 ft of 12-in.	CONV		
24	10150000	Polk Run WWTP Ph 2 STO	Sep-05	$ 11,186,361			WWTP Optim. - Phase 2	Optimization	NOTE 1	
25	10150240	Maple Ave.	Sep-05	$ 233,361			Loveland Supplemental Agreement	-		
26	10144920	Harrison & State Ave. West 4	Oct-05	$ 171,990		CSO 4	HW/DW Protection	HW		
27	10145020	Montana Ave.	Oct-05	$ 138,382		CSO 89	New sewer and building connections to eliminate CSO 89	SEP		0.05
28	10141680	406 Elliot Ave.	Nov-05	$ 130,892		SSO 572	Relief sewer to Elim. SSO 572 - 203 ft of 16"	CONV	2 yr	
29	10145080	Eastern Ave. (Collins to Bayou)	Nov-05	$ 451,318			Phase 2 – Express Sewer to allow for development and conveyance of wet weather flows	CONV		
30	10170940	Stewart Rd. East Regulator	Nov-05	$ 412,420		CSO 557	Completed; CIP 2002-05 Full Separation – Elimination Exhibit 1	FS		0.0
31	10141360	Garden Hills PS	Dec-05	$ 1,065,355			PS Elim w/sewer - 4068 ft of 15 & 16"	CONV		
32	10141620	Mill Creek WWTP Solids Mgmt Centrifuge Procurement	Dec-05	$ 2,616,020			Solids Management Program Centrifuge Procurement - Cost in WWTP Optimization	WWTP	NOTE 1	
33	10144960	Harrison & State Ave. West 3	Dec-05	$ 325,357		CSO 3	HW/DW Protection	HW		
34	**PROJECTS IN CLOSEOUT**			$ 93,631,813	$ 18,938,454					
35	10141760	Mill Creek WWTP Raw Sewage Pumps	Dec-05	$ 3,153,931	$ 864,295		Replace depleted wastewater Pumping System	WWTP	NOTE 1	
36	10120400	Arrow St. WWTP Elimination & North Bend Crossing	Jan-06	$ 1,371,433	$ 26,412		PS Elim & WWTP Elim. w/sewer - 6108 ft of 8-12"	CONV		
37	10141640	Mill Creek WWTP Solids Mgmt. Centrifuge Install.	Feb-06	$ 10,208,487	$ -		Solids Management Program Centrifuge Installation	WWTP	NOTE 1	
38	10144900	Ludlow Run	Mar-06	$ 2,615,592	$ 490,658	CSO 151	Collector Upgrade CIP 83-10 Exhibit 1	CONV		16.8
39	10145240	Este Ave.	Jul-06	$ 90,636	$ 76,915		Flood Remediation Sewer Este Ave. Overflow	-		
40	10145140	Givaudan Sewer	Sep-06	$ 67,933	$ -		Removal of process flow from combined sewer to interceptor	-		
41	10170060	Mariemont SSO Elimination 679A, 679B & 680	Sep-06	$ 8,271,513	$ 809,602	SSO 679A, 679B & 680	Elim. of SSOs 679, 679A, & 680 w/sewer. 5800 ft of 36 inch & 2000 ft of 8-21 inch	CONV	2 yr	

INDEX	REVISED WWIP ATTACHMENT 1B - DECEMBER 2012		Project Completion	Sunk Costs	Remaining Costs		CSO SSO		Technology	Plan CAPP	Plan Remaining CSO
			Actual	2006 Dollars	2006 Dollars		Identifier	Description/Design (NOTE 4)			(MG/year)
42	10171420	Archer St. Div Dam, HDW	Sep-06	$ 244,636	$ -		CSO 86	HW/DW Protection	HW		
43	10171820	Beechmont Sluice Gate Rehabilitation	Oct-06	$ 1,753,157	$ 226,600			E-504 Beechmont Sluice Gate WWTP Rehabilitation	WWTP		
44	10141500	Pleasant Run PS	Nov-06	$ 6,332,251	$ 485,377			Phase 2 - Replace existing FM - 3000 ft of 16" FM	FM		
45	10170800	Berkley Woods PS	Nov-06	$ 198,244	$ 123,747		PSO 851	Elim. PSO 851 w/Sewer - 1745 ft of 12"	CONV	2 yr	
46	10120340	Streamwood Pump Station	Dec-06	$ 270,665	$ 96,942			PS Elim w/sewer - 1072 ft of 12"	CONV		
47	10141380	N. Bend Rd./Connecticut Sewer	Dec-06	$ 908,577	$ 280,075		SSO 222	Relief sewer to Elim. SSO 222 - 1821 ft of 12-21"	CONV	2 yr	
48	10141820	SSO 700 CEHRS Treatment Facility	Dec-06	$ 12,730,053	$ 1,500,406		SSO 700	CEHRS Treatment Facility (Performance in 41180)	CEHRS		
49	10170840	Johnson Rd. PS	Mar-07	$ 605,979	$ 253,036			Phase 2 Elim. of P.S. w/Sewer - 834 ft of 30"	CONV		
50	10142000	W. Branch Mill Creek SSO 574	May-07	$ 444,930	$ 349,792		SSO 574	Elim. SSO 574 w/sewer - 950 ft of 15"	CONV	2 yr	
51	10141420	Centurion Estates PS	Jun-07	$ 385,144	$ 307,478		PSO	PS Elim w/sewer - 1570 ft of 12"	CONV	2 yr	
52	10141600	Mill Creek WWTP Replacement Screens Ph2	Jun-07	$ 2,919,250	$ 701,430			Phase II - Replace Screens	WWTP	NOTE 1	
53	10141340	Greenridge PS	Sep-07	$ 580,614	$ 87,582			PS and 1000 ft of 6" FM	PSU/FM		
54	10150011	Polk Run WWTP PS Elimination Sewer Ph3A	Sep-07	$ 522,457	$ 145,486			Polk Run WWTP PS Elimination Sewer Ph3A	Optimization	NOTE 1	
55	10145200	Butler St.	Oct-07	$ 94,432	$ -		CSO 450	Separation sewer to aid in elimination of CSO 450	PS		0.0
56	10172200	Broadview Dr./Country Club, SEP	Nov-07	$ 1,096,035	$ 425,547			Partial Separation	PS		
57	10141780	Arrowhead Ct. PS & Marview Terrace PS	Dec-07	$ 657,361	$ 131,280		PSO 790, 798	Relief sewer to Elim. Marview PS (900 ft of 8") & New PS/FM to Replace Arrowhead PS (245 ft of 4")	PSU/CONV	2 yr	
58	10145040	West 3rd St., Ph3 CSO 437	Dec-07	$ 301,714	$ 54,969		CSO 437	Partial Separation Phase 3 CIP 98-91 – 2006 Construction (CD Exhibit 1)	PS		0.2
59	10130420	Wulff Run Rd.	Jan-08	$ 94,677	$ 57,510			Parallel section of Wulff Run Interceptor - 200 ft of 24"	CONV		
60	10145220	Ross Run CSO 487 Twin Outfall	Jan-08	$ 3,658,803	$ 832,675		CSO 487	Real Time Control Project to retain water in CSO with inflatable dam (CSO annual reduction of approximately 250 MG/year)	RTC		in 43040 NOTE 5
61	10145100	Ross Run	Apr-08	$ 1,614,452	$ 343,174		CSO 487	Aid in separation of existing combined sewer	SEP		in 45220
62	10160000	Sycamore WWTP Ph 1&2	Apr-08	$ 26,566,214	$ 3,035,574		SSO 1052	Sycamore WWTP Upgrade _ 50 MGD, Phase 1 and 2	Optimization	NOTE 1	
63	10131200	Mt. St. Joseph Sewer Replacement	Jul-08	$ 511,347	$ 519,479		CSO 406	Mount St. Joseph Sewer Replacement	PS		in 30780
64	10120380	Hengehold 4th & Yates 3rd PSE	Oct-08	$ 703,189	$ 397,965		PSO 774, 783	PS Elim w/sewer - 2708 ft of 12"	CONV	2 yr	
65	10141839	McGrew Ave. PSU	Oct-08	$ 304,233	$ 5,020			McGrew Ave. PSU	PSU		
66	10120360	Pebble Creek WWTP	Oct-08	$ 828,541	$ 647,905			WWTP replaced w/PS & FM	WWTP Elim.		
67	10142440	7601 Production Dr. Grating	Dec-08	$ 122,447	$ 104,550		CSO 191	Regulator Improvements -0.20 cfs	RI		0.2
68	10172090	Kenwood Rd. PSU	Dec-08	$ 757,102	$ 1,375,273			Upgrade of Existing Kenwood PS No. 724	PSU		
69	10150012	Polk Run WWTP Expansion Ph3B	Dec-08	$ 1,188,153	$ 938,980			Polk Run WWTP Expansion Ph3B	Optimization	NOTE 1	
70	10141440	Millbrook 1 PSU	Dec-08	$ 402,371	$ 302,501		PSO 799	PS and 600 ft of 6" FM	PSU/FM	2 yr	
71	10170560	Woodruff Rd. @ 8 Mile/Britney Acres PSU	Jan-09	$ 630,061	$ 371,610		PSO 852	P.S. Upgrade - 1.2 MGD, 600 ft of 6" F.M.	PSU/FM	2 yr	
72	10141520	Arrowood PSE	Jan-09	$ 425,199	$ 613,609		PSO 861	Eliminate PSO 861	CONV	2 yr	
73	**REMAINING PHASE 1 PROJECTS TO BE CONSTRUCTED**			$ 114,204,002	$ 807,433,016						
74	10145280	Mitchell Ave. RTC		$ 1,127,341	$ 1,516,011		CSO 482	Real Time Control Project to retain water in CSO with inflatable dam (CSO annual reduction of approximately 100 MG/year)	RTC		in 45380 NOTE 5
75	10145300	Badgeley Run RTC		$ 305,854	$ 2,617,058		CSO 125	Real Time Control Project to retain water in CSO with inflatable dam (CSO annual reduction of approximately 60 MG/year)	RTC		in 45380 NOTE 5
76	10145180	Mill Creek Interceptor Diversion Chamber		$ 1,223,735	$ 365,126		CSO 181	Bloody Run & Spring Grove Ave - Phase 2 - REG	RI		in 42700
77	10145320	Lick Run RTC		$ 76,572	$ 1,376,762		CSO 5	Real Time Control Project to retain water in CSO with inflatable dam (CSO annual reduction of approximately 200 MG/year)	RTC		in 45380 NOTE 5
78	10130560	Muddy Creek WWTP Secondary Enhancement		$ 5,734,429	$ 5,289,057			W-102 WWTP Optimization Secondary Enhancement (98-09),	WWTP	NOTE 1	
79	10130565	Muddy Creek WWTP Effluent Pump Upgrade		$ 608,071	$ 2,801,053			W-102 WWTP Optimization Raw Sewage Pump Upgrade, Effluent Pump Upgrade	WWTP	NOTE 1	
80	10170780	LM WWTP, Activated Sludge Thickening		$ 2,429,843	$ 3,346,832			E-503 Activated sludge thickening (CIP 2005-31)	WWTP	NOTE 1	
81	10130680	Harwinton Lane		$ 117,431	$ 1,049,285		SSO 1012	Replace sewer - 2000 ft of 12"	CONV	2 yr	
82	10141540	Winton and Sherwood Ph1 PS		$ 338,400	$ 2,060,694		PSO 805	Phase I - New PS, gravity sewer from Winton 2 to Winton 1, and New FM in Winton Rd	CONV	2 yr	
83	10141560	Winton and Sherwood Ph2 PS		$ 297,485	$ 1,362,778		PSO 805	Phase II - New sewer to Elim. Sherwood PS - 2300 ft of sewer & 4730 ft of FM	CONV	2 yr	
84	10160005	Sycamore WWTP Ph 3		$ 770,557	$ 8,114,644		SSO 1052	Sycamore WWTP Upgrade _ 50 MGD, Phase 3	Optimization	NOTE 1	
85	10160010	Sycamore WWTP Ph 4		$ 216,253	$ 2,550,814		SSO 1052	Sycamore WWTP Upgrade _ 50 MGD, Phase 4	Optimization	NOTE 1	
86	10180600	Mill Creek WWTP, TPE Incinerator		$ 35,021,978	$ 36,057,036			Mill Creek WWTP, TPE Incinerator	WWTP	NOTE 1	
87	10120420	Diamond Oaks, Windmere 3rd & Regency Ridge PS		$ 306,882	$ 1,336,137		PSO	PS Elim w/sewer - 3200 ft of 8"	CONV	2 yr	

INDEX	REVISED WWIP ATTACHMENT 1B - DECEMBER 2012		Project Completion	Sunk Costs	Remaining Costs		CSO SSO Identifier	Description/Design (NOTE 4)	Technology	Plan CAPP	Plan Remaining CSO (MG/year)
			Actual	2006 Dollars	2006 Dollars						
88	10170081	Montgomery Rd & Lester Ave		$ 57,618	$ 984,962			Montgomery Rd & Lester Ave	CONV		
89	10144441	1852 Columbia Pkwy Sewer		$ 242,189	$ 1,744,316		CSO 455	2145 feet of 27 to 36" combined sewer and 2050 feet of 36" storm sewer. Catch basins along the storm sewer will be diverted to the storm sewer, allowing the combined sewer to be downsized.	PS		in 44440
90	10144880	Mill Creek WWTP Grit Removal		$ 667,744	$ 36,263,529			C-402 Mill Creek Grit Removal Improvements (CIP 2006-30)	WWTP	NOTE 1	
91	10120460	Towers East Pump Station		$ 20,305	$ 2,183,245		PSO 887, 891	Eliminate Towers East PS & Upgrade Ponderosa PS	PSE/PSU	2 yr	
92	10144884	Mill Creek WWTP Secondary Treatment Enhance. -		$ 985,315	$ 40,260,301			C-402 Secondary Treatment Enhancements	WWTP	NOTE 1	
93	10171980	**(A)** Eastern Delta Ave. Ph1		$ 4,552,591	$ 39,127,126			E-501 Construct Real Time Control Chamber at Little Miami WWTP, construct 72" intersecting sewer to Eastern Avenue	CONV		
94	10171920	**(A)** Eastern Delta Ave. Ph2		$ 1,139,074	$ 18,594,985		CSO 469	Extend interceptors to 2 new CSOs (469A & 469B)	CONV		75.9
95	10171900	**(A)** Eastern Delta Ave. Ph3		$ 1,009,542	$ 14,249,639		CSO 467A, 467, 468, 469, 657	Separation of area tributary to CSO 467A and 657; construction of new flow regulator and flap gate (HW/DW) structures at CSO 467, 468, and 469; demolision of Delta Ave Pump Station	CONV		47.5
96	10131220	Glenview PS at Wesselman		$ -	$ 760,302		PSO 773	Upgrade PS	PSU	2 yr	
97	10142240	Blue Rock Rd. Sewer Separation		$ 2,931	$ 1,897,181		CSO 180	Full Separation – CIP 94-25 and Regulator Improvements -7.7 cfs Community Priority	FS		0.1
98	10171840	**(B)** CSO 471 Grandin Rd. Reg. Improvements		$ 585	$ 286,093		CSO 471	Regulator Improvements - 9.3 cfs Premised on operational changes at Four Mile P.S.	RI		0.0
99	10171860	**(B)** CSO 470 Eastern Ave. Sewer Separation		$ 309	$ 1,607,283		CSO 470	Partial Separation & Regulator Improvements Construct storm sewer from Eastern Ave to Wilmer Rd	PS		0.0
100	10131180	**(C)** Muddy Creek WWTP New Belt Filter Press			$ 1,248,000			W-102 Add new Belt Filter Press-B&N Proj. DR-2	WWTP	NOTE 1	
101	10131240	**(C)** Muddy Creek WWTP Grit Replacement			$ 4,470,000			Muddy Creek WWTP Grit Replacement	WWTP	NOTE 1	
102	10142020	Daly Rd. to Compton Rd.		$ 505,196	$ 13,742,834			Replace sewer #161 - 6500 ft of 21-30"	CONV		
103	10145500	**(D)** Mill Creek WWTP Outfall Improvements			$ 15,163,200			Additional Optimization - Auxiliary Outfall Improvements	WWTP	NOTE 1	
104	10145560	**(D)** Mill Creek WWTP Secondary Bypass Weir			$ 137,000			Secondary Bypass Weir	WWTP	NOTE 1	
105	10145580	**(D)** Mill Creek WWTP Added Sludge Pumping			$ 1,315,000			Additional Primary Sludge Pumping	WWTP	NOTE 1	
106	10143920	**(E)** CSO 194 High Point Sewer Separation		$ 13,317	$ 4,105,549		CSO 194	Partial Separation Community Priority	PS		3.0
107	10143940	**(E)** CSO 195 Westwood Northern Sewer Separation		$ 13,170	$ 2,808,123		CSO 195	Partial Separation Community Priority	PS		3.7
108	10143960	**(E)** CSO 525 Mt. Airy Grating Sewer Separation		$ 6,619	$ 2,407,688		CSO 525	Partial Separation Community Priority	PS		2.5
109	10130740	Werk & Westbourne Grating		$ 374,405	$ 26,259,984		CSO 522	EHRT - 106 MGD Community Priority (NOTE 2)	EHRT		64.7
110	10141080	**(F)** Ludlow and Lafayette Parallel Sewer			$ 865,920		SSO 645, 225-A	New parallel sewer to follow original alignment - 1700 ft of 15"	CONV	2 yr	
111	10143220	**(F)** Scarlet Oaks Regulator			$ 1,306,000		CSO 179	Partial Separation	PS		0.4
112	10145660	Revised Original LMCPR		$ -	$ 244,342,000		5, 125, 127, CSO 128, 181, 217A, 483	Strategic separation and watershed approach, storage and one RTC in Lick Run, West Fork, Kings Run and Bloody Run to remove 1.78 BG overflow (under Model v. 3.2) (removal via RTC projects 45220, 45280, 45300, 45320 included)	SEP; CONV; RTC; Watershed		
113		Allowances		$ 56,038,261	$ 252,000,000						
114	10170080	**(G)** SSO 1000 Elimination			$ 1,815,294		SSO 1000	Replace existing pipe - Approx. 4400 LF of 15-24"	CONV	2 yr	
115	10170100	**(G)** SSO 228 Elimination			$ 1,381,001		SSO 228	Replace existing pipe - Approx. 3100 LF of 15-18"	CONV	2 yr	
116	10171580	**(G)** CSO 54 Elimination			$ 277,344		CSO 54	Regulator Improvements-10.0 cfs CAPP P-LM-LIT-CAPP-C-064	RI		0.1
117	10171620	**(G)** CSO 187 Improvements			$ 277,345		CSO 187	No modification-Int 0.50 cfs 0.0 MGD to UD Channel HRT	RI		0.0
118	10171740	**(G)** CSO 551 Sewer Separation			$ 3,781,924		CSO 551	Sewer Separation	SEP		13.1
119	10171780	**(G)** CSO 553 Sewer Separation			$ 1,926,561		CSO 553	Sewer Separation	SEP		5.4
120	**PHASE 1 PROJECTS/BUNDLES - PLANNING and DESIGN ONLY**			$ 3,344,857	$ 57,119,240						
121	10171540	CSO 135 Elimination			$ 33,629		CSO 135	Regulator Improvements - 2.4 cfs	RI		
122	10171560	CSO 43 Elimination			$ 33,185		CSO 43	Regulator Improvements - 2.8 cfs	RI		
123	10171600	CSO 170 Elimination			$ 34,664		CSO 170	Regulator Improvement - 3.1 cfs	RI		
124	10171640	CSO 214 Storage Facility			$ 2,348,676		CSO 214	Storage - 2.00 MG	STO		
125	10171660	CSO 500 Improvements			$ 34,275		CSO 500	Regulator Improvement - 1.5 cfs. See E-500	RI		
126	10171680	CSO 501 Improvements			$ 33,971		CSO 501	Regulator Improvement - 0.1cfs. See E-500	RI		
127	10171700	CSO 549 Improvements			$ 33,731		CSO 549	Regulator Improvement - 5.0 cfs. See E-500	RI		
128	10171720	CSO 550 Improvements			$ 33,525		CSO 550	Regulator Improvement - 0.4 cfs. See E-500	RI		
129	10171760	CSO 552 Improvements			$ 35,234		CSO 552	Regulator Improvement - 19.4 cfs	RI		
130	10171800	Upper Duck Creek EHRT Facility			$ 2,347,477			E-500 EHRT - 40-MGD - Serves CSOs 170, 549, 550, 501 & 500 (NOTE 2)	EHRT		

INDEX	REVISED WWIP ATTACHMENT 1B - DECEMBER 2012		Project Completion Actual	Sunk Costs 2006 Dollars	Remaining Costs 2006 Dollars		CSO SSO Identifier	Description/Design (NOTE 4)	Technology	Plan CAPP	Plan Remaining CSO (MG/year)
131	10170782	LM Four Mile Pump Station Upgrade			$ 542,498			E-503 - Four Mile Pump Station Rec Proj – PS-1	WWTP	NOTE 1	
132	10170783	LMWWTP Pump Station Reconfiguration			$ 467,842			E-503 - Modify LMR Pump Station Rec Proj – PS-5	WWTP	NOTE 1	
133	10170784	LMWWTP Grit Station Upgrade			$ 1,185,142			E-503 - Grit Collection Proj – SG-1	WWTP	NOTE 1	
134	10170785	LMWWTP Pump Station Hydraulic Improvements			$ 280,006			E-503 - Four Mile Pump Station to Screen Building Rec Proj - H-1	WWTP	NOTE 1	
135	10170786	LMWWTP Primary to Secondary Hydrau. Improvements			$ 231,868			E-503 - Primary to Secondary Conveyance Rec Proj – H-2	WWTP	NOTE 1	
136	10170787	LMWWTP Chemically Enhanced Primary			$ 899,299			E-503 - Chemical Enhance Primary Rec Proj – PT-2	WWTP	NOTE 1	
137	10170788	LMWWTP Secondary Treatmant Modifications			$ 1,372,476			E-503 - Modification to Secondary Treatment Rec Proj – ST-2	WWTP	NOTE 1	
138	10170790	LMWWTP Chemical Feed Upgrades			$ 541,064			E-503 - Upgrade Chemical Feed Sys Storage – D-2	WWTP	NOTE 1	
139	10170793	LMWWTP Sludge Receiving Improvements			$ 64,639			E-503 - Improvement to Sludge Receiving Facility Rec Proj – DR-6	WWTP	NOTE 1	
140	10170794	LMWWTP Standby Power			$ 1,074,223			E-503 - Dual Feed / Standby Power Rec Proj – E-1	WWTP	NOTE 1	
141	10172020	LMWWTP Wet Weather Pump Station			$ 5,286,355			E-505 - Wet Weather Pump Station with Screening 150 MGD to Auxiliary Outfall	WWTP	NOTE 1	
142	10172260	LMWWTP Dry Weather Pump Station			$ 125,000			Four Mile PS - Dry Weather Pumps - B&N Rec. Proj. PS-1	WWTP	NOTE 1	
143	10140400	Lockland Sewer Separation			$ 381,514		SSO 1045, 1010	Replace collector following original alignment - 7968 ft of 12-24"	CONV		
144	10142280	Oxley Grating			$ 36,201		CSO 226	Regulator Improvement-6 cfs. Combine with implementation of green infrastructure as redevelopment, renovation, and routine maintenance occurs to achieve CSO control to achieve 85%.	RI		
145	10142300	914 Oak St. Grating			$ 36,066		CSO 559	Regulator Improvements-14.0 cfs. Green potential greater than storage need.	RI		
146	10142320	200' West of Bacon St. Grating			$ 33,680		CSO 515	Regulator Improvements-0.7 cfs	RI		
147	10142340	Bacon St. Grating			$ 33,680		CSO 516	Regulator Improvements-0.11 cfs	RI		
148	10142360	No. 96 North Park Grating			$ 36,066		CSO 538	Regulator Improvements-0.31 cfs	RI		
149	10142380	117 E. Charlotte Grating			$ 35,995		CSO 539	Regulator Improvements-5.0 cfs	RI		
150	10142400	428 South Cooper Grating			$ 35,994		CSO 562	Regulator Improvements-3.08 cfs	RI		
151	10130000	Muddy Creek Basin Storage & Conveyance Sewer		$ 42,512	$ 14,060,624		SSO 701, 702, 692, 697, 675-A, 1061	Storage & Conveyance Tunnel unloads Muddy Creek PS, Eliminating SSOs 692 & 697, provides CSO control for 518, 404, 405, and 406 - 25 ft diameter, 8500 ft long, 35 MGD pumps at WWTP	TUNNEL		
152	10130160	Muddy Creek Pump Station Upgrade and Forcemain		$ 4,043	$ 1,511,582		SSO 692, 697, 675-A	Elim. PSO - Increase capacity & convey to Hillside Relief Tunnel - 25 MGD pumps, 12" FM for DWF, 36" FM for WWF (associated with 30000)	PSU/FM		
153	10130400	River Rd. Near Muddy Creek WWTP Conveyance Sewer		$ 3,725	$ 53,862		SSO 702	Rapid Run/Bender Rd. Interceptor directly into New Tunnel - 800 ft of 36"	CONV		
154	10131020	CSO 402 Topinabee Dr. Reg. Improvements		$ 797	$ 34,470		CSO 402	Regulator Improvement - 13.3 cfs (dependent on 30000, 30160, 31120)	RI		
155	10131040	CSO 403 Elco St. Div. Dam Reg. Improvements		$ 735	$ 34,648		CSO 403	Regulator Improvement - 7.10 cfs (dependent on 30000, 30160, 31120)	RI		
156	10131060	CSO 404 Ivanhoe St. Reg. Improvements		$ 704	$ 35,848		CSO 404	Regulator Improvement - 26.9 cfs (dependent on 30000, 30160, 31120)	RI		
157	10131080	CSO 405 Revere St. Reg. Improvements		$ 630	$ 35,034		CSO 405	Regulator Improvement - 6.20 cfs (dependent on 30000, 30160, 31120)	RI		
158	10131100	CSO 406 Kennebeck St. Reg. Improvements		$ 5,611	$ 35,178		CSO 406	Regulator Improvement -15.4 cfs (dependent on 30000, 30160, 31120)	RI		
159	10131120	West Branch Ohio River Interceptor Sewer		$ 16,349	$ 564,167		CSO 404, 405, 406	Convey Flow from CSO 404 to WWTP - 4000' - 60", sized for 85% control for CSOs 404, 405, and 406 (dependent on 30000, 30160)	CONV		
160	10140000	SSO 1048 Conveyance Sewer Phase 1			$ 450,870		SSO 1048	Replace collector following original alignment - 4115 ft of 18-27"; Tunnel 375 ft of 18-24"	CONV		
161	10140020	SSO 1048 Conveyance Sewer Phase 2			$ 375,348		SSO 1048, 587	Replace collector following original alignment - 4256' of 30-36"	CONV		
162	10140080	SSO 587 Conveyance Sewer			$ 275,637		SSO 587	Replace collector following original alignment - 4235 ft of 15-24"	CONV		
163	10140120	Sharonville/Evandale Trunk to SSO 700			$ 4,839,634		SSO 1048, 587	24,929 LF of 30-66"; Tunnel 6250 LF of 30-78''	CONV		
164	10140480	Pleasant Run Interceptor Replacement			$ 310,718			WIBs Replace collector following original alignment - 4246 ft of 21-24"	CONV		
165	10141180	I-75 & Shepard Ave. SSO 700			$ 9,407,964		SSO 700	Increase Storage at existing site - Additional 24 MG (NOTE 3)	STOR		
166	10142120	Mill & Vine St. Grating			$ 36,064		CSO 512	Regulator Improvements-3.25 cfs	RI		
167	10142200	Bernard & Reisenberg Grating			$ 360,034		CSO 513	Partial Separation	PS		
168	10142220	Smalley Grating			$ 193,696		CSO 514	Partial Separation	PS		

INDEX	REVISED WWIP ATTACHMENT 1B - DECEMBER 2012		Project Completion Actual	Sunk Costs 2006 Dollars	Remaining Costs 2006 Dollars		CSO SSO Identifier	Description/Design (NOTE 4)	Technology	Plan CAPP	Plan Remaining CSO (MG/year)
169	10130020	Muddy Creek Interceptor Rehabilitation			$ 722		SSO CSO SSO 1061, CSO 518, MH 16006007	Clean Interceptor - 5000 ft of 36"	CLEAN		
170	10130040	CSO 518 Muddy Creek Conveyance Sewer			$ 856,426		SSO CSO SSO 1061, CSO 518, MH 16006007	Replace section of Muddy Creek Int. - 9000 ft of 36", Provides CSO interception capacity for CSO 518	CONV		
171	10130280	Addyston PS Elimination			$ 266,996		PSO 730, 10902003	Elim. Addyston P.S. w/gravity along Rte. 50 - 2650' of 36" and two 100' of 24"	CONV		
172	10130700	Muddy Creek @ Westbourne EHRT			$ 4,178,406		CSO 198	EHRT - 126 MGD Community Priority (NOTE 2)	EHRT		
173	10130720	CSO 518 Improvements			$ 33,309		CSO 518	Regulator Improvement - 27.4 cfs Premised on CAPP Activity ID – 30040 Community Priority	RI		
174	10130780	CSO's 223, 408, 410, 541, 654		$ 281,421	$ -		CSO 223, 408, 410, 541, 654	CD Exhibit 1 Partial Separation	PS		
175	10130840	CSO's 411, 412, 413, 414, 415, 416		$ 208,080	$ 953		CSO 411, 412, 413, 414, 415, 416	CD Exhibit 1 Regulator Improvement–3.21 cfs and Relocation Complete Partial Separation - Activity ID 31140	RI/PS		
176	10131000	E. Branch Muddy Ph1 Interceptor		$ 1,239,024	$ 103,652			W-103 - Exhibit 1 Interceptor Replacement Phase 1	CONV		
177	10131002	E. Branch Muddy Ph2 Interceptor		$ 432,610	$ 4,783			W-103 - Exhibit 1 Interceptor Replacement Phase 2	CONV		
178	10131003	E. Branch Muddy Ph3-A Pump Station (Changed to AM)		$ 861,975	$ -			W-103 - Exhibit 1 Interceptor Replacement Phase 3	CONV		
179	10131004	East Branch Muddy Ph3-B Pump Station (Changed to AM)		$ 246,641	$ -			East Branch Muddy Ph3-B Pump Station	CONV		
180	10131006	East Branch Muddy Interceptor			$ 362,587			W-105 - Interceptor Extension	CONV		
181	10131140	E. Branch Ohio Interceptor Sewer Separation			$ 1,028,053		CSO 408, 411, 412, 414, 415, 416	W-104 - Complete Partial Separation in CSOs areas 408, 411, 412, 414, 415, 416	PS		
182	TOTAL PHASE 1			$ 264,781,000	$ 883,490,710						

NOTES:

1. PROJECT COMPLETE AND IN SERVICE AT SPECIFIED CAPACITY
2. FOR ALL PROJETS WITH EHRT TECHNOLOGY VOLUME SHOWING IS REMAINING UNTREATED OVERFLOW - SEE ATTACHMENT 5.
3. INFORMATION RELATED TO THIS PROJECT IS PRELIMINARY AND SUBJECT TO CHANGE BASED ON FURTHER STUDY AS SET FORTH IN PARAGRAPH A.3 OF THE WWIP
4. CAPP DESIGN: ALL CAPP SEWER PROJECTS WILL BE DESIGNED TO MEET THE 10 YEAR DESIGN STORM EVENT . ALL CAPP PUMP STATION AND STORAGE FACILITEIS WILL BE DESIGNED TO MEET THE 2 YEAR DESIGN STORM EVENT. THE 2 AND 10 YEAR DESIGN STORMS ARE SCS TYPE II-24 HOUR EVENTS.
5. FOR THESE RTC PROJECTS, THE STATED REDUCTION IN THE TYPICAL YEAR CSO DISCHARGE VOLUME SHALL ALSO BE THE PERFORMANCE CRITERIA FOR THE FACILITY.
6. PERFORMANCE CRITERIA FOR CSO VOLUMES REMAINING AFTER IMPLEMENTATION OF CSO CONTROLS ARE THE VOLUMES NOT TO BE EXCEEDED AT A PARTICULAR OUTFALL DURING MSDGC'S TYPICAL RAINFALL YEAR (1970). COMPLIANCE WITH THESE CRITERIA WILL BE EVALUATED BY IMPLEMENTATION OF A POST CONSTRUCTION MONITORING PROGRAM (WHICH WILL BE SUBMITTED TO THE REGULATORY AGENCIES FOR REVIEW AND APPROVAL IN ACCORDANCE WITH THE GLOBAL CONSENT DECREE) THAT WILL UTILIZE MSDGC'S HYDROLOGIC AND HYDRAULIC MODEL TO NORMALIZE THE RESULTS OF THE POST CONSTRUCTION MONITORING TO THE TYPICAL YEAR.

Bundle Identifiers:

- **(A)** The Eastern Delta Bundle on Attachment 1A consists of these projects.
- **(B)** The Little Lower Miami Bundle on Attachment 1A consists of these projects.
- **(C)** The Muddy Creek WWTP Bundle on Attachment 1A consists of these projects.
- **(D)** The Mill Creek WWTP Bundle on Attachment 1A consists of these projects.
- **(E)** The Westwood Northern Bundle on Attachment 1A consists of these projects.
- **(F)** The North Side Upper Bundle on Attachment 1A consists of these projects.
- **(G)** The Upper Duck All Bundle on Attachment 1A consists of these projects.

REVISED ATTACHMENT 1C
DECEMBER 2012

Original LMCPR

This Attachment is null and void.

INDEX	REVISED WWIP ATTACHMENT 2 - DECEMBER 2012		Sunk Costs	Remaining Costs		CSO SSO Identifier	Description / Design (NOTE4)	Technology	Plan CAPP	Plan Remaining CSO (MG/year)
			2006 Dollars	2006 Dollars						
185	10171540	CSO 135 Elimination		$ 243,716		CSO 135	Regulator Improvements - 2.4 cfs	RI		0.0
186	10171560	CSO 43 Elimination		$ 244,159		CSO 43	Regulator Improvements - 2.8 cfs	RI		0.7
187	10171600	CSO 170 Elimination		$ 242,681		CSO 170	EHRT - Regulator Improvement - 3.1 cfs	RI		in 71800
188	10171640	CSO 214 Storage Facility		$ 14,074,375		CSO 214	Storage - 2.00 MG	STOR		57.4
189	10171660	CSO 500 Improvements		$ 243,069		CSO 500	Regulator Improvement - 1.5 cfs. See E-500	RI		in 71800
190	10171680	CSO 501 Improvements		$ 243,373		CSO 501	Regulator Improvement - 0.1cfs. See E-500	RI		0.0
191	10171700	CSO 549 Improvements		$ 243,613		CSO 549	Regulator Improvement - 5.0 cfs. See E-500	RI		in 71800
192	10171720	CSO 550 Improvements		$ 243,820		CSO 550	Regulator Improvement - 0.4 cfs. See E-500.	RI		in 71800
193	10171760	CSO 552 Improvements		$ 242,109		CSO 552	Regulator Improvement - 19.4 cfs	RI		18.6
194	10171800	Upper Duck Creek EHRT Facility		$ 14,541,318			E-500 - EHRT - 40-MGD - Serves CSOs 170, 549, 550, 501 & 500 (NOTE 2)	EHRT		106.0
195	10170782	LM Four Mile Pump Station Upgrade		$ 3,617,502			E-503 - Four Mile Pump Station Rec Proj – PS-1	WWTP	NOTE 1	
196	10170783	LMWWTP Pump Station Reconfiguration		$ 3,172,158			E-503 - Modify LMR Pump Station Rec Proj – PS-5	WWTP	NOTE 1	
197	10170784	LMWWTP Grit Station Upgrade		$ 8,174,858			E-503 - Grit Collection Proj – SG-1	WWTP	NOTE 1	
198	10170785	LMWWTP Pump Station Hydraulic Improvements		$ 1,799,992			E-503 - Four Mile Pump Station to Screen Building Rec Proj - H-1	WWTP	NOTE 1	
199	10170786	LMWWTP Primary to Secondary Hydrau. Improvements		$ 1,328,132			E-503 - Primary to Secondary Conveyance Rec Proj – H-2	WWTP	NOTE 1	
200	10170787	LMWWTP Chemically Enhanced Primary		$ 5,860,701			E-503 - Chemical Enhance Primary Rec Proj – PT-2	WWTP	NOTE 1	
201	10170788	LMWWTP Secondary Treatment Modifications		$ 9,235,525			E-503 - Modification to Secondary Treatment Rec Proj – ST-2	WWTP	NOTE 1	
202	10170790	LMWWTP Chemical Feed Upgrades		$ 3,618,935			E-503 - Upgrade Chemical Feed Sys Storage – D-2	WWTP	NOTE 1	
203	10170793	LMWWTP Sludge Receiving Improvements		$ 455,361			E-503 - Improvement to Sludge Receiving Facility Rec Proj – DR-6	WWTP	NOTE 1	
204	10170794	LMWWTP Standby Power		$ 7,141,778			E-503 - Dual Feed / Standby Power Rec Proj – E-1	WWTP	NOTE 1	
205	10172020	LMWWTP Wet Weather Pump Station		$ 36,586,845			E-505 - Wet Weather Pump Station with Screening 150 MGD to Auxiliary Outfall	WWTP	NOTE 1	
206	10172260	LMWWTP Dry Weather Pump Station		$ 375,000			Four Mile PS - Dry Weather Pumps - B&N Rec. Proj. PS-1	WWTP	NOTE 1	
207	10140400	Lockland Sewer Separation		$ 2,424,977		SSO 1045, 1010	Replace collector following original alignment - 7968 ft of 12-24"	CONV	2 yr	
208	10142280	Oxley Grating		$ 241,149		CSO 226	Regulator Improvement-6 cfs. Combine with implementation of green infrastructure as redevelopment, renovation, and routine maintenance occurs to achieve CSO control to achieve 85%.	RI		4.6
209	10142300	914 Oak St. Grating		$ 241,284		CSO 559	Regulator Improvements-14.0 cfs. Green potential greater than storage need.	RI		7.0
210	10142320	200' West of Bacon St. Grating		$ 243,670		CSO 515	Regulator Improvements-0.7 cfs	RI		0.0
211	10142340	Bacon St. Grating		$ 243,670		CSO 516	Regulator Improvements-0.11 cfs	RI		0.1
212	10142360	No. 96 North Park Grating		$ 241,284		CSO 538	Regulator Improvements-0.31 cfs	RI		0.1
214	10142400	428 South Cooper Grating		$ 241,356		CSO 562	Regulator Improvements-3.08 cfs	RI		0.0
215	10130000	Muddy Creek Basin Storage & Conveyance Sewer		$ 120,122,277		SSO 701, 702, 692, 697,675-A, 1061	Storage & Conveyance Tunnel unloads Muddy Creek PS, Eliminating SSOs 692 & 697, provides CSO control for 518, 404, 405 and 406 - 25 ft diameter , 8500 ft long, 35 MGD pumps at WWTP	TUNNEL	2 yr	
216	10130160	Muddy Creek Pump Station Upgrade and Forcemain		$ 8,643,782		SSO 692, 697, 675-A	Elim. PSO - Increase capacity & convey to Hillside Relief Tunnel - 25 MGD pumps, 12" FM for DWF, 36" FM for WWF (associated with 30000)	PSU/FM	2 yr	
217	10130400	River Rd. Near Muddy Creek WWTP Conveyance Sewer		$ 396,774		SSO 702	Rapid Run/Bender Rd. Interceptor directly into New Tunnel - 800 ft of 36"	CONV	2 yr	
218	10131020	CSO 402 Topinabee Dr. Reg. Improvements		$ 242,680		CSO 402	Regulator Improvement - 13.3 cfs (dependent on 30000, 30160, 31120)	RI		7.2
219	10131040	CSO 403 Elco St. Div. Dam Reg. Improvements		$ 245,338		CSO 403	Regulator Improvement - 7.10 cfs (dependent on 30000, 30160, 31120)	RI		3.6
220	10131060	CSO 404 Ivanhoe St. Reg. Improvements		$ 241,095		CSO 404	Regulator Improvement - 26.9 cfs (dependent on 30000, 30160, 31120)	RI		16.2
221	10131080	CSO 405 Revere St. Reg. Improvements		$ 242,108		CSO 405	Regulator Improvement - 6.20 cfs (dependent on 30000, 30160, 31120)	RI		3.7
222	10131100	CSO 406 Kennebeck St. Reg. Improvements		$ 242,079		CSO 406	Regulator Improvement -15.4 cfs (dependent on 30000, 30160, 31120)	RI		9.0
223	10131120	West Branch Ohio River Interceptor Sewer		$ 3,477,204		CSO 404, 405, 406	Convey Flow from CSO 404 to WWTP - 4000' - 60", sized for 85% control for CSOs 404, 405 and 406 (dependent on 30000, 30160)	CONV		-

INDEX	REVISED WWIP ATTACHMENT 2 - DECEMBER 2012		Sunk Costs	Remaining Costs		CSO SSO Identifier	Description / Design (NOTE4)	Technology	Plan CAPP	Plan Remaining CSO (MG/year)
			2006 Dollars	2006 Dollars						
224	10140000	SSO 1048 Conveyance Sewer Phase 1		$ 1,710,579		SSO 1048	Replace collector following original alignment - 4115 ft of 18-27"; Tunnel 375 ft of 18-24"	CONV	2 yr	
225	10140020	SSO 1048 Conveyance Sewer Phase 2		$ 2,467,502		SSO 1048	Replace collector following original alignment - 4256' of 30-36"	CONV	2 yr	
226	10140080	SSO 587 Conveyance Sewer		$ 1,178,958		SSO 587	Replace collector following original alignment - 4235 ft of 15-24"	CONV	2 yr	
227	10140120	Sharonville/Evandale Trunk to SSO 700		$ 34,000,590		SSO 1048, 587	24,929 LF of 30-66"; Tunnel 6250 LF of 30-78''	CONV	2 yr	
228	10140480	Pleasant Run Interceptor Replacement		$ 1,203,840			WIBs - Replace collector following original alignment - 4246 ft of 21-24"	CONV		
229	10141180	I-75 & Shepard Ave. SSO 700		$ 60,020,365		SSO 700	Increase Storage at existing site - Additional 24 MG (NOTE 3)	STOR	2 yr	
231	10142200	Bernard & Reisenberg Grating		$ 2,242,366		CSO 513	Partial Separation	PS		1.7
232	10142220	Smalley Grating		$ 1,226,004		CSO 514	Partial Separation	PS		0.2
233	10130020	Muddy Creek Interceptor Rehabilitation		$ 4,889		SSO 1061 CSO 518 MH 16006007	Clean Interceptor - 5000 ft of 36"	CLEAN		
234	10130040	CSO 518 Muddy Creek Conveyance Sewer		$ 5,495,655		SSO 1061 CSO 518 MH 16006007	Replace section of Muddy Creek Int. - 9000 ft of 36"	CONV	2 yr	
235	10130280	Addyston PS Elimination		$ 1,712,696		PSO 730, 10902003	Elim. Addyston P.S. w/gravity along Rte. 50 - 2650' of 36" and two 100' of 24"	CONV	2 yr	
236	10130700	Muddy Creek @ Westbourne EHRT		$ 24,184,412		CSO 198	EHRT - 126 MGD Community Priority (NOTE 2)	EHRT		61.2
237	10130720	CSO 518 Improvements		$ 244,422		CSO 518	Regulator Improvement - 27.4 cfs Premised on CAPP Activity ID – 30040, 30000 Community Priority	RI		8.4
238	10130780	CSO's 223, 408, 410, 541, 654		$ 1,859,360		CSO 223, 408, 410, 541, 654	CD Exhibit 1 Partial Separation	PS		0.3
239	10130840	CSO's 411, 412, 413, 414, 415, 416		$ 4,082,231		CSO 411, 412, 413, 414, 415, 416	CD Exhibit 1 Regulator Improvement–3.21 cfs and Relocation Complete Partial Separation - Activity ID 31140	PS		12.9
240	10131000	E. Branch Muddy Ph1 Interceptor - Combined in 31006					W-103 - CD Exhibit 1 Interceptor Replacement Phase 1	CONV		
241	10131002	E. Branch Muddy Ph2 Interceptor - Combined in 31006					W-103 - CD Exhibit 1 Interceptor Replacement Phase 2	CONV		
242	10131003	E. Branch Muddy Ph3-A Pump Station - Combined in 31006					W-103 - CD Exhibit 1 Interceptor Replacement Phase 3	CONV		
243	10131004	East Branch Muddy Ph3-B Pump Station - Combined in 31006					East Branch Muddy Ph3-B Pump Station	CONV		
244	10131006	East Branch Muddy Interceptor		$ 60,315,458			W-105 - Interceptor Extension	CONV		
245	10131140	E. Branch Ohio Interceptor Sewer Separation		$ 15,848,746		CSO 408, 411, 412, 414, 415, 416	W-104 - Complete the Partial Separation in CSOs areas 408, 411, 412, 414, 415, 416	PS		In 30840 and 30780
246	**REMAINING PHASE 2 PROJECTS/BUNDLES**		$ 182,720	$ 1,547,526,371						
247	**MIWWTP**	**Mill Creek Wastewater Treatment Plant**								
248	10144882	Mill Creek WWTP Chemical Enhanced Primary Treat.	$ 164,235	$ 25,215,765			C-402 - Enhanced Primary Treatment	WWTP	NOTE 1	
249	**LDCU**	**Lower Duck Creek Upper**								
250	10170920	Nu-Tone Parking Lot Grating		$ 9,989,847		CSO 68	Storage - 2.53 MG	STOR		36.9
251	10170960	Madison & Redbank Grating		$ 277,349		CSO 66	Regulator Improvements - 2.7 cfs	RI		0.0
252	10171260	4730 Madison Ave. Grating		$ 277,349		CSO 61	Regulator Improvements - 8.2 cfs	RI		2.1
253	10171280	End of Harrow St. Div. Dam		$ 277,350		CSO 64	Regulator Improvements - 9.7 cfs	RI		0.1
254	10171300	Brotherton Rd. Grating		$ 277,349		CSO 80	Regulator Improvements - 7.0 cfs	RI		0.0
255	10171320	3675 Forest Hills Grating		$ 277,349		CSO 83	Regulator Improvements -11 cfs	RI		2.7
256	10171340	3646 Madison Rd. Div. Dam		$ 277,350		CSO 188	Regulator Improvements - 8.1 cfs	RI		4.4
257	10171360	Ford Gate Grating		$ 277,350		CSO 199	Regulator Improvements - 27 cfs	RI		0.0
258	10171440	Camberwell Ave. Div. Dam		$ 2,259,200		CSO 205	Partial Separation	PS		0.5
259	10171460	Old Red Bank Rd. Grating		$ 5,514,020		CSO 84	Consolidate to STO @ CSO 503 1,500' of 72" sewer	STOR		in 71520
260	10171480	3979 Rosslyn Dr. Grating		$ 19,158,278		CSO 136	Storage - 4.00 MG	STOR		31.0

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			2006 Dollars	2006 Dollars						
261	10171520	Zaeh Rd. Grating		$ 5,099,999		CSO 503	Pipe Rehab Replacement and Stream Restoration	SEP/GREEN		15.1
262	**PLWWTP**	**Pleasant Run Wastewater Treatment Plant**								
263	10145540	WWTP Joint MSD/ Butler County Facility		$ 100,354,974			Pleasant Run Flow Diversion from Mill Creek - Joint MSD/Butler Co. Facility	WWTP	NOTE 1	
264	**RL**	**Reading Lower**								
265	10140340	Ronald Reagan & Reading Rd.		$ 1,402,999		SSO 1001, 1020	Replacement collector following original alignment - 4336 ft of 12-21"	CONV	2 yr	
266	10142060	214 Clark St. Grating		$ 277,351		CSO 507	Regulator Improvements-0.9 cfs	RI		0.4
267	10142080	Gebert St. Grating		$ 277,350		CSO 509	Regulator Improvements-3.0 cfs	RI		0.1
270	10142160	Southern Ave. Grating		$ 277,350		CSO 510A	Regulator Improvements- 0.6 cfs	RI		0.1
271	10142180	245 Clark St. Overflow		$ 948,900		CSO 508	Partial Separation	PS		1.3
272	**LDR**	**Little Duck Regulators**								
273	10171040	Camargo & East Fork Grating		$ 277,345		CSO 69	Regulator Improvements - 8.4 cfs Relocated Completed CIP 96-12	RI		0.0
274	10171080	Plainville & Indian Hill		$ 277,345		CSO 71	Regulator Improvements - 2.0 cfs Relocated Completed CIP 96-12	RI		0.3
275	10171100	4800 Jameson Grating		$ 277,344		CSO 72	Regulator Improvements –1.7 cfs	RI		0.1
276	10171120	6402 Roe St. Grating		$ 277,345		CSO 74	Regulator Improvements –3.2 cfs	RI		0.7
277	10171140	6333 Roe St. Grating		$ 277,344		CSO 75	Regulator Improvements –7.9 cfs	RI		1.3
278	10171160	Bramble & Homer Grating		$ 277,344		CSO 76	Regulator Improvements - 7.9 cfs	RI		1.3
279	10171180	3980 South Whetsel Grating		$ 277,344		CSO 78	Regulator Improvements - 5.5 cfs	RI		0.3
280	10171200	Southern Ave. Grating		$ 277,346		CSO 79	Regulator Improvements - 7.0 cfs	RI		1.5
281	10171220	Wooster @ Red Bank Div. Dam		$ 277,343		CSO 656	Regulator Improvements Remove downstream flow restriction @ Beechmont Sluice Gate	RI		In 71920
282	**LDCR**	**Lower Duck Creek**								
283	10171380	5150 Wooster Pike Grating		$ 2,180,499		CSO 85	Full Separation	FS		0.0
284	10171400	Archer St. Div. Dam, SEP		$ 2,327,200		CSO 86	Partial Separation CIP 93-02 HW/DW Relocate	PS		1.9
285	10171500	Turpin St. Div. Dam		$ 277,349		CSO 472	Regulator Improvements	RI		26.5
286	**ICWWTP**	**Indian Creek Wastewater Treatment Plant**								
287	10110000	Indian Creek WWTP		$ 299,238			Opt.Existing Facility, 8.2 - 10.8 MGD	Optimization	NOTE 1	
288	10110020	Cleves Pump Station		$ 11,042,000		PSO 677	1.5 MG Storage w/new 3.6 MGD pumps and FM for wet weather flow	STOR	2 yr	
289	**AC**	**Amberely Creek**								
290	10141160	Reading Rd. & Losantiville Rd.		$ 824,968		SSO 1032	Replace collector following original alignment - 1793 ft of 12-18"	CONV	2 yr	
292	10142480	Ridge/Lakeview Div. Dam		$ 277,332		CSO 651	Regulator Improvements -3.75 cfs	RI		0.3
293	10142500	6536 Cliffridge Grating		$ 1,953,100		CSO 506	Partial Separation	PS		1.3
294	**CRU**	**Congress Run Upper**								
295	10142520	146 Ridgeway Grating		$ 277,350		CSO 535	Regulator Improvements -3.25 cfs	RI		0.0
296	10142540	60 St. Clair Grating		$ 277,350		CSO 560	Regulator Improvement - 3.25 cfs	RI		0.0
297	10142580	No. 41 Sherry Grating		$ 928,701		CSO 537	Partial Separation	PS		0.2
298	10141140	Ronald Reagan & Galbraith Rd.		$ 784,079		SSO 1029	Replace collector following original alignment - 3005 ft of 15-21"	CONV	2 yr	
299	10145600	Anthony Wayne Flooded MHs		$ 65,126,882		Anthony Wayne	Future Wet Weather Facility to provide system capacity in the Mill Creek Interceptor system			
300	10140880	W. Galbraith Road		$ 3,181,999		SSO 568, 569	CIP 2008-25 (in planning)	CONV	2 yr	
301	10141100	Ronald Reagan & Galbraith		$ 7,297,254		SSO 1029	Replace collector following original alignment - 15,583 ft of 21-48"; Tunnel 200 ft of 42"	CONV	2 yr	

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			2006 Dollars	2006 Dollars						
302	**TWLL**	**Tributary to Winton Lake Lower**								
303	10141020	Colerain & Galbraith Storage Facility	**$ 2,356**	**$ 17,353,671**		SSO 640	Below ground Storage, protects trunk sewer - 5.9 MG	STOR	2 yr	
304	10140820	Colerain - Jessup Replacement Sewer	**$ 2,406**	**$ 5,893,498**			Replace collector following original alignment - 12,950 ft of 15-60"; Tunnel 220 ft of 18-42"	CONV		
305	**MA**	**Montgomery All**								
306	10170160	Dawson Rd. & Rosecrest Ave.		**$ 2,150,290**		SSO 1008, 1014, 608	Replace existing pipe - Approx. 2600 LF of 18-27"	CONV	2 yr	
307	10170180	Miami Ave. N. Btwn Mardel Dr. & Euclid Rd.		**$ 3,023,001**		SSO 1008	Replace existing pipe - Approx. 7300 LF of 15-21"	CONV	2 yr	
308	10170320	Miami Rd. W. @ Miami-Demar Rd.		**$ 1,369,644**			Replace existing pipe - Approx. 1700 LF of 18"	CONV		
309	10170340	Graves Rd. @ Rheinstorm Park		**$ 1,795,303**			Replace existing pipe - Approx. 3800 LF of 15-18"	CONV		
310	**CCA**	**Clough Creek A**								
311	10170120	Beechmont Ave. South of Birkshire		**$ 3,524,420**		SSO 588	Replace existing pipe - Approx. 4000 LF of 27-30"	CONV	2 yr	
312	10170140	Birney Ln. South of Beechmont		**$ 1,929,768**		SSO 588	Replace existing pipe - Approx. 4100 LF of 15-27"	CONV	2 yr	
313	10170220	Spindlehill Dr. @ Beechview Estates		**$ 17,284,000**			Regional Storage - 4.6 MG	STOR		
314	10170240	Clough Pike @ Batavia Rd. & Corbly Rd.		**$ 18,560,565**			Replace existing pipe - Approx. 9600 LF of 15-48"	CONV		
315	10170260	Clough Pike @ Bartels Rd. & Goldengate Dr.		**$ 2,298,465**			Replace existing pipe - Approx. 3000 LF of 48"	CONV		
316	10170280	Berkshire Rd.		**$ 2,882,335**			WIBs - Replace existing pipe - Approx. 4100 LF of 27-54"	CONV		
317	10170890	Berkshire HRT		**$ 17,781,369**		CSO 182	EHRT - 44.3 MGD Community Priority (NOTE 2)	EHRT		18.3
318	10170900	Clough Cir. Div. Dam		**$ 277,729**		CSO 476	Regulator Improvements - 49.2 cfs Premised on operational changes at WWTP Four Mile P.S.	RI		2.4
319	10170860	Prospect Woods		**$ 819,293**		PSO 861	Prospect Woods PS Upgrade	PSU	2 yr	
320	**W**	**Winton**								
321	10140620	Springfield Pike & Riddle Rd.		**$ 24,900,000**			Partially buried Storage - Protects Interceptors; 9.4 MG, gravity in & out	STOR		
322	10141040	Winton Rd. & Lakeview Dr.		**$ 5,799,999**			New parallel sewer to follow original alignment - 11,238 ft of 18-42" Sensitive Receiving Stream	CONV		
323	10141320	Greenpine Acres PS		**$ 609,699**		PSO 794	PS Elim, PSO 794, w/sewer	CONV	2 yr	
324	10140800	Ronald Reagan & Hamilton		**$ 5,199,070**		SSO 612, 1003	Replace collector following original alignment - 12,396 ft of 12-48"; Tunnel 80 ft of 36"	CONV	2 yr	
325	**DAL**	**Delta Ave. Lower**								
326	10172000	Kellogg @ Wilmer, REG		**$ 277,730**		CSO 669	Regulator Improvement	RI		0.0
327	**D**	**Deerfield**								
328	10170980	Stewart & Ken Arbre Grating		**$ 277,349**		CSO 554	Regulator Improvements - 4.1 cfs	RI		0.0
329	10171000	6735 Ken Arbre Grating		**$ 5,200,543**		CSO 555	Sewer Separation	PS		8.9
330	10171020	Stewart Rd. West Regulator		**$ 11,779,329**		CSO 556	Storage - 2.90 MG	STOR		17.5
331	**RR**	**Rapid Run**								
332	10130440	Wulff Run Creek, From Neeb Rd. to Viscount		**$ 3,293,342**			Replace Interceptor in Wulff Run - 4500 ft of 24"	CONV		
333	10130460	Delhi Rd & Oakwood Park Dr.		**$ 8,389,474**		SSO 623	Storage Tank capturing SSO 623 - 1.25 MG w/3 MGD pump	STOR	2 yr	
334	10130500	Delhi Rd. East to Schroer Ave.		**$ 1,524,556**			Replace Interceptor along original alignment through Delhi - 5500 ft of 18-24"	CONV		
335	10130760	Rapid Run & Devils Backbone		**$ 26,634,390**		CSO 523	EHRT - 106 MGD Community Priority (NOTE 2)	EHRT		55.3
336	**TWLU**	**Tributary to Winton Lake Upper**								
337	10142260	Daly Rd. Vortex Separator		**$ 63,483,831**		CSO 532	EHRT - 204.7 MGD Community Priority (NOTE 2)	EHRT		33.9
338	**LDC**	**Lower Duck Conveyance**								
339	10170200	Wooster Pike & West St.		**$ 1,844,367**			WIBs - Replace existing pipe - Approx. 2800 LF of 12-27"	CONV		
340	10170680	Plainview Rd.		**$ 1,580,886**			WIBs - Replace existing pipe - Approx. 2800 LF of 12-27"	CONV		

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			2006 Dollars	2006 Dollars						
341	**SP**	**Sycamore Plan**								
342	10160020	Montgomery & Deerfield		$ 192,639			Replace pipe - 500 ft of 18"	CONV		
343	**CCB**	**Clough Creek B**								
344	10170300	Gungadin Dr. W. of 5 Mile & Paddison		$ 4,716,433			Replace existing pipe - Approx. 8800 LF of 21-27"	CONV		
345	10170360	Concordridge Dr. & Hunley Rd.		$ 5,019,056			Replace existing pipe - Approx. 6600 LF of 15-18"	CONV		
346	10170380	Lawyer Rd. @ Heatherwood Ln.		$ 786,806			Replace existing pipe - Approx. 2100 LF of 15"	CONV		
347	10170480	Clough Pike @ Goldengate Dr.		$ 4,263,535			Replace existing pipe - Approx. 6100 LF of 21-27"	CONV		
348	10170500	Clough Pike @ Wolfangle Rd.		$ 2,185,711			Replace existing pipe - Approx. 5300 LF of 18-21"	CONV		
349	**PRWWTP**	**Polk Run Wastewater Treatment Plant**								
350	10150020	Polk WWTP STO Storage Tank		$ 16,936,648			Storage - 6 MG (NOTE 1)	STOR		
351	10150015	Polk Run WWTP Optimization Ph4		$ 8,156,003			Polk Run WWTP Optimization Ph4	Optimization	NOTE 1	
352	10150080	Polk WWTP STO Replace Pipe		$ 5,852,872			Replacement pipe - 800 ft of 30"/1 MG tank	CONV/STOR		
353	10150100	Polk WWTP CNV Map 015		$ 1,141,145			Replacement pipe - 2700 ft of 15-18"	CONV		
354	10150140	Polk WWTP CNV Map 002		$ 5,424,227			Replace pipe (200 ft of 18"). New PS & Storage tank	CONV/STOR		
355	10150160	Polk WWTP CNV Map 010		$ 12,937,008			Replace pipe - 7000 ft of 36 - 48"	CONV		
356	**CA**	**California Plan**								
357	10170400	5 Mile Rd. & Old Kellogg		$ 7,976,701			Replace existing pipe - Approx. 5000 LF of 36-54"	CONV		
358	10170420	5 Mile Rd. & Birney Ln.		$ 6,037,842			Replace existing pipe - Approx. 2000 LF of 42"	CONV		
359	10170440	4 Mile Rd. @ I-275		$ 5,890,945			Replace existing pipe - Approx. 7400 LF of 21-30"	CONV		
360	10170460	Indian Creek Rd.		$ 3,739			Seal Manhole Lids	Seal Manhole Lids		
361	10170540	Kellogg Ave. @ Coney Island		$ 7,195,266			Replace existing pipe - Approx. 6200 LF of 54-66"	CONV		
362	**WOL**	**West Ohio Lower**								
363	10144660	Delhi Ave. Div. Dam		$ 583,399		CSO 420	Partial Separation	PS		0.1
364	10144680	River Rd. @ Delhi Div. Dam		$ 857,500		CSO 421	Partial Separation	PS		0.2
365	10144760	Bold Face Sr. Div. Dam		$ 96,810,229		CSO 419	EHRT - 275 MGD (NOTE 2)	EHRT		137.2
366	10144780	Mt. Echo Rd. Regulator		$ 277,350		CSO 422	Regulator Improvements - 22.2 cfs	RI		13.4
367	10144800	Mt. Hope Ave. Regulator		$ 13,886,537		CSO 423	Storage-3.5 MG	STOR		24.9
368	**KRU**	**Kings Run Upper**								
369	10142940	Ross Run Regulator		$ 277,300		CSO 485	Regulator Improvements -70.4 cfs	RI		29.1
371	10143000	Kings Run and Spring Cove		$ 2,245,402		CSO 486	Partial Separation	PS		0.4
372	10143040	Ross Run Grating		$ 186,895,962		CSO 487	EHRT - 584 MGD (NOTE 2)	EHRT		289.2
374	**HS**	**Hopple Street**								
376	**WF**	**West Fork**								
384	10143860	Butte/Todd 1/Twin Grating		**TBD**		CSO 130	To Be Determined in LMCFR	TBD		TBD
386	10143840	Todd 1 Grating, CNV - incl. with 10143820		**TBD**		CSO 126	To Be Determined in LMCFR	TBD		TBD
387	10143880	Twin Grating, CNV - incl. with 10143820		**TBD**		CSO 203	To Be Determined in LMCFR	TBD		TBD
388	10143900	Dreman Grating - incl. with 10143820		**TBD**		CSO 117A	To Be Determined in LMCFR	TBD		TBD
389	**EL**	**Elmwood Lower**								
392	10142700	Bloody Run Regulator		**TBD**		CSO 181	To Be Determined in LMCFR	TBD		TBD
393	**EO1U**	**East Ohio 1 Upper**								
394	10144160	Gest St. West-2-A Div. Dam, STO				CSO 430	In-line Storage in existing piping (also 431 & 432)	STOR		27.6
395	10144180	9th & McLean Div. Dam, STO				CSO 432	In-line Storage in existing piping (also 430 & 431A)	STOR		5.2

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			2006 Dollars	2006 Dollars						
396	10144200	Blackford St. Regulator		$ 2,702,301		CSO 431A	In-line Storage in existing piping (also 430 & 432) Dewater pump station for 2.0 MGD	STOR		102.5
397	**EO2**	**East Ohio 2**								
398	10144220	Pike St. Div. Dam		$ 277,350		CSO 449	Regulator Improvement - 1.0 cfs	RI		0.1
399	10144240	Collard St. Regulator		$ 277,349		CSO 453A	Regulator Improvement - 2.6 cfs	RI		0.3
400	10144260	Riverfront Coliseum Regulator		$ 1,530,200		CSO 447	Partial Separation	PS		0.1
401	10144320	Parsons St. Div. Dam		$ 277,350		CSO 452	Regulator Improvement - 8.5 cfs	RI		4.1
402	10144340	Eggleston & 4th Div. Dam		$ 27,874,917		CSO 461	EHRT - 120 MGD (NOTE 2)	EHRT		119.2
403	10144360	Eggleston & 3rd F. Div.		$ 277,350		CSO 464	Regulator Improvement - 6.4 cfs	RI		3.6
404	10144380	Eggleston & 3rd		$ 277,350		CSO 465	Regulator Improvement - 2.0 cfs	RI		1.0
405	10144400	Eggleston & 3rd E. Div.		$ 277,349		CSO 465E	Regulator Improvements- 5.8 cfs	RI		2.8
406	10144420	Eggleston & Pete Rose Way		$ 277,350		CSO 466E	Regulator Improvement - 2.6 cfs	RI		1.6
407	**WOU**	**West Ohio Upper**								
408	10144700	Evans & 6th Street Div.		$ 381,500		CSO 668	Partial Separation	PS		0.5
409	10144720	Evans & River Rd. No. 1 Div.		$ 97,801		CSO 426A	Full Separation	FS		0.3
410	10144740	Evans & River Rd. No. 2 Div.		$ 1,682,099		CSO 426B	Partial Separation	PS		0.5
411	10144820	River Rd. @ State Div. Dam		$ 4,237,794		CSO 424	Partial Separation	PS		5.2
412	10144860	State Ave. Div. Dam		$ 277,351		CSO 425B	Regulator Improvement - 1.7 cfs Overcontrol @ CSO 419	RI		8.5
413	**EO1LW**	**East Ohio 1 Lower West**								
414	10144020	Baymiller St. Regulator		$ 277,333		CSO 435	Regulator Improvements-11.2 cfs	RI		6.6
415	10144040	Carr St. Regulator		$ 2,638,500		CSO 433	Partial Separation	PS		1.0
416	10144060	Carr & Front Div. Dam		$ 824,599		CSO 434	Partial Separation	PS		0.2
417	10144120	7th & Mclean Div. Dam		$ 785,300		CSO 489	Partial Separation	PS		0.1
418	10144140	Gest & Front Regulator		$ 4,587,403		CSO 436	Partial Separation	PS		8.4
419	**CRL**	**Congress Run Lower**								
420	10142560	Lockland & Highway Grating		$ 2,876,601		CSO 490	Partial Separation	PS		0.9
421	10142600	Vine & Decamp Div. Dam		$ 8,274,751		CSO 171	Storage - 2.00 MG	STOR		23.0
422	**KRL**	**Kings Run Lower**								
424	10142980	Clifton Ave. West Grating		$ 1,159,300		CSO 480	Partial Separation	PS		1.3
425	**EO3W**	**East Ohio 3 West**								
426	10144440	Walden St. Div. Dam		$ 6,473,599		CSO 455	Partial Separation	PS		3.3
427	10144460	Hazen St. Div. Dam		$ 1,459,000		CSO 456	Partial Separation	PS		1.0
428	10144480	Collins St. West Div. Dam		$ 1,323,000		CSO 457	Partial Separation	PS		0.2
429	10144520	Hazen St. @ Glen Alley Div.		$ 541,898		CSO 658	Full Separation	FS		0.0
430	10144560	Litherbury St. South Div.		$ 136,000		CSO 454B	Full Separation	FS		0.0
431	10144580	Collins St. West Regulator		$ 1,272,000		CSO 457A	Partial Separation	PS		0.5
432	10144600	Collins St. East Div. Dam		$ 19,890,435		CSO 458	Storage - 6.0 MG Consolidate with CSO 460	STOR		10.1
433	10144640	Litherbury St. North Div.		$ 277,350		CSO 454A	Regulator Improvement - 5.5 cfs	RI		12.7
434	**EO1LE**	**East Ohio 1 Lower East**								
435	10144000	3rd St. @ Central Ave.		$ 277,331		CSO 438A	Regulator Improvements-52.4 cfs	RI		8.9
436	10144100	Central Ave. Grating		$ 3,683,099		CSO 438	Partial Separation	PS		14.3
439	**EU**	**Elmwood Upper**								
441	10142720	64th St. Div. Dam		$ 2,280,418		CSO 39	Partial Separation	PS		2.2
442	10142740	68th St. Div. Dam		$ 277,301		CSO 488	Over Control at 181 to eliminate conveyance element	RI		35.3
443	**SGL**	**Spring Grove Lower**								
444	10143360	4710 Howard Grating		$ 277,300		CSO 110	Regulator Improvements -2.90 cfs	RI		0.3
446	10143420	1547 Springlawn Grating		$ 1,218,799		CSO 112	Partial Separation	PS		0.7

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			2006 Dollars	2006 Dollars						
447	**EO3E**	**East Ohio 3 East**								
448	10144500	Bayou St. 120 West Regulator		$ 471,800		CSO 459	Partial Separation	PS		0.3
449	10144540	Eastern and Gotham		$ 2,435,600		CSO 667	Partial Separation	PS		2.6
450	10144620	Bayou St. 100 West Div. Dam		$ 6,668,046		CSO 460/458	Consolidate with CSO 458	CONV		14.7
451	**LMCFR**	**Lower Mill Creek Final Remedy**								
452	10145380	Phase 2 Default (Lower Mill Creek Final Remedy)		$ 305,658,000		CSO 3, 4, 6, 7, 9, 666, 152, 428	To Be Determined	TBD		
453	10143120	Bank Ave. Regulator - KRU - incl. with 10145380				CSO 33	TBD	TBD		15.1
454	10142800	Denham St. Regulator - HS - incl. with 10145380				CSO 10	TBD	TBD		81.4
455	10142820	Hopple St. Regulator - HS - incl. with 10145380				CSO 11	TBD	TBD		6.7
456	10142840	Bates Run Regulator - HS - incl. with 10145380				CSO 12	TBD	TBD		76.4
457	10142860	Yonkers St. Regulator - HS - incl. with 10145380				CSO 13	TBD	TBD		11.2
458	10142880	Station 15 Regulator - HS - incl. with 10145380				CSO 14	TBD	TBD		15.3
459	10142900	Arlington St. Regulator - HS - incl. with 10145380				CSO 15	TBD	TBD		24.3
460	10143280	Ludlow Ave. Div. Dam - NSU - incl. with 10145380				CSO 22	TBD	TBD		14.5
461	10143300	Alibone St. & Ludlow Run Regulator - NSU - incl. with 10145380				CSO 23	TBD	TBD		19.9
462	10143320	Ludlow Run Regulator, CNV - NSU - incl. with 10145380				CSO 24	TBD	TBD		36.6
463	10143020	Mitchell Ave. Regulator - KRL - incl. with 10145380				CSO 482	TBD	TBD		109.5
464	10143060	Clifton Ave. East Grating - KRL - incl. with 10145380				CSO 28	TBD	TBD		10.3
466	10143100	Lafayette Cir. Grating - KRL - incl. with 10145380				CSO 30	TBD	TBD		24.5
467	10143160	Winton Rd. A Regulator - KRL - incl. with 10145380				CSO 025A	TBD	TBD		8.4
468	10143182	New Este Ave CSO - KRL - incl. with 10145380				CSO Este	TBD	TBD		-
469	10143240	Colerain Ave. Div. Dam - NSL - incl. with 10145380				CSO 18	TBD	TBD		8.6
470	10143260	Streng St. Div. Dam - NSL - incl. with 10145380				CSO 21	TBD	TBD		31.9
471	10143340	Dreman Ave. Div. Dam - NSL - **incl. with 10145380**				CSO 017B	TBD	TBD		2.9
472	**TOTAL PHASE 2 WITHOUT PHASE 2 ALLOWANCES**		$ 182,720	$ 2,015,466,833						

NOTES:

1 PROJECT COMPLETE AND IN SERVICE AT SPECIFIED CAPACITY

2 FOR ALL PROJECTS WITH EHRT TECHNOLOGY VOLUME SHOWING IS REMAINING UNTREATED OVERFLOW - SEE ATTACHMENT 5.

3 INFORMATION RELATED TO THIS PROJECT IS PRELIMINARY AND SUBJECT TO CHANGE BASED ON FURTHER STUDY AS SET FORTH IN PARAGRAPH A.3. OF THE WWIP

4 CAPP DESIGN: ALL CAPP SEWER PROJECTS WILL BE DESIGNED TO MEET THE 10 YEAR DESIGN STORM EVENT. ALL CAPP PUMP STATION AND STORAGE FACILITIES WILL BE DESIGNED TO MEET THE 2 YEAR DESIGN STORM EVENT. THE 2 AND 10 YEAR DESIGN STORMS ARE SCS TYPE II - 24 HOUR EVENTS.

5 FOR THESE RTC PROJECTS, THE STATED REDUCTION IN THE TYPICAL YEAR CSO DISCHARGE VOLUME SHALL ALSO BE THE PERFORMANCE CRITERIA FOR THE FACILITY.

6 PERFORMANCE CRITERIA FOR CSO VOLUMES REMAINING AFTER IMPLEMENTATION OF CSO CONTROLS ARE THE VOLUMES NOT TO BE EXCEEDED AT A PARTICULAR OUTFALL DURING MSDGC'S TYPICAL YEAR RAINFALL (1970). COMPLIANCE WITH THESE CRITERIA WILL BE EVALUATED BY IMPLEMENTATION OF A POST CONSTRUCTION MONITORING PROGRAM (WHICH WILL BE SUBMITTED TO THE REGULATORY AGENCIES FOR REVIEW AND APPROVAL IN ACCORDANCE WITH THE GLOBAL CONSENT DECREE) THAT WILL UTILIZE MSDGC'S HYDROLOGIC AND HYDRAULIC MODEL TO NORMALIZE THE RESULTS OF THE POST CONSTRUCTION MONITORING TO THE TYPICAL YEAR.

7 THIS REVISED WWIP ATTACHMENT 2, DECEMBER 2012 TRACKS TO THE ATTACHMENT 2 FINAL WWIP, DATED NOVEMBER 2009, EXCEPT FOR THE FOLLOWING CHANGES:
CERTAIN PROJECTS HAVE BEEN REMOVED FROM THE LIST BECAUSE THEY HAVE BEEN COMPLETED; THE REVISED ORIGINAL LMCPR CHANGES VARIOUS LISTED PROJECTS; AND OTHER PROJECTS REMOVED BASED ON UPDATED MODELING. LISTED COST ESTIMATES REMAIN ESTIMATES REFLECTING 2009 FINAL WWIP PROJECTS.
COST ESTIMATES MAY CHANGE TO REFLECT ACTUAL PROJECTS SELECTED AND DESIGNED.

INDEX	REVISED WWIP ATTACHMENT 2 - DECEMBER 2012 STRIKETHROUGH VERSION		Sunk Costs	Remaining Costs		CSO SSO Identifier	Description / Design (NOTE4)	Technology	Plan CAPP	Plan Remaining CSO (MG/year)
			2006 Dollars	2006 Dollars						
185	10171540	CSO 135 Elimination		$ 243,716		CSO 135	Regulator Improvements - 2.4 cfs	RI		0.0
186	10171560	CSO 43 Elimination		$ 244,159		CSO 43	Regulator Improvements - 2.8 cfs	RI		0.7
187	10171600	CSO 170 Elimination		$ 242,681		CSO 170	EHRT - Regulator Improvement - 3.1 cfs	RI		in 71800
188	10171640	CSO 214 Storage Facility		$ 14,074,375		CSO 214	Storage - 2.00 MG	STOR		57.4
189	10171660	CSO 500 Improvements		$ 243,069		CSO 500	Regulator Improvement - 1.5 cfs. See E-500	RI		in 71800
190	10171680	CSO 501 Improvements		$ 243,373		CSO 501	Regulator Improvement - 0.1cfs. See E-500	RI		0.0
191	10171700	CSO 549 Improvements		$ 243,613		CSO 549	Regulator Improvement - 5.0 cfs. See E-500	RI		in 71800
192	10171720	CSO 550 Improvements		$ 243,820		CSO 550	Regulator Improvement - 0.4 cfs. See E-500.	RI		in 71800
193	10171760	CSO 552 Improvements		$ 242,109		CSO 552	Regulator Improvement - 19.4 cfs	RI		18.6
194	10171800	Upper Duck Creek EHRT Facility		$ 14,541,318			E-500 - EHRT - 40-MGD - Serves CSOs 170, 549, 550, 501 & 500 (NOTE 2)	EHRT		106.0
195	10170782	LM Four Mile Pump Station Upgrade		$ 3,617,502			E-503 - Four Mile Pump Station Rec Proj – PS-1	WWTP	NOTE 1	
196	10170783	LMWWTP Pump Station Reconfiguration		$ 3,172,158			E-503 - Modify LMR Pump Station Rec Proj – PS-5	WWTP	NOTE 1	
197	10170784	LMWWTP Grit Station Upgrade		$ 8,174,858			E-503 - Grit Collection Proj – SG-1	WWTP	NOTE 1	
198	10170785	LMWWTP Pump Station Hydraulic Improvements		$ 1,799,992			E-503 - Four Mile Pump Station to Screen Building Rec Proj - H-1	WWTP	NOTE 1	
199	10170786	LMWWTP Primary to Secondary Hydrau. Improvements		$ 1,328,132			E-503 - Primary to Secondary Conveyance Rec Proj – H-2	WWTP	NOTE 1	
200	10170787	LMWWTP Chemically Enhanced Primary		$ 5,860,701			E-503 - Chemical Enhance Primary Rec Proj – PT-2	WWTP	NOTE 1	
201	10170788	LMWWTP Secondary Treatment Modifications		$ 9,235,525			E-503 - Modification to Secondary Treatment Rec Proj – ST-2	WWTP	NOTE 1	
202	10170790	LMWWTP Chemical Feed Upgrades		$ 3,618,935			E-503 - Upgrade Chemical Feed Sys Storage – D-2	WWTP	NOTE 1	
203	10170793	LMWWTP Sludge Receiving Improvements		$ 455,361			E-503 - Improvement to Sludge Receiving Facility Rec Proj – DR-6	WWTP	NOTE 1	
204	10170794	LMWWTP Standby Power		$ 7,141,778			E-503 - Dual Feed / Standby Power Rec Proj – E-1	WWTP	NOTE 1	
205	10172020	LMWWTP Wet Weather Pump Station		$ 36,586,845			E-505 - Wet Weather Pump Station with Screening 150 MGD to Auxiliary Outfall	WWTP	NOTE 1	
206	10172260	LMWWTP Dry Weather Pump Station		$ 375,000			Four Mile PS - Dry Weather Pumps - B&N Rec. Proj. PS-1	WWTP	NOTE 1	
207	10140400	Lockland Sewer Separation		$ 2,424,977		SSO 1045, 1010	Replace collector following original alignment - 7968 ft of 12-24"	CONV	2 yr	
208	10142280	Oxley Grating		$ 241,149		CSO 226	Regulator Improvement-6 cfs. Combine with implementation of green infrastructure as redevelopment, renovation, and routine maintenance occurs to achieve CSO control to achieve 85%.	RI		4.6
209	10142300	914 Oak St. Grating		$ 241,284		CSO 559	Regulator Improvements-14.0 cfs. Green potential greater than storage need.	RI		7.0
210	10142320	200' West of Bacon St. Grating		$ 243,670		CSO 515	Regulator Improvements-0.7 cfs	RI		0.0
211	10142340	Bacon St. Grating		$ 243,670		CSO 516	Regulator Improvements-0.11 cfs	RI		0.1
212	10142360	No. 96 North Park Grating		$ 241,284		CSO 538	Regulator Improvements-0.31 cfs	RI		0.1
~~213~~	~~10142380~~	~~117 E. Charlotte Grating~~		~~$ 241,356~~		~~CSO 539~~	~~Regulator Improvements-5.0 cfs~~	~~RI~~		~~1.3~~
214	10142400	428 South Cooper Grating		$ 241,356		CSO 562	Regulator Improvements-3.08 cfs	RI		0.0
215	10130000	Muddy Creek Basin Storage & Conveyance Sewer		$ 120,122,277		SSO 701, 702, 692, 697,675-A, 1061	Storage & Conveyance Tunnel unloads Muddy Creek PS, Eliminating SSOs 692 & 697, provides CSO control for 518, 404, 405 and 406 - 25 ft diameter , 8500 ft long, 35 MGD pumps at WWTP	TUNNEL	2 yr	
216	10130160	Muddy Creek Pump Station Upgrade and Forcemain		$ 8,643,782		SSO 692, 697, 675-A	Elim. PSO - Increase capacity & convey to Hillside Relief Tunnel - 25 MGD pumps, 12" FM for DWF, 36" FM for WWF (associated with 30000)	PSU/FM	2 yr	
217	10130400	River Rd. Near Muddy Creek WWTP Conveyance Sewer		$ 396,774		SSO 702	Rapid Run/Bender Rd. Interceptor directly into New Tunnel - 800 ft of 36"	CONV	2 yr	
218	10131020	CSO 402 Topinabee Dr. Reg. Improvements		$ 242,680		CSO 402	Regulator Improvement - 13.3 cfs (dependent on 30000, 30160, 31120)	RI		7.2
219	10131040	CSO 403 Elco St. Div. Dam Reg. Improvements		$ 245,338		CSO 403	Regulator Improvement - 7.10 cfs (dependent on 30000, 30160, 31120)	RI		3.6
220	10131060	CSO 404 Ivanhoe St. Reg. Improvements		$ 241,095		CSO 404	Regulator Improvement - 26.9 cfs (dependent on 30000, 30160, 31120)	RI		16.2
221	10131080	CSO 405 Revere St. Reg. Improvements		$ 242,108		CSO 405	Regulator Improvement - 6.20 cfs (dependent on 30000, 30160, 31120)	RI		3.7
222	10131100	CSO 406 Kennebeck St. Reg. Improvements		$ 242,079		CSO 406	Regulator Improvement -15.4 cfs (dependent on 30000, 30160, 31120)	RI		9.0
223	10131120	West Branch Ohio River Interceptor Sewer		$ 3,477,204		CSO 404, 405, 406	Convey Flow from CSO 404 to WWTP - 4000' - 60", sized for 85% control for CSOs 404, 405 and 406 (dependent on 30000, 30160)	CONV		-

INDEX		REVISED WWIP ATTACHMENT 2 - DECEMBER 2012 STRIKETHROUGH VERSION	Sunk Costs	Remaining Costs		CSO SSO Identifier	Description / Design (NOTE4)	Technology	Plan CAPP	Plan Remaining CSO (MG/year)
			2006 Dollars	2006 Dollars						
224	10140000	SSO 1048 Conveyance Sewer Phase 1		$ 1,710,579		SSO 1048	Replace collector following original alignment - 4115 ft of 18-27"; Tunnel 375 ft of 18-24"	CONV	2 yr	
225	10140020	SSO 1048 Conveyance Sewer Phase 2		$ 2,467,502		SSO 1048	Replace collector following original alignment - 4256' of 30-36"	CONV	2 yr	
226	10140080	SSO 587 Conveyance Sewer		$ 1,178,958		SSO 587	Replace collector following original alignment - 4235 ft of 15-24"	CONV	2 yr	
227	10140120	Sharonville/Evandale Trunk to SSO 700		$ 34,000,590		SSO 1048, 587	24,929 LF of 30-66"; Tunnel 6250 LF of 30-78''	CONV	2 yr	
228	10140480	Pleasant Run Interceptor Replacement		$ 1,203,840			WIBs - Replace collector following original alignment - 4246 ft of 21-24"	CONV		
229	10141180	I-75 & Shepard Ave. SSO 700		$ 60,020,365		SSO 700	Increase Storage at existing site - Additional 24 MG (NOTE 3)	STOR	2 yr	
~~230~~	~~10142120~~	~~Mill & Vine St. Grating~~		~~$ 241,286~~		~~CSO 512~~	~~Regulator Improvements 3.25 cfs~~	~~RI~~		~~0.2~~
231	10142200	Bernard & Reisenberg Grating		$ 2,242,366		CSO 513	Partial Separation	PS		1.7
232	10142220	Smalley Grating		$ 1,226,004		CSO 514	Partial Separation	PS		0.2
233	10130020	Muddy Creek Interceptor Rehabilitation		$ 4,889		SSO 1061 CSO 518 MH 16006007	Clean Interceptor - 5000 ft of 36"	CLEAN		
234	10130040	CSO 518 Muddy Creek Conveyance Sewer		$ 5,495,655		SSO 1061 CSO 518 MH 16006007	Replace section of Muddy Creek Int. - 9000 ft of 36"	CONV	2 yr	
235	10130280	Addyston PS Elimination		$ 1,712,696		PSO 730, 10902003	Elim. Addyston P.S. w/gravity along Rte. 50 - 2650' of 36" and two 100' of 24"	CONV	2 yr	
236	10130700	Muddy Creek @ Westbourne EHRT		$ 24,184,412		CSO 198	EHRT - 126 MGD Community Priority (NOTE 2)	EHRT		61.2
237	10130720	CSO 518 Improvements		$ 244,422		CSO 518	Regulator Improvement - 27.4 cfs Premised on CAPP Activity ID – 30040, 30000 Community Priority	RI		8.4
238	10130780	CSO's 223, 408, 410, 541, 654		$ 1,859,360		CSO 223, 408, 410, 541, 654	CD Exhibit 1 Partial Separation	PS		0.3
239	10130840	CSO's 411, 412, 413, 414, 415, 416		$ 4,082,231		CSO 411, 412, 413, 414, 415. 416	CD Exhibit 1 Regulator Improvement–3.21 cfs and Relocation Complete Partial Separation - Activity ID 31140	PS		12.9
240	10131000	E. Branch Muddy Ph1 Interceptor - Combined in 31006					W-103 - CD Exhibit 1 Interceptor Replacement Phase 1	CONV		
241	10131002	E. Branch Muddy Ph2 Interceptor - Combined in 31006					W-103 - CD Exhibit 1 Interceptor Replacement Phase 2	CONV		
242	10131003	E. Branch Muddy Ph3-A Pump Station - Combined in 31006					W-103 - CD Exhibit 1 Interceptor Replacement Phase 3	CONV		
243	10131004	East Branch Muddy Ph3-B Pump Station - Combined in 31006					East Branch Muddy Ph3-B Pump Station	CONV		
244	10131006	East Branch Muddy Interceptor		$ 60,315,458			W-105 - Interceptor Extension	CONV		
245	10131140	E. Branch Ohio Interceptor Sewer Separation		$ 15,848,746		CSO 408, 411, 412, 414, 415, 416	W-104 - Complete the Partial Separation in CSOs areas 408, 411, 412, 414, 415, 416	PS		In 30840 and 30780
246	**REMAINING PHASE 2 PROJECTS/BUNDLES**		**$ 182,720**	**$ 1,547,526,371**						
247	**MIWWTP**	**Mill Creek Wastewater Treatment Plant**								
248	10144882	Mill Creek WWTP Chemical Enhanced Primary Treat.	**$ 164,235**	**$ 25,215,765**			C-402 - Enhanced Primary Treatment	WWTP	NOTE 1	
249	**LDCU**	**Lower Duck Creek Upper**								
250	10170920	Nu-Tone Parking Lot Grating		$ 9,989,847		CSO 68	Storage - 2.53 MG	STOR		36.9
251	10170960	Madison & Redbank Grating		$ 277,349		CSO 66	Regulator Improvements - 2.7 cfs	RI		0.0
252	10171260	4730 Madison Ave. Grating		$ 277,349		CSO 61	Regulator Improvements - 8.2 cfs	RI		2.1
253	10171280	End of Harrow St. Div. Dam		$ 277,350		CSO 64	Regulator Improvements - 9.7 cfs	RI		0.1
254	10171300	Brotherton Rd. Grating		$ 277,349		CSO 80	Regulator Improvements - 7.0 cfs	RI		0.0
255	10171320	3675 Forest Hills Grating		$ 277,349		CSO 83	Regulator Improvements -11 cfs	RI		2.7
256	10171340	3646 Madison Rd. Div. Dam		$ 277,350		CSO 188	Regulator Improvements - 8.1 cfs	RI		4.4
257	10171360	Ford Gate Grating		$ 277,350		CSO 199	Regulator Improvements - 27 cfs	RI		0.0
258	10171440	Camberwell Ave. Div. Dam		$ 2,259,200		CSO 205	Partial Separation	PS		0.5
259	10171460	Old Red Bank Rd. Grating		$ 5,514,020		CSO 84	Consolidate to STO @ CSO 503 1,500' of 72" sewer	STOR		in 71520

INDEX	REVISED WWIP ATTACHMENT 2 - DECEMBER 2012 STRIKETHROUGH VERSION		Sunk Costs	Remaining Costs		CSO SSO Identifier	Description / Design (NOTE4)	Technology	Plan CAPP	Plan Remaining CSO (MG/year)
			2006 Dollars	2006 Dollars						
260	10171480	3979 Rosslyn Dr. Grating		$ 19,158,278		CSO 136	Storage - 4.00 MG	STOR		31.0
261	10171520	Zaeh Rd. Grating		$ 5,099,999		CSO 503	Pipe Rehab Replacement and Stream Restoration	SEP/GREEN		15.1
262	**PLWWTP**	**Pleasant Run Wastewater Treatment Plant**								
263	10145540	WWTP Joint MSD/ Butler County Facility		$ 100,354,974			Pleasant Run Flow Diversion from Mill Creek - Joint MSD/Butler Co. Facility	WWTP	NOTE 1	
264	**RL**	**Reading Lower**								
265	10140340	Ronald Reagan & Reading Rd.		$ 1,402,999		SSO 1001, 1020	Replacement collector following original alignment - 4336 ft of 12-21"	CONV	2 yr	
266	10142060	214 Clark St. Grating		$ 277,351		CSO 507	Regulator Improvements-0.9 cfs	RI		0.4
267	10142080	Gebert St. Grating		$ 277,350		CSO 509	Regulator Improvements-3.0 cfs	RI		0.1
~~268~~	~~10142100~~	~~531 Davis Street Grating~~		~~$ 277,350~~		~~CSO 511~~	~~Regulator Improvements-4.49 cfs~~	~~RI~~		~~0.0~~
~~269~~	~~10142140~~	~~Reading Rd. @ Galbraith~~		~~$ 3,854,201~~		~~CSO 670~~	~~Partial Separation~~	~~PS~~		~~2.2~~
270	10142160	Southern Ave. Grating		$ 277,350		CSO 510A	Regulator Improvements- 0.6 cfs	RI		0.1
271	10142180	245 Clark St. Overflow		$ 948,900		CSO 508	Partial Separation	PS		1.3
272	**LDR**	**Little Duck Regulators**								
273	10171040	Camargo & East Fork Grating		$ 277,345		CSO 69	Regulator Improvements - 8.4 cfs Relocated Completed CIP 96-12	RI		0.0
274	10171080	Plainville & Indian Hill		$ 277,345		CSO 71	Regulator Improvements - 2.0 cfs Relocated Completed CIP 96-12	RI		0.3
275	10171100	4800 Jameson Grating		$ 277,344		CSO 72	Regulator Improvements –1.7 cfs	RI		0.1
276	10171120	6402 Roe St. Grating		$ 277,345		CSO 74	Regulator Improvements –3.2 cfs	RI		0.7
277	10171140	6333 Roe St. Grating		$ 277,344		CSO 75	Regulator Improvements –7.9 cfs	RI		1.3
278	10171160	Bramble & Homer Grating		$ 277,344		CSO 76	Regulator Improvements - 7.9 cfs	RI		1.3
279	10171180	3980 South Whetsel Grating		$ 277,344		CSO 78	Regulator Improvements - 5.5 cfs	RI		0.3
280	10171200	Southern Ave. Grating		$ 277,346		CSO 79	Regulator Improvements - 7.0 cfs	RI		1.5
281	10171220	Wooster @ Red Bank Div. Dam		$ 277,343		CSO 656	Regulator Improvements Remove downstream flow restriction @ Beechmont Sluice Gate	RI		In 71920
282	**LDCR**	**Lower Duck Creek**								
283	10171380	5150 Wooster Pike Grating		$ 2,180,499		CSO 85	Full Separation	FS		0.0
284	10171400	Archer St. Div. Dam, SEP		$ 2,327,200		CSO 86	Partial Separation CIP 93-02 HW/DW Relocate	PS		1.9
285	10171500	Turpin St. Div. Dam		$ 277,349		CSO 472	Regulator Improvements	RI		26.5
286	**ICWWTP**	**Indian Creek Wastewater Treatment Plant**								
287	10110000	Indian Creek WWTP		$ 299,238			Opt.Existing Facility, 8.2 - 10.8 MGD	Optimization	NOTE 1	
288	10110020	Cleves Pump Station		$ 11,042,000		PSO 677	1.5 MG Storage w/new 3.6 MGD pumps and FM for wet weather flow	STOR	2 yr	
289	**AC**	**Amberely Creek**								
290	10141160	Reading Rd. & Losantiville Rd.		$ 824,968		SSO 1032	Replace collector following original alignment - 1793 ft of 12-18"	CONV	2 yr	
~~291~~	~~10142460~~	~~Beredith & Kincaid Grating~~		~~$ 277,332~~		~~CSO 505~~	~~Regulator Improvements - 8.3 cfs~~	~~RI~~		~~0.0~~
292	10142480	Ridge/Lakeview Div. Dam		$ 277,332		CSO 651	Regulator Improvements -3.75 cfs	RI		0.3
293	10142500	6536 Cliffridge Grating		$ 1,953,100		CSO 506	Partial Separation	PS		1.3
294	**CRU**	**Congress Run Upper**								
295	10142520	146 Ridgeway Grating		$ 277,350		CSO 535	Regulator Improvements -3.25 cfs	RI		0.0
296	10142540	60 St. Clair Grating		$ 277,350		CSO 560	Regulator Improvement - 3.25 cfs	RI		0.0
297	10142580	No. 41 Sherry Grating		$ 928,701		CSO 537	Partial Separation	PS		0.2
298	10141140	Ronald Reagan & Galbraith Rd.		$ 784,079		SSO 1029	Replace collector following original alignment - 3005 ft of 15-21"	CONV	2 yr	
299	10145600	Anthony Wayne Flooded MHs		$ 65,126,882		Anthony Wayne	Future Wet Weather Facility to provide system capacity in the Mill Creek Interceptor system			
300	10140880	W. Galbraith Road		$ 3,181,999		SSO 568, 569	CIP 2008-25 (in planning)	CONV	2 yr	
301	10141100	Ronald Reagan & Galbraith		$ 7,297,254		SSO 1029	Replace collector following original alignment - 15,583 ft of 21-48"; Tunnel 200 ft of 42"	CONV	2 yr	

INDEX	REVISED WWIP ATTACHMENT 2 - DECEMBER 2012 STRIKETHROUGH VERSION		Sunk Costs	Remaining Costs		CSO SSO Identifier	Description / Design (NOTE4)	Technology	Plan CAPP	Plan Remaining CSO (MG/year)
			2006 Dollars	2006 Dollars						
302	**TWLL**	**Tributary to Winton Lake Lower**								
303	10141020	Colerain & Galbraith Storage Facility	$ 2,356	$ 17,353,671		SSO 640	Below ground Storage, protects trunk sewer - 5.9 MG	STOR	2 yr	
304	10140820	Colerain - Jessup Replacement Sewer	$ 2,406	$ 5,893,498			Replace collector following original alignment - 12,950 ft of 15-60"; Tunnel 220 ft of 18-42"	CONV		
305	**MA**	**Montgomery All**								
306	10170160	Dawson Rd. & Rosecrest Ave.		$ 2,150,290		SSO 1008, 1014, 608	Replace existing pipe - Approx. 2600 LF of 18-27"	CONV	2 yr	
307	10170180	Miami Ave. N. Btwn Mardel Dr. & Euclid Rd.		$ 3,023,001		SSO 1008	Replace existing pipe - Approx. 7300 LF of 15-21"	CONV	2 yr	
308	10170320	Miami Rd. W. @ Miami-Demar Rd.		$ 1,369,644			Replace existing pipe - Approx. 1700 LF of 18"	CONV		
309	10170340	Graves Rd. @ Rheinstorm Park		$ 1,795,303			Replace existing pipe - Approx. 3800 LF of 15-18"	CONV		
310	**CCA**	**Clough Creek A**								
311	10170120	Beechmont Ave. South of Birkshire		$ 3,524,420		SSO 588	Replace existing pipe - Approx. 4000 LF of 27-30"	CONV	2 yr	
312	10170140	Birney Ln. South of Beechmont		$ 1,929,768		SSO 588	Replace existing pipe - Approx. 4100 LF of 15-27"	CONV	2 yr	
313	10170220	Spindlehill Dr. @ Beechview Estates		$ 17,284,000			Regional Storage - 4.6 MG	STOR		
314	10170240	Clough Pike @ Batavia Rd. & Corbly Rd.		$ 18,560,565			Replace existing pipe - Approx. 9600 LF of 15-48"	CONV		
315	10170260	Clough Pike @ Bartels Rd. & Goldengate Dr.		$ 2,298,465			Replace existing pipe - Approx. 3000 LF of 48"	CONV		
316	10170280	Berkshire Rd.		$ 2,882,335			WIBs - Replace existing pipe - Approx. 4100 LF of 27-54"	CONV		
317	10170890	Berkshire HRT		$ 17,781,369		CSO 182	EHRT - 44.3 MGD Community Priority (NOTE 2)	EHRT		18.3
318	10170900	Clough Cir. Div. Dam		$ 277,729		CSO 476	Regulator Improvements - 49.2 cfs Premised on operational changes at WWTP Four Mile P.S.	RI		2.4
319	10170860	Prospect Woods		$ 819,293		PSO 861	Prospect Woods PS Upgrade	PSU	2 yr	
320	**W**	**Winton**								
321	10140620	Springfield Pike & Riddle Rd.		$ 24,900,000			Partially buried Storage - Protects Interceptors; 9.4 MG, gravity in & out	STOR		
322	10141040	Winton Rd. & Lakeview Dr.		$ 5,799,999			New parallel sewer to follow original alignment - 11,238 ft of 18-42" Sensitive Receiving Stream	CONV		
323	10141320	Greenpine Acres PS		$ 609,699		PSO 794	PS Elim, PSO 794, w/sewer	CONV	2 yr	
324	10140800	Ronald Reagan & Hamilton		$ 5,199,070		SSO 612, 1003	Replace collector following original alignment - 12,396 ft of 12-48"; Tunnel 80 ft of 36"	CONV	2 yr	
325	**DAL**	**Delta Ave. Lower**								
326	10172000	Kellogg @ Wilmer, REG		$ 277,730		CSO 669	Regulator Improvement	RI		0.0
327	**D**	**Deerfield**								
328	10170980	Stewart & Ken Arbre Grating		$ 277,349		CSO 554	Regulator Improvements - 4.1 cfs	RI		0.0
329	10171000	6735 Ken Arbre Grating		$ 5,200,543		CSO 555	Sewer Separation	PS		8.9
330	10171020	Stewart Rd. West Regulator		$ 11,779,329		CSO 556	Storage - 2.90 MG	STOR		17.5
331	**RR**	**Rapid Run**								
332	10130440	Wulff Run Creek, From Neeb Rd. to Viscount		$ 3,293,342			Replace Interceptor in Wulff Run - 4500 ft of 24"	CONV		
333	10130460	Delhi Rd & Oakwood Park Dr.		$ 8,389,474		SSO 623	Storage Tank capturing SSO 623 - 1.25 MG w/3 MGD pump	STOR	2 yr	
334	10130500	Delhi Rd. East to Schroer Ave.		$ 1,524,556			Replace Interceptor along original alignment through Delhi - 5500 ft of 18-24"	CONV		
335	10130760	Rapid Run & Devils Backbone		$ 26,634,390		CSO 523	EHRT - 106 MGD Community Priority (NOTE 2)	EHRT		55.3
336	**TWLU**	**Tributary to Winton Lake Upper**								
337	10142260	Daly Rd. Vortex Separator		$ 63,483,831		CSO 532	EHRT - 204.7 MGD Community Priority (NOTE 2)	EHRT		33.9
338	**LDC**	**Lower Duck Conveyance**								
339	10170200	Wooster Pike & West St.		$ 1,844,367			WIBs - Replace existing pipe - Approx. 2800 LF of 12-27"	CONV		
340	10170680	Plainview Rd.		$ 1,580,886			WIBs - Replace existing pipe - Approx. 2800 LF of 12-27"	CONV		
341	**SP**	**Sycamore Plan**								
342	10160020	Montgomery & Deerfield		$ 192,639			Replace pipe - 500 ft of 18"	CONV		

INDEX	REVISED WWIP ATTACHMENT 2 - DECEMBER 2012 STRIKETHROUGH VERSION		Sunk Costs	Remaining Costs		CSO SSO Identifier	Description / Design (NOTE4)	Technology	Plan CAPP	Plan Remaining CSO (MG/year)
			2006 Dollars	2006 Dollars						
343	**CCB**	**Clough Creek B**								
344	10170300	Gungadin Dr. W. of 5 Mile & Paddison		$ 4,716,433			Replace existing pipe - Approx. 8800 LF of 21-27"	CONV		
345	10170360	Concordridge Dr. & Hunley Rd.		$ 5,019,056			Replace existing pipe - Approx. 6600 LF of 15-18"	CONV		
346	10170380	Lawyer Rd. @ Heatherwood Ln.		$ 786,806			Replace existing pipe - Approx. 2100 LF of 15"	CONV		
347	10170480	Clough Pike @ Goldengate Dr.		$ 4,263,535			Replace existing pipe - Approx. 6100 LF of 21-27"	CONV		
348	10170500	Clough Pike @ Wolfangle Rd.		$ 2,185,711			Replace existing pipe - Approx. 5300 LF of 18-21"	CONV		
349	**PRWWTP**	**Polk Run Wastewater Treatment Plant**								
350	10150020	Polk WWTP STO Storage Tank		$ 16,936,648			Storage - 6 MG (NOTE 1)	STOR		
351	10150015	Polk Run WWTP Optimization Ph4		$ 8,156,003			Polk Run WWTP Optimization Ph4	Optimization	NOTE 1	
352	10150080	Polk WWTP STO Replace Pipe		$ 5,852,872			Replacement pipe - 800 ft of 30"/1 MG tank	CONV/STOR		
353	10150100	Polk WWTP CNV Map 015		$ 1,141,145			Replacement pipe - 2700 ft of 15-18"	CONV		
354	10150140	Polk WWTP CNV Map 002		$ 5,424,227			Replace pipe (200 ft of 18"). New PS & Storage tank	CONV/STOR		
355	10150160	Polk WWTP CNV Map 010		$ 12,937,008			Replace pipe - 7000 ft of 36 - 48"	CONV		
356	**CA**	**California Plan**								
357	10170400	5 Mile Rd. & Old Kellogg		$ 7,976,701			Replace existing pipe - Approx. 5000 LF of 36-54"	CONV		
358	10170420	5 Mile Rd. & Birney Ln.		$ 6,037,842			Replace existing pipe - Approx. 2000 LF of 42"	CONV		
359	10170440	4 Mile Rd. @ I-275		$ 5,890,945			Replace existing pipe - Approx. 7400 LF of 21-30"	CONV		
360	10170460	Indian Creek Rd.		$ 3,739			Seal Manhole Lids	Seal Manhole Lids		
361	10170540	Kellogg Ave. @ Coney Island		$ 7,195,266			Replace existing pipe - Approx. 6200 LF of 54-66"	CONV		
362	**WOL**	**West Ohio Lower**								
363	10144660	Delhi Ave. Div. Dam		$ 583,399		CSO 420	Partial Separation	PS		0.1
364	10144680	River Rd. @ Delhi Div. Dam		$ 857,500		CSO 421	Partial Separation	PS		0.2
365	10144760	Bold Face Sr. Div. Dam		$ 96,810,229		CSO 419	EHRT - 275 MGD (NOTE 2)	EHRT		137.2
366	10144780	Mt. Echo Rd. Regulator		$ 277,350		CSO 422	Regulator Improvements - 22.2 cfs	RI		13.4
367	10144800	Mt. Hope Ave. Regulator		$ 13,886,537		CSO 423	Storage-3.5 MG	STOR		24.9
368	**KRU**	**Kings Run Upper**								
369	10142940	Ross Run Regulator		$ 277,300		CSO 485	Regulator Improvements -70.4 cfs	RI		29.1
~~370~~	~~10143180~~	~~Wooden Shoe Regulator~~	~~$ 13,723~~	~~$ 25,596,976~~		~~CSO 217A~~	~~EHRT - 75 MGD (NOTE 2)~~	~~EHRT~~		~~23.3~~
371	10143000	Kings Run and Spring Cove		$ 2,245,402		CSO 486	Partial Separation	PS		0.4
372	10143040	Ross Run Grating		$ 186,895,962		CSO 487	EHRT - 584 MGD (NOTE 2)	EHRT		289.2
~~373~~	~~10143140~~	~~Kings Run Regulator~~		~~$ 5,487,501~~		~~CSO 483~~	~~Partial Separation to new Interceptor connection~~	~~PS~~		~~15.3~~
374	**HS**	**Hopple Street**								
~~375~~	~~10142760~~	~~Vinton St. Regulator~~		~~$ 277,301~~		~~CSO 8~~	~~Regulator Improvements -1.54 cfs~~	~~RI~~		~~0.9~~
376	**WF**	**West Fork**								
~~377~~	~~10143680~~	~~Powers No. 1 Grating~~		~~$ 277,349~~		~~CSO 527A~~	~~Regulator Improvements - 4.6 cfs~~	~~RI~~		~~0.4~~
~~378~~	~~10143700~~	~~Beekman North Grating~~		~~$ 277,350~~		~~CSO 528A~~	~~Regulator Improvements - 3.0 cfs~~	~~RI~~		~~0.2~~
~~379~~	~~10143720~~	~~Beekman South Grating~~		~~$ 277,350~~		~~CSO 528B~~	~~Regulator Improvements - 8.5 cfs~~	~~RI~~		~~0.9~~
~~380~~	~~10143740~~	~~Liewellen Grating~~		~~$ 277,350~~		~~CSO 529B~~	~~Regulator Improvements - 3.9 cfs~~	~~RI~~		~~0.1~~
~~381~~	~~10143760~~	~~Hoffner Grating~~		~~$ 359,200~~		~~CSO 123~~	~~Partial Separation~~	~~PS~~		~~0.0~~
~~382~~	~~10143780~~	~~Hays Grating~~		~~$ 895,800~~		~~CSO 127~~	~~Partial Separation~~	~~PS~~		~~0.2~~
~~383~~	~~10143800~~	~~Todd No. 2 Grating~~		~~$ 1,337,900~~		~~CSO 128~~	~~Partial Separation~~	~~PS~~		~~0.3~~
384	10143860	Butte/Todd 1/Twin Grating		TBD		CSO 130	~~Conveyance to Tunnel at Mill Creek, 12,600' of 84" sewer~~ To Be Determined in LMCFR	~~CONV~~ TBD		~~56.29~~ TBD
~~385~~	~~10143820~~	~~Badgeley Run Grating - incl. with 10143820~~				~~CSO 125~~	~~Conveyance to Tunnel at Mill Creek, 12,600' of 84" sewer, Cost in CSO 130~~	~~CONV~~		~~68.9~~
386	10143840	Todd 1 Grating, CNV - incl. with 10143820		TBD		CSO 126	~~Conveyance to Tunnel at Mill Creek, 12,600' of 84" sewer~~ To Be Determined in LMCFR	~~CONV~~ TBD		~~33.23~~ TBD

INDEX	REVISED WWIP ATTACHMENT 2 - DECEMBER 2012 STRIKETHROUGH VERSION		Sunk Costs	Remaining Costs		CSO SSO Identifier	Description / Design (NOTE4)	Technology	Plan CAPP	Plan Remaining CSO (MG/year)
			2006 Dollars	2006 Dollars						
387	10143880	Twin Grating, CNV - incl. with 10143820		**TBD**		CSO 203	~~Conveyance to Tunnel at Mill Creek, 12,600' of 84" sewer~~ To Be Determined in LMCFR	~~CONV~~ TBD		~~5.42~~ TBD
388	10143900	Dreman Grating - incl. with 10143820		**TBD**		CSO 117A	~~Conveyance to Tunnel at Mill Creek, 12,600' of 84" sewer~~ To Be Determined in LMCFR	~~CONV~~ TBD		~~9.4~~ TBD
389	**EL**	**Elmwood Lower**								
~~390~~	~~10142640~~	~~Vine St. Div. Dam~~		~~$ 1,019,100~~		~~CSO 544~~	~~Partial Separation~~	~~PS~~		~~0.1~~
~~391~~	~~10142660~~	~~Murray Rd. Div. Dam~~		~~$ 510,101~~		~~CSO 653~~	~~Partial Separation~~	~~PS~~		~~0.4~~
392	10142700	Bloody Run Regulator		**$ 75,958,176**		CSO 181	~~EHRT - 230 MGD (NOTE 2)~~ To Be Determined in LMCFR	~~EHRT~~ **TBD**		TBD
393	**EO1U**	**East Ohio 1 Upper**								
394	10144160	Gest St. West-2-A Div. Dam, STO				CSO 430	In-line Storage in existing piping (also 431 & 432)	STOR		27.6
395	10144180	9th & McLean Div. Dam, STO				CSO 432	In-line Storage in existing piping (also 430 & 431A)	STOR		5.2
396	10144200	Blackford St. Regulator		**$ 2,702,301**		CSO 431A	In-line Storage in existing piping (also 430 & 432) Dewater pump station for 2.0 MGD	STOR		102.5
397	**EO2**	**East Ohio 2**								
398	10144220	Pike St. Div. Dam		**$ 277,350**		CSO 449	Regulator Improvement - 1.0 cfs	RI		0.1
399	10144240	Collard St. Regulator		**$ 277,349**		CSO 453A	Regulator Improvement - 2.6 cfs	RI		0.3
400	10144260	Riverfront Coliseum Regulator		**$ 1,530,200**		CSO 447	Partial Separation	PS		0.1
401	10144320	Parsons St. Div. Dam		**$ 277,350**		CSO 452	Regulator Improvement - 8.5 cfs	RI		4.1
402	10144340	Eggleston & 4th Div. Dam		**$ 27,874,917**		CSO 461	EHRT - 120 MGD (NOTE 2)	EHRT		119.2
403	10144360	Eggleston & 3rd F. Div.		**$ 277,350**		CSO 464	Regulator Improvement - 6.4 cfs	RI		3.6
404	10144380	Eggleston & 3rd		**$ 277,350**		CSO 465	Regulator Improvement - 2.0 cfs	RI		1.0
405	10144400	Eggleston & 3rd E. Div.		**$ 277,349**		CSO 465E	Regulator Improvements- 5.8 cfs	RI		2.8
406	10144420	Eggleston & Pete Rose Way		**$ 277,350**		CSO 466E	Regulator Improvement - 2.6 cfs	RI		1.6
407	**WOU**	**West Ohio Upper**								
408	10144700	Evans & 6th Street Div.		**$ 381,500**		CSO 668	Partial Separation	PS		0.5
409	10144720	Evans & River Rd. No. 1 Div.		**$ 97,801**		CSO 426A	Full Separation	FS		0.3
410	10144740	Evans & River Rd. No. 2 Div.		**$ 1,682,099**		CSO 426B	Partial Separation	PS		0.5
411	10144820	River Rd. @ State Div. Dam		**$ 4,237,794**		CSO 424	Partial Separation	PS		5.2
412	10144860	State Ave. Div. Dam		**$ 277,351**		CSO 425B	Regulator Improvement - 1.7 cfs Overcontrol @ CSO 419	RI		8.5
413	**EO1LW**	**East Ohio 1 Lower West**								
414	10144020	Baymiller St. Regulator		**$ 277,333**		CSO 435	Regulator Improvements-11.2 cfs	RI		6.6
415	10144040	Carr St. Regulator		**$ 2,638,500**		CSO 433	Partial Separation	PS		1.0
416	10144060	Carr & Front Div. Dam		**$ 824,599**		CSO 434	Partial Separation	PS		0.2
417	10144120	7th & Mclean Div. Dam		**$ 785,300**		CSO 489	Partial Separation	PS		0.1
418	10144140	Gest & Front Regulator		**$ 4,587,403**		CSO 436	Partial Separation	PS		8.4
419	**CRL**	**Congress Run Lower**								
420	10142560	Lockland & Highway Grating		**$ 2,876,601**		CSO 490	Partial Separation	PS		0.9
421	10142600	Vine & Decamp Div. Dam		**$ 8,274,751**		CSO 171	Storage - 2.00 MG	STOR		23.0
422	**KRL**	**Kings Run Lower**								
~~423~~	~~10142960~~	~~Station Ave. A Div. Dam~~		~~$ 277,301~~		~~CSO 026A~~	~~Regulator Improvements - 7.1 cfs~~	~~RI~~		~~0.0~~
424	10142980	Clifton Ave. West Grating		**$ 1,159,300**		CSO 480	Partial Separation	PS		1.3
425	**EO3W**	**East Ohio 3 West**								
426	10144440	Walden St. Div. Dam		**$ 6,473,599**		CSO 455	Partial Separation	PS		3.3
427	10144460	Hazen St. Div. Dam		**$ 1,459,000**		CSO 456	Partial Separation	PS		1.0
428	10144480	Collins St. West Div. Dam		**$ 1,323,000**		CSO 457	Partial Separation	PS		0.2
429	10144520	Hazen St. @ Glen Alley Div.		**$ 541,898**		CSO 658	Full Separation	FS		0.0
430	10144560	Litherbury St. South Div.		**$ 136,000**		CSO 454B	Full Separation	FS		0.0
431	10144580	Collins St. West Regulator		**$ 1,272,000**		CSO 457A	Partial Separation	PS		0.5

INDEX	REVISED WWIP ATTACHMENT 2 - DECEMBER 2012 STRIKETHROUGH VERSION		Sunk Costs	Remaining Costs		CSO SSO Identifier	Description / Design (NOTE4)	Technology	Plan CAPP	Plan Remaining CSO (MG/year)
			2006 Dollars	2006 Dollars						
432	10144600	Collins St. East Div. Dam		$ 19,890,435		CSO 458	Storage - 6.0 MG Consolidate with CSO 460	STOR		10.1
433	10144640	Litherbury St. North Div.		$ 277,350		CSO 454A	Regulator Improvement - 5.5 cfs	RI		12.7
434	**EO1LE**	**East Ohio 1 Lower East**								
435	10144000	3rd St. @ Central Ave.		$ 277,331		CSO 438A	Regulator Improvements-52.4 cfs	RI		8.9
436	10144100	Central Ave. Grating		$ 3,683,099		CSO 438	Partial Separation	PS		14.3
437	**NSL**	**North Side Lower**								
~~438~~	~~10143200~~	~~Geringer St. Grating~~		~~$ 277,300~~		~~CSO 19~~	~~Regulator Improvement - 7.6~~	~~RI~~		~~0.9~~
439	**EU**	**Elmwood Upper**								
~~440~~	~~10142620~~	~~Maple St. Div. Dam~~		~~$ 277,301~~		~~CSO 37~~	~~Regulator Improvements - 6.2 cfs~~	~~RI~~		~~1.3~~
441	10142720	64th St. Div. Dam		$ 2,280,418		CSO 39	Partial Separation	PS		2.2
442	10142740	68th St. Div. Dam		$ 277,301		CSO 488	Over Control at 181 to eliminate conveyance element	RI		35.3
443	**SGL**	**Spring Grove Lower**								
444	10143360	4710 Howard Grating		$ 277,300		CSO 110	Regulator Improvements -2.90 cfs	RI		0.3
~~445~~	~~10143400~~	~~Springlawn Grating~~		~~$ 1,406,906~~		~~CSO 111~~	~~Partial Separation~~	~~PS~~		~~4.1~~
446	10143420	1547 Springlawn Grating		$ 1,218,799		CSO 112	Partial Separation	PS		0.7
447	**EO3E**	**East Ohio 3 East**								
448	10144500	Bayou St. 120 West Regulator		$ 471,800		CSO 459	Partial Separation	PS		0.3
449	10144540	Eastern and Gotham		$ 2,435,600		CSO 667	Partial Separation	PS		2.6
450	10144620	Bayou St. 100 West Div. Dam		$ 6,668,046		CSO 460/458	Consolidate with CSO 458	CONV		14.7
451	**LMCFR**	**Lower Mill Creek Final Remedy**								
452	10145380	Phase 2 Default (Lower Mill Creek Final Remedy)		$ 305,658,000		**CSO 3, 4, 6, 7, 9, 666, 152, 428**	To Be Determined	TBD		
453	10143120	Bank Ave. Regulator - KRU - incl. with 10145380				CSO 33	TBD	TBD		15.1
454	10142800	Denham St. Regulator - HS - incl. with 10145380				CSO 10	TBD	TBD		81.4
455	10142820	Hopple St. Regulator - HS - incl. with 10145380				CSO 11	TBD	TBD		6.7
456	10142840	Bates Run Regulator - HS - incl. with 10145380				CSO 12	TBD	TBD		76.4
457	10142860	Yonkers St. Regulator - HS - incl. with 10145380				CSO 13	TBD	TBD		11.2
458	10142880	Station 15 Regulator - HS - incl. with 10145380				CSO 14	TBD	TBD		15.3
459	10142900	Arlington St. Regulator - HS - incl. with 10145380				CSO 15	TBD	TBD		24.3
460	10143280	Ludlow Ave. Div. Dam - NSU - incl. with 10145380				CSO 22	TBD	TBD		14.5
461	10143300	Alibone St. & Ludlow Run Regulator - NSU - incl. with 10145380				CSO 23	TBD	TBD		19.9
462	10143320	Ludlow Run Regulator, CNV - NSU - incl. with 10145380				CSO 24	TBD	TBD		36.6
463	10143020	Mitchell Ave. Regulator - KRL - incl. with 10145380				CSO 482	TBD	TBD		109.5
464	10143060	Clifton Ave. East Grating - KRL - incl. with 10145380				CSO 28	TBD	TBD		10.3
~~465~~	~~10143080~~	~~Donnell St. Grating - KRL - incl. with 10145380~~				~~CSO 29~~	~~TBD~~	~~TBD~~		~~1.7~~
466	10143100	Lafayette Cir. Grating - KRL - incl. with 10145380				CSO 30	TBD	TBD		24.5
467	10143160	Winton Rd. A Regulator - KRL - incl. with 10145380				CSO 025A	TBD	TBD		8.4
468	10143182	New Este Ave CSO - KRL - incl. with 10145380				CSO Este	TBD	TBD		-
469	10143240	Colerain Ave. Div. Dam - NSL - incl. with 10145380				CSO 18	TBD	TBD		8.6
470	10143260	Streng St. Div. Dam - NSL - incl. with 10145380				CSO 21	TBD	TBD		31.9
471	10143340	Dreman Ave. Div. Dam - NSL - **incl. with 10145380**				CSO 017B	TBD	TBD		2.9
472	**TOTAL PHASE 2 WITHOUT PHASE 2 ALLOWANCES**		**$ 182,720**	**$ 2,015,466,833**						

INDEX	REVISED WWIP ATTACHMENT 2 - DECEMBER 2012 STRIKETHROUGH VERSION	Sunk Costs 2006 Dollars	Remaining Costs 2006 Dollars		CSO SSO Identifier	Description / Design (NOTE4)	Technology	Plan CAPP	Plan Remaining CSO (MG/year)

NOTES:

1 PROJECT COMPLETE AND IN SERVICE AT SPECIFIED CAPACITY

2 FOR ALL PROJECTS WITH EHRT TECHNOLOGY VOLUME SHOWING IS REMAINING UNTREATED OVERFLOW - SEE ATTACHMENT 5.

3 INFORMATION RELATED TO THIS PROJECT IS PRELIMINARY AND SUBJECT TO CHANGE BASED ON FURTHER STUDY AS SET FORTH IN PARAGRAPH A.3. OF THE WWIP

4 CAPP DESIGN: ALL CAPP SEWER PROJECTS WILL BE DESIGNED TO MEET THE 10 YEAR DESIGN STORM EVENT. ALL CAPP PUMP STATION AND STORAGE FACILITIES WILL BE DESIGNED TO MEET THE 2 YEAR DESIGN STORM EVENT. THE 2 AND 10 YEAR DESIGN STORMS ARE SCS TYPE II - 24 HOUR EVENTS.

5 FOR THESE RTC PROJECTS, THE STATED REDUCTION IN THE TYPICAL YEAR CSO DISCHARGE VOLUME SHALL ALSO BE THE PERFORMANCE CRITERIA FOR THE FACILITY.

6 PERFORMANCE CRITERIA FOR CSO VOLUMES REMAINING AFTER IMPLEMENTATION OF CSO CONTROLS ARE THE VOLUMES NOT TO BE EXCEEDED AT A PARTICULAR OUTFALL DURING MSDGC'S TYPICAL YEAR RAINFALL (1970). COMPLIANCE WITH THESE CRITERIA WILL BE EVALUATED BY IMPLEMENTATION OF A POST CONSTRUCTION MONITORING PROGRAM (WHICH WILL BE SUBMITTED TO THE REGULATORY AGENCIES FOR REVIEW AND APPROVAL IN ACCORDANCE WITH THE GLOBAL CONSENT DECREE) THAT WILL UTILIZE MSDGC'S HYDROLOGIC AND HYDRAULIC MODEL TO NORMALIZE THE RESULTS OF THE POST CONSTRUCTION MONITORING TO THE TYPICAL YEAR.

7 THIS REVISED WWIP ATTACHMENT 2, DECEMBER 2012 TRACKS TO THE ATTACHMENT 2 FINAL WWIP, DATED NOVEMBER 2009, EXCEPT FOR THE FOLLOWING CHANGES: CERTAIN PROJECTS HAVE BEEN REMOVED FROM THE LIST BECAUSE THEY HAVE BEEN COMPLETED; THE REVISED ORIGINAL LMCPR CHANGES VARIOUS LISTED PROJECTS; AND OTHER PROJECTS REMOVED BASED ON UPDATED MODELING. LISTED COST ESTIMATES REMAIN ESTIMATES REFLECTING 2009 FINAL WWIP PROJECTS. COST ESTIMATES MAY CHANGE TO REFLECT ACTUAL PROJECTS SELECTED AND DESIGNED.

Appendix A

List of Acronyms

Appendix A – Acronyms

Ac-ft	acre-feet
BG	billion gallons
BMP	Best Management Practice
BoCC	Board of County Commissioners
CAGIS	Cincinnati Area Geographical Interface System
CAPP	Capacity Assurance Program Plan
CDOTE	Cincinnati Department of Transportation & Engineering
CDW	Community Design Workshop
CFAC	Communities of the Future Advisory Committee
CIP	Capital Improvement Program
CPB	Cincinnati Parks Board
CPS	Cincinnati Public Schools
CRC	Cincinnati Recreation Commission
CSO	Combined Sewer Overflow
CSS	Combined Sewer System
DB	Detention Basin
DWF	Dry Weather Flow
EHRT	Enhanced High Rate Treatment Facility
EI, EIP	Enabled Impact Project
EPA, USEPA	United States Environmental Protection Agency
FAQ	Frequently Asked Questions
FEMA	Federal Emergency Management Association
FRP	Final Remedial Plan
GCWW	Greater Cincinnati Water Works
GIS	Geographical Interface System
HMS/HEC	Hydraulic model of water flow through natural rivers and other channels
I/I	Infiltration & Inflow
LMC	Lower Mill Creek
LMCFR	Lower Mill Creek Final Remedy
LMCPR	Lower Mill Creek Partial Remedy
LTCP	Long Term Control Plan
MBI	Midwest Biodiversity Institute
MG	million gallons
MGD	million gallons per day
MOT	Maintenance of Traffic
MOU	Memorandum of Understanding
MSD, MSDGC	Metropolitan Sewer District of Greater Cincinnati
O&M	Operations & Maintenance
OAC	Ohio Administrative Code
ODOT	Ohio Department of Transportation
OEPA	Ohio Environmental Protection Agency
NA	Not Applicable
Q&A	Questions and Answers
RDII	Rainfall Derived Inflow and Infiltration

ROW	Right-of-Way
RTC	Real Time Control Facility
RTK	Abbreviation for hydraulic parameters
Sf	Square Foot
SFBA	South Fairmount Business Association
SFCC	South Fairmount Community Council
SI	Sustainable Infrastructure
SMU	Stormwater Management Utility
SSO	Sanitary Sewer Overflow
SWEP	Sustainable Watershed Evaluation Plan
SWEPP	Sustainable Watershed Evaluation Planning Process
SWIM	Stormwater Wastewater Integrated Management
SWM	System-Wide Model
TBD	To Be Determined
TCC	Total Construction Cost
USACE	United States Army Corps of Engineers
VCS	Valley Conveyance System
WAP	Watershed Action Plan
WQS	Water Quality Standard
WWIP	Wet Weather Improvement Program
WWTP	Wastewater Treatment Plant

Appendix B

Bibliography

Appendix B - Bibliography

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Bloody Run Watershed Strategic Separation Project. Prepared by Camp Dresser and McKee, Inc (CDM). June 2012.

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Lick Run Master Plan. Prepared by MSD in collaboration with the Communities of the Future Advisory Committee (CFAC), Hamilton County Planning and Development, and the City of Cincinnati Planning Department. May 2012.

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Lower Mill Creek Partial Remedy MSD's Recommendation to the Co-Defendants of LMCPR Alternative. Prepared by MSD. September 26, 2012.

Lower Mill Creek Partial Remedy (Draft) Revised Concept Design Report. Prepared by Black & Veatch/CH2M Hill. May 2011.

Lower Mill Creek Partial Remedy Technical Baseline Report. Prepared by Black & Veatch/CH2M Hill. March 2011.

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Lower Mill Creek Partial Remedy Revised Plan, Task 107: Project Cost Estimating Protocol. Prepared by CH2M Hill, Inc. February 2012.

Lower Mill Creek SA Partial Remedy Alternatives Report. Prepared by XCG Consultants, Inc., June 1, 2012.

Lower Mill Creek-SA System Wide Model Restructuring Version 3.2, Version 4.0.10, and Version 4.2. Prepared by XCG Consultants, Inc., June 1, 2012.

Lower Mill Creek Watershed Action Plan (Draft). Prepared by the Lower Mill Creek Watershed Action Plan. August 2012.

Lower Mill Creek Watershed Water Quality Evaluation Initial Results. Prepared by LimnoTech/CH2M Hill. April 3, 2012.

MSDGC's Integrated Sustainable Watershed Management Manual. Prepared by MSD. October 2012.

Sustainable Infrastructure Policy Gap Analysis. Prepared by MSD in collaboration with the Communities of the Future Advisory Committee (CFAC) Policy Subcommittee, Hamilton County Planning and Development, and the City of Cincinnati Planning Department. January 2012.

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Sustainable Projects: Documentation Summaries of Model Development and Calibration. Prepared by Malcolm Pirnie, Inc. December 2012.

West Fork Sustainable Watershed Alternatives Analysis Report. Prepared by ARCADIS US, Inc. July 2012.

Wet Weather Improvement Program V.01 to V.24. Prepared by MSDGC. 2006.

Wet Weather Improvement Plan (WWIP) - FINAL. Prepared by MSDGC. June 2009.

Appendix C

Regulatory Draft for Discussion
Guidance

Guidance Pertaining to Consideration of Any Proposed Revised Original Lower Mill Creek Partial Remedy Defendants May Choose to Submit in Accordance With Paragraph A.2 of the Wet Weather Improvement Program
Draft for Discussion

Under the consent decrees between the United States, State of Ohio and Ohio River Water Sanitation Commission (the Regulators); and the Board of County Commissioners for Hamilton County and City of Cincinnati (Defendants), Defendants are required under to construct the Lower Mill Creek Partial Remedy (LMCPR) described in Attachment 1C to the Wet Weather Improvement Program (WWIP); in accordance with the schedule, performance criteria and design criteria set forth in Attachments 1A and 1B of the WWIP.

Paragraph A.2.a of the WWIP provides:

> Phase 1 will include a 3-year study/detailed design period to examine green measures and other measures to refine the Original LMCPR approach and cost estimates. Defendants may submit to the Regulators proposed changes to, or improvements on, the Original LMCPR remedy as a result of this study, provided the proposed revised remedy ("Revised Original LMCPR") provides equal or greater control of CSO annual volume as the Original LMCPR and is completed by the Phase 1 End Date. Defendants shall submit to the Regulators a LMCPR Study Report and any proposal for a Revised Original LMCPR by December 31, 2012.

The purpose of this document is to provide the Metropolitan Sewer District of Great Cincinnati (MSDGC) with guidance on certain issues that Defendants should consider if they choose to submit a proposed Revised Original LMCPR to the Regulators in accordance with Paragraph A.2.a of the WWIP. This document does not replace, revise, or amend the WWIP itself, or the consent decrees.

1. The primary means of determining if green control measures are equivalent to a planned grey infrastructure control measure will be model runs. The Hydrology and Hydraulic Model would be used to simulate the effects of the source control and green infrastructure measures (along with grey infrastructure elements that would be built) and provide specific information on the volume of overflows in a typical year. The Regulators will need to have a good understanding of the assumptions that were used in the model run, e.g., adjustments to the Hydrology inputs to reflect the source control/green infrastructure projects in order to conduct a review and concur on the model run results.

2. In addition to the model runs, a proposed Revised Original LMCPR should include the following:

(a) A detailed description of the source control/green infrastructure project(s), including specific technologies to be employed, project dimensions and configurations, material specifications and characteristics, project drawings that include the drainage area tributary to the proposed project, intended mode(s) of operation, and any other available information that may aid the Regulators in their assessment of the proposed project.

(b) An identification of all tasks required to implement the proposed project, a cost proposal, and a schedule for completion of this work and implementation of the project that is consistent with the approved WWIP.

(c) A specific identification of the grey infrastructure components or projects to be modified or eliminated. Also an analysis of how the downsizing or elimination of planned grey infrastructure projects could potentially affect other elements of the overall conveyance and treatment system.

(d) A description of the source control/green infrastructure maintenance activities to be carried out, including responsible organizations and schedules for maintenance, and a description of the legal authority that will be used to ensure that those activities will be carried out. This description could include, for example, a description (1) of a public entity e.g., (MSDGC, the City, the County) that would be responsible for meeting the legal requirements for operation of the systems; (2) how such public entity would retain legal authority to have permanent access and sufficient control over the land devoted to the green infrastructure measures; (3) how the public entity would acquire ownership of land parcels, or obtain legally-binding agreements, to retain permanent access and sufficient control of the parcels. (The point here is to demonstrate how the source control/green infrastructure control measures would be held/preserved for the long term, with no changes to the site/area that would reduce performance and with access and control so that maintenance activities can be carried out.)

(e) A description of stakeholder outreach and public participation, implemented and planned, associated with the proposed green infrastructure measures. The public participation for proposed green-for grey substitutions should include, but not be limited to, people, households, and neighborhoods in the service area that have low household incomes, poor educational attainment, or concentrated minority populations.

(f) A description of how MSDGC or the responsible public entity would track implementation, operation, and maintenance of the source control/green infrastructure measures, report on such activities and accomplishments as part of regular reporting.

(g) A description of any unique issues that could arise in the context of developing the Post-Construction Monitoring Study required by Section X of the CSO Decree, in light of the source control/green infrastructure measures in the proposed Revised Original LMCPR.

Appendix D

Cost Summaries

Lick Run Revised Original LMCPR (CSO 5)
All Costs in 2006 Dollars

	Sunset Ave SSA (11240010)			Rapid Run ESP (11040010)	Wyoming Ave (11240030)	Harrison Ave Phase A (11240050)	Harrison Ave Phase B (11240051)
Estimate Variables	**Separation**	**Basin 21**		**Separation**	**Separation**	**Separation**	**Separation**
Project Stage	30% Design	30% Design		30% Design	30% Design	90% Design	30% Design
Construction Duration (years)	0.980769231	0.057692308		0.980769231	0.980769231	1.980769231	1.980769231
Interest Rate	4.2%	4.2%		4.2%	4.2%	4.2%	4.2%
Life Cycle Analysis Period (years)	25	25		25	25	25	25

Estimate Description	Total	Total	Sunset Total	Total	Total	Total	Total
Contractor's Base Costs Contractor's On-Site General Conditions	$ 5,552,000	$ 63,000	$ 5,615,000	$ 983,000	$ 1,251,000	$ 1,522,000	$ 816,000
Contractor's Overhead	$ 555,000	$ 6,000	$ 561,000	$ 98,000	$ 125,000	$ 152,000	$ 82,000
Contractor's Profit	$ 278,000	$ 3,000	$ 281,000	$ 49,000	$ 63,000	$ 76,000	$ 41,000
Base Construction Cost	**$ 6,390,000**	**$ 70,000**	**$ 6,460,000**	**$ 1,130,000**	**$ 1,440,000**	**$ 1,750,000**	**$ 940,000**
Design Contingency	$ 958,000	$ 11,000	$ 969,000	$ 170,000	$ 216,000	$ 88,000	$ 141,000
Bonding	$ 73,000	$ 1,000	$ 74,000	$ 13,000	$ 17,000	$ 18,000	$ 11,000
Insurance	$ 73,000	$ 1,000	$ 74,000	$ 13,000	$ 17,000	$ 18,000	$ 11,000
Total Construction Cost	**$ 7,494,000**	**$ 83,000**	**$ 7,577,000**	**$ 1,326,000**	**$ 1,690,000**	**$ 1,874,000**	**$ 1,103,000**
Real Estate Costs	$ 362,000	$ -	$ 362,000	$ -	$ 202,000	$ -	$ 303,000
Administration Costs	$ 637,000	$ 16,000	$ 653,000	$ 113,000	$ 143,000	$ 159,000	$ 94,000
Project Contingency	$ 749,000	$ 8,000	$ 757,000	$ 133,000	$ 169,000	$ 187,000	$ 110,000
Construction Interest	$ 154,000	$ -	$ 154,000	$ 27,000	$ 35,000	$ 78,000	$ 46,000
Miscellaneous	$ 119,000	$ 23,000	$ 142,000	$ 63,000	$ 69,000	$ 71,000	$ 59,000
Field Engineering & Inspection	$ 262,000	$ 4,000	$ 266,000	$ 46,000	$ 59,000	$ 66,000	$ 39,000
Design & Eng. Services	$ 593,000	$ 22,000	$ 615,000	$ 167,000	$ 199,000	$ 215,000	$ 145,000
Planning & Preliminary Design	$ 359,000	$ 21,000	$ 380,000	$ 121,000	$ 141,000	$ 150,000	$ 107,000
Capital Cost	**$ 10,729,000**	**$ 177,000**	**$ 10,906,000**	**$ 1,996,000**	**$ 2,707,000**	**$ 2,800,000**	**$ 2,006,000**
Present Worth of Residual Value of Capital Cost	$ (2,876,000)	$ (32,000)	$ (2,908,000)	$ (535,000)	$ (725,000)	$ (751,000)	$ (537,000)
Present Worth of Equipment Replacement	$ -	$ 4,000	$ 4,000	$ -	$ -	$ -	$ -
Present Worth of Annual O&M	$ 194,000	$ 45,000	$ 239,000	$ 35,000	$ 73,000	$ 73,000	$ 35,000
Life Cycle Cost (from Costing Tool)	**$ 8,047,000**	**$ 194,000**	**$ 8,241,000**	**$ 1,496,000**	**$ 2,055,000**	**$ 2,122,000**	**$ 1,504,000**
Present Worth of Additional Annual O&M	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Revised Life Cycle Cost	**$ 8,047,000**	**$ 194,000**	**$ 8,241,000**	**$ 1,496,000**	**$ 2,055,000**	**$ 2,122,000**	**$ 1,504,000**

Notes: 1. State Avenue and Queen City Phase 3 separation projects are included in the Valley Conveyance System project (112400000).
Quebec Heights Phase 1 and Phase 2 have been combined into one project in the internal Schedule under (11240170).
Lick Run Property Demolitions (11240001) costs are included in the real estate costs of the Valley Conveyance System.
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Lick Run Revised Original LMCPR (CSO 5)
All Costs in 2006 Dollars

	State Ave (11240000) [1]	White St (11240090)	Quebec Rd (11240110)	Queen City Ave Phase 2 (11240130)			
Estimate Variables	**Separation**	**Separation**	**Separation**	**Separation**	**Basin 1**	**Basin 2**	
Project Stage	Preliminary Design	30% Design	30% Design	30% Design	30% Design	30% Design	
Construction Duration (years)	0.980769231	0.980769231	0.980769231	0.980769231	0.076923077	0.076923077	
Interest Rate	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	
Life Cycle Analysis Period (years)	25	25	25	25	25	25	

Estimate Description	Total	Total	Total	Total	Total	Total	Queen City Ave Phase 2 Total
Contractor's Base Costs Contractor's On-Site General Conditions	$ 1,463,000	$ 2,683,000	$ 3,409,000	$ 4,327,000	$ 102,000	$ 116,000	$ 4,545,000
Contractor's Overhead	$ 146,000	$ 268,000	$ 341,000	$ 433,000	$ 10,000	$ 12,000	$ 455,000
Contractor's Profit	$ 73,000	$ 134,000	$ 170,000	$ 216,000	$ 5,000	$ 6,000	$ 227,000
Base Construction Cost	**$ 1,680,000**	**$ 3,090,000**	**$ 3,920,000**	**$ 4,980,000**	**$ 120,000**	**$ 130,000**	**$ 5,230,000**
Design Contingency	$ 336,000	$ 463,000	$ 588,000	$ 746,000	$ 18,000	$ 20,000	$ 784,000
Bonding	$ 20,000	$ 35,000	$ 45,000	$ 57,000	$ 1,000	$ 2,000	$ 60,000
Insurance	$ 20,000	$ 35,000	$ 45,000	$ 57,000	$ 1,000	$ 2,000	$ 60,000
Total Construction Cost	**$ 2,056,000**	**$ 3,623,000**	**$ 4,598,000**	**$ 5,840,000**	**$ 140,000**	**$ 154,000**	**$ 6,134,000**
Real Estate Costs	$ 140,000	$ 869,000	$ 1,197,000	$ 667,000	$ -	$ -	$ 667,000
Administration Costs	$ 175,000	$ 308,000	$ 391,000	$ 496,000	$ 23,000	$ 25,000	$ 544,000
Project Contingency	$ 206,000	$ 362,000	$ 460,000	$ 584,000	$ 14,000	$ 16,000	$ 614,000
Construction Interest	$ 42,000	$ 75,000	$ 95,000	$ 120,000	$ -	$ -	$ 120,000
Miscellaneous	$ 74,000	$ 91,000	$ 100,000	$ 109,000	$ 27,000	$ 28,000	$ 164,000
Field Engineering & Inspection	$ 72,000	$ 127,000	$ 161,000	$ 204,000	$ 6,000	$ 6,000	$ 216,000
Design & Eng. Services	$ 230,000	$ 348,000	$ 414,000	$ 494,000	$ 32,000	$ 35,000	$ 561,000
Planning & Preliminary Design	$ 159,000	$ 227,000	$ 264,000	$ 307,000	$ 29,000	$ 31,000	$ 367,000
Capital Cost	**$ 3,154,000**	**$ 6,030,000**	**$ 7,680,000**	**$ 8,821,000**	**$ 271,000**	**$ 295,000**	**$ 9,387,000**
Present Worth of Residual Value of Capital Cost	$ (847,000)	$ (1,615,000)	$ (2,059,000)	$ (2,364,000)	$ (48,000)	$ (53,000)	$ (2,465,000)
Present Worth of Equipment Replacement	$ -	$ -	$ -	$ -	$ 7,000	$ 7,000	$ 14,000
Present Worth of Annual O&M	$ 58,000	$ 122,000	$ 158,000	$ 142,000	$ 47,000	$ 48,000	$ 237,000
Life Cycle Cost (from Costing Tool)	**$ 2,365,000**	**$ 4,537,000**	**$ 5,779,000**	**$ 6,599,000**	**$ 277,000**	**$ 297,000**	**$ 7,173,000**
Present Worth of Additional Annual O&M	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Revised Life Cycle Cost	**$ 2,365,000**	**$ 4,537,000**	**$ 5,779,000**	**$ 6,599,000**	**$ 277,000**	**$ 297,000**	**$ 7,173,000**

Notes: 1. State Avenue and Queen City Phase 3 separation projects are included in the Valley Conveyance System project (112400000).
Quebec Heights Phase 1 and Phase 2 have been combined into one project in the internal Schedule under (11240170).
Lick Run Property Demolitions (11240001) costs are included in the real estate costs of the Valley Conveyance System.
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Lick Run Revised Original LMCPR (CSO 5)
All Costs in 2006 Dollars

	Queen City and Cora Ave (Fenton) (11240150)				
Estimate Variables	**Separation**	**Basin 7**	**Basin 9**	**Basin 10**	
Project Stage	30% Design	30% Design	30% Design	30% Design	
Construction Duration (years)	0.980769231	0.076923077	0.134615385	0.134615385	
Interest Rate	4.2%	4.2%	4.2%	4.2%	
Life Cycle Analysis Period (years)	25	25	25	25	

Estimate Description	Total	Total	Total	Total	Queen City and Cora Ave Total
Contractor's Base Costs Contractor's On-Site General Conditions	$ 1,083,000	$ 150,000	$ 163,000	$ 223,000	$ 1,619,000
Contractor's Overhead	$ 108,000	$ 15,000	$ 16,000	$ 22,000	$ 161,000
Contractor's Profit	$ 54,000	$ 8,000	$ 8,000	$ 11,000	$ 81,000
Base Construction Cost	**$ 1,250,000**	**$ 170,000**	**$ 190,000**	**$ 260,000**	**$ 1,870,000**
Design Contingency	$ 187,000	$ 26,000	$ 28,000	$ 39,000	$ 280,000
Bonding	$ 14,000	$ 2,000	$ 2,000	$ 3,000	$ 21,000
Insurance	$ 14,000	$ 2,000	$ 2,000	$ 3,000	$ 21,000
Total Construction Cost	**$ 1,465,000**	**$ 200,000**	**$ 222,000**	**$ 305,000**	**$ 2,192,000**
Real Estate Costs	$ 1,128,000	$ -	$ -	$ -	$ 1,128,000
Administration Costs	$ 124,000	$ 30,000	$ 32,000	$ 40,000	$ 226,000
Project Contingency	$ 146,000	$ 20,000	$ 22,000	$ 30,000	$ 218,000
Construction Interest	$ 30,000	$ -	$ 1,000	$ 1,000	$ 32,000
Miscellaneous	$ 65,000	$ 31,000	$ 32,000	$ 36,000	$ 164,000
Field Engineering & Inspection	$ 51,000	$ 6,000	$ 11,000	$ 11,000	$ 79,000
Design & Eng. Services	$ 179,000	$ 42,000	$ 45,000	$ 56,000	$ 322,000
Planning & Preliminary Design	$ 128,000	$ 37,000	$ 39,000	$ 48,000	$ 252,000
Capital Cost	**$ 3,316,000**	**$ 366,000**	**$ 404,000**	**$ 527,000**	**$ 4,613,000**
Present Worth of Residual Value of Capital Cost	$ (888,000)	$ (66,000)	$ (72,000)	$ (94,000)	$ (1,120,000)
Present Worth of Equipment Replacement	$ -	$ 9,000	$ 10,000	$ 13,000	$ 32,000
Present Worth of Annual O&M	$ 49,000	$ 48,000	$ 48,000	$ 48,000	$ 193,000
Life Cycle Cost (from Costing Tool)	**$ 2,477,000**	**$ 357,000**	**$ 390,000**	**$ 494,000**	**$ 3,718,000**
Present Worth of Additional Annual O&M	$ -	$ -	$ -	$ -	$ -
Revised Life Cycle Cost	**$ 2,477,000**	**$ 357,000**	**$ 390,000**	**$ 494,000**	**$ 3,718,000**

Notes: 1. State Avenue and Queen City Phase 3 separation projects are included in the Valley Conveyance System project (112400000).
Quebec Heights Phase 1 and Phase 2 have been combined into one project in the internal Schedule under (11240170).
Lick Run Property Demolitions (11240001) costs are included in the real estate costs of the Valley Conveyance System.
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Lick Run Revised Original LMCPR (CSO 5)
All Costs in 2006 Dollars

	Quebec Heights Phase 1 (Glenway Woods) (11240170) [2]			Quebec Heights Phase 2 (Wells) (11240170) [2]	Queen City Ave Ph 3 (11240000) [1]
Estimate Variables	**Separation**	**Basin 17**		**Separation**	**Separation**
Project Stage	30% Design	30% Design		Preliminary Design	Preliminary Design
Construction Duration (years)	0.980769231	0.076923077		0.980769231	0.980769231
Interest Rate	4.2%	4.2%		4.2%	4.2%
Life Cycle Analysis Period (years)	25	25		25	25

Estimate Description	Total	Total	Quebec Heights Phase 1 Total	Total	Total
Contractor's Base Costs Contractor's On-Site General Conditions	$ 1,413,000	$ 159,000	$ 1,572,000	$ 325,000	$ 2,451,000
Contractor's Overhead	$ 141,000	$ 16,000	$ 157,000	$ 33,000	$ 245,000
Contractor's Profit	$ 71,000	$ 8,000	$ 79,000	$ 16,000	$ 123,000
Base Construction Cost	**$ 1,620,000**	**$ 180,000**	**$ 1,800,000**	**$ 370,000**	**$ 2,820,000**
Design Contingency	$ 244,000	$ 27,000	$ 271,000	$ 75,000	$ 564,000
Bonding	$ 19,000	$ 2,000	$ 21,000	$ 4,000	$ 34,000
Insurance	$ 19,000	$ 2,000	$ 21,000	$ 4,000	$ 34,000
Total Construction Cost	**$ 1,902,000**	**$ 211,000**	**$ 2,113,000**	**$ 453,000**	**$ 3,452,000**
Real Estate Costs	$ 384,000	$ -	$ 384,000	$ 117,000	$ 258,000
Administration Costs	$ 162,000	$ 31,000	$ 193,000	$ 39,000	$ 293,000
Project Contingency	$ 191,000	$ 21,000	$ 212,000	$ 46,000	$ 345,000
Construction Interest	$ 39,000	$ -	$ 39,000	$ 9,000	$ 71,000
Miscellaneous	$ 72,000	$ 32,000	$ 104,000	$ 42,000	$ 90,000
Field Engineering & Inspection	$ 67,000	$ 6,000	$ 73,000	$ 16,000	$ 121,000
Design & Eng. Services	$ 217,000	$ 44,000	$ 261,000	$ 76,000	$ 336,000
Planning & Preliminary Design	$ 152,000	$ 38,000	$ 190,000	$ 62,000	$ 220,000
Capital Cost	**$ 3,186,000**	**$ 383,000**	**$ 3,569,000**	**$ 860,000**	**$ 5,186,000**
Present Worth of Residual Value of Capital Cost	$ (855,000)	$ (69,000)	$ (924,000)	$ (232,000)	$ (1,390,000)
Present Worth of Equipment Replacement	$ -	$ 10,000	$ 10,000	$ -	$ -
Present Worth of Annual O&M	$ 25,000	$ 48,000	$ 73,000	$ 27,000	$ 84,000
Life Cycle Cost (from Costing Tool)	**$ 2,356,000**	**$ 372,000**	**$ 2,728,000**	**$ 655,000**	**$ 3,880,000**
Present Worth of Additional Annual O&M	$ -	$ -	$ -	$ -	$ -
Revised Life Cycle Cost	**$ 2,356,000**	**$ 372,000**	**$ 2,728,000**	**$ 655,000**	**$ 3,880,000**

Notes: 1. State Avenue and Queen City Phase 3 separation projects are included in the Valley Conveyance System project (112400000).
Quebec Heights Phase 1 and Phase 2 have been combined into one project in the internal Schedule under (11240170).
Lick Run Property Demolitions (11240001) costs are included in the real estate costs of the Valley Conveyance System.

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Lick Run Revised Original LMCPR (CSO 5)
All Costs in 2006 Dollars

	Queen City Ave Ph 1 (11240270)	Valley Conveyance System (11240000) [1] (11240001) [3]				Lick Run Total
Estimate Variables	**Separation**	**Channel**	**Forebay**	**Elements**		
Project Stage	30% Design	Preliminary Design	Preliminary Design	Preliminary Design		
Construction Duration (years)	0.5	2.5	0.192307692	1		
Interest Rate	4.2%	4.2%	4.2%	4.2%		
Life Cycle Analysis Period (years)	25	25	25	25		

Estimate Description	Total	Total	Total	Total	Valley Conveyance System Total	Lick Run Total
Contractor's Base Costs Contractor's On-Site General Conditions	$ 2,840,000	$ 42,663,000	$ 291,000	$ 10,985,472	$ 53,939,472	$ 85,033,472
Contractor's Overhead	$ 284,000	$ 4,266,000	$ 29,000	$ 1,098,547	$ 5,393,547	$ 8,501,547
Contractor's Profit	$ 142,000	$ 2,133,000	$ 15,000	$ 549,274	$ 2,697,274	$ 4,252,274
Base Construction Cost	**$ 3,270,000**	**$ 49,060,000**	**$ 330,000**	**$ 12,633,000**	**$ 62,023,000**	**$ 97,793,000**
Design Contingency	$ 490,000	$ 9,813,000	$ 67,000	$ 2,527,000	$ 12,407,000	$ 17,842,000
Bonding	$ 38,000	$ 589,000	$ 4,000	$ 152,000	$ 745,000	$ 1,156,000
Insurance	$ 38,000	$ 589,000	$ 4,000	$ 152,000	$ 745,000	$ 1,156,000
Total Construction Cost	**$ 3,836,000**	**$ 60,051,000**	**$ 405,000**	**$ 15,464,000**	**$ 75,920,000**	**$ 117,947,000**
Real Estate Costs	$ 142,000	$ 24,777,000	$ -	$ -	$ 24,777,000	$ 30,546,000
Administration Costs	$ 326,000	$ 5,104,000	$ 50,000	$ 1,314,000	$ 6,468,000	$ 10,125,000
Project Contingency	$ 383,000	$ 4,005,000	$ 41,000	$ 1,296,000	$ 5,342,000	$ 9,544,000
Construction Interest	$ 40,000	$ 3,153,000	$ 2,000	$ 325,000	$ 3,480,000	$ 4,343,000
Miscellaneous	$ 93,000	$ 300,000	$ 40,000	$ 156,000	$ 496,000	$ 1,822,000
Field Engineering & Inspection	$ 134,000	$ 2,102,000	$ 17,000	$ 541,000	$ 2,660,000	$ 4,135,000
Design & Eng. Services	$ 363,000	$ 3,603,000	$ 70,000	$ 1,008,000	$ 4,681,000	$ 8,933,000
Planning & Preliminary Design	$ 235,000	$ 1,802,000	$ 58,000	$ 566,000	$ 2,426,000	$ 5,301,000
Capital Cost	**$ 5,552,000**	**$ 104,897,000**	**$ 683,000**	**$ 20,670,000**	**$ 126,250,000**	**$ 192,696,000**
Present Worth of Residual Value of Capital Cost	$ (1,488,000)	$ (28,664,000)	$ (123,000)	$ (5,610,000)	$ (34,397,000)	$ (51,993,000)
Present Worth of Equipment Replacement	$ -	$ -	$ 17,000	$ -	$ 17,000	$ 77,000
Present Worth of Annual O&M	$ 52,000	$ -	$ 46,000	$ -	$ 46,000	$ 1,505,000
Life Cycle Cost (from Costing Tool)	**$ 4,116,000**	**$ 78,233,000**	**$ 623,000**	**$ 15,060,000**	**$ 93,916,000**	**$ 144,285,000**
Present Worth of Additional Annual O&M	$ -	$ 2,409,000	$ -	$ 3,509,000	$ 5,918,000	$ 5,918,000
Revised Life Cycle Cost	**$ 4,116,000**	**$ 80,642,000**	**$ 623,000**	**$ 18,569,000**	**$ 99,834,000**	**$ 150,203,000**

Notes: 1. State Avenue and Queen City Phase 3 separation projects are included in the Valley Conveyance System project (112400000).
Quebec Heights Phase 1 and Phase 2 have been combined into one project in the internal Schedule under (11240170).
Lick Run Property Demolitions (11240001) costs are included in the real estate costs of the Valley Conveyance System.
2.
3.

Kings Run Revised Original LMCPR (CSOs 483 and 217)
All Costs in 2006 Dollars

	Stream Separations and Basins (10240021 and 11243140) [1]						
Estimate Variables	**Separations**	**Pond 1**	**Pond 2**	**Pond 3**	**Former Basin 4 [2]**	**Pond 4 (Basin 15)**	
Project Stage	Preliminary Design	Preliminary Design	Preliminary Design	Preliminary Design	Preliminary Design	Preliminary Design	
Construction Duration (years)	2	0.134615385	0.076923077	0.326923077	0.134615385	0.134615385	
Interest Rate	4.2%	4.2%	4.2%	4.2%	4.2%	4.2%	
Life Cycle Analysis Period (years)	25	25	25	25	25	25	

Estimate Description	**Total**	**Total**	**Total**	**Total**	**Total**	**Total**	**Separation and Basins Total**
Contractor's Base Costs	$ 9,171,000	$ 227,000	$ 76,000	$ 944,000	$ 199,000	$ 645,000	$ 11,262,000
Contractor's On-Site General Conditions							
Contractor's Overhead	$ 917,000	$ 23,000	$ 8,000	$ 94,000	$ 20,000	$ 64,000	$ 1,126,000
Contractor's Profit	$ 459,000	$ 11,000	$ 4,000	$ 47,000	$ 10,000	$ 32,000	$ 563,000
Base Construction Cost	**$ 10,550,000**	**$ 260,000**	**$ 90,000**	**$ 1,090,000**	**$ 230,000**	**$ 740,000**	**$ 12,960,000**
Design Contingency	$ 2,109,000	$ 52,000	$ 18,000	$ 217,000	$ 46,000	$ 148,000	$ 2,590,000
Bonding	$ 127,000	$ 3,000	$ 1,000	$ 13,000	$ 3,000	$ 9,000	$ 156,000
Insurance	$ 127,000	$ 3,000	$ 1,000	$ 13,000	$ 3,000	$ 9,000	$ 156,000
Total Construction Cost	**$ 12,913,000**	**$ 318,000**	**$ 110,000**	**$ 1,333,000**	**$ 282,000**	**$ 906,000**	**$ 15,862,000**
Real Estate Costs	$ 2,419,000	$ -	$ -	$ -	$ -	$ -	$ 2,419,000
Administration Costs	$ 1,097,000	$ 42,000	$ 19,000	$ 77,000	$ 38,000	$ 91,000	$ 1,364,000
Project Contingency	$ 1,041,000	$ 32,000	$ 11,000	$ 133,000	$ 28,000	$ 91,000	$ 1,336,000
Construction Interest	$ 542,000	$ 1,000	$ -	$ 9,000	$ 1,000	$ 3,000	$ 556,000
Miscellaneous	$ 146,000	$ 37,000	$ 25,000	$ 63,000	$ 35,000	$ 54,000	$ 360,000
Field Engineering & Inspection	$ 452,000	$ 11,000	$ 6,000	$ 34,000	$ 11,000	$ 11,000	$ 525,000
Design & Eng. Services	$ 883,000	$ 59,000	$ 26,000	$ 167,000	$ 53,000	$ 126,000	$ 1,314,000
Planning & Preliminary Design	$ 505,000	$ 49,000	$ 25,000	$ 121,000	$ 45,000	$ 95,000	$ 840,000
Capital Cost	**$ 19,998,000**	**$ 549,000**	**$ 222,000**	**$ 1,937,000**	**$ 493,000**	**$ 1,377,000**	**$ 24,576,000**
Present Worth of Residual Value of Capital Cost	$ (5,429,000)	$ (99,000)	$ (39,000)	$ (345,000)	$ (88,000)	$ (246,000)	$ (6,246,000)
Present Worth of Equipment Replacement	$ -	$ 14,000	$ 5,000	$ 48,000	$ 12,000	$ 34,000	$ 113,000
Present Worth of Annual O&M	$ 303,000	$ 47,000	$ 46,000	$ 49,000	$ 46,000	$ 42,000	$ 533,000
Life Cycle Cost	**$ 15,122,000**	**$ 511,000**	**$ 234,000**	**$ 1,689,000**	**$ 463,000**	**$ 1,207,000**	**$ 19,226,000**

Notes: 1. For Kings Run (Wooden Shoe) cost summary above, cost for stream restoration is included in Stream Separation and Basins (11243140). In internal schedule, stream restoration is included with Phase 2 11243141.

Former Basin 4 was removed from scope of project during the study. Construction cost was adjusted for the Separation and Basins phase to factor in that change. Kings Run (Wooden Shoe) project contains 4 ponds.

2.

Kings Run Revised Original LMCPR (CSOs 483 and 217)
All Costs in 2006 Dollars

Estimate Variables	CSO 217 Tank (11243141) [1] At CSO 217	Kings Run (Wooden Shoe) Total
Project Stage	Conceptual Planning	
Construction Duration (years)	2	
Interest Rate	4.2%	
Life Cycle Analysis Period (years)	25	

Estimate Description	Total	Kings Run (Wooden Shoe) Total
Contractor's Base Costs	$ 4,441,000	$ 15,703,000
Contractor's On-Site General Conditions		
Contractor's Overhead	$ 444,000	$ 1,570,000
Contractor's Profit	$ 222,000	$ 785,000
Base Construction Cost	**$ 5,110,000**	**$ 18,070,000**
Design Contingency	$ 1,788,000	$ 4,378,000
Bonding	$ 69,000	$ 225,000
Insurance	$ 69,000	$ 225,000
Total Construction Cost	**$ 7,036,000**	**$ 22,898,000**
Real Estate Costs	$ 396,000	$ 2,815,000
Administration Costs	$ 285,000	$ 1,649,000
Project Contingency	$ 703,000	$ 2,039,000
Construction Interest	$ 295,000	$ 851,000
Miscellaneous	$ 166,000	$ 526,000
Field Engineering & Inspection	$ 342,000	$ 867,000
Design & Eng. Services	$ 639,000	$ 1,953,000
Planning & Preliminary Design	$ 412,000	$ 1,252,000
Capital Cost	**$ 10,274,000**	**$ 34,850,000**
Present Worth of Residual Value of Capital Cost	$ (1,968,000)	$ (8,214,000)
Present Worth of Equipment Replacement	$ 899,000	$ 1,012,000
Present Worth of Annual O&M	$ 410,000	$ 943,000
Life Cycle Cost	**$ 9,615,000**	**$ 28,841,000**

Notes: 1. For Kings Run (Wooden Shoe) cost summary above
Former Basin 4 was removed from scope of project

2.

West Fork Revised Original LMCPR (CSO 125, 127, and 128)
All Costs in 2006 Dollars

	CSO 125 Separation and Detention (10240018)				CSO 127/CSO 128 Separation Project (11243840)			West Fork Total
Estimate Variables	**Separation**	**North Basin**	**Martha Basin**		**CSO 127**	**CSO 128**		
Project Stage	60% Design	60% Design	60% Design		Preliminary Design	Preliminary Design		
Construction Duration (years)	0.9	0.423076923	0.326923077		1	1		
Interest Rate	4.2%	4.2%	4.2%		4.2%	4.2%		
Life Cycle Analysis Period (years)	25	25	25		25	25		

Estimate Description	Total	Total	Total	CSO 125 Total	Total	Total	CSO 127 & 128	West Fork Total
Contractor's Base Costs Contractor's On-Site General Conditions	$ 3,772,000	$ 2,037,000	$ 355,000	$ 6,164,000	$ 58,000	$ 132,000	$ 190,000	$ 6,354,000
Contractor's Overhead	$ 377,000	$ 204,000	$ 36,000	$ 617,000	$ 6,000	$ 13,000	$ 19,000	$ 636,000
Contractor's Profit	$ 189,000	$ 102,000	$ 18,000	$ 309,000	$ 3,000	$ 7,000	$ 10,000	$ 319,000
Base Construction Cost	**$ 4,340,000**	**$ 2,340,000**	**$ 410,000**	**$ 7,090,000**	**$ 70,000**	**$ 150,000**	**$ 220,000**	**$ 7,310,000**
Design Contingency	$ 434,000	$ 234,000	$ 41,000	$ 709,000	$ 13,000	$ 30,000	$ 43,000	$ 752,000
Bonding	$ 48,000	$ 26,000	$ 4,000	$ 78,000	$ 1,000	$ 2,000	$ 3,000	$ 81,000
Insurance	$ 48,000	$ 26,000	$ 4,000	$ 78,000	$ 1,000	$ 2,000	$ 3,000	$ 81,000
Total Construction Cost	**$ 4,870,000**	**$ 2,626,000**	**$ 459,000**	**$ 7,955,000**	**$ 85,000**	**$ 184,000**	**$ 269,000**	**$ 8,224,000**
Real Estate Costs	$ 1,457,000	$ -	$ -	$ 1,457,000	$ 11,000	$ -	$ 11,000	$ 1,468,000
Administration Costs	$ 414,000	$ 124,000	$ 55,000	$ 593,000	$ 7,000	$ 16,000	$ 23,000	$ 616,000
Project Contingency	$ 487,000	$ 263,000	$ 46,000	$ 796,000	$ 8,000	$ 19,000	$ 27,000	$ 823,000
Construction Interest	$ 92,000	$ 23,000	$ 3,000	$ 118,000	$ 2,000	$ 4,000	$ 6,000	$ 124,000
Miscellaneous	$ 102,000	$ 81,000	$ 42,000	$ 225,000	$ 22,000	$ 30,000	$ 52,000	$ 277,000
Field Engineering & Inspection	$ 170,000	$ 46,000	$ 34,000	$ 250,000	$ 3,000	$ 6,000	$ 9,000	$ 259,000
Design & Eng. Services	$ 432,000	$ 275,000	$ 77,000	$ 784,000	$ 22,000	$ 39,000	$ 61,000	$ 845,000
Planning & Preliminary Design	$ 274,000	$ 186,000	$ 62,000	$ 522,000	$ 21,000	$ 35,000	$ 56,000	$ 578,000
Capital Cost	**$ 8,298,000**	**$ 3,624,000**	**$ 778,000**	**$ 12,700,000**	**$ 181,000**	**$ 333,000**	**$ 514,000**	**$ 13,214,000**
Present Worth of Residual Value of Capital Cost	$ (2,224,000)	$ (648,000)	$ (139,000)	$ (3,011,000)	$ (48,000)	$ (90,000)	$ (138,000)	$ (3,149,000)
Present Worth of Equipment Replacement	$ -	$ 89,000	$ 19,000	$ 108,000	$ -	$ -	$ -	$ 108,000
Present Worth of Annual O&M	$ 141,000	$ 48,000	$ 48,000	$ 237,000	$ 5,000	$ 4,000	$ 9,000	$ 246,000
Life Cycle Cost	**$ 6,215,000**	**$ 3,113,000**	**$ 706,000**	**$ 10,034,000**	**$ 138,000**	**$ 247,000**	**$ 385,000**	**$ 10,419,000**
Present Worth of Additional Annual O&M	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Revised Life Cycle Cost	**$ 6,215,000**	**$ 3,113,000**	**$ 706,000**	**$ 10,034,000**	**$ 138,000**	**$ 247,000**	**$ 385,000**	**$ 10,419,000**

Note: There is no construction specifically on the West Fork grates in the West Fork Branch channel. The anticipated benefit at the grates is due to the reduction in surcharging of the interceptor from the projects above.

Bloody Run Revised Original LMCPR (CSO 181)
All Costs in 2006 Dollars

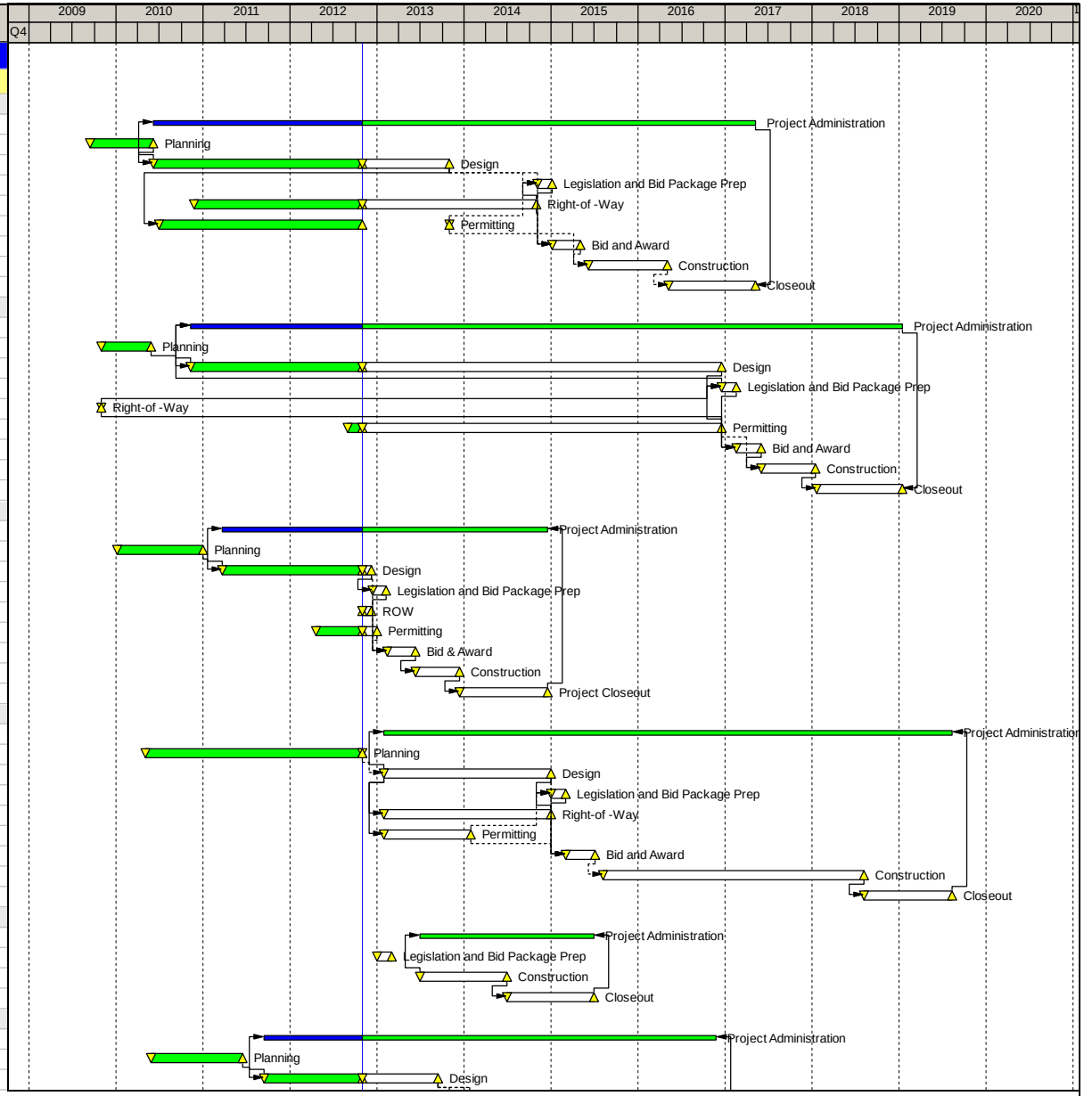
Estimate Variables	Bloody Run RTC (11240020)
Project Stage	Preliminary Design
Construction Duration (years)	0.307692308
Interest Rate	4.2%
Life Cycle Analysis Period (years)	25

Estimate Description	Total
Contractor's Base Costs	$ 1,786,000
Contractor's On-Site General Conditions	
Contractor's Overhead	$ 179,000
Contractor's Profit	$ 89,000
Base Construction Cost	**$ 2,050,000**
Design Contingency	$ 411,000
Bonding	$ 25,000
Insurance	$ 25,000
Total Construction Cost	**$ 2,511,000**
Real Estate Costs	$ -
Administration Costs	$ 214,000
Project Contingency	$ 251,000
Construction Interest	$ 16,000
Miscellaneous	$ 80,000
Field Engineering & Inspection	$ 88,000
Design & Eng. Services	$ 266,000
Planning & Preliminary Design	$ 181,000
Capital Cost	**$ 3,607,000**
Present Worth of Residual Value of Capital Cost	$ (968,000)
Present Worth of Equipment Replacement	$ -
Present Worth of Annual O&M	$ -
Life Cycle Cost	**$ 2,639,000**
Present Worth of Additional Annual O&M	$ -
Revised Life Cycle Cost	**$ 2,639,000**

Appendix E

Schedule Summaries

Activity ID	Activity Name	Orig Dur	Rem Dur	Start	Finish
WBS: AM-MS09.SP Environmental Program Management Projects					
WBS: AM-MS09.SP.10240018 10240018 CSO 125 Stream Separation					
10240018.00	Project Administration	1586	1647	08-Jun-10 A	05-May-17
10240018.100	Planning	187	0	14-Sep-09 A	07-Jun-10 A
10240018.206	Design	629	255	08-Jun-10 A	31-Oct-13
10240018.296	Legislation and Bid Package Prep	43	43	03-Nov-14	05-Jan-15
10240018.300	Right-of -Way	510	510	24-Nov-10 A	31-Oct-14
10240018.400	Permitting	615	0	28-Jun-10 A	01-Nov-13
10240018.500	Bid and Award	86	86	06-Jan-15	05-May-15
10240018.600	Construction	233	233	05-Jun-15	04-May-16
10240018.700	Closeout	255	255	05-May-16	05-May-17
WBS: AM-MS09.SP.10240021 10240021 CSO 483 Stream Separation - Winton Road Rehab					
10240021.00	Project Administration	761	2267	12-Nov-10 A	15-Jan-19
10240021.100	Planning	147	0	02-Nov-09 A	28-May-10 A
10240021.206	Design	911	1051	12-Nov-10 A	15-Dec-16
10240021.296	Legislation and Bid Package Prep	43	43	16-Dec-16	16-Feb-17
10240021.300	Right-of -Way	368	0	02-Nov-09 A	02-Nov-09 A
10240021.400	Permitting	16	1051	28-Aug-12 A	15-Dec-16
10240021.500	Bid and Award	73	73	17-Feb-17	31-May-17
10240021.600	Construction	158	158	01-Jun-17	15-Jan-18
10240021.700	Closeout	255	255	16-Jan-18	15-Jan-19
WBS: AM-MS09.SP.11040010 11040010 Rapid Run Park Early Success Project					
11040010.00	Project Administration	0	540	21-Mar-11 A	15-Dec-14
11040010.100	Planning	253	0	04-Jan-10 A	30-Dec-10 A
11040010.206	Design	287	26	21-Mar-11 A	07-Dec-12
11040010.296	Legislation and Bid Package Prep	43	43	10-Dec-12	08-Feb-13
11040010.300	ROW	0	26	01-Nov-12 A	07-Dec-12
11040010.400	Permitting	22	41	20-Apr-12 A	31-Dec-12
11040010.500	Bid & Award	86	86	11-Feb-13	11-Jun-13
11040010.600	Construction	129	129	12-Jun-13	12-Dec-13
11040010.700	Project Closeout	256	256	13-Dec-13	15-Dec-14
WBS: AM-MS09.SP.11240000 11240000 Lick Run Valley Conveyance					
11240000.00	Project Administration	1664	1664	30-Jan-13	08-Aug-19
11240000.100	Planning	488	0	03-May-10 A	01-Nov-12
11240000.206	Design	490	490	30-Jan-13	31-Dec-14
11240000.296	Legislation and Bid Package Prep	43	43	02-Jan-15	03-Mar-15
11240000.300	Right-of -Way	490	490	30-Jan-13	31-Dec-14
11240000.400	Permitting	254	254	30-Jan-13	28-Jan-14
11240000.500	Bid and Award	86	86	04-Mar-15	02-Jul-15
11240000.600	Construction	765	765	05-Aug-15	03-Aug-18
11240000.700	Closeout	258	258	06-Aug-18	08-Aug-19
WBS: AM-MS09.SP.11240001 11240001 Lick Run Property Demolitions					
11240001.00	Project Administration	510	510	01-Jul-13	30-Jun-15
11240001.296	Legislation and Bid Package Prep	43	43	02-Jan-13*	01-Mar-13
11240001.600	Construction	255	255	01-Jul-13*	30-Jun-14
11240001.700	Closeout	255	255	01-Jul-14	30-Jun-15
WBS: AM-MS09.SP.11240010 11240010 Sunset Avenue, Sunset Lane and Rapid Run Pike					
11240010.00	Project Administration	955	1484	14-Sep-11 A	23-Nov-16
11240010.100	Planning	268	0	28-May-10 A	17-Jun-11 A
11240010.206	Design	509	219	14-Sep-11 A	11-Sep-13



Revised Original LMCPR - Internal Schedule

November 28, 2012

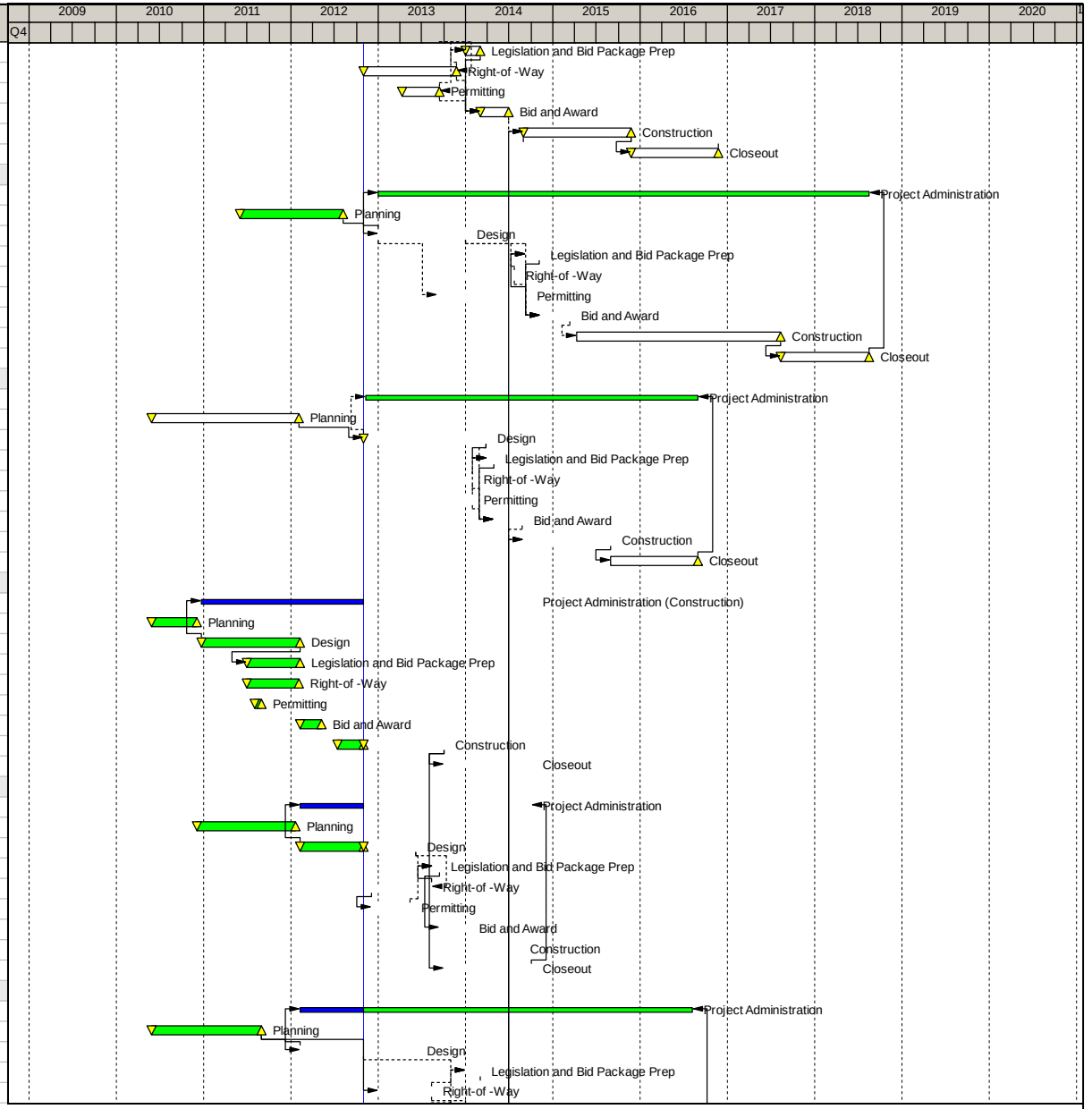
Remaining Level of Effort
Actual Level of Effort
Actual Work
Remaining Work
Milestone

Data Date: 01-Nov-12

Run Date: 28-Nov-12

Note: These schedules are not Milestones deadline dates for purposes of the WWIP or Consent Decrees.

Activity ID	Activity Name	Orig Dur	Rem Dur	Start	Finish
11240010.296	Legislation and Bid Package Prep	43	43	02-Jan-14*	03-Mar-14
11240010.300	Right-of -Way	271	271	01-Nov-12	22-Nov-13
11240010.400	Permitting	108	108	10-Apr-13	11-Sep-13
11240010.500	Bid and Award	83	83	04-Mar-14	27-Jun-14
11240010.600	Construction	316	316	29-Aug-14	24-Nov-15
11240010.700	Closeout	255	255	25-Nov-15	23-Nov-16
WBS: AM-MS09.SP.11240020 11240020 CSO 181 - RTC					
11240020.00	Project Administration	1432	1432	02-Jan-13	13-Aug-18
11240020.100	Planning	235	0	01-Jun-11 A	07-Aug-12 A
11240020.206	Design	255	255	02-Jan-13	31-Dec-13
11240020.296	Legislation and Bid Package Prep	43	43	09-Sep-14	06-Nov-14
11240020.300	Right-of -Way	226	226	04-Sep-13	23-Jul-14
11240020.400	Permitting	258	258	04-Sep-13	08-Sep-14
11240020.500	Bid and Award	86	86	07-Nov-14	11-Mar-15
11240020.600	Construction	594	594	10-Apr-15	08-Aug-17
11240020.700	Closeout	258	258	09-Aug-17	13-Aug-18
WBS: AM-MS09.SP.11240030 11240030 Wyoming & Minion Avenues Sewer Separation					
11240030.00	Project Administration	1390	1390	09-Nov-12	29-Aug-16
11240030.100	Planning	426	0	28-May-10 A	01-Feb-12 A
11240030.206	Design	358	358	09-Nov-12 A	28-Mar-14
11240030.296	Legislation and Bid Package Prep	22	22	31-Mar-14	29-Apr-14
11240030.300	Right-of -Way	157	157	19-Jun-13	30-Jan-14
11240030.400	Permitting	157	157	19-Jun-13	30-Jan-14
11240030.500	Bid and Award	83	83	30-Apr-14	26-Aug-14
11240030.600	Construction	255	255	29-Aug-14	28-Aug-15
11240030.700	Closeout	255	255	31-Aug-15	29-Aug-16
WBS: AM-MS09.SP.11240050 11240050 Harrison Avenue Sewer Separation - Phase 1					
11240050.00	Project Administration (Constructi	592	487	20-Dec-10 A	30-Sep-14
11240050.100	Planning	130	0	28-May-10 A	01-Dec-10 A
11240050.206	Design	288	0	20-Dec-10 A	06-Feb-12 A
11240050.296	Legislation and Bid Package Prep	189	0	01-Jul-11 A	06-Feb-12 A
11240050.300	Right-of -Way	148	0	01-Jul-11 A	01-Feb-12 A
11240050.400	Permitting	23	0	01-Aug-11 A	01-Sep-11 A
11240050.500	Bid and Award	81	0	07-Feb-12 A	07-May-12 A
11240050.600	Construction	318	232	15-Jul-12 A	30-Sep-13
11240050.700	Closeout	255	255	01-Oct-13	30-Sep-14
WBS: AM-MS09.SP.11240051 11240051 Harrison Avenue Sewer Separation - Phase 2					
11240051.00	Project Administration	592	487	07-Feb-12 A	30-Sep-14
11240051.100	Planning	289	0	01-Dec-10 A	20-Jan-12 A
11240051.206	Design	338	149	07-Feb-12 A	03-Jun-13
11240051.296	Legislation and Bid Package Prep	22	22	13-Aug-13	12-Sep-13
11240051.300	Right-of -Way	177	177	03-Dec-12	12-Aug-13
11240051.400	Permitting	114	114	03-Dec-12	13-May-13
11240051.500	Bid and Award	83	83	13-Sep-13	10-Jan-14
11240051.600	Construction	128	128	11-Feb-14	11-Aug-14
11240051.700	Closeout	255	255	01-Oct-13	30-Sep-14
WBS: AM-MS09.SP.11240090 11240090 White St Sewer Separation					
11240090.00	Project Administration	885	1373	07-Feb-12 A	04-Aug-16
11240090.100	Planning	321	0	28-May-10 A	01-Sep-11 A
11240090.206	Design	347	152	07-Feb-12 A	06-Jun-13
11240090.296	Legislation and Bid Package Prep	43	43	02-Jan-14*	03-Mar-14
11240090.300	Right-of -Way	157	157	02-Jan-13	12-Aug-13



Revised Original LMCPR - Internal Schedule

November 28, 2012

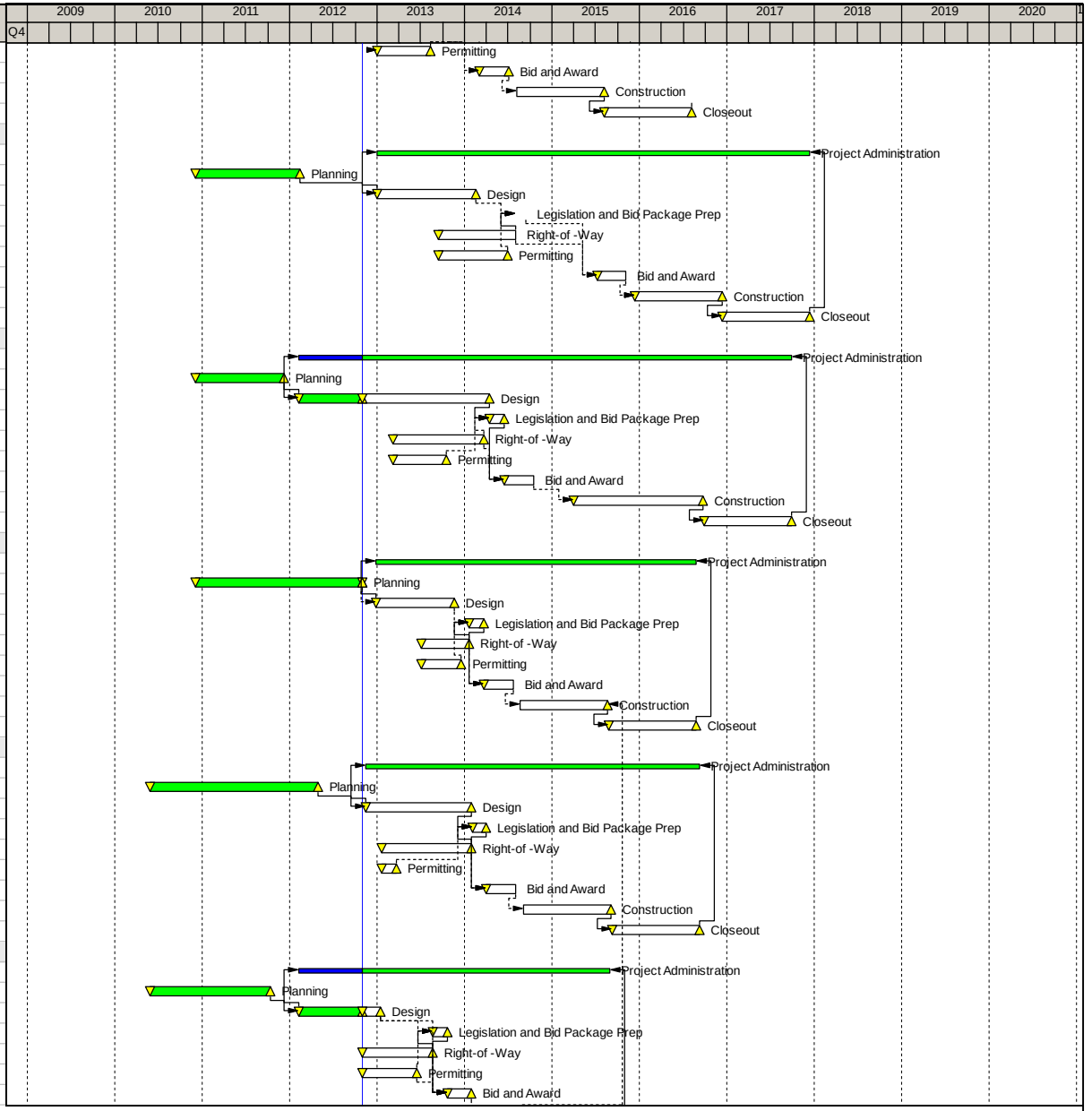
Remaining Level of Effort
Actual Level of Effort
Actual Work
Remaining Work
Milestone

Data Date: 01-Nov-12

Run Date: 28-Nov-12

Note: These schedules are not Milestones deadline dates for purposes of the WWIP or Consent Decrees.

Activity ID	Activity Name	Orig Dur	Rem Dur	Start	Finish
11240090.400	Permitting	157	157	02-Jan-13	12-Aug-13
11240090.500	Bid and Award	86	86	04-Mar-14	02-Jul-14
11240090.600	Construction	255	255	04-Aug-14	04-Aug-15
11240090.700	Closeout	255	255	05-Aug-15	04-Aug-16
WBS: AM-MS09.SP.11240110 11240110 Quebec Rd Sewer Separation					
11240110.00	Project Administration	1805	1805	02-Jan-13	11-Dec-17
11240110.100	Planning	318	0	01-Dec-10 A	14-Feb-12 A
11240110.206	Design	287	287	02-Jan-13	14-Feb-14
11240110.296	Legislation and Bid Package Prep	30	30	31-Jul-14	11-Sep-14
11240110.300	Right-of -Way	225	225	12-Sep-13	30-Jul-14
11240110.400	Permitting	204	204	12-Sep-13	30-Jun-14
11240110.500	Bid and Award	86	86	09-Jul-15	06-Nov-15
11240110.600	Construction	256	256	10-Dec-15	09-Dec-16
11240110.700	Closeout	254	254	13-Dec-16	11-Dec-17
WBS: AM-MS09.SP.11240130 11240130 Queen City Ave Sewer Separation - Phase 2					
11240130.00	Project Administration	1156	1791	06-Feb-12 A	26-Sep-17
11240130.100	Planning	259	0	01-Dec-10 A	07-Dec-11 A
11240130.206	Design	560	370	06-Feb-12 A	15-Apr-14
11240130.296	Legislation and Bid Package Prep	43	43	16-Apr-14	16-Jun-14
11240130.300	Right-of -Way	268	268	05-Mar-13	21-Mar-14
11240130.400	Permitting	157	157	05-Mar-13	14-Oct-13
11240130.500	Bid and Award	86	86	17-Jun-14	16-Oct-14
11240130.600	Construction	379	379	01-Apr-15	23-Sep-16
11240130.700	Closeout	255	255	27-Sep-16	26-Sep-17
WBS: AM-MS09.SP.11240150 11240150 Queen City & Cora Avenues R/W Sewer Separatic					
11240150.00	Project Administration	1334	1334	28-Dec-12	22-Aug-16
11240150.100	Planning	361	0	01-Dec-10 A	01-Nov-12
11240150.206	Design	228	228	28-Dec-12*	18-Nov-13
11240150.296	Legislation and Bid Package Prep	43	43	20-Jan-14*	19-Mar-14
11240150.300	Right-of -Way	139	139	02-Jul-13	17-Jan-14
11240150.400	Permitting	119	119	02-Jul-13	18-Dec-13
11240150.500	Bid and Award	86	86	20-Mar-14	21-Jul-14
11240150.600	Construction	255	255	21-Aug-14*	20-Aug-15
11240150.700	Closeout	255	255	24-Aug-15	22-Aug-16
WBS: AM-MS09.SP.11240170 11240170 Quebec Heights Sewer Separation					
11240170.00	Project Administration	1392	1392	15-Nov-12	06-Sep-16
11240170.100	Planning	490	0	28-May-10 A	30-Apr-12 A
11240170.206	Design	307	307	15-Nov-12*	30-Jan-14
11240170.296	Legislation and Bid Package Prep	43	43	31-Jan-14*	01-Apr-14
11240170.300	Right-of -Way	263	263	21-Jan-13	30-Jan-14
11240170.400	Permitting	44	44	21-Jan-13	21-Mar-13
11240170.500	Bid and Award	86	86	02-Apr-14	01-Aug-14
11240170.600	Construction	256	256	04-Sep-14	03-Sep-15
11240170.700	Closeout	255	255	08-Sep-15	06-Sep-16
WBS: AM-MS09.SP.11240270 11240270 Queen City Ave Sewer Separation - Phase 1					
11240270.00	Project Administration	705	1034	06-Feb-12 A	31-Aug-15
11240270.100	Planning	351	0	28-May-10 A	14-Oct-11 A
11240270.206	Design	289	50	06-Feb-12 A	14-Jan-13
11240270.296	Legislation and Bid Package Prep	43	43	21-Aug-13	21-Oct-13
11240270.300	Right-of -Way	204	204	01-Nov-12	20-Aug-13
11240270.400	Permitting	157	157	01-Nov-12	13-Jun-13
11240270.500	Bid and Award	70	70	22-Oct-13	30-Jan-14



Revised Original LMCPR - Internal Schedule

November 28, 2012

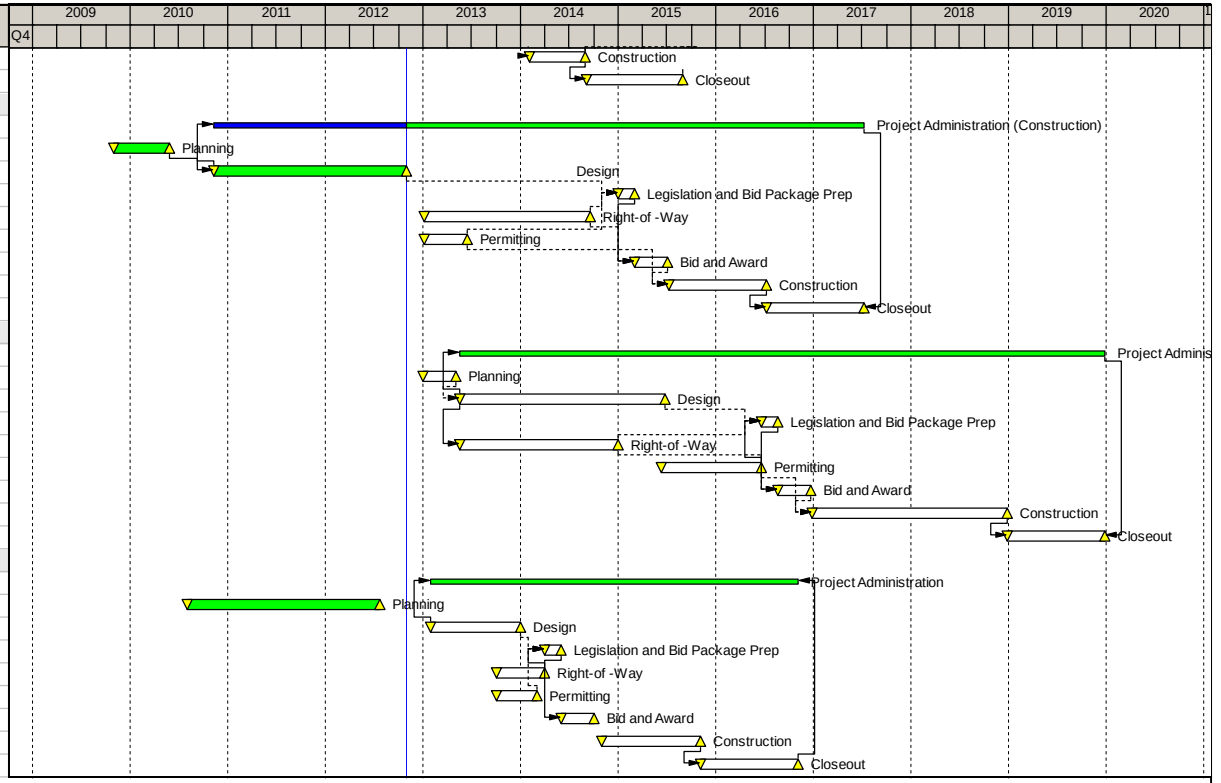
Remaining Level of Effort
Actual Level of Effort
Actual Work
Remaining Work
Milestone

Data Date: 01-Nov-12

Run Date: 28-Nov-12

Note: These schedules are not Milestones deadline dates for purposes of the WWIP or Consent Decrees.

Activity ID	Activity Name	Orig Dur	Rem Dur	Start	Finish
11240270.600	Construction	148	148	31-Jan-14	28-Aug-14
11240270.700	Closeout	255	255	02-Sep-14	31-Aug-15
WBS: AM-MS09.SP.11243140 11243140 CSO 217/483 Sewer Separation - Phase 1					
11243140.00	Project Administration (Constructi	0	1710	12-Nov-10 A	07-Jul-17
11243140.100	Planning	147	0	02-Nov-09 A	28-May-10 A
11243140.206	Design	911	409	12-Nov-10 A	10-Jun-14
11243140.296	Legislation and Bid Package Prep	43	43	02-Jan-15*	03-Mar-15
11243140.300	Right-of -Way	437	437	03-Jan-13*	18-Sep-14
11243140.400	Permitting	116	116	03-Jan-13	14-Jun-13
11243140.500	Bid and Award	86	86	04-Mar-15	02-Jul-15
11243140.600	Construction	255	255	09-Jul-15	07-Jul-16
11243140.700	Closeout	255	255	08-Jul-16	07-Jul-17
WBS: AM-MS09.SP.11243141 11243141 CSO 217/483 Sewer Separation - Phase 2					
11243141.00	Project Administration	2416	2416	16-May-13	26-Dec-19
11243141.100	Planning	86	86	02-Jan-13*	01-May-13
11243141.206	Design	536	536	16-May-13	23-Jun-15
11243141.296	Legislation and Bid Package Prep	43	43	20-Jun-16	18-Aug-16
11243141.300	Right-of -Way	414	414	16-May-13	31-Dec-14
11243141.400	Permitting	260	260	12-Jun-15	17-Jun-16
11243141.500	Bid and Award	86	86	19-Aug-16	20-Dec-16
11243141.600	Construction	510	510	27-Dec-16	26-Dec-18
11243141.700	Closeout	255	255	27-Dec-18	26-Dec-19
WBS: AM-MS09.SP.11243840 11243840 CSO 127/128 Stream Seperation					
11243840.00	Project Administration	962	962	30-Jan-13	04-Nov-16
11243840.100	Planning	421	0	02-Aug-10 A	24-Jul-12 A
11243840.206	Design	235	235	30-Jan-13*	31-Dec-13
11243840.296	Legislation and Bid Package Prep	43	43	01-Apr-14*	30-May-14
11243840.300	Right-of -Way	126	126	02-Oct-13	31-Mar-14
11243840.400	Permitting	104	104	02-Oct-13	28-Feb-14
11243840.500	Bid and Award	86	86	02-Jun-14	01-Oct-14
11243840.600	Construction	255	255	31-Oct-14	02-Nov-15
11243840.700	Closeout	258	258	02-Nov-15	04-Nov-16



Revised Original LMCPR - Internal Schedule

November 28, 2012

Remaining Level of Effort
Actual Level of Effort
Actual Work
Remaining Work
Milestone

Data Date: 01-Nov-12

Run Date: 28-Nov-12

Note: These schedules are not Milestones deadline dates for purposes of the WWIP or Consent Decrees.

Appendix F

Anticipated Maintenance Schedule

Anticipated Maintenance Schedule for Revised Original LMCPR
Updated: 2012-12-17
2012 Dollars

Item	Frequency	Anticipated O&M Cost (2012$/yr)	Maintenance Comment	Type of Maintenance	Owner of Infrastructure	Method of Ownership or Permanent Access	Anticipated Responsible Organization for O&M [1]	Anticipated Agreement for O&M [1]
Lick Run Valley Conveyance System								
Asphaltic Concrete Pavement	Bi-Annually	$6,500	Crack and/or repalcement patching spring and fall on 5% of total/yr; 5% of total (57,000 sf)/yr = 3000 sf	Access	County/MSD	Parcel	CDOTE	MOU
Seed & Mulch Restoration	Bi-Annually	$25,200	Mulching and spring/fall cleanup	Living System	County/MSD	Parcel	CPB	MOU
Riparian Edge Planting	Weekly/ 9 months	$49,900	Weeding, plant dead-heading, and litter pick-up	Living System	County/MSD	Parcel	CPB	MOU
Retaining Walls (CIP and Gravity)	Bi-Annually	$5,200	Graffiti Control on 5% of vsf/yr; 5% of 73,000 vsf of wall=3,650 vsf/yr	Community	County/MSD	Parcel	CPB	MOU
Safety Fencing	Annually	$2,600	Painting of metal fencing at 20%/year interval and 50'/mh for prep and 100'/mh for painting; 6,200 lf total= 1,200'/yr	Safety	County/MSD	Parcel	MSD	--
CIP Elevated Slabs - Box Conduit	Annually	$8,100	5,600 lf of box conduit conveyance	Hard System	County/MSD	Parcel	MSD	--
Low Flow Channel - Limestone Walls	Weekly/ 9 months	$12,500	Trash pick up and repairs	Hard System	County/MSD	Parcel	MSD	--
Low Flow Channel Inlet Connections w/ Box Conduit	Weekly/ Bi-Annually	$3,500	Inspection, Replacement of one inlet grate and cleaning of all grates	Hard System	County/MSD	Parcel	MSD	--
Recirculation/Aeration Pumping Station, Force Main and aeration features	Weekly	$30,200	Labor hours (208/yr for PS); power costs based 18hrs/day @ 9 months/yr, at 2000 gpm with 56 TDH	Hard System	County/MSD	Parcel	MSD	--
Large Pond w/ Flood Plain Enhancement Area	Weekly	$19,000	1 visit/wk and 0.5 hrs/wet weather event with 60 wet weather events/yr. Dredge every 5 years.	Living System	County/MSD	Parcel	CPB	MOU
Forebay (Detention Basin 14)	Weekly	$18,000	1 visit/wk and 0.5 hrs/wet weather event with 60 wet weather events/yr. Dredge every 5 years.	Hard & Living System	County/MSD	Parcel	CPB	MOU
Irrigation	Monthly	$2,100	Flushing and repairs	Living System	County/MSD	Parcel	CPB	MOU
Planting Beds/Rain Gardens	Weekly	$42,200	Weeding, plant dead-heading and litter pick-up	Living System	County/MSD	Parcel	CPB	MOU
Meadow	Weekly	$14,500	Weed control & overseeding		County/MSD	Parcel	CPB	MOU
Flood Channel Lawn	Weekly	$43,600	Mowing, litter pick-up, one annual fertilization and one annual core aeration	Living System	County/MSD	Parcel	CPB	MOU
Upland Area Lawn	Weekly	$35,300	Mowing, litter pick-up, one annual fertilization and one annual core aeration	Living System	County/MSD	Parcel	CPB	MOU

Anticipated Maintenance Schedule for Revised Original LMCPR
Updated: 2012-12-17
2012 Dollars

Item	Frequency	Anticipated O&M Cost (2012$/yr)	Maintenance Comment	Type of Maintenance	Owner of Infrastructure	Method of Ownership or Permanent Access	Anticipated Responsible Organization for O&M [1]	Anticipated Agreement for O&M [1]
Trees	Weekly	$3,100	Spring, Summer, Fall pruning	Living System	County/MSD	Parcel	CPB	MOU
Top Soil Maintenance/Erosion Control	Weekly	$18,100	Erosion control/soil maintenance	Living System	County/MSD	Parcel	CPB	MOU
Porous Pavement	Quarterly	$4,000	Vacuum 39,620 sf; $500/ half acre and 2-4 times/yr	Living System	County/MSD	Parcel	CPB	MOU
Brick/Stone Pavers	Annually	$5,800	Reset 2%/yr of 24,000 sf= 480 sf @ $12/sf	Access	County/MSD	Parcel	CPB	MOU
Lighting	Monthly	$12,600	Changing bulbs & electric @ $72/pole/yr for 175 poles	Safety	County/MSD	Parcel	MSD	--
Railings	Weekly	$5,200	Minor repairs of railings, etc. (litter pick-up distributed among other items)	Safety	County/MSD	Parcel	MSD	--
Basketball Courts (Replacement - CRC)	Weekly	$0	Replacement of existing structure; CRC will continue maintenance.	Community	CRC	Parcel	CRC	--
Shelter (Replacement - CRC)	Weekly	$0	Replacement of existing structure; CRC will continue maintenance.	Community	CRC	Parcel	CRC	--
Playground (Replacement - CRC)	Monthly	$0	Replacement of existing structure; CRC will continue maintenance.	Community	CRC	Parcel	CRC	--
Outfall feature	Monthly	$4,100	Inspection/Cleaning, 6 hrs per month, Illicit program	Hard System	County/MSD	Parcel	MSD	--
Vehicle Bridges (6)	Annually	$0	Annual Inspection	Access	DOTE	ROW	DOTE	--
Pedestrian Bridges (2)	Annually	$300	Annual Inspection	Access	County/MSD	Parcel	DOTE	MOU
Subtotal Lick Run Valley Conveyance Channel		$371,600						
Lick Run Sewer Separation								
New storm or combined pipes	Annually	$84,000	Per MSD/SMU standards	Hard System	County/MSD	Parcel or Easement or ROW	MSD	--
Structural BMP's (Vortechs Units)	Monthly	$18,600	4 Vortech Units, visited monthly, 2 people for 2 hrs/visit. Vactor truck.	Hard System	County/MSD	Parcel	MSD	--
Queen City Ave Phase 2 Basin 1	Weekly	$4,900	1 hr/wk and 0.5 hrs/wet weather event with 54 wet weather events/yr. Dredge every 5 years.	Living System	County/MSD	Easement	CPB	MOU
Queen City Ave Phase 2 Basin 2	Weekly	$5,000	1 hr/wk and 0.5 hrs/wet weather event with 57 wet weather events/yr. Dredge every 5 years.	Living System	County/MSD	Easement	CPB	MOU
Queen City & Cora Basin 7	Weekly	$5,400	1 hr/wk and 0.5 hrs/wet weather event with 56 wet weather events/yr. Dredge every 5 years.	Living System	County/MSD	Parcel	CPB	MOU
Queen City & Cora Basin 9	Weekly	$6,100	1 hr/wk and 0.5 hrs/wet weather event with 56 wet weather events/yr. Dredge every 5 years.	Living System	County/MSD	Parcel	CPB	MOU

Anticipated Maintenance Schedule for Revised Original LMCPR
Updated: 2012-12-17
2012 Dollars

Item	Frequency	Anticipated O&M Cost (2012$/yr)	Maintenance Comment	Type of Maintenance	Owner of Infrastructure	Method of Ownership or Permanent Access	Anticipated Responsible Organization for O&M [1]	Anticipated Agreement for O&M [1]
Queen City & Cora Basin 10	Weekly	$6,900	1 hr/wk and 0.5 hrs/wet weather event with 55 wet weather events/yr. Dredge every 5 years.	Living System	County/MSD	Parcel	CPB	MOU
Quebec Heights Basin 17 (Glenway)	Weekly	$5,400	1 hr/wk and 0.5 hrs/wet weather event with 55 wet weather events/yr. Dredge every 5 years.	Living System	CPB	Easement	CPB	MOU
Sunset Basin 21	Weekly	$4,700	1 hr/wk and 0.5 hrs/wet weather event with 45 wet weather events/yr. Dredge every 5 years.	Living System	County/MSD	Parcel	CPB	MOU
Rapid Run bioswale with minor infiltration basins	Monthly	$2,100	Inspection/Cleaning, 4 hrs/month	Living System	County/MSD	Easement	CPB	MOU
Queen City and Cora Restored Streams	Monthly	$2,100	Inspection/Cleaning, 4 hrs/month	Living System	County/MSD	Easement	CPB	MOU
Glenway Restored Streams	Monthly	$2,100	Inspection/Cleaning, 4 hrs/month	Living System	County/MSD	Easement	CPB	MOU
Subtotal Lick Run Sewer Separation		$147,300						
Kings Run (Wooden Shoe)								
New storm or combined pipes	Annually	$17,400	Per MSD/SMU standards	Hard System	County/MSD	Parcel or Easement or ROW	MSD	--
CSO 217 Storage Tank not including pumping	Weekly	$19,400	Tank - 8 hrs labor/week (416 per year) and 8 additional hours for each wet weather event (4)	Hard System	County/MSD	Parcel	MSD	--
CSO 217 Storage Pumping	Weekly	$9,600	Pumping - 4 hrs labor/week (208 per year). 5,574 kwh/yr	Hard System	County/MSD	Parcel	MSD	--
Pond 1 Detention Basin	Weekly	$5,300	1 hr/wk and 0.5 hrs/wet weather event with 54 wet weather events/yr. Dredge every 5 years.	Living System	County/MSD	Parcel	CPB	MOU
Pond 2 Detention Basin	Weekly	$4,700	1 hr/wk and 0.5 hrs/wet weather event with 51 wet weather events/yr. Dredge every 5 years.	Living System	County/MSD	Parcel	CPB	MOU
Pond 3 Detention Basin	Weekly	$8,500	1 hr/wk and 0.5 hrs/wet weather event with 61 wet weather events/yr. ODNR Class inspection cost included. Dredge every 5 years.	Living System	County/MSD	Parcel	CPB	MOU
Pond 4 Detention Basin (formerly Measure 15)	Weekly	$7,700	1 hr/wk and 0.5 hrs/wet weather event with 37 wet weather events/yr. Dredge every 5 years.	Living System	County/MSD	Parcel	CPB	MOU
GCWW Facility	Weekly	$2,300	Weeding, plant maintenance, 1 hr/wk	Living System	GCWW	Parcel	MSD Joint Maintenance	MOU

Anticipated Maintenance Schedule for Revised Original LMCPR
Updated: 2012-12-17
2012 Dollars

Item	Frequency	Anticipated O&M Cost (2012$/yr)	Maintenance Comment	Type of Maintenance	Owner of Infrastructure	Method of Ownership or Permanent Access	Anticipated Responsible Organization for O&M [1]	Anticipated Agreement for O&M [1]
Stormwater outfall	Monthly	$2,000	Inspection/Cleaning, 2 hrs per month, Illicit program	Hard System	County/MSD	Easement	MSD	--
Subtotal Kings Run (Wooden Shoe)		$76,900						
West Fork Separation and Detention								
New storm or combined pipes	Annually	$11,800	Per MSD/SMU standards	Hard System	County/MSD	Parcel or Easement or ROW	MSD	--
Trash removal headwall (CSO 128)	Monthly	$1,600	Assume 3 hours per month for 12 months for $39.57/hr - one worker for trash removal	Hard System	County/MSD	Parcel or Easement	MSD	--
Martha Basin	Weekly	$5,300	1 hr/wk and 0.5 hrs/wet weather event with 56 wet weather events/yr. Dredge every 5 years.	Living System	County/MSD	Parcel	CPB	MOU
North Basin	Weekly	$8,100	1 hr/wk and 0.5 hrs/wet weather event with 55 wet weather events/yr. Dredge every 5 years.	Living System	County/MSD	Parcel	CPB	MOU
Three stormwater outfalls	Monthly	$4,100	Inspection/Cleaning, 2 hrs per month, Illicit program	Hard System	County/MSD	Parcel or Easement or ROW	MSD	--
Subtotal West Fork Separation and Detention		$30,900						
Bloody Run Real Time Control								
RTC	Weekly	$20,000	Allowance provided for inspection, cleaning, telemetry monitoring.	Hard System	County/MSD	ROW	MSD	--
Subtotal Bloody Run Real Time Control		$20,000						
TOTAL LMCPR REVISED PLAN		**$646,700**						

Notes: 1. Or other entity consistent with Ohio law.

CPB	Cincinnati Parks Board
CDOTE	Cincinnati Department of Transportation & Engineering
CRC	Cincinnati Recreation Commission
GCWW	Greater Cincinnati Water Works
MSD	Metropolitan Sewer District of Greater Cincinnati
MOU	Memorandum of Understanding
ROW	Right-of-Way
SMU	Stormwater Management Utility - City of Cincinnati

Appendix G

LMCPR Community
Engagement Activities

Appendix G – LMCPR Community Engagement Activities

Tables

Figures

LMCPR Community Engagement Activities

In addition to the two formal public comment periods sponsored by MSD and Hamilton County, two town hall meetings sponsored by MSD, and the four public hearings sponsored by the County, MSD has performed extensive community engagement activities as described in this Appendix to the LMCPR Report. Additional detailed information regarding all facets of MSD's Community Outreach Program is included in MSD's *LMCPR Community Engagement Outreach Summary* dated December 2012.

The following is a detailed description of community outreach activities, most of which are ongoing, conducted by MSD to help inform and educate the public about potential solutions for substantially reducing the volume of CSOs into the Mill Creek by 2018.

Engagement with the community included the following tactics:

- Communities of the Future Advisory Committee
- Written and visual materials
- Project website
- Open houses/community design workshops
- Meetings with community groups
- Direct communications with the community
- Partnerships with the community
- Media relations

Figures 1, 2, and 3 depict the education, income, and diversity demographics of the Lower Mill Creek Watershed. The four watersheds where the Revised Original LMCPR projects will be constructed are outlined in a contrasting color: Lick Run, West Fork, Kings Run and Bloody Run.

Figure 1 Lower Mill Creek Demographics - Education

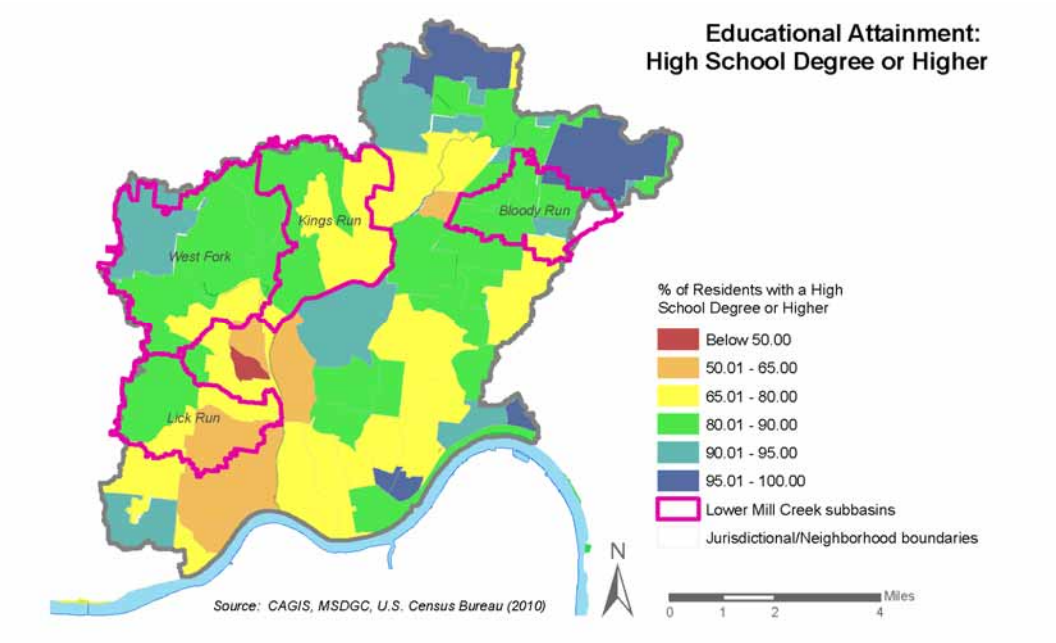


Figure 2 Lower Mill Creek Demographics - Income

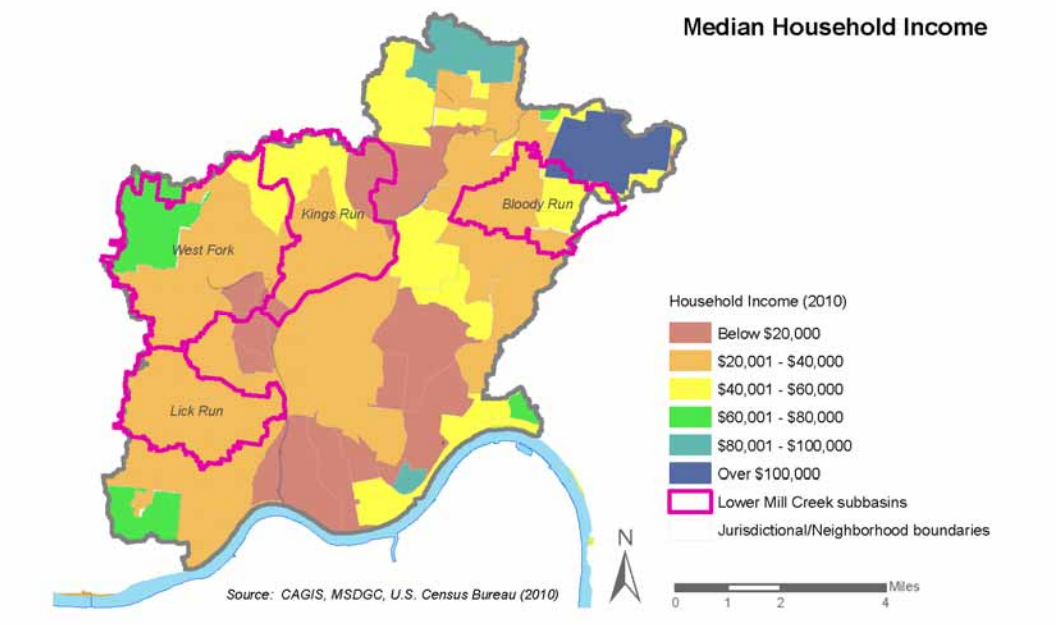
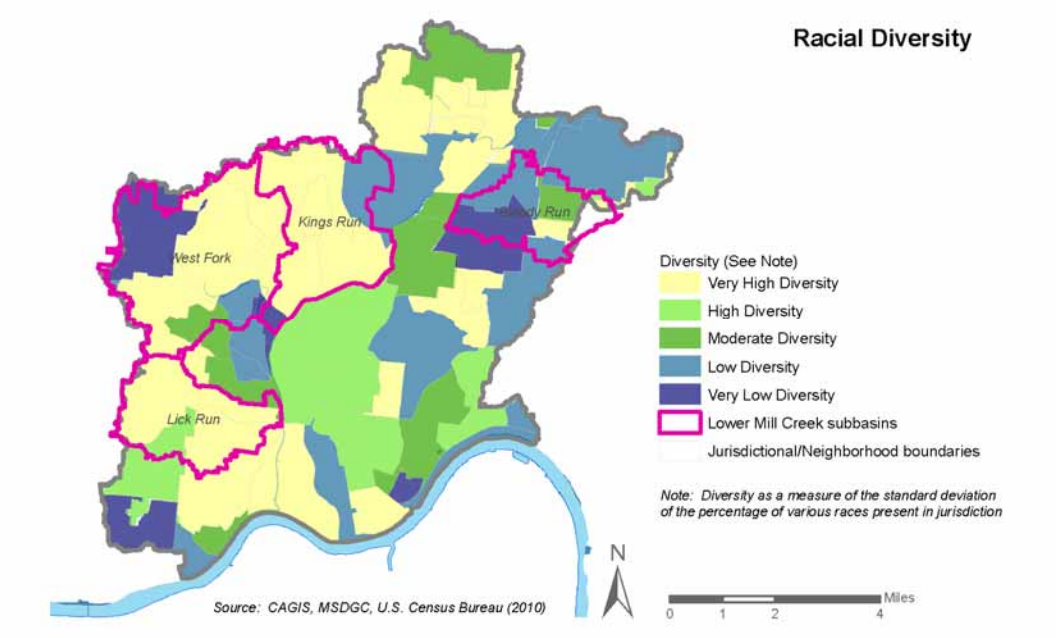


Figure 3 Lower Mill Creek Demographics – Diversity



1. Communities of the Future Advisory Committee (CFAC)

As part of Project Groundwork, MSD developed a concept called "Communities of the Future," which integrates sustainable sewer infrastructure improvements with urban renewal in areas that experience high volume or frequent CSOs. To assist and guide MSD with this vision, CFAC was created and convened in March 2010 as a forum for dialogue and counsel. The CFAC is comprised of about 100 people, including citizens and representatives from 40-plus public and private agencies, including government, non-profits, academia and Regulators. Each member shares ideas and perspectives on how MSD can effectively engage with the community, as well as influence policy changes to support economic development to be leveraged by sustainable infrastructure investments. CFAC meetings are planned, coordinated and scheduled by Hamilton County Regional Planning. Information about CFAC, including meeting schedule, meeting minutes and a membership list, are posted on the CFAC website at http://www.projectgroundwork.org/cfac.

2. Engagement Materials

To help increase public awareness of the LMCPR, MSD has developed numerous written and/or visual materials to communicate key messages and provide information about the LMCPR as a whole or more specific efforts or activities within sub-watersheds of Lower Mill Creek. Materials include but are not limited to:

- Videos: Project Groundwork video, Lick Run video
- Interactive Kiosk: Sustainable Watershed Evaluation Process
- Fact sheets: Project Groundwork, Lower Mill Creek, Lick Run, Kings Run, West Fork, Bloody Run, Enabled Impact Program, specific fact sheets on Enabled Impact Projects, etc.
- Brochures: Project Groundwork, Sustainability and Lick Run Community Design Workshops
- Meeting invitations to open houses, community design workshops, community "town halls"
- FAQs: Project Groundwork, LMCPR, and Lick Run
- Newsletter articles: open houses, community design workshops, community "town halls"
- Posters for public meetings
- Media advisories/press releases for public meetings
- Signage for Enabled Impact Projects
- 3D model of Lick Run Watershed

3. Project Website

MSD developed a dedicated website for Project Groundwork (*www.projectgroundwork.org*) in 2009 to provide an overview of the challenges in addressing sewer overflows and the solutions being considered to achieve compliance. MSD then began developing watershed-specific websites for Lower Mill Creek (www.projectgroundwork.org/lowermillcreek), Lick Run (www.projectgroundworkorg/lickrun), Kings Run (www.projectgroundworkorg/kingrun), West Fork (www.projectgroundworkorg/westfork), and Bloody Run (www.projectgroundworkorg/bloodyrun). The websites serve an important role in both keeping the community up to date on the LMCPR and in archiving extensive amounts of information and data for use by the community. Periodic emails are sent out alerting interested citizens to new updates on the website. Although the website itself is not yet interactive, community members are encouraged to contact MSD with questions or concerns via email at MSD.Communications@cincinnati-oh.gov or by phone at (513) 557-3594.

4. Open Houses and Community Design Workshops

MSD has hosted four watershed open houses in the Lick Run, Kings Run, West Fork and Bloody Run sub- watersheds and three Lick Run specific community design workshops to inform and educate the public and gain critical feedback. A summary of these meeting is presented in Tables 9-3, 9-4, and 9-5.

Following the completion of the Lick Run Community Design Workshop, MSD published its Lick Run Watershed Master Plan. The purpose of the Lick Run Master Plan was to help inform MSD's Lick Run Design Team and the detailed design phase as well as cost estimating for the LMC Study. The Master Plan sought input from the community to help vet the basis of design for the Valley Conveyance System and consider watershed-based planning tools to support a watershed-based wet weather strategy. The design workshops started out summarizing for and discussing with the community and interested stakeholders to project considerations and design constraints and with that, the Design Team was able to gain direct and specific feedback about how best to integrate this potential solution with the community so that it can be considered a valuable green infrastructure asset that utilizes stormwater as a resource. The workshops were organized with 3 distinct goals in mind.

The first workshop was to raise awareness about the current conditions, current mandate and needs of MSD and consider ways in which the community might see the watershed-based solution fitting into the landscape. The Second goal was to consider different types of Valley Conveyance Concepts, their strength and weaknesses as well as other community based needs incorporated into the planning and evaluation process. The Third and final workshop was to focus on the Preliminary Vision Plan or Base Plan that would then be used by MSD for its basis of design for advancement into detailed design to meet the timeframe associated with the WWIP.

Throughout the process, input from the public helped to understanding existing conditions and challenges as well as specific goals and priorities for the community so that they could be integrated with MSD design and construction schedules.

Another purpose of the design workshop was to develop broader planning partners. Through the partnership with City Planning, the Lick Run Master Plan developed a stormwater transect using Form Based Code Principles to support sustainable infrastructure and the Lick Run watershed wet weather strategy.

Moving forward, MSD plans to initiate community design workshops in Kings Run and West Fork Sub-basins to help refine the design process and incorporate more specific community feedback. MSD plans to schedule these smaller scale community design workshops within these sub-basins in the first quarter of 2013.

5. Meetings with Community Groups

MSD has interacted with numerous community groups, including local community councils, business associations, neighborhood groups, special interest groups and the Sierra Club, among others.

Community Councils and Special Interest Groups

MSD has reached out to all the community councils within the Lick Run, Bloody Run, Kings Run and West Fork Watersheds to make them aware of watershed activities and public meetings and to provide articles for their websites/newsletters. In addition, MSD has attended and given presentations to community councils in South Fairmount, Northside and North Fairmount. Since 2010, an MSD representative has attended each meeting of the South Fairmount Community Council (SFCC) to answer questions and provide project updates. Upon request, MSD and its planning consultants have made presentations to this group addressing specific areas of concern. Throughout the engagement with SFCC, there were technical conceptual proposals offered by the Community Council by their consultant. MSD reviewed proposals from the SFCC and met with them to discuss comments and issues associated with costs, risks and uncertainty in the technology proposal offered by SFCC.

Table 1 Summary of Lick Run Open Houses and Community Design Workshops

Meeting	Date	Notice	Attendees	Discussion & Meeting Topics
Lick Run Open House	January 2011	Postcards to >6,500 Lick Run residents, property owners, businesses; community newsletters	120 community members 30 staff, consultants, and public agency volunteers	• Concept of sustainable stormwater management • Overview & background of Consent Decree • Potential Lick Run Solution • Default Tunnel Solution • One-on-One interactions via 8 project stations
Community Design Workshop #1	April 11, 2011	Postcards to >6,500 Lick Run residents, property owners, businesses; community newsletters; Lick Run website	113 people 60% live/work/own in Lick Run of which 45% from South Fairmount	• Proposed urban waterway characteristics and recreational opportunities • South Fairmount neighborhood business district • Historic and cultural features • Watershed planning guidelines • Feedback via visual preference survey, written survey, & exit survey
Community Design Workshop #2	October 26, 2011	Postcards to >6,500 Lick Run residents, property owners, businesses; community newsletters; Lick Run website; local news media	93 people 63% live/work/own in Lick Run of which 43% were from South Fairmount	• Revised concepts from 1st workshop feedback • Transportation, trail, & civic network opportunities • Green planning principles • In-stream water quality features and ecological benefits • Pedestrian safety improvements • Feedback via questionnaire and exit survey
Community Design Workshop #3	February 23, 2012	Postcards to >6,500 Lick Run residents, property owners, businesses; community newsletters; Lick Run website; local news media	98 people 58% live/work/own in Lick Run of which 49% were from South Fairmount	• Revised concepts from 2nd workshop feedback • Overview presentation; Q&A and breakout sessions • Evaluation of strengths and weaknesses of preliminary design concept for the urban waterway in South Fairmount • Long-term vision plan • Feedback via questionnaire and exit survey

Table 2 Summary of Lick Run Community Feedback and Integration into Project and Lick Run Master Plan

Examples of Attendee Feedback	How Feedback was Integrated into Project
In response to Western Gateway Zone Concept "Celebratory feature where water comes out of ground, visually exciting & opportunity for educational display." "Need eco-friendly parking lot & trailhead observation platforms, community gathering places, trails & walkways are very important." "A definitive beginning is a nice feature."	The Urban Waterway Base Plan includes a daylighting feature, interpretive signage describing how the urban waterway system works, and a bridge and observation that provide views of the daylighting feature. The daylighting feature provides a dramatic moment where upstream stormwater exits the storm sewer conveyance box and begins the urban waterway. The stormwater runoff flowing in the stormwater conveyance box exits through series of narrow, horizontal slits. As the water level rises during a large storm event, it exits the outfall feature at the next higher stratum of the stone and cascades down the face. This configuration allows the water to exit the pipe while restricting public access (an access point is incorporated into the feature to enable periodic maintenance and cleaning).
In response to Narrow Channel Zone Concept 1 "I like the fact that there is a long promenade for pedestrian/ bicycle access. I also like the business district" "Walkway on north of water is better than not having one. Open to "back" side of building for new purpose. Need to have people in the space to keep it vibrant." "Pedestrian bridges overlooking streams." "Separating pedestrians from the green space allows it to promote wild life habitat. Supporting local business is important. Bikeway and pedestrian walkway is good."	On the north bank of the urban waterway behind existing (and future) buildings, a 20-foot wide multi-purpose, paved access drive doubles as a maintenance road and pedestrian path. Because the drive accommodates people, a decorative handrail on top of the retaining wall provides visual interest and safe barrier to the waterway because public access to the waterway is restricted in this area. Pedestrian scale, decorative lighting is integrated into the wall/fence design. Restricted access vehicles can use the drive for maintenance of the waterway and its landscape. The access path also serves as a permanent easement for the existing combined sewer below.
In response to Eastern Gateway Zone Concept 1: "Keeping existing rec facilities and improving them." "More celebrated recreation area; wetland areas vs. 'lake'; amphitheater & stage & community pavilion "Floodplain wetlands! Trail & pavilions nice. Connectivity nice- again shallow grade as possible to Mill Creek." "Really like wetlands more than lakes- some large pools fine- lost 60 foot deep pool in Mill Creek. Like [recreation bug with pavilion, amphitheater and amenities]. Like some easier access for education in wetland. Many more [in-stream features]- more helpful. Like business center here and community gathering place. Like wetland with pools/riffles cleaning water. Really like [defined/enhanced central core for neighborhood]" "Large water feature visually appealing as entrance to the West side."	A more celebrated, concentrated recreation area builds upon existing facilities and allows for a variety of activity zones. The existing sprayground remains, the existing playground is relocated slightly west, and the existing basketball courts are relocated slightly east. This physical separation is important for creating activity zones conducive to different age groups. The urban waterway widens more and a large, water quality wetland feature is located just south of primary channel. The predominant habitat in this zone is meadow, which in combination with the wetland surrounding the pond, should create an especially attractive home for wildlife. Smaller segments of riparian habitat flank portions of the waterway. The location of the wetland feature would make a dramatic statement by strengthening neighborhood identity and pride, and serving as a visual anchor for visitors entering the corridor.

Table 3 Summary of Open Houses in other Sub-Basins

Meeting	Date	Notice	Attendees	Discussion & Meeting Topics
West Fork Open House	January 26, 2012	Postcards to >9,000 West Fork residents/businesses; press releases to media; flyers and articles for local municipalities and Cincinnati neighborhoods	65 people of which 70% live/work/own in West Fork	Introduce West Fork watershed community to the complex issues associated with the Consent Decree. Begin dialogue with stakeholders in advance of more detailed discussions about watershed-level solutions. Watershed overlaps with portions of the neighborhoods of Cheviot, Green Township, College Hill, East Westwood, Fay Apartments, Mt. Airy, Northside, South Cumminsville, and Westwood.
Bloody Run Open House	February 9, 2012	Postcards to >5,500 Bloody Run residents/businesses; press releases to media; flyers and articles for local municipalities and Cincinnati neighborhoods	42 people of which 60% live or own in Bloody Run 20-25 staff from numerous government agencies, community service institutions, and other civic organizations	Introduce Bloody Run watershed community to the complex issues associated with the Consent Decree. Begin dialogue with stakeholders in advance of more detailed discussions about watershed-level solutions. Watershed overlaps with portions of neighborhoods of Amberley Village, Columbia Township, Village of Golf Manor, City of Norwood, Bond Hill, Pleasant Ridge, and Roselawn.
Kings Run Open House	March 1, 2012	Postcards to >5,000 Kings Run residents/businesses; press releases to media; flyers and articles for local municipalities and Cincinnati neighborhoods	54 people of which 70% live or own in Kings Run 20-25 staff from numerous government agencies, community service institutions, and other civic organizations	Introduce Kings Run watershed community to the complex issues associated with the Consent Decree. Begin dialogue with stakeholders in advance of more detailed discussions about watershed-level solutions. Watershed overlaps with Cincinnati neighborhoods of College Hill, Spring Grove Village, Winton Hills, small part of Springfield Township, and Northside.

Business Outreach and Business Associations

In early 2010 MSD visited local businesses in South Fairmount who could potentially be impacted by or have interest in solutions proposed for the corridor in order to engage them in a one-on-one dialogue and to ask for input on how they would like to see the community improved through the process. At the request of the South Fairmount Business Association (SFBA) and to ensure business voices across the project area were continuing to be considered, MSD conducted a survey of businesses in January 2012. The survey was distributed at a SFBA meeting, and individual businesses were also contacted. The survey asked for interest in remaining within the Lick Run corridor and what assistance a business would like to see with regard to relocation. The business survey findings were provided to the SFBA and SFCC, as well as to the CFAC.

MSD has attended meetings of the SFBA as requested, making presentations and directly responding to questions and concerns. MSD met regularly with a core committee of members of this group called the Committee of Five. These meetings offered an additional opportunity for businesses to stay abreast of on-going project analysis and evolving concepts, as well as proactively raise issues of concern.

At the request of the SFCC and the SFBA, a special follow up input meeting was held after Community Design Workshop #2 with the leadership of these community groups to allow for additional review and comment on the concepts presented at the workshop. A preview discussion was held with the leadership of the SFCC and the SFBA prior to Community Design Workshop to facilitate upfront input from these groups as promised by MSD to the two organizations.

Neighborhood Groups

MSD has met on several occasions with representatives of the Wooden Shoe neighborhood in the Kings Run Watershed as well as the Northside Community Council to discuss their concerns about CSOs and potential solutions. A community design workshop is anticipated in each of these sub-basins in the first quarter of 2013.

Historic Preservation Groups

MSD has met on several occasions with citizens, public agencies and non-profit organizations who are interested in the preservation of historic buildings in South Fairmount. MSD has utilized its Inform & Influence Subcommittee to gain input on historic and cultural resource considerations and develop best management practices.

Sierra Club

Representatives of the Sierra Club have been actively engaged in the community dialogue initiated by MSD over the past 2 years, including serving as inaugural members of the CFAC and the CFAC Inform & Influence Subcommittee. Sierra Club representatives also participated in the Open House and Community Design Workshops for the Lick Run Watershed, as well as Open Houses in the Bloody Run, Kings Run and

West Fork Watersheds. The Sierra Club has provided feedback throughout the process, reviewing MSD proposed policies, commenting on various draft documents and providing valuable perspectives from the environmental community on the sustainable alternative and proposed concepts.

MSD received technical questions from the Sierra Club following the August 16th Town Hall Meeting. Responses were provided in a timely manner. A follow-up meeting was held with MSD and representatives from the Sierra Club on September 7th to discuss the update the system-wide model and the model results as applicable to the LMCPR default and a potential Sustainable Alternative. MSD received follow-up questions from the Sierra Club and provided a response on September 12th.

First Suburbs Consortium, Mill Creek Watershed Council, Watershed Action Plan Workgroup, Stakeholder Breakfast, etc.

MSD has given presentations on the LMCPR to local organizations such as the First Suburbs Consortium (e.g., local elected officials representing the suburbs of Cincinnati), the Mill Creek Watershed Council of Communities and provided watershed planning background on various projects for use by the Lower Mill Creek Watershed Action Planning Workgroup as well as regular updates at annual events such as MSD's stakeholder breakfast which draws attendance from MSD's entire service area, among others.

6. Direct Communications with the Community

In addition to MSD-sponsored public meetings and meetings with community groups, MSD has interacted directly with average citizens since the inception of the communication effort, either through direct communication (e.g., letters, phone calls, emails or via face to face meetings), participation in local fairs and festivals or MSD-sponsored watershed tours.

Communication with Citizens by Letter/Phone/Email/Face to Face

MSD has encouraged questions and comments from the public throughout its communication efforts. Citizens are directed to contact MSD customer service by phone at (513) 557-3594 or via email at MSD.Communications@cincinnati-oh.gov. All contacts and responses are recorded in MSD's customer service database. MSD has met one-on-one with property owners and residents in the watersheds who have requested additional information. MSD has maintained an on-going dialogue with interested individuals through multiple email exchanges, phone calls, and meetings. MSD also responded to an influx of more than 100 phone calls and emails early in the communication effort in response to an update letter.

Lick Run Watershed Tours

During the summer and fall of 2011 and spring 2012, MSD sponsored public tours of the Lick Run watershed to help them gain a better understanding of the challenges associated with CSOs. Participants visited CSO #5 in South Fairmount, the largest volume CSO in Hamilton County, and also learned about potential solutions for resolving CSOs. More than 100 people have participated in the tours.

7. Partnerships

MSD has partnered with numerous public and private agencies since the community engagement effort was initiated in 2010. These agencies represent a range of expertise and bring important voices to the table to ensure the concepts put forward for USEPA consideration are vetted thoroughly on multiple fronts such as transportation, public safety, urban planning, relocation, environmental issues, and more. These agencies also represent community members across Hamilton County and Cincinnati through their respective memberships, and they have served an important role in informing a broad cross-section of the entire greater Cincinnati community. Some of these agencies include:

- Hamilton County Planning and Development Department
- Mill Creek Watershed Council of Communities
- Cincinnati Parks
- City of Cincinnati Economic Development Division
- Ohio State University (OSU) Extension
- Hamilton County
- City of Cincinnati Department of Planning & Buildings
- U.S. Geological Survey
- Groundwork Cincinnati, formerly the Mill Creek Restoration Project
- Green Umbrella
- Ohio EPA, and USEPA.

In addition, MSD has also initiated a Project Groundwork Partners program that recognizes vital partners in developing solutions to the infrastructure challenges. A list of partners can be found at *www.projectgroundwork.org/partners*.

8. Media Relations

MSD has provided interviews to numerous local, regional and national media outlets (e.g., newspapers, magazines, on-line news and television) and participated in several local radio shows to help broaden public awareness. MSD has received National press attention in *The New York Times, Sustainable City Network.com* and *Stormwater* (StormH2O.com).