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September 28, 2016

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Subject: Minor Project Modifications
Logan Street and Breckinridge Street CSO Basin
Bells Lane Wet Weather Treatment Facility
Nightingale Pump Station Replacement and Storage
Southern Outfall Inline Storage (SOR2)

DOJ Case No. 90-5-1-1-08254

Attention Chiefs and Director:

MSD is requesting approval of a proposed minor project modification to each of the following four projects:

Logan Street and Breckinridge Street CSO Basin (L_SO_MF_092_M_09B_B_D_8)
Bells Lane Wet Weather Treatment Facility (L_OR_MF_015_M_13_B_B_8)
Nightingale Pump Station Replacement and Storage (L_SO_MF_018_S_03_A_A)
Southern Outfall Inline Storage (SOR2) (L_OR_MF_211_M_13_B_A_8)

This request is part of the ongoing adaptive management review of the approved Integrated Overflow Abatement Plan (IOAP) dated May 2014. None of the proposed modifications impacts previously committed levels of control, residual Average Annual Overflow Volume (AAOV) or project sizing. Similarly, the final completion date of December 31, 2020, for the entire suite of Long Term Control Plan projects is not affected by this request. The unique details of each of the project modification requests are discussed below.

Logan Street and Breckinridge Street

2009 IOAP Project Description

The original Logan Street and Breckinridge Street Storage Basin project involved the construction of an 11.83 million gallon (MG) storage basin to be completed by December 31, 2017, with a level of control of eight overflows per Typical Year.

2012 IOAP Modification

After the system-wide recalibration of the hydraulic model completed in 2010, the benefit cost analysis to justify project sizing and level of control was repeated. The level of control analysis based on the benefit cost

evaluation determined that the project level of control should remain at eight overflows per Typical Year. The basin size increased from 11.83 MG to 16.6 MG. This was the basin size included in the approved 2012 IOAP Modification dated May 2014. The completion date remained December 31, 2017.

2016 Project Modification Request

Relative to the technical functionality of this project, there is no change. It will remain an underground 16.6 MG storage basin with a level of control of eight overflows per Typical Year. The project was originally designed to be at grade with a building above the basin structure, but recently a major design change was made to bury the basin to allow community-accessible open space. Fortunately, the project was ahead of schedule at the time, and the project is still anticipated to be completed by December 31, 2017.

Technical Justification

The original design of the project called for a one-story brick building to cover the entire basin structure. The actual storage volume required at the site had a water surface elevation below the existing grade, and the area between the stored water and the proposed building's roof was open space. In the fall/winter of 2015/2016, the public became more actively engaged regarding this site and the final proposed conditions of the project. At other basin sites, MSD has proposed completely burying the basins, with the exception of control/maintenance buildings. The public began requesting the same leave-behind conditions for this project.

Although construction was well underway for this basin, and the proposed basin floor had been poured, it was feasible to modify the design without additional excavation. Interceptor and CSO existing invert levels dictated the basin depth necessary for gravity-in operations in the original design. Because the water surface elevation to mitigate CSOs to eight overflows per Typical Year was eight feet below grade, incorporating the structural components needed to support a buried roof and soil loadings was possible. The previously mentioned open space above the water surface elevation allowed the basin roof to be buried with a minimum soil cover of 18 inches.

In April 2016, the MSD Board approved the change of modifying main structure to be at grade, and MSD directed the designer to revise the plans. While the project was ahead of schedule initially, the change removes most of the contingency time that was built into the schedule. It is still expected to be completed prior to December 31, 2017.

Bell's Lane Wet Weather Treatment Facility

2009 IOAP Project Description

The original Bell's Lane Wet Weather Treatment Facility (initially titled "Paddy's Run Wet Weather Treatment Facility") project involved the construction of a 50 million gallon/day (MGD) high rate treatment facility to be completed by December 31, 2014, with a level of control of eight overflows per Typical Year. The proposed project was in the vicinity of the Paddy's Run Flood Pump Station.

2012 IOAP Modification

After the system-wide recalibration of the hydraulic model completed in 2010, the benefit cost analysis to justify project sizing and level of control was repeated. The level of control analysis based on the benefit cost evaluation determined that the project level of control should remain at eight overflows per Typical Year. However, optimization of flow through Morris Forman WQTC, as well as the recalibration, required the addition of 25 MG of offline storage at the plant. Additionally, the project location moved to near the Southwestern Pump

Station site, and a renovation of the Southwestern Pump Station was also included in the revised project to allow flows to be pumped to the high rate treatment facility. Due to the increase in size and re-location of the project, the revised completion date approved in the 2012 IOAP Modification was December 31, 2016.

2016 Project Modification Request

The project modification request involves no changes to the details of the project design or technical functionality. It will remain as a 50 MGD high rate treatment facility with a 25 MG offline storage basin at a level of control of eight overflows per Typical Year. The requested modification is to allow the project completion date to be moved to September 30, 2017.

Technical Justification

When the project location was changed under the 2012 modification, the design team began working on the design and permitting the new facility at the new location. When the contract was awarded, the contract substantial completion date for the contractor was prior to the December 31, 2016, IOAP completion date. However, multiple delays have put the Contractor behind schedule. MSD presented the scope of the delays in a December 9, 2015, meeting in Atlanta with EPA Region IV staff and Kentucky Division of Water staff (KDOW staff attended by phone). The most significant of these delays was obtaining the necessary easement from the Paducah and Louisville Railroad resulting in a contractor request for 270-day time extension. After detailed review and considerable negotiation MSD agreed to a 215-day delay due to the railroad easement and unforeseen soil conditions encountered during the tunnel boring under the railroad tracks. Both delays were outside the control of either the Contractor or MSD. This delay is the major source of the overall change in the schedule.

To attempt to expedite the schedule, MSD has had multiple meetings with the Contractor to determine if there were any methods that would allow for substantial completion prior to December 31, 2016. MSD has continued to update EPA and KDOW on project progress during monthly conference calls. As discussed in the December 9, 2015, meeting, discussions with the Contractor have included exploring extended work hours, use of temporary facilities to "short-circuit" the critical path, and changing materials, means, and methods of construction. MSD was cautiously optimistic that some time could be made up to offset the permitting and unforeseen soil condition delay. Unfortunately, due to the required sequential construction of this type of project, not enough significant time savings could be obtained to allow this project to finish prior to December 31, 2016.

MSD reported to EPA and KDOW in a conference call on June 15, 2016, that the project could not be completed within the allotted time, and this minor modification would be requested for a time extension.

Nightingale Pump Station Replacement and Storage

2009 IOAP Project Description

The original Nightingale Pump Station project involved the replacement of the existing pump station with a new 60 MGD pump station to be completed by December 31, 2016, with a level of control of zero overflows per Typical Year. No storage was associated with the original project.

2012 IOAP Modification

After the system-wide recalibration of the hydraulic model completed in 2010, the benefit cost analysis to justify project sizing and level of control was repeated. The level of control analysis based on the benefit cost evaluation determined that the level of control should remain at zero overflows per Typical Year. Additionally, a

study was performed that revealed impacts to the downstream system. Due to this study, the pumping rate was reduced from 60 MGD to 33 MGD. Based on this change, as well as re-calibration modifications in 2012, a 7.7 MG storage basin was added to the project.

2016 Project Modification Request

The project modification request involves no changes to the details of the project design or technical functionality. It will remain as a 33 MGD pump station with a 7.7 MG offline storage basin at a level of control of zero overflows per Typical Year. The requested modification is to allow the project completion date to be moved to June 30, 2017.

Technical Justification

The contracted substantial completion date for the project was originally set at September 21, 2016. However, multiple unforeseen delays have put the contractor behind schedule. MSD described the issues causing delays in the December 9, 2015, meeting previously referenced. Major items impacting schedule have been:

- The proposed storage basin site was located on privately owned property. Obtaining the final required right of entry to begin construction initially delayed when construction could begin.
- Despite the description of soil characteristics contained in the geotechnical reports, the contractor found the material onsite to be more difficult to handle than originally anticipated. Wet weather events in March and April 2015 prior to and during the initial site excavation flooded the site, resulting in saturated soil that behaved substantially differently than expected. Soil conditions encountered during excavation caused multiple modifications of the sheeting and shoring system to stabilize the excavation. These modifications impacted the production rate of soil excavation as additional measures had to be taken to stabilize the excavation prior to removing additional material; and
- The extreme storms of July 2015 also impacted completion of the excavation, resulting in excavation flooding and difficulty in removing the saturated material.

To attempt to expedite the schedule, multiple meetings have occurred with the contractor to determine if there were any actions that would allow for substantial completion prior to December 31, 2016. Some of these efforts were described in the meeting with EPA and KDOW on December 9, 2015, and discussed in our monthly conference calls with EPA and KDOW. The contractor has not been able to implement a method or schedule to allow the project to be completed prior to December 31, 2016, due in part to limitations imposed by sequential critical path elements. In addition, recovery plan attempts have been impacted by other major projects concurrently being constructed in the Louisville area. The contractor has had difficulty maintaining laborers onsite and getting materials in a timely manner. Some of this would appear to be due to management of the contractor, but some of it is caused by several large projects (Ohio River Bridges Project, other MSD basin projects, and several large scale private development projects) being constructed at the same time. This amount of simultaneous construction in Louisville Metro has not occurred since prior to the economic recession that began in 2008, and contractors report we currently do not have the resources to meet the needs of all projects. The shortages most severely impact projects like this one that are behind schedule and trying to implement recovery plans.

MSD reported to EPA and KDOW in a conference call on June 15, 2016, that the project could not be completed within the allotted time, and this minor modification would be requested.

Southern Outfall Inline Storage 2 (SOR2) Replacement

2009 IOAP Project Description

This project was not included as a discrete project in the 2009 IOAP. Mitigation for these CSOs (016, 210, and 211) was being handled by a proposed offline storage basin (Algonquin Parkway) with in-line storage at two locations on the Southern Outfall, with a level of control of eight overflows per Typical Year. The Algonquin Parkway project was scheduled to be completed December 31, 2018.

2012 IOAP Modification

In 2011, the flow rate through the Morris Forman WQTC was optimized based on the RTC systems as well reviewing the overall capabilities of the plant. Based on a maximum flow rate of 325 MGD, it was determined that the Algonquin Parkway Storage Basin could be eliminated and the project objectives met by only constructing the inline storage. The identified inline storage sites were Southern Outfall Retention 1 (SOR1) at 43rd Street and Southern Outfall Retention 2 (SOR2) at 12th Street and Wilson Avenue. The level of control analysis based on the benefit cost evaluation determined that the level of control should remain at eight overflows per Typical Year. The scheduled completion date in the revised IOAP for SOR1 and SOR2 was set at December 31, 2018.

2016 Project Modification Request

The project modification request involves eliminating the SOR2 project due to unavoidable risks of the project increasing the potential for surface flooding and basement backups. Eliminating the SOR2 project is necessary to prevent the potential harm this project could cause to the community. To mitigate the overflow volume that SOR2 was intended to capture, improvements are being made to the flow control at the Main Diversion Structure and an extensive rehabilitation of the Morris Forman WQTC Headworks is being completed. The combination of the flow control improvements and the Headworks rehabilitation will increase the Morris Forman WQTC maximum capacity and will also improve operational reliability. The SOR1 project will remain as stated in the 2012 IOAP. The project completion deadline remains December 31, 2018, and level of control for this facility remains at eight overflows per Typical Year.

Technical Justification

During the design of the SOR1 and SOR2 facilities, a detailed review of upstream implications of the proposed facilities was performed. Modeling indicated that SOR1, in combination with other LTCP projects, would not have a negative impact on upstream areas, but that SOR2 would likely cause additional upstream flooding and basement back-ups in an area already inundated with historical flooding and basement back-up problems. Several alternatives were evaluated for the structure design, but each alternative resulted in an increase in the hydraulic grade line upstream of SOR2 for various events. Because overflow abatement projects cannot cause or contribute to surface or basement flooding, options to avoid these risks were evaluated.

The area upstream of SOR2 consists of approximately 2,600 acres with 15,000 residents and 4,500 primary structures. This includes homes, businesses, and educational institutions that have historically experienced basement and surface flooding. The area is extremely flood-prone due to the flat nature of the ground surface, storm inlet conveyance restrictions to the combined system, as well as hydraulically full combined sewers during wet weather. When projected basement elevations are compared to model results, a large number of properties show a risk of basement flooding and sewer backups. Approximately 2,300 upstream structures have basements lying below the 100-year storm hydraulic grade line for all evaluated alternatives, and careful analysis demonstrated that even small increases in the water surface elevation would exacerbate existing sewer backups and flood conditions.

The table below shows the variation in water surface elevations under 10-year and 100-year storm conditions with the increased number of structures that could be expected to experience flooding if in-line storage was implemented at SOR2. The table below also projects a flat pool elevation upstream of the proposed SOR2 structure. Even when accounting for a 20-foot emergency bypass weir in the case of a gate failure condition, hundreds of homes would be impacted.

SOR2 Flooding Impacts

	Water Surface Elevation (ft AD)		Primary Structure Flooding – Existing Conditions		Primary Structure Flooding – SOR2 (gate failure)	
	Existing Condition	SOR2 (gate failure)	First Floor Flooding	Basement Flooding	First Floor Flooding	Basement Flooding
10-year SCS	450.7	451.7	36	461	94	641
100-year SCS	452.2	452.7	140	713	203	784

Based on the results of this analysis indicating an increased risk to the health and safety of upstream property owners, the SOR2 project is not an acceptable solution. Although MSD cannot justify pursuing inline storage at this location, an alternative analysis has been evaluated to increase sustainable treatment capacity and wet weather flows through the Morris Forman WQTC, and thereby offset the reduction in upstream storage and provide the same level of AAOV reduction as the original suite of SOR projects.

In 2015, MSD awarded a contract for the Morris Forman WQTC Preliminary Treatment Modifications. This project will completely renovate the Morris Forman WQTC East and West Headworks facilities in order to more reliably treat increased wet weather flows. The East Headworks will have the following rehabilitation/replacement work completed:

- Replace the four existing ½-inch bar screens with four new 3/8-inch bar screens that will do a better job of capturing rags and floatable solids;
- Replace the mechanisms in the four vortex grit removal units with new mechanisms and updated baffling and control modifications to provide facilities that incorporate the most current design of this type of grit removal units. The improvements to the grit system will result in increased capture of fine grit, thereby reducing the solids load on the primary sedimentation basins, allowing them to sustain higher wet weather flow rates with less build up of sludge blankets.

Similar upgrades are underway for the West Headworks, including the following:

- Modify the flow control weir gate upstream of the West Headworks to improve flow control to the West Headworks and flow balancing between both Headworks facilities.
- Replace the three existing 1½-inch bar screens with new 3/8-inch bar screens that will do a much better job of capturing rags and floatable solids.
- Replace the aeration system and grit handling equipment in the three aerated grit chambers. The new aeration system will have flow meters for better air control, allowing the aerated grit systems to be tuned for optimal grit capture. The improvements to the grit system will result in increased capture of fine grit, thereby reducing the solids load on the primary sedimentation basins, allowing them to sustain higher wet weather flow rates with less build up of sludge blankets.

Other modifications will be made to the grit and screenings load-out area and the roads and site around the load-out area. The Preliminary Treatment Modifications project is currently on schedule to be completed in December, 2017, well in advance of the SOR2 in-line storage facility targeted completion date.

MSD is also planning to automate the operation of the SG-1 flow control gate at the Main Diversion Structure, which controls gravity flow entering the treatment plant. Implementing automated flow control at this location will require increased level monitoring at a number of key locations. These level monitors will provide feedback loops to the flow control system. Control algorithms have been developed and tested to allow a submerged orifice equation to provide automated flow control through connection with MSD's Real Time Control system. Implementation of the automated flow control will coincide with start-up of the Preliminary Treatment Modifications project and the Bells Lane Wet Weather Treatment Facility. These new facilities will be incorporated into an updated wet weather treatment strategy to improve overall control of wet weather flows thereby allowing an increase in the sustainable maximum flow capacity.

The improved reliability and flow management capability expected from the Preliminary Treatment Modifications and automation of the influent gate projects will allow a sustained maximum wet weather capacity of 330 MGD. Achieving this plant flow and increasing sustainable wet weather treatment capacity will provide an enhanced net benefit and risk reduction to the community. The Preliminary Treatment Modifications project costs are approximately \$12 million. The automation modifications are estimated to cost upwards of \$200,000. The original SOR2 estimated costs were approximately \$3.5 million.

As described, modeling and operational feasibility analysis determined that optimization of inline storage at SOR1, along with increased peak wet weather flow capacity at the Morris Forman WQTC would allow the SOR2 project to be eliminated while still meeting the intent of the IOAP and maintaining the same residual average annual overflow volume (AAOV). When the plant sustained maximum wet weather flow capacity is increased to 330 MGD, modeling indicates the SOR2 inline storage facility is not needed to achieve the target level of control and volume reduction. Implementing SOR1 in combination with the Preliminary Treatment Modifications project still maintains the same level of control of eight overflows per Typical Year as the previously approved project without creating any additional risk of environmental or public harm.

Overall Summary

Below is a summary table summarizing the changes for each of the projects.

2016 Modification Request Summary

Project Name	IOAP Project Number	Modification Request	Discussion
Logan and Breckinridge Storage Basin	L_SO_MF_092_M_09B_B_D_8	Notification of change in final basin configuration	Public response required change. No change to size, LOC, or schedule.
Bell's Lane High Rate Treatment Facility	L_OR_MF_015_M_13_B_B_8	Revise completion date from 12/30/2016 to 8/2/2017	Acquisition of easement delayed project
Nightingale Pump Station and Storage	L_SO_MF_018_S_03_A_A	Revise completion date from 12/30/2016 to 6/30/2017	Multiple construction setbacks have delayed project
Southern Outfall Inline Storage	L_OR_MF_211_M_13_B_A_	Eliminate SOR2 Project	Increase in peak plant flow allows for elimination
Morris Forman WQTC Preliminary Treatment Modifications	L_OR_MF_211_M_13_B_A_ (replacement project)	New Project for rehabilitation and renewal of the East and West Headworks	Improved flow control and improved capture of screening and grit

Both on an individual site level and on a system wide level, the proposed modifications will have no impact to the levels of control at each site or residual AAOV for the entire system at the target completion date of 2020. The cumulative suite of projects will still result in a residual AAOV of 340 MG or less during the Typical Year at the completion of the project.

For your reference, copies of project fact sheets and maps are provided. The Southern Outfall Inline Storage project fact sheets and maps from the approved 2012 IOAP Modification dated May 2014 are included in Attachment A. A new fact sheet for the Morris Forman Preliminary Treatment Modifications is provided to document the project that is replacing the deleted SOR2 project in Attachment B. Since the other projects do not physically change, revised fact sheets have not been prepared.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering such information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If you have questions or need additional information, please contact me at (502) 540-6136.

Sincerely,


Angela L. Akridge, P.E.
Chief Engineer

cc: T. Parrot P. Purifoy

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Attachments

Attachment A



CSO Project Fact Sheet

2012 IOAP Project Modification



Project Name: Southern Outfall In-line Storage at 12th St & Wilson Ave (SOR2)

Project Number: L_OR_MF_211_M_13_B_A_8

Project Type: In-Line Storage

Rec Stream: Ohio River

Project Description: In-line storage using an actuated gate or inflatable dam in the Southern Outfall (4.7 MG) linked to Real Time Control near the intersection of 12th Street and Wilson Avenue. Project will reduce overflows to 8 overflows in a typical year.

Design Assumption: Inflatable dam must be available for manufacture at the necessary size.

Capital Cost: \$3,544,000

Capital Benefit/Cost: 109.27

Present Worth Benefit Cost: 113.96

CSO	CSO Name	Existing May 2012 ¹		Baseline May 2012 ²	
		Avg. Annual Overflow Volume	Avg. Annual Frequency	Avg. Annual Overflow Volume	Avg. Annual Frequency
CSO016	MILES PARK BYPASS	47.90	28	13.86	29
CSO210	45th STREET-GREENWOOD	71.45	50	61.89	50
CSO211	MAIN DIVERSION STRUCTURE	348.50	24	283.12	22

1. Existing May 2012 conditions reflect existing system operating conditions as of that date.

2. Baseline May 2012 assumes all SSDP projects are complete and critical combined sewer facilities (e.g. Morris Forman WQTC Southwestern Pump Station, Starkey Pump Station) are operating at optimal, sustainable levels.

Integrated Overflow Abatement Plan Vol. 2 - Final CSO Long Term Control Plan Ohio River

Southern Outfall In-line Storage
12th St & Wilson Ave (SOR2)

Preliminary - For Budget Development Only

- Active CSO
- Eliminated CSO
- ▲ Proposed Flow Control Solution
- PS Pump Stations
- MSD
- Proposed Pipe Solution
- Southern outfall
- Combined Sewer Pipe
- Force Main
- Collector < 12"
- Interceptor ≥ 12"
- ▭ Proposed Off-line Storage
- Streams
- ▨ Floodway
- Flood Wall
- Jefferson County Boundary

General representation of overflow abatement solutions are for preliminary planning purposes. Alignments and locations may be altered during design.

1 inch = 157 feet



Aerial Date:
2009

Map Revision:
April 9, 2012



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Attachment B

Project Name: Morris Forman WQTC Headworks

Project Number: L_OR_MF_211_M_13_B_A_8

Project Type: Treatment Plant Rehabilitation

Rec Stream: Ohio River

Project Description: The Morris Forman WQTC Headworks will replace the existing 1/2" bar screens with 3/8" bar screens at the East and West Headworks Facility, allowing it to more reliably remove rags and solid floatables. The grit removal systems at each headworks will also be replaced, and the aeration systems will be replaced at the West Headworks. Flow control structures will be modified to more precisely control flow to the East and West Headworks.

Design Assumption: Modifications will be made to the operations at SG-1 concurrent with the implementation of the Headworks Improvements.

Capital Cost: \$12,000,000

Capital Benefit/Cost: 32.27

Present Worth Benefit Cost:

CSO	CSO Name	Existing May 2012 ¹		Baseline May 2012 ²	
		Avg. Annual Overflow Volume	Avg. Annual Frequency	Avg. Annual Overflow Volume	Avg. Annual Frequency
CSO016	MILES PARK BYPASS	39.04	32	122.22	33
CSO210	45th STREET-GREENWOOD	19.39	31	23.65	31
CSO211	MAIN DIVERSION STRUCTURE	1090.44	62	297.84	25

1. Existing May 2012 conditions reflect existing system operating conditions as of that date.

2. Baseline May 2012 assumes all SSDP projects are complete and critical combined sewer facilities (e.g. Morris Forman WQTC Southwestern Pump Station, Starkey Pump Station) are operating at optimal, sustainable levels.

Integrated Overflow Abatement Plan Vol. 2 - Final CSO Long Term Control Plan

Ohio River

Morris Forman WQTC Headworks

Preliminary - For Budget Development Only

- Active CSO
- Eliminated CSO
- PS Proposed Pump Station Solution
- PS Pump Stations
- Proposed Pipe Solution
- Combined Sewer Pipe
- Force Main
- Collector < 12"
- Interceptor >= 12"
- Drainage Mains
- ▭ Proposed Storage Solution
- Streams
- ▨ Floodway
- Jefferson County Boundary

General representation of overflow abatement solutions are for preliminary planning purposes. Alignments and locations may be altered during design.

1 inch = 400 feet N Aerial Date: 2012 Map Revision: Sep 07, 2016



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