



Metropolitan Sewer District of Greater Cincinnati

Ludlow Run Sustainable Source Control

Contract No. 95x12762

MSDGC Project ID 10142910

Risk Management Plan and Risk Register

Final, Revision A

July 21, 2020

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Revision A – July 1, 2020

1. OVERVIEW

1.1. PURPOSE OF RISK MANAGEMENT

All projects involve risk and opportunities to the client and the consultant team. Without early identification, monitoring, and control, these risks may lead to projects being delivered over-budget, behind-schedule, or lacking critical stakeholder support. For this project, the team will follow a four-step process including risk planning (identification, analysis and mitigation) and risk monitoring and control. Early in the project the consultant team met internally to perform the risk planning in accordance with this Risk Management Plan (RMP). The purpose of this RMP is to document the approach used for this project to identify, assess and manage risks associated specifically with the planning, design, construction and operation and maintenance of the Ludlow Run Sustainable Source Control Project.

1.2. PROJECT OVERVIEW

The Arcadis team shall provide planning serves and may provide the supplemental design and construction phase services for a Wet weather Improvements Plan (WWIP) project (or Projects) to reduce the volume of the combined sewer overflows in the Ludlow Run watershed (CSO's 151, 109, 110, 111, 112, 162 and 024). The project will also address asset management needs within the Ludlow Run watershed.

The Ludlow Run sub-watershed, located in King's Run watershed, includes portions of Cincinnati neighborhoods: Northside, College Hill, Winton Hill, and Winton Place. CSO 024, referred to as the Ludlow Run Regulator is located on the west bank of the Mill Creek at the three-way intersection of Spring Grove Avenue, Dooley Bypass, and Dana Avenue. Six CSO's are nested within CSO 024 sub-watershed. Listed from North to south within the sub-watershed, CSOs 151, 109, 110, 111, 112, and 162 overflow into Ludlow Run, which then enters the combined sewer system and contributes to overflows at CSO 024.

Arcadis will provide all planning serves and may provide the supplemental design and construction phase services. The proposed improvement designed during the supplemental design phase services shall be designed in accordance with the latest version of the MSDGC Rules and Regulations Governing the Design, Construction, Maintenance, and Use of Sanitary Combined Sewers.

Project Understandings:

1. Arcadis will execute a similar approach to the planning, design and construction of the Ludlow Run Sustainable Source Control project that we have been refining through continuous improvement practices on past and current MSDGC source control projects.

2. The culmination of the Planning Phase will be in the modeling report, alternatives analysis report, and subsequently the Business Case Evaluation (BCE).
3. The design services will be based on the approved solution from the BCE.

1.3. ORGANIZATION OF THE RISK MANAGEMENT PLAN

This RMP has been organized as follows:

- **Section 2: Definitions** – Provides standard definitions for risk and issues, clarifies the difference between risks and action items.
- **Section 3: Approach to Risk Management for the Project** – Presents an overview of how risk management will occur for this project. It also establishes the requirements for periodic updates.
- **Section 4: Project Risk Management Methodology** – Provides step – by – step instruction for preparing the project risk register, guidance for qualitative assessment of project risk, preparation of risk management strategies and plans.
- **Section 5: Governance Documents - References**
- **Appendix A: Risk Register** – Provides the project related risks and associated information and scoring.

2. DEFINITIONS

Accept – The team will do nothing until the risk occurs.

Action Item – Is a matter that requires follow-up execution and usually occurs on an ad hoc basis during meetings or as a by-product of working on another activity. A series of action items might be required as part of a risk response plan but action items themselves are not necessarily risks that need to be tracked as part of the risk management process.

Avoid – The team acts to eliminate the threat or protect the project from the impact.

COO – Consequence of Occurrence

Issue – An incident that has already happened and has immediate potential for adversely impacting the project. In other words, a risk becomes an issue after it is “realized” and begins to adversely affect project schedule, cost or quality.

Mitigate – The team will employ a set of actions to reduce the likelihood of occurrence and/or impact of the risk.

LOO – Likelihood of Occurrence

Opportunity – A risk that would have a positive effect on one or more project objectives.

Project-Level Risks - Risks that are unique to individual projects. An example of a project-level risk is, “Delay in acquiring a critical easement that is needed before the project can be bid.”

Program-Level Risks – Risks that apply to multiple projects or a single risk that could affect the overall program. A project-level risk rises to the level of a program-level risk if multiple projects all have the same or similar risk, requiring it to be managed at the program level. There are program risks such as inflation, bond market fluctuation and contractor capacity that potentially affect all projects in the program.

Risk - an uncertain event that, if it occurs, has a positive or negative effect on a project's objectives. Risk Score is expressed by the following formula:

Risk Score - Consequence x Likelihood of Occurrence

Transfer – The team will shift the impact and ownership to a third party.

3. APPROACH TO RISK MANAGEMENT

3.1. GENERAL

This project is anticipated to be greater than \$1M in construction cost. As such, a risk management plan is required. The risk register will be updated throughout the planning, design and construction as required. The Consultant and project stakeholders will have a role in risk management process.

The consultant will prepare a draft risk management plan and risk register and submit it to MSDGC for review and comment. The risk register will be updated as necessary throughout the project. The risk register will include project risks and opportunities, cause, category, consequence, COO Rating, LOO Rating and the strategy. The initial risk management plan and risk register will be submitted to MSDGC and will be discussed at the first meeting after submission. The risk management plan and risk register will be updated and finalized based on MSDGC comments.

4. PROJECT RISK MANAGEMENT METHODOLOGY

4.1. RISK MANAGEMENT PROCESS STEPS

The development of risk management will occur using the following process:

- **Plan Risk Management** – Prepare guidelines, assign scoring and define process.
- **Risk Identification** – identify risks to project and record on Risk Register.
- **Qualitative Risk Analysis** – describe consequence of each risk and determine the likelihood of occurrence and the relative consequence of occurrence
- **Quantitative Risk Analysis** – The team will utilize MSDGC’s standard rating for quantitative risk analysis.
- **Plan Risk Response** – develop possible management strategies and recommend a risk response plan.
- **Control Risks** – Monitor, report and respond throughout project.

The following sections describe in detail the process for developing a risk register as well as a description for monitor and control.

4.2. RISK IDENTIFICATION

MSD’s project team including the MSD Technical Review Committee will participate in Risk Identification efforts at the Planning Workshop during Task 2 Data Collection and Review. At that point in the project, both Arcadis and MSD will be up to speed on the issues of the project and able to better identify and assess the risks.

During the Planning Workshop, risk identification will be carried out by brainstorming and using sticky notes with the MS Technical Review Committee.

New risks should be communicated to the Arcadis Project Manager. The risk register will be updated and additional risks will be identified as necessary, throughout the planning project at these milestones at a minimum:

- Risk Management Plan
- Alternatives Analysis Report
- Business Case Evaluation

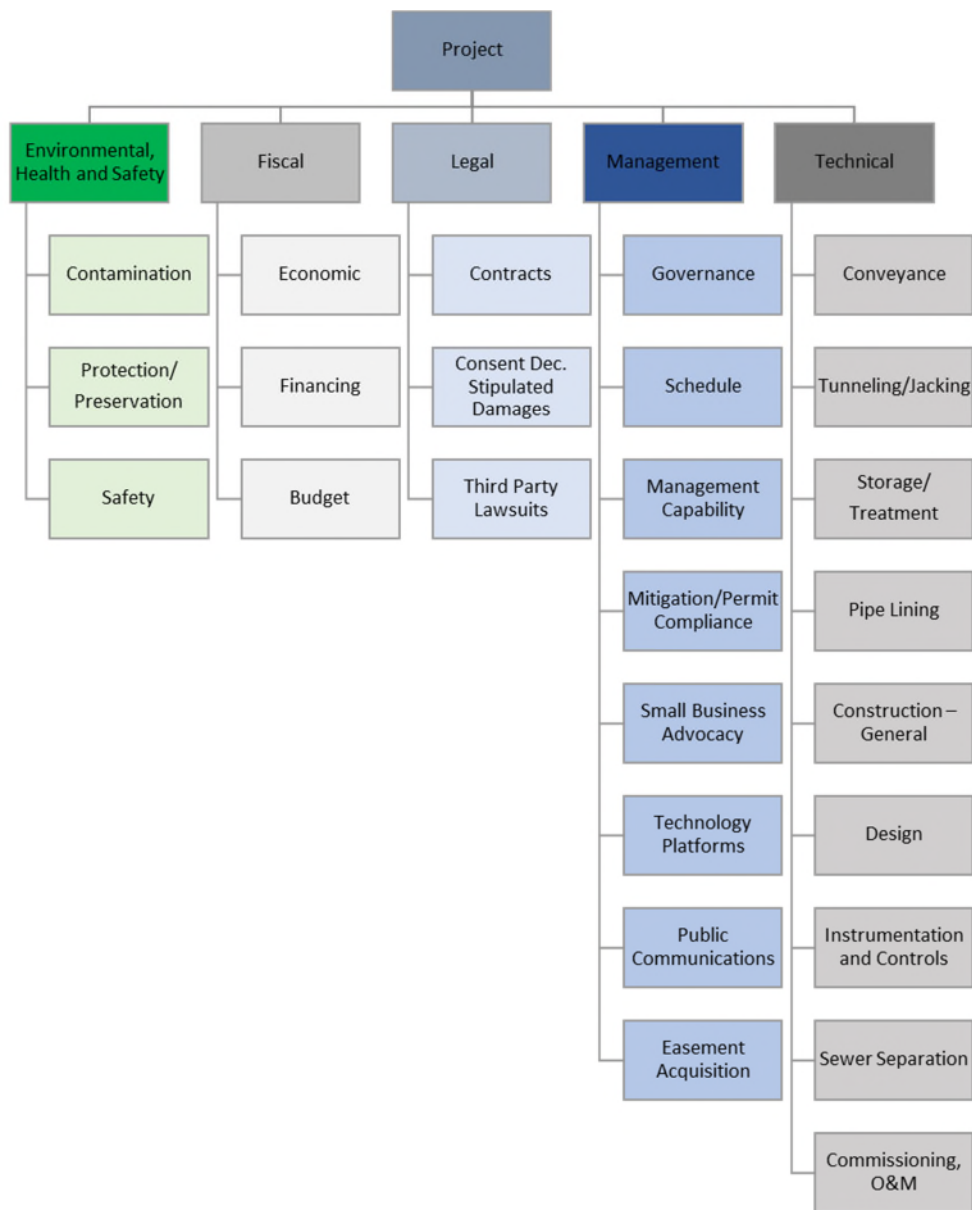
4.3. RISK ASSESSMENT

A risk register is quite simply a list of risks that might affect the project. There are many techniques for developing a risk register but the one that the Arcadis Team will be utilizing for this project is brainstorming. This involves conducting a risk workshop early in the project that

assembles a multi-disciplined team and asks the question of “What can go wrong or right with the implementation of this project?” This project includes past watershed planning that needs further evaluated with an eye on the potential risks.

A set of categories to be used for this project are shown in Figure 1. These categorizes will be used heavily during the internal workshop. The items are pre-programmed into the risk register. An initial risk register has been started for this project and attached as Appendix A.

Figure 1: Risk Categories



The risk assessment, performed for each risk on the register, is the next step in the process. The risk assessment involves the assignment of a consequence and likelihood of occurrence rating to each identified risk. Assigning a consequence rating requires the team member to determine (or estimate) the maximum foreseeable loss associated with a risk if it were to be realized. However, many times it is difficult to assign an amount and therefore a qualitative assessment can be assigned. It is acceptable to make an educated guess at the consequence and likelihood of occurrence ratings. (Refer to Tables 1 & 2.)

Table 1: Consequence Rating

CONSEQUENCE RATING	MAXIMUM FORESEEABLE LOSS	QUALITATIVE DESCRIPTION
1	1% Reduction in Contingency (cost or time)	Insignificant
2-3	2%-50% Reduction in Contingency (cost or time)	Minor impact
4-6	51%-100% Reduction in Contingency (cost or time) Up To 10%-20% Over Budget/Project Delay	Moderate impact
7-9	21%-30% Over Budget/Project Delay Up To 40% Over Budget/Project Delay	Significant impact
10	>40% Over Budget/Project Delay	Major impact

This range will be reviewed during the pre-workshop phase and a final table will be issued during the workshop. The likelihood of occurrence rating is assigned using the following guidelines in Table 2.

Table 2: Likelihood of Occurrence Rating

LIKELIHOOD RATING	LIKELIHOOD OF OCCURRENCE	QUALITATIVE DESCRIPTION
1-2	1%-20%	Highly unlikely to occur
3-4	21% - 40%	Unlikely to occur
5-6	41%-60%	Likely to occur
7-8	61%-80%	Very likely to occur
9	81%-90%	Highly likely to occur

A risk score is calculated as the product of the consequence rating and likelihood of occurrence rating. The risk score classification is established as shown in Table 3.

Table 3: Risk Score Classifications

Consequence	10	10	20	30	40	50	60	70	80	90
	9	9	18	27	36	45	54	63	72	81
	8	8	16	24	32	40	48	56	64	72
	7	7	14	21	28	35	42	49	56	63
	6	6	12	18	24	30	36	42	48	54
	5	5	10	15	20	25	30	35	40	45
	4	4	8	12	16	20	24	28	32	36
	3	3	6	9	12	15	18	21	24	27
	2	2	4	6	8	10	12	14	16	18
	1	1	2	3	4	5	6	7	8	9
		1	2	3	4	5	6	7	8	9
Likelihood of Occurrence										

Key	
Very High	
High	
Medium	
Low	
Very Low	

Table 3: Risk Score = Consequence x Likelihood of Occurrence

4.4. RISK MANAGEMENT STRATEGY AND PLAN

There are four types of risk management strategies that can be employed for risks; Avoid, Transfer, Mitigate, or Accept. Opportunities are the events that may positively impact a project and they can be: Shared, Exploited, Enhanced, or Accepted (Project Management Institute, 2013). It is important for the team to consider different risk response plans under different strategies in order to select the most appropriate. Upon review of the available strategies for each risk, a single risk response plan is recommended and entered into the risk register. This risk response plan should be specific enough to allow tracking of its implementation.

4.5. MONITOR AND CONTROL

The development of risk management at the outset of a project is a good first step and requires iterative updates of the risk register until the risk response plans are implemented and the risks are recorded as closed in the risk register. New risks should be communicated to the Arcadis Project Manager. The risk register will be updated throughout the project at these milestones at a minimum:

- Risk Management Plan
- Alternatives Analysis Report
- Business Case Evaluation
- 30% Basis of Design Report
- 60% Basis of Design Report
- 90% Basis of Design Report

The Arcadis project manager together with the MSD project manager will be the project's Risk Managers and are responsible for managing project-level risk. The Risk Managers are also responsible for the development and maintenance of the project's Risk Management Plan and the overall adherences to the Risk Management Plan.

4.6. REMAINING CONSEQUENCES

The concept of retained risk is important because many of the risks that are being managed by MSDGC cannot be entirely eliminated. That is to say, that even after implementation of the risk response plan there will be some likelihood of occurrence and consequence that is retained even after the risk has been managed. It is helpful to consider this during the time at which the risk register is developed. The same process used to assess the risks originally is used again when determining the remaining consequences.

5. GOVERNANCE DOCUMENTS

The following table summarizes the documents referenced in this document.

Document Name and Version	Description	Location
<i>Risk Management Guidelines, (Revised October 19, 2011)</i>	<i>The minimum MSD requirements to implement Risk Management.</i>	<i>MSD's Capital Project Resource Library: http://www.msdbg.org/downloads/customer_care/forms_and_documents/risk/risk_management_guidelines.pdf</i>
<i>Project Level Risk Register, (Revised June 17, 2011)</i>	<i>An established tool to implement risk management that includes a list of project risks.</i>	<i>MSD's Capital Project Resource Library, (see "Risk" for Project Level Risk Register Template download): http://www.msdbg.org/customer_care/forms_and_documents/capital_project_resource_library/index.html</i>

Appendix A

Risk Register

PROJECT-LEVEL RISK REGISTER

PROJECT NAME: Ludlow Run Sustainable Source Control, Contract No. 95x12762 MSD Project ID 10142910

UPDATED: July 21, 2020



IDENTIFICATION				ASSESSMENT					RESPONSE			REPORTING			
ID	RISK	CAUSE OF RISK	CATEGORY	SUB-CATEGORY	CONSEQUENCES	CONSEQUENCE RATING	LIKELIHOOD OF OCCURRENCE RATING	RISK SCORE	RISK CLASS	RISK RESPONSE PLAN	Assigned To (Risk Responder)	Due Date	Resolved On	Status	ACTIONS TAKEN
001	Funding to implement project is limited due to economic conditions.	County funding for projects reduced	Fiscal	Budget	Not all needed projects can be implemented or are implemented over a longer time period.	9	2	18	Medium	Monitor County funding trends.	Mamacos	Ongoing		Watch	
002	Political impact, project cancelled	Other projects take funding priority	Management	Financing	Project delayed due to political impact	8	3	24	Medium	MSD to stay in contact with stakeholders	Mamacos	Ongoing		Watch	
003	Public not satisfied with the results of the planning study	public not informed of the limitations of the planning scope with regards to their requests	Management	Public Communications	Impact to schedule and cost due to multiple revisions	9	9	81	Very High	MSD to align the scope this project with the resident concerns	Mamacos	Ongoing		Active	
004	Expectations by stakeholders are not aligned with current scope and budget.	Multiple expectations from different departments	Fiscal	Budget	Increase in project budget.	8	8	64	Very High	Monitor out of scope work and change requests with a change request log	Benick	Ongoing		Active	
005	Political opposition arising from potentially adversely impacted landowners	Landowners are adversely impacted from construction or easements	Management	Public Communications	Customers voice complaints to their political representatives.	5	6	30	Medium	MSD to stay in contact with stakeholders	Mamacos	Ongoing		Watch	
006	Planning amendment required	Change of planning scope required to adjust project objectives to meet public needs	Management	Management Capability	Schedule delay due to administrative process.	5	10	50	High	Work to quickly incorporate changes	Benick	With Design	---	Active	
007	Key team member leaves.	Better opportunity	Management	Management Capability	New team member doesn't have historical knowledge and ownership which leads to less efficient project completion.	8	3	24	Medium	Work with MSD to develop acceptable replacement staff.	Benick	Ongoing		Watch	
008	Lack of suitable, significant rain events and/or recording of rain events causes recalibration of model to be delayed.	Equipment failure during rain and flow monitoring. Not enough suitable rain events.	Technical	Schedule	Extend flow monitoring and perform calibration after data is captured.	4	3	12	Low	MSDGC and ADS have been maintaining the flow monitors through out the period. Adjustments are being made when data appears off. Monitors can stay installed for full year to provide MSDGC with additional data.	Watershed Operations	Ongoing		Active	
009	Model calibration does not meet MSDGC guidelines	Lack of quality rain and flow monitor data to use.	Technical	Schedule	Additional time is need to collect more quality data.	5	4	20	Medium	MSDGC and ADS have been maintaining the flow monitors through out the period. Adjustments are being made when data appears off. Monitors can stay installed for full year to provide MSDGC with additional data.	Benick	Ongoing		Active	
010	Missed opportunities of efficiencies of construction	lack of coordination with other utilites or jurisdictions	Management	Budget	Increased cost of project	5	5	25	Medium	MSDGC to stay in contact with other City departments	Mamacos	Mamacos		Watch	
011	MSD reorganization places new stakeholders in new positions of authority which causes decisions/direction to change on project.	Reorganization.	Management	Management Capability	Changes cause redesign which impacts scope, schedule and budget.	8	2	16	Low	Proper Communication within MSDGC. Have up-to-date schedule, minutes, and project documentation.	Mamacos	Ongoing		Watch	
012	Difficulty in obtaining consensus on improvements required	Difference of opinions between stakeholders	Management	Management Capability	Causing a delay in the construction and increase to construction costs	4	4	16	Low	MSD to stay in contact with stakeholders	Mamacos	Ongoing		Active	
013	Safety concerns for potential green infrastructure	A storm water feature that creates standing water conditions (even temporary) in a residential neighborhood creates a safety risk.	Technical	Safety	Drowning or other water-related injury.	9	1	9	Low	Design that includes fencing and/or signage around the storm water feature.	Watershed Operations	Ongoing		Watch	

PROJECT-LEVEL RISK REGISTER

PROJECT NAME: Ludlow Run Sustainable Source Control, Contract No. 95x12762 MSD Project ID 10142910

UPDATED: July 21, 2020



IDENTIFICATION					ASSESSMENT					RESPONSE			REPORTING		
ID	RISK	CAUSE OF RISK	CATEGORY	SUB-CATEGORY	CONSEQUENCES	CONSEQUENCE RATING	LIKELIHOOD OF OCCURRENCE RATING	RISK SCORE	RISK CLASS	RISK RESPONSE PLAN	Assigned To (Risk Responder)	Due Date	Resolved On	Status	ACTIONS TAKEN
014	By separating these areas, additional storm water base load may be directed to existing outfall, thereby potentially increasing the erosion potential.	Velocity and erosion	Technical	Design	Increased erosion would be a negative environment impact of the project.	5	5	25	Medium	Evaluate velocities leaving the system at the outfall	Abbott	Ongoing		Watch	
015	Comments on deliverables contradict with one another at different periods in schedule.	Differing opinions among groups.	Management	Management Capability	Rework required which impacts schedule and budget.	4	5	20	Medium	Comments on deliverables contradict with one another at different periods in schedule.	Mamacos	With Design		Watch	