Southern Indiana Stormwater Advisory Committee

Regional Water Quality Characterization Report

SWAC
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Executive Summary

The Southern Indiana Region consists of eight (8) municipal communities in Floyd, Clark, and Jefferson County along the Ohio River, including Jeffersonville, Clarksville, Sellersburg, Oak Park, New Albany, Floyd County, Georgetown, and Madison, which have been designated as Municipal Separate Storm Sewer Systems (MS4s). The Indiana MS4 program provides regulation for communities for non-point source stormwater runoff as an unfunded federally mandated component of the Clean Water Act (CWA), which is managed by the Indiana Department of Environmental Management (IDEM), for the purpose of protecting and improving water quality. These communities have joined together to form the Southern Indiana Stormwater Advisory Committee (SWAC), in a regional partnership to enhance their MS4 programs in a cost-efficient and effective manner.

These communities have made great efforts to continue proactive MS4 programs to both educate and get the public involved in contributing to the MS4 program goals of managing water pollution. These efforts have led to the education of citizens, students, the construction industry, elected officials, and public employees regarding stormwater and the requirements, as well as benefits, of the MS4 program. Adoption and implementation of stormwater ordinances for Illicit Discharge Detection and Elimination, Construction Site Runoff Control, and Post-Construction Stormwater Management have led to improved water quality through efforts to eliminate illicit discharges, improved management of stormwater from construction sites, installation and improved long term operation and maintenance of post-construction structural Best Management Practices (BMPs). The Post-Construction ordinance requires long term operation and maintenance agreements for privately owned post-construction BMPs. Additionally, pollution prevention and good housekeeping procedures have been enhanced at county facilities and throughout the community including cleaning and maintaining the stormwater system, periodic street sweeping, and education and training for public employees and citizens.

The findings of this Regional Baseline Characterization were used to recommend the best applicable methods throughout the region as MS4 communities continue to implement the MS4 program, which includes structural and non-structural BMPs. An appendix for each of the SWAC communities is included for information specific to that community. The following additional BMPs are recommended for consideration during the development of activities associated with the Stormwater Quality Management Plan:

- Finalize the development of 2023 the Qualified Professional Inspector (QPI) program and implement the updated training for construction site inspections.
- Continue to implement the Stream Visual Assessment Protocol (SVAP) in selected streams within the MS4 areas.
- Continue to enhance education and outreach efforts for public employees, citizens, contractor, developers, engineers, and municipal staff.
- Enhance procedures to improve tracking of BMPs including BMP inspection and maintenance.

This Regional Water Quality Characterization Report reviews available data, including water quality monitoring data to determine benefits to the region and further guide MS4 programs.

Table of Contents

List of Appendices

Table of Revisions

The following table summarizes revisions, additions, deletions, etcetera to the contents of this report:

Date	Revised Pages/Appendices	Summary of Change
04/7/2022	All	Moved information to individual WQCRs for community-specific reports.
02/07/2023	All	Executive summary, references, and summary of results enhanced.

3.0 Introduction

1.1 General Information

1.1.1 Acronym List

BMP	Best Management Practice
BOD	Biological Oxygen Demand
CD	Conservancy District
CFU	Colony Forming Unit
CSO	Combined Sewer Overflow
ERU	Equivalent Residential Unit
HUC	Hydrologic Unit Code
IAC	Indiana Administrative Code
IDEM	Indiana Department of Environmental Management
IDNR	Indiana Department of Natural Resources
LTCP	(Combined Sewer Overflow) Long Term Control Plan
MCM	Minimum Control Measure
Mg/l	Milligram per Liter
MOA	Memorandum of Agreement
MS4	Municipal Separate Storm Sewer System
NWI	National Wetland Inventory
ORSANCO	Ohio River Sanitation Commission
RBP	Rapid Bioassessment Protocol
SIC	Standard Industrial Code
SOP	Standard Operating Procedure
SQMP	Stormwater Quality Management Permit
SVAP	Stream Visual Assessment Protocol
SWAC	Storm Water Advisory Committee
SWCD	Soil and Water Conservation District
SWMD	Solid Waste Management District
SWQMP	Storm Water Quality Management Plan
TSS	Total Suspended Solids
UIC	Underground Injection Control
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WH-OL	Wellhead Protection Overlay District
WHPA	Wellhead Protection Area
WHPP	Wellhead Protection Plan

1.2 Location and Description

This Southern Indiana Region consists of eight (8) MS4 communities along the Ohio River. These municipal communities include: the City of Jeffersonville, Floyd County, Oak Park Conservancy District, Town of Clarksville, Town of Georgetown, Town of Sellersburg, City of New Albany, and the City of Madison. Figure 1 shows an overview of all the SWAC community boundaries with an inset for the City of Madison to the northeast. A closer view of the seven (7) contiguous MS4s can be seen in Figure 2. Individual MS4 districts are described in greater detail in the individual appendices. The region encompasses approximately 208 square miles and the total population of the regional MS4 districts is 183,000 with approximately 839 people per square mile (2020 Census). The Clark County MS4 is contiguous with SWAC communities, but is not participating in the SWAC. The Floyd County MS4 area does not include Greenville or Galena.

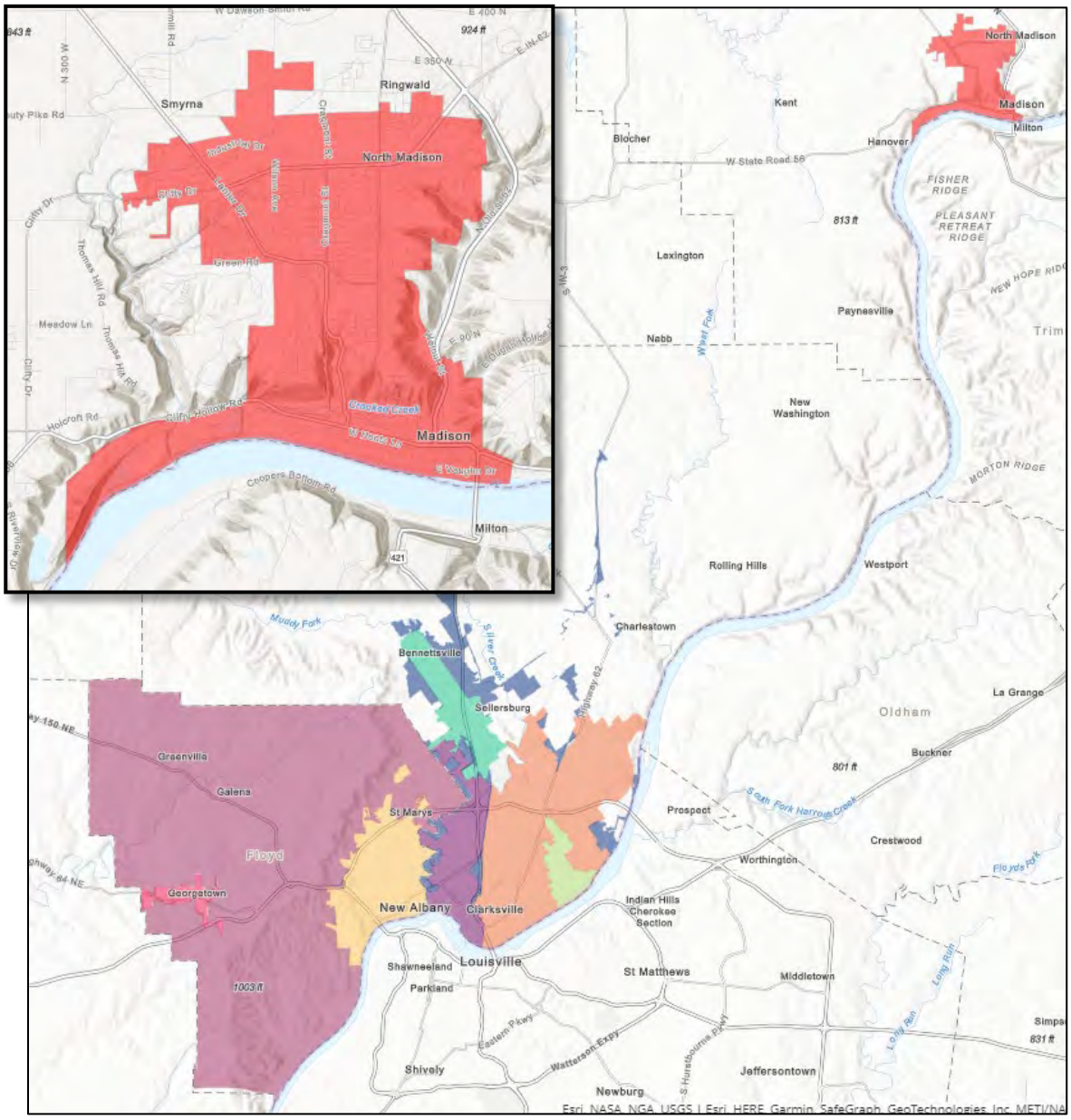

Figure 1. SWAC MS4 Communities (City of Madison inset)

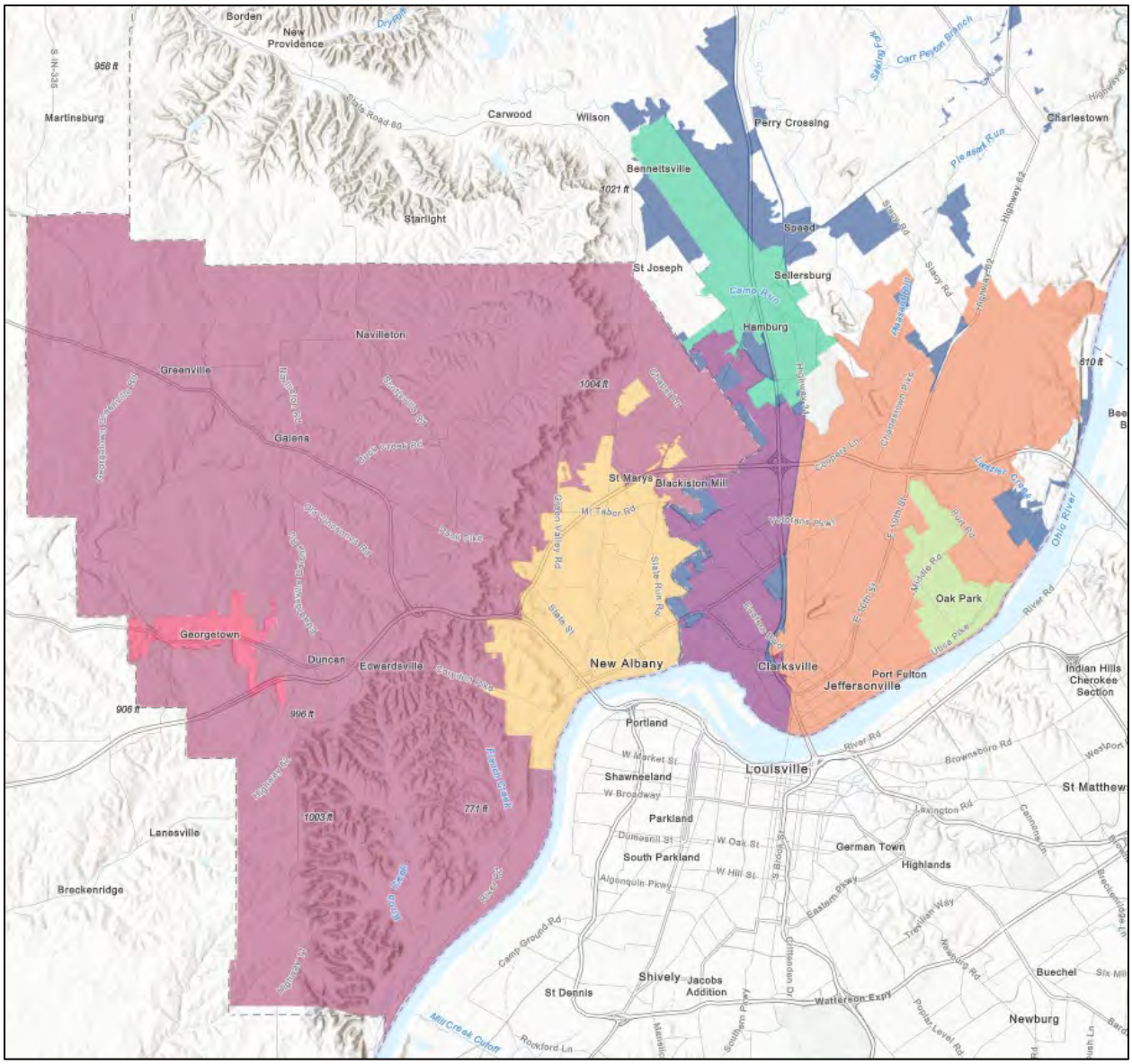

Figure 2. Contiguous SWAC Communities

1.3 Drainage System Description

The Municipal Separate Storm Sewer System refers to inlets, such as catch basins, storm drains, and manholes, where stormwater enters a system, and the means by which it is transported to creeks, lakes and rivers, such as through pipes, culverts, and ditches. Natural streams are not considered a component of the MS4 system, but the MS4 system often discharges to streams through outfalls.

2.0 Baseline Characterization

To continue implementing appropriate structural and non-structural best management practices (BMPs), in alignment with the goals established by the Southern Indiana Stormwater Advisory Committee (SWAC), the Indiana Department of Environmental Management (IDEM), and the Environmental Protection Agency (EPA), it is necessary to routinely assess the health and quality of all known waters that receive stormwater discharges from the MS4 areas within the SWAC boundaries. Assessment and characterization occur in the form of a baseline water quality characterization report (WQRC). The following WQRC was developed for the SWAC using the most current data available with additional consideration given to historical data that serves to better describe the chemical, biological and physical condition of the receiving waters of the SWAC MS4 jurisdictional areas. To preserve both detail and clarity, the SWAC communities will be evaluated and characterized as a single entity with individual community MS4 characterizations in the appendices.

2.1 Land Use Within the MS4 Areas (Assessment of Land Use)

The Stormwater Advisory Committee of Southern Indiana is comprised of eight (8) municipal separate storm sewer system (MS4) areas across Clark, Floyd, and Jefferson County. Although seven of these communities are contiguous, the SWAC communities collectively possess a unique combination of environmental, geographical, and geological features as best characterized by the diversity of land usage within the region. This report reflects the standard land cover classifications from the National Land Cover Database (NLCD) adopted by the Multi-Resolution Land Characteristics (MRLC) Consortium. To preserve clarity, this report will focus only on fifteen (15) of the most prevalent land cover classifications found within the SWAC boundaries, seen in Figure 3.

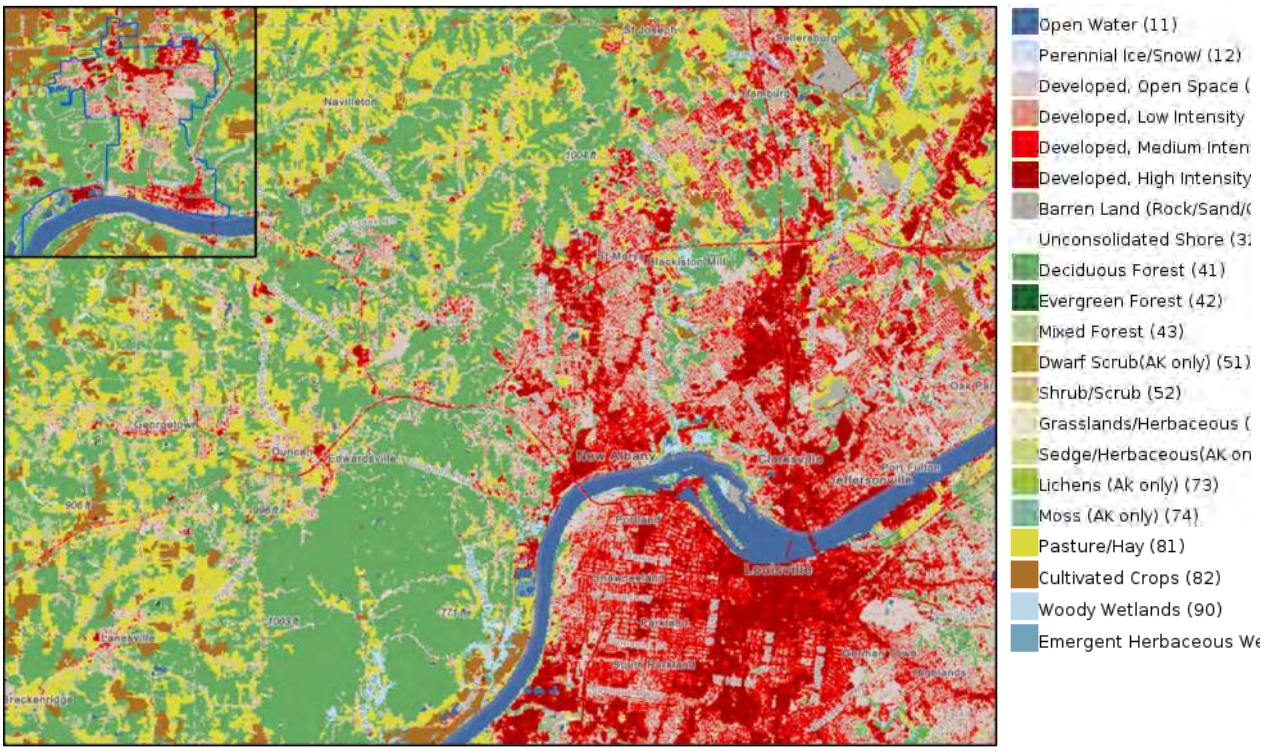

Figure 3. Land Use Classifications in SWAC Region

The Southern Indiana SWAC Communities collectively encompass approximately 210 square miles of land. To further contextualize the communities discussed, individualized characterizations related to total land area and populations, both surveyed and estimated, are shown in Table 1 below.

Table 1. Land Area and Population for Southern Indiana SWAC MS4 Communities

Community	Total Land Area (Acres)	Population (2000 Census)	Population (2010 Census)	Population (2020 Census)
City of Jeffersonville	19,810.59	27,362	39,574	44,068
Floyd Co. MS4 Area	83,883.28	30,993	34,735	39,143
Oak Park CD	2,183.42	5,379	5,379	5,379
Town of Clarksville	6,481.95	21,400	21,724	22,333
Town of Georgetown	1,400.9	2,227	2,867	3,305
Town of Sellersburg	4,752.62	6,071	6,128	9,310
City of New Albany	9,629.99	37,603	36,372	37,841
City of Madison	5,484.8	12,004	11,967	12,357
Total	**133,627.6**	**143,039**	**158,746**	**173,736**

Source: U.S Census Bureau (2000, 2010, 2020)

Additionally, Table 2 shows acreages of the fifteen (15) most prevalent land use types within the Southern Indiana SWAC communities, viewed in Figure 3 above. These data were clipped from the most recent release of the National Land Cover Database (NLCD) by the MRLC. These data are available at 30m resolution and represent the most current land use data available. Over 57% of the total Southern Indiana SWAC region consists of deciduous forest and hay/pasture, primarily because of Floyd County. New Albany, Jeffersonville, Clarksville, Oak Park, and areas within Madison, Sellersburg, and Georgetown are heavily developed.

For further explanation regarding the classification system and individual category descriptions, refer to Appendix A: Table 1. Though the data compiled is the most current land use data available, recent land changes may not reflected. Please note that the City of Madison is in Jefferson County northeast of the other eight (8) municipal communities, shown in the inset of the map in Figure 3.

Table 2. Land Use for Southern Indiana SWAC MS4 Areas

Category	Acres	Percentage
Deciduous Forest	46707.72	34.65%
Hay/Pasture	27920.80	20.71%
Developed, Open Space	15645.73	11.61%
Developed, Low Intensity	12950.43	9.61%
Mixed Forest	6950.40	5.16%
Cultivated Crops	7911.11	5.87%
Developed, Medium Intensity	8459.11	6.27%
Developed, High Intensity	4309.54	3.20%
Woody Wetlands	1154.63	0.86%
Open Water	962.07	0.71%
Herbaceous	866.84	0.64%
Barren Land	407.67	0.30%

Emergent Herbaceous Wetlands	206.25	0.15%
Evergreen Forest	125.95	0.09%
Shrub/Scrub	229.788	0.17%
TOTAL	**134808.04**	**100.0%**

Source: Land Cover for Indiana, NLCD (2019)

As noted above, the SWAC MS4 areas have been summarized as a single region including both unincorporated areas such as Floyd County and incorporated areas such as the City of New Albany, the Town of Georgetown, the Town of Sellersburg, the City of Jeffersonville, Oak Park Conservancy District, the Town of Clarksville, and the City of Madison. Generally, developed land uses (high, medium, low) tend to occur around the incorporated areas of the SWAC region with forested and agricultural land uses occurring in unincorporated areas of the SWAC region.

Geographically, the Southern Indiana SWAC communities are directly north and northeast of the City of Louisville, a large and highly developed area, with the Ohio River providing separation between the two metro areas. Although geographically relevant, the Ohio River is not included in any additional descriptions or characterizations within this report as it is monitored by the Ohio River Valley Sanitation Commission (ORSANCO). To the west, east, and north of the Southern Indiana SWAC communities are mostly rural areas with forest and agricultural land uses.

3.0 Best Management Practices

3.1 Structural and Non-Structural Best Management Practices – Inventory of MS4 Owned/Operated Structural Stormwater Management Measures

The following section serves as an opportunity for Southern Indiana SWAC Communities to appropriately recognize, itemize, and categorize their continued efforts to improve stormwater quality through the MS4 program. The Indiana Department of Environmental Management (IDEM) requires that all efforts to improve stormwater quality are categorized in the manner described by Phase II of the National Pollutant Discharge Elimination System (NPDES) program and as outlined below.

The Environmental Protection Agency (EPA) qualitatively defines the successfulness of a MS4 region's efforts to improve stormwater quality based on their ability to implement the six (6) Minimum Control Measures (MCMs). The six (6) MCMs include:

1. Public Education and Outreach
2. Public Participation and Involvement
3. Illicit Discharge Detection and Elimination
4. Construction Site Stormwater Runoff Controls
5. Post-Construction Stormwater Management
6. Municipal Operations Pollution Prevention and Good Housekeeping

The structural, vegetative, or managerial practices of a MS4 region used to treat, prevent, or reduce stormwater contamination are referred to as Best Management Practices (BMPs) and are often divided into structural and non-structural sub-sections. Successful selection and implementation of BMPs requires identification of specific regional stormwater needs, and as such, BMPs tend to vary considerably between MS4 regions.

This report will include examples of and references to both structural and non-structural BMPs. Due to the highly variable nature of these practices between MS4s, no generalizations have been made concerning the Southern Indiana SWAC. These will be utilized by the individual MS4 regions to enumerate, document and articulate these practices as they have occurred within their region. It is the expectation of IDEM and the EPA that all MS4 areas have a complete and updated inventory of all MS4 owned/operated structural stormwater management measures that are operated for the purpose of stormwater quality, stormwater management, and flood control, including an identification number, geographic coordinate, and structural condition. This information will be covered in the individual community components in the appendices. Additional assessments will occur during this permit term as a requirement of the new Stormwater Quality Management Plans (SWQMPs).

When assessing the successfulness of stormwater improvements, the EPA recommends BMPs are assessed holistically, granting equal consideration to the effectiveness of the practice, its cost, and the overall cost and effectiveness rather than looking at each practice in isolation. Furthermore, it is recommended that BMPs and MCMs are used in conjunction with one another, as BMPs are a basis for estimating the effectiveness, costs, and economic impacts of achieving the MCMs.

The BMP examples and references included in this report are not intended to be comprehensive. Additionally, the list of BMPs is not all-inclusive, and it does not preclude MS4s from using other technically sound practices. However, the practice or set of practices chosen needs to achieve the minimum measure.

3.2 Structural Best Management Practices

As their classification implies, Structural BMPs involve the implementation of an engineered system used to treat, prevent, or reduce stormwater contamination. As noted above, the relative effectiveness of structural best management practices is contingent upon several sociological and ecological factors, one of which is land use. The examples of structural BMPs listed below in Table 3 are classified in a manner which also includes the recommended implementation area, as described by the predominate land cover classification or future intended use for a site. The purpose of such classifications is not to discourage communities from implementing any one BMP, but rather help inform the decisions of MS4 communities so they may develop more effective means of preventing and reducing stormwater pollution.

Table 3. Example Structural Management Practices for Stormwater Quality/Management

	Predominate Land Use (Relative Effectiveness)					
Structural Management Practice	**Residential**	**Industrial**	**Recreational**	**Agricultural**	**Forrest**	**Wetlands**
Infiltration Basins and Infiltration Trenches	Good	Moderate	Good	Moderate	Moderate	Poor
Dry Wells	Moderate	Poor	Moderate	Moderate	Moderate	poor
Rain Barrels	Moderate	Poor	Poor	Moderate	Poor	Moderate
Rain Gardens	Good	Moderate	Good	Good	Good	Good
Pervious Pavement	Moderate	Poor	Poor	Poor	Moderate	Moderate
Subsurface Infiltration Bed	Moderate	Moderate	Good	Moderate	Poor	Poor
Vegetated Swale	Moderate	Poor	Moderate	Moderate	Good	Good
Vegetated Filler Strip	Moderate	Poor	Moderate	Moderate	Good	Good
Constructed Filter	Poor	Good	Poor	Moderate	Moderate	Moderate
Infiltration Berm/Retention Grading	Good	Moderate	Moderate	Moderate	Good	Moderate
Vegetated Roof	Moderate	Moderate	Moderate	Poor	Poor	Poor
Runoff Capture and Reuse	Moderate	Poor	Poor	Moderate	Poor	Poor
Constructed Watershed	Good	Good	Moderate	Moderate	Moderate	Moderate
Wet Pond/Retention Basin	Good	Good	Good	Good	Good	Good
Dry Extended Retention Basin	Moderate	Good	Moderate	Moderate	Moderate	Moderate
Water Quality Filters/Hydrodynamic Devices	Poor	Moderate	Moderate	Moderate	Poor	Poor
Riparian Buffer Restoration	Good	Moderate	Moderate	Good	Good	Good
Landscape Restoration	Moderate	Moderate	Moderate	Poor	Poor	Poor
Soil Amendment Restoration	Good	Moderate	Good	Moderate	Poor	Poor
Floodplain Restoration	Moderate	Poor	Moderate	Moderate	Poor	Moderate
Level Spreader	Moderate	Moderate	Good	Moderate	Poor	Poor
Special Detention Areas	Moderate	Good	Good	Good	Poor	Poor

Further information regarding structural management practices, such as individual descriptions and summaries, can be found in Appendix A: Table 2.

3.3 Non-Structural Best Management Practices

As their classification implies, Non-Structural BMPs involve the implementation of a broader planning and design approach used to treat, prevent, or reduce stormwater contamination. As above, the examples of non-structural BMPs listed below in Table 4 are classified in a manner which also includes the recommended implementation area, as described by the predominate land cover classification. Again, the purpose of such classifications is not to discourage communities from implementing any one BMP, but rather help inform the decisions of MS4 communities so they may develop more effective means of preventing and reducing stormwater pollution.

Table 4. Example Non-Structural Management Practices for Stormwater Quality/Management

	Predominate Land Cover (Relative Effectiveness)					
Non-Structural Management Practice	**Residential**	**Industrial**	**Recreational**	**Agricultural**	**Forrest**	**Wetlands**
Protect Sensitive and Special Value Features	Good	Poor	Good	Good	Good	Good
Protect / Utilize Natural Flow Pathways	Moderate	Moderate	Moderate	Good	Good	Good
Cluster Uses at Each Site / Build on Smallest Area Possible	Moderate	Poor	Moderate	Moderate	Moderate	Moderate
Use Smart Growth Practices	Good	Moderate	Good	Good	Moderate	Moderate
Minimize Total Disturbed Area– Grading	Good	Good	Good	Good	Good	Good
Minimize Soil Compaction	Good	Good	Good	Good	Good	Good
Re-Vegetate and Re-Forest Disturbed Areas	Good	Good	Good	Good	Moderate	Moderate
Reduce Street Imperviousness and Parking Imperviousness	Moderate	Good	Moderate	Moderate	Moderate	Poor
Rooftop Disconnection	Good	Moderate	Moderate	Moderate	Moderate	Poor
Disconnection from Storm Sewers	Good	Moderate	Moderate	Poor	Poor	Poor
Municipal Ordinances	Good	Good	Good	Moderate	Moderate	Moderate
Street Sweeping	Moderate	Moderate	Moderate	Poor	Poor	Poor

Further information regarding non-structural management practices, such as individual descriptions and summaries, can be found in Table 3 in Appendix A.

3.4 Flood Control

Water quantity issues are managed in other ways, especially along the Ohio River, which is subject to flooding with widespread impacts. Additional information specific to communities is included in their portion of the appendices, but general flood control BMPs are included here.

Levees: The USACE works with levee sponsors to understand the benefits and risks associated with levees, build awareness among the public, and take actions to manage performance. The USACE Levee Safety Program is not a regulatory program; rather it serves as an organizing framework to improve consistency and coordination in how levee-related activities are implemented. Key program activities include levee inspections, risk assessments, and sharing levee information. The Louisville District's levee system inventory includes 58 Federally authorized and constructed Levee Systems and 1 Non-Federally Constructed Levee System. Levees have been built up along the Ohio River in Jeffersonville, Clarksville, and New Albany to protect many of the MS4 Districts that are adjacent to the river.

Flood Insurance**:** National Flood Insurance Program (NFIP), which makes federally backed flood insurance available for all eligible buildings, whether they are in a floodplain or not. Flood insurance covers direct losses caused by surface flooding, including a river, lake, or stream flowing over its banks and local drainage problems.

Flood Wall: The Floodwall runs for approximately 1.5 miles adjacent to the Ohio River protecting the City of Jeffersonville and Town of Clarksville, and 0.7 miles in the City of New Albany. The floodwall transitions to a levee at both east and west end.

4.0 Receiving Waters and Sensitive Areas

4.1 Identification of Receiving Waters, Wetlands, and Lakes

A complete understanding of the hydrological features of a region is crucial to the effective and efficient implementation of structural and non-structural BMPs within an MS4 area. The content of this report reflects only the hydrological characterizations required for completion of the MS4 permitting process such as identification of all receiving waters, including wetlands and lakes, 303(d) listed impaired waters, and Total Maximum Daily Loads (TMDLs) for receiving waters. This report is not intended to serve as a comprehensive evaluation of regional water bodies, but rather supplement the documentation of individual MS4 areas.

4.1.1 Receiving Waters

The following streams or creeks in Table 5 are the streams each MS4 discharges stormwater to through the separate storm sewer system.

Table 5. Receiving Waters of SWAC Communities

Community	Receiving Waters
City of Jeffersonville	Lentzier Creek, Lick Run, Silver Creek, Mill Creek, Pleasant Run, Lancassange Creek, Battle Creek, Little Battle Creek, Jenny Lind Run, Ohio River, Unnamed Tributaries
Floyd Co. MS4 Area	Little Indian Creek, Indian Creek, Silver Creek, Richland Creek, Georgetown Creek , French Creek, Yellow Fork, Jacobs Creek , Corn Creek, Lewis Branch, Middle Fork Indian Creek, Bald Knob Creek, Jersey Park Creek, Knob Creek, Black Creek, Bannamon Creek, Uphill Run, James Branch, Woertz Creek, Miller Branch, Elk Run, Lazy Creek, Atkins Run, Pine Run, Chapel Branch, Crooked Run, Clear Fork, Bear Creek, Campbell Branch, Buck Creek , Thomson Creek, Lost Knob Brook, Flat Run, Blackiston Run, Carters Run, Falling Run, Friendship Run, Bow Run, East Fork Pilot Grove Creek, War Run, Slate Run, Saint Marys Run, Hill Brook, Lamb Run, Jay Run, Floyds Creek, Arrow Run, Vincennes Run, Church Run, Green Run, Union Creek, Cross Brook, Fork Run, Plum Run, Rail Run, Ohio River, Unnamed Tributaries
Oak Park CD	Lancassange Creek, Ohio River, Unnamed Tributaries
Town of Clarksville	Plum Run, Silver Creek, Mill Creek, Cane Run, Big Drain, Carter Run, Ohio River, Unnamed Tributaries
Town of Georgetown	Georgetown Creek, Unnamed Tributaries
Town of Sellersburg	Camp Run, Anson Branch, Elk Run, Muddy Fork, Plum Run, Silver Creek, Unnamed Tributaries
City of New Albany	Fall Run, Falling Run, Slate Run, Vincennes Run, Blackiston Run, Rail Run, Silvercrest Run, Green Run, Silver Creek, County Run, Land Run, Bald Knob Creek, Lost Knob Brook, Fork Run, State Run, Coryden Run, Town Run, Grace Run, Jacobs Creek, Flat Run, Friendship Run, Hill Brook, Unnamed Tributaries
City of Madison	Deans Branch, Big Clifty Creek, Crooked Creek, Little Clifty Creek

4.1.2 Identification of Wetlands

Understanding the designation and purpose of identified water bodies within a MS4 area is the best first step when designing and implementing BMPs. As noted in Section 404 of the Clean Water Act, "Wetlands are areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." The continued saturation of these areas is in large part due to stormwater runoff from surrounding areas. As such, wetlands have long been noted for their water quality improvement functions and flood control. However, the prolonged and continual use of natural wetlands as receptacles for non-point sources of pollution by way of runoff from impervious surfaces in urbanized areas is known to have an adverse effect on wetlands and the organisms who inhabit these unique ecological features. As noted in their Guide to Stormwater Best Management Practices, the Office of Water (EPA) found that "wetlands in urban areas can be dramatically altered by uncontrolled runoff resulting from natural drainage to wetland systems." Therefore, successful understanding and identification of these unique bodies of water is the first step in the implementation of Best Management Practices to ensure their prolonged heath and presence in Southern Indiana.

The Southern Indiana SWAC communities collectively encompass 6.82 square mile (4,365 acres) of natural wetlands. Table 6 shows the acreages of the natural wetlands within the Southern Indiana SWAC communities as divided among individual MS4 areas. Included in the inventory are further subclassifications of natural wetlands which include lacustrine (lake systems), palustrine (wetland and marsh systems), and riverine (river systems). Table 7 shows the different types of wetlands within the SWAC communities. These data were clipped from the continually released US Fish and Wildlife Service (NFS) National Wetland Inventory (NWI). These data represent the most current natural wetlands data available.

Table 6. Natural Wetlands within the Southern Indiana SWAC MS4 Areas

SWAC Community	Square Miles	Acres
Floyd Co.	3.59	2,296.31
New Albany	0.53	341.73
Georgetown	0.07	43.06
Clarksville	0.60	385.74
Jeffersonville	0.82	522.05
Oak Park Conservancy District	0.14	89.42
Sellersburg	0.32	207.21
Madison	0.34	220.87
TOTAL	**6.41**	**4,106.39**

Source: National Wetlands Inventory, NWI (2021)

Table 7. Types of Wetlands within the Southern Indiana SWAC MS4 Areas

Type	Square Miles	Acres
Freshwater Emergent Wetland	0.38	243.09
Freshwater Forested/Shrub Wetland	2.00	1,277.87
Freshwater Pond	1.92	1,229.29
Lake	0.35	224.04
Riverine	2.17	1,391.15
Total	**6.82**	**4,365.44**

Source: National Wetlands Inventory, NWI (2021)

For a more complete geographical representation the relative size and location of these bodies of water within the Southern Indiana SWAC Communities, see Figure 4 and Figure 5. Though the data compiled is the most current land use data available, more recent land changes may not be reflected.

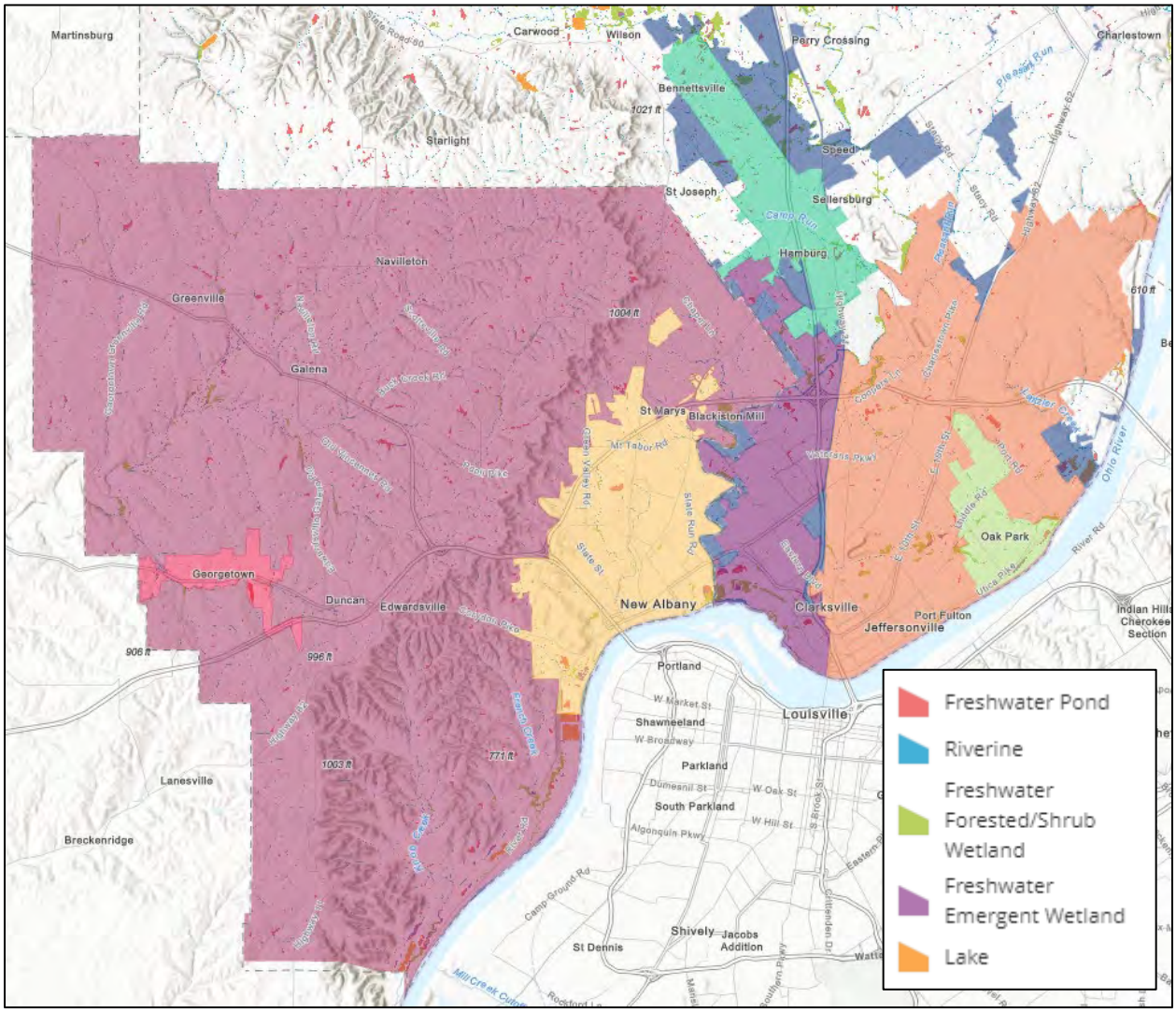

Figure 4. Wetlands within SWAC Communities

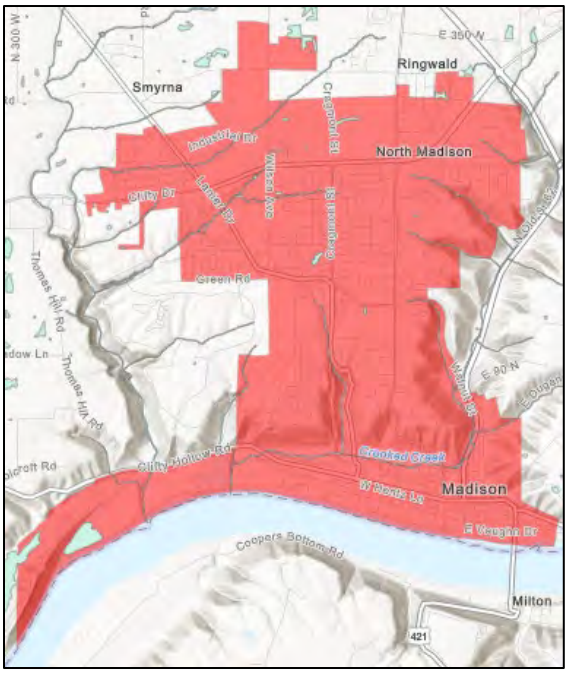

Figure 5. Wetlands within Madison, Indiana

Successful preservation and protection of wetlands is critical to successful non-point source pollution abatement found within stormwater. The preservation and protection of wetlands should include maintenance of function of existing areas which includes but is not limited to the "vegetative composition and cover, flow characteristics of surface water and ground water, hydrology and geochemical characteristics of substrate, and species composition" through the implementation off structural and non-structural best management practices.

Effective structural and non-structural Best Management Practices for the protection and preservation of local wetlands are included below. The BMP examples and references included in this report are not intended to be comprehensive. Additionally, the list of BMPs is not all-inclusive, and it does not preclude MS4s from using other technically sound practices. However, the practice or set of practices chosen needs to achieve the minimum measure.

4.1.3 Structural and Non-Structural Best Management Practices for the Protection of Wetlands

The geographic and ecological diversity present within each MS4 area in the Southern Indiana SWAC makes the recommendation of any single BMP difficult. Rather, it is the responsibility of each community to utilize the numerical and geographic resources within this report and accompanying documents in conjunction with municipal assessment and water quality monitoring to identify the most effective and locally relevant BMPs.

- Acquisition: Obtain easements or full acquisition rights for wetlands and riparian areas along streams, bays, and estuaries.
- Zoning and Protective Ordinances: Control activities with a negative impact on these targeted areas through special area zoning and transferable development rights.
- Water Quality Standards: Almost all wetlands are waters of the United States, as defined in the Clean Water Act. Ensure that State water quality standards apply to wetlands.

- Regulation and Enforcement: Establish, maintain, and strengthen regulatory and enforcement programs. Where allowed by law, include conditions in permits and licenses under CWA §401, §402, and §404; state regulations; or other regulations to protect wetlands.
- Restoration: Programs such as USDA's Conservation Reserve and Wetlands Reserve Program provide opportunities to set aside and restore wetlands and riparian areas. Also, incentives that encourage private restoration of fish and wildlife productivity are more cost-effective than Federal acquisition and can in turn reduce property tax receipts by local government.
- Education and Training: Educate farmers, urban dwellers, and Federal agencies on the role of wetlands and riparian areas in protecting water quality and on best management practices (BMPs) for restoring stream edges.
- Provide a Hydrologic Regime: Restoration of hydrology is a critical factor to gain non-point source benefits and to increase the probability of successful restoration.
- Restore Native Plant Species: When consistent with preexisting wetland or riparian area type, plant a diversity of plant types or manage natural succession of diverse plant types rather than planting monocultures.

4.2 303(d) Impaired Waters and Total Maximum Daily Loads

To remain compliant with federally mandated regulations, designated MS4 areas are required to identify and characterize all impaired waters (rivers, lakes, streams) as described in Section 303(d) of the Clean Water Act. Identification of impaired waters is the responsibility of the Indiana Department of Environmental Management (IDEM) as part of the Integrated Water Monitoring and Assessment Report (ATTAINS data) submitted biannually to the EPA. It is the responsibility of MS4 areas to interpolate and develop appropriate protection measures in the form of BMPs to sufficiently protect these bodies of water from polluted stormwater discharge in the case of a storm event. A table of water quality measurement and standards for Indiana can be found in Appendix A: Table 4. Streams and rivers are assessed and designated in accordance with the Indiana Department of Environmental Management's Consolidated Assessment and Listing Methodology (CALM). The CALM is revised and updated every two years to continually reflect the most recent changes to federal and state water quality standards. The standards described in this report are reflective of those included in the 2022 CALM published in conjunction with the IDEM 2022 303(d) list. Excerpts from the 2022 IDEM CALM are included in Appendix A: Table 5 for further information regarding the most recent water quality standards for streams and waterways.

The communities represented by the Southern Indiana Stormwater Committee contain a total of 74.8 miles of impaired streams and river within their jurisdictional boundaries. The primary sources of contamination include E. coli and excessive nutrients. Impaired streams included on the 303d list within SWAC MS4 boundaries can be seen in Figure 6. The total length of impaired water bodies as found within individual SWAC MS4 areas is in Table 8. Total length based on impairment is shown in Table 9. This data represents the most current submittal's by IDEM to receive approval by the U.S EPA (IDEM, 2022) at the time of this report.

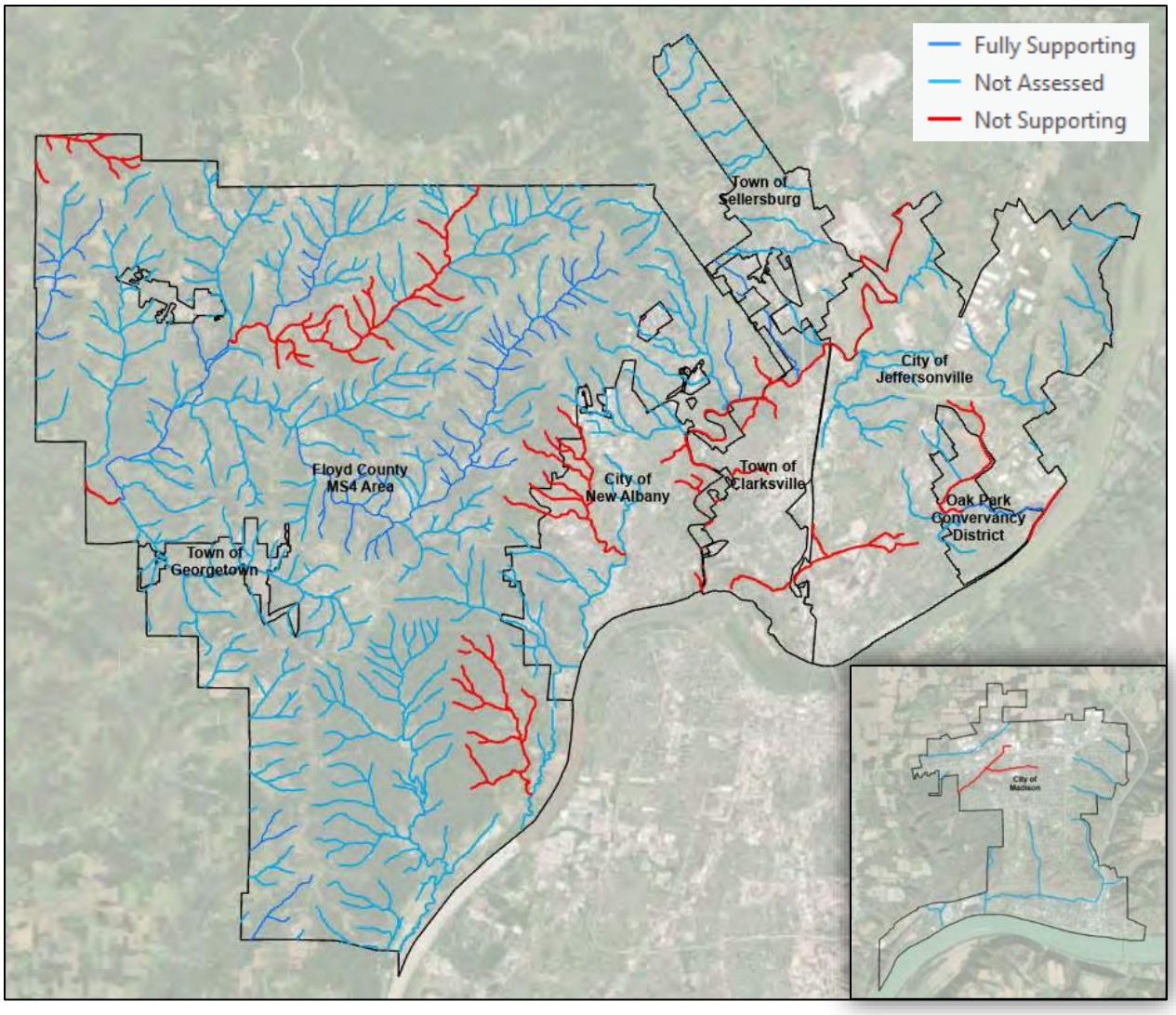

Figure 6. IDEM ATTAINS Water Assessment - 303d Impaired Streams in SWAC Communities

Table 8. 303(d) Impaired Waters within the Southern Indiana SWAC MS4 Areas (Length)

SWAC Community	Length (Miles)
Town of Georgetown	0.00
Town of Sellersburg	0.09
City of Jeffersonville	10.6
Oak Park Conservancy District	2.4
Town of Clarksville	6.2
Floyd Co. MS4 Area (non-incorporated area)	42.8
City of New Albany	10.6
City of Madison	2.1
TOTAL:	**74.8**

Source: IDEM ATTAINS, 2022

Table 9. 303(d) Impaired Waters within the Southern Indiana SWAC MS4 Areas (Impairment)

Impairment	Length (Miles)*
E. coli	69.5
Nutrients	15.03
Dissolved Oxygen	11.52
PCBs (Fish Tissue)	5.38

Source: IDEM ATTAINS, 2022. *Streams may be impaired for more than one category.

As noted above, the primary causes of waterway impairment are elevated levels of E. coli and nutrient pollution. Low dissolved oxygen content is only in one waterway for Falling Run in New Albany. PBC impairments are only listed where Silver Creek is impacted by New Albany, Clarksville, and Floyd County. The impaired designation is indicative of a sample or series of samples taken within the identified body of water which failed to meet the minimum requirements to ensure the safety of aquatic and human life. The water quality standards relating to the bacteria E. coli and nutrient pollution can be found in Appendix A: Tables 4 and 5, respectively. The process to obtain the measurements of E.coli can also be found in Appendix A: Table 4.

It is important that individual communities work with regional ecologists, environmentalists, and stormwater specialists to identify the potential causes of each impairment as to better identify and implement relevant structural and non-structural BMPs. Below is a non-comprehensive listing of potential sources of E. coli and nutrient pollution. For further guidance, individual communities are encouraged to reach out independently.

4.2.1 Sources of E. coli in the Environment:

Combined Sewer Overflows - When it rains, those systems can become overburdened and release excess storm water and untreated sewage. Communities must post warning sign near where outfalls are located.

Sanitary Sewer Overflow Bypasses - Separate sanitary sewer and wastewater treatment plants occasionally experience unauthorized discharges of untreated or partially treated wastewater.

Septic Systems - When septic systems fall into disrepair or reach capacity, the sewage can leak into nearby waterways. Because of this, the absorption field, or area over which the discharged sewage is dispersed into the ground, should be located away from waterways and wells.

Straight Pipes - Some individual homes or subdivisions have pipes that transfer untreated waste directly from septic tanks to a river or lake. This illegal practice should be corrected and is punishable by fines if continued.

Wildlife - Waste from ducks, geese, deer, raccoons, and other fauna living on or near water can contaminate waterways with E. coli.

Urban and Agricultural Runoff - Waste from pets, farm animals, and manure application to fields are sources of E. coli.

4.2.2 Sources of Non-Point Source Nutrient Pollution:

Animal Production Operations and Feedlots – Commercial animal production results in centralized accumulation of organic waste rich in nitrogen and phosphorus. If stored incorrectly, these nutrients will enter local streams and water bodies by means of stormwater runoff.

Agricultural Activities – The inappropriate and excess application of chemical fertilizers rich in nitrogen and phosphorus results in a significant amount of agricultural fertilizer being washed from fields and entering local steams and water bodies by means of stormwater runoff.

Stream Bank and Shoreline Erosion – Although a natural process, the continued alternation of the natural landscape by humans and livestock results in modified hydrologic characteristics which increase the frequency and rate at which shorelines and stream banks erode and by extension, the rate at which sediment and nutrients enter the water bodies.

Timber Harvesting – The large-scale harvesting of timber results in the soil's prolonged exposure to sunlight and a documented temperature increase. Together, these ecological changes make the sediment and nutrients within the soil more likely to enter local streams and water bodies by means of stormwater runoff.

Land Disturbance – Recently disturbed land, particularly from earthmoving or construction activities, significantly increases the likelihood of erosion and sediment filled runoff entering local water bodies during a storm event. These sediments are right in nutrients which can pollute and threaten the water body.

Urban, Suburban, and Rural Residential Runoff - When precipitation falls on our cities and towns it runs across hard surfaces - like rooftops, sidewalks, and roads - and carries pollutants, including nitrogen and phosphorus, into local waterways.

As is the case with non-point sources of pollution found within stormwater runoff, there exists no singular solution or prevention practice which will prove to be comprehensive or entirely successful. Rather, there exist only recommendations which can be made regarding structural and non-structural best management practices which can serve as educated efforts to prevent the further degradation of local streams and waterways. Recognizing that the challenges and regulations faced by SWAC communities exist on a national scale across the US, it is imperative that communities support one another in the compilation of data, information, and solutions as they relate to stormwater runoff. However, communities must also identify unique infrastructural, geographical, geological, and ecological features which require adaptation of previously implemented BMPs as to ensure a maximized impact.

In their publication "Handbook for Developing Watershed Plans to Restore and Protect Our Waters" the EPA highlights common structural best management practices used for the reduction of E. coli and nutrient loading to streams and water bodies as well as their evaluated effectiveness. Below in Table 10 is an excerpt from the larger example management practice screening matrix depicting more common BMPs used in the Southern Indiana region.

Table 10. Example Management Screening Practices for E. coli and Nutrient Pollution

Structural Management Practice	Nutrient Pollution (Relative Effectiveness)	Fecal Coliform Bacteria (E. coli) (Relative Effectiveness)
Bioretention	Good, High	Good, High
Conventional Dry Detention	Poor, Low, or No Influence	Good, High
Extended Dry Detention	Moderate	Good, High
Grass Swale	Poor, Low, or No Influence	Poor, Low, or No Influence
Green Roof	Poor, Low, or No Influence	Poor, Low, or No Influence
Infiltration Trench	Good, High	Good, High
Parking Lot Underground Storage	Good, High	Moderate
Permeable Pavement	Poor, Low, or No Influence	Moderate
Sand Filter	Good, High	Moderate
Stormwater Wetland	Good, High	Good, High
Vegetated Filter Strip with Level Spreader	Moderate	Poor, Low, or No Influence
Water Quality Swale	Good, High	Poor, Low, or No Influence
Wet Pond	Good, High	Good, High

It is recommended that individual SWAC communities consider the multifaceted nature of non-point source pollution and the many possible factors which contribute to the contamination of streams. Although certainly important, it is worth noting that implementation of any single or multitude of BMPs will never result in the complete elimination of any one pollutant. Rather, interpreting and understanding the 303(d) listing as presented here is an opportunity for regional improvement, where continued communal efforts will lead to a general water body improvement.

As a component of discovering opportunities for water quality improvement and appropriate actionable steps, communities are required to investigate the Total Maximum Daily Load (TMDL) Reports approved for Indiana by the EPA. TMDL Reports are a combination of water body characterization, contamination sources, analysis summary, required pollutant reduction standards, and actionable items which will reduce pollutant levels. Within the SWAC Boundaries there exist only 4.6 miles of stream with a TMDL Report, all within the upper northwest reaches of Floyd County in Bear Creek which flows into Washington County (see Figure 7). This area is sparsely populated and primarily wooded in the Floyd County portion of the stream.

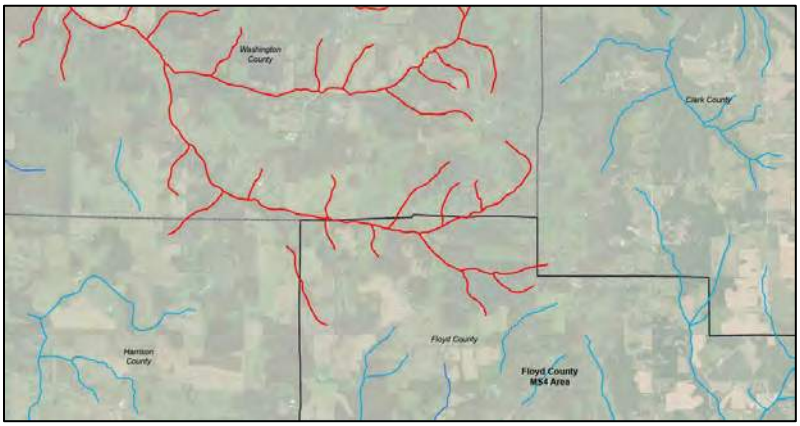

Figure 7. TMDL within Floyd County - Bear Creek Unnamed Tributary

However, even if currently unaffected by published TMDL Reports, individual communities are advised to review the biannual release of the 303(d) and TMDL reports to check for any updates or revisions which directly include or impact their community. As noted above, the data displayed in this report is related to the 2018 303(d) submitted by IDEM and approved by the EPA. The 2020 submission has received only partial approval and is therefore not included in this report. Upon final approval by the EPA, the 2020 303(d) and TMDL listings will take precedent over the 2018 listing.

4.3 Identification of Known Sensitive Areas

Sensitive areas are defined in Permit INR040000, as:

- Public swimming areas
- Surface drinking water intakes
- Threatened or endangered species or their habitat
- State outstanding resource waters
- Exceptional use waters

Public Beaches/Full Body Contact Recreation: For details, see individual MS4 community WQCRs.

Surface Drinking Water Intakes: For details and locations, see individual MS4 Community WQCRs.

Threatened or Endangered Species or Their Habitat: A list of Threatened, Endangered, and Rare Species within Clark, Floyd, and Jefferson Counties from the Indiana Department of Natural Resources can be found in Appendix B. Information concerning Threatened, Endangered, and Rare Species within each county is available through IDNR. These species are protected under the Federal Endangered Species Act, which is applicable to projects that utilize federal funds and/or require a federal permit.

Outstanding Resource Waters: The Natural Resources Commission is responsible for the identification of rivers and streams which have particular aesthetic or environmental interest to the state of Indiana. According to IDNR's list of Outstanding Waters (20070530-IR-312070287NRA), there are no outstanding resource waters which pass through the SWAC MS4 areas.

However, it should be noted that Fourteen Mile Creek in central Clark Co. is a designated Outstanding Stream. As such, portions of the Fourteen Mile Creek-Dry Branch HUC-14 watershed will drain into this Outstanding Water Body and communities should select and develop best management practices with special consideration given to this stream.

Similarly, beginning at the Floyd/Harrison Co. line, to its confluence with the Ohio River, Indiana Creek is a designated Outstanding Resource Stream. Although definitionally the designated stream exists outside of any SWAC MS4 areas, it is important to recognize that Indian Creek travels through a significant portion of the Floyd MS4. HUC – 14 watersheds which drain into Indian Creek within the Floyd Co. MS4 area include Little Indian Creek (north), Indian Creek-Headwaters, Indian Creek-Galena, Indian Creek-Middle Fork, Indian Creek-Jersey Park Creek, Little Indian Creek-Lower, Indian Creek-above Georgetown Creek, Indian Creek-Richland Creek, Indian Creek-south tributary.

Due to the tangential nature of relation MS4 areas have to these Outstanding Waters and the nature of these listings such that except where incorporated into a statute or rule, the listing is intended to provide guidance

rather than to have regulatory application, there are no predetermined actions associated with the designation, rather the section is meant to provide additional information to guide selection and implementation of appropriate management practices to protect these and all water bodies with municipalities MS4 areas.

Exceptional Use Waters: According to IDNR's list of Exceptional Use Waters, there are no exceptional use waters within the MS4 area.

In addition to these sensitive features specifically identified in INR040000, this report also considered wellhead protection areas and sinkhole areas.

Wellhead Protection Areas: For details, see individual MS4 community WQCRs.

Sinkhole Areas: The total number of sinkhole areas within each MS4 area were identified through a review of the Sinkhole Inventory for Southern Indiana and Northern Kentucky created by the Indiana Geological Survey (IGS, 2011). The data extracted from this inventory as applicable to the SWAC MS4 regions is provided in the communities individual WQCR. See Figure 8 for a visual heat map of karst areas within the SWAC region. The Madison Region sinkhole inventory can be seen in Figure 9. Heavy karst regions tend to be outside of the SWAC MS4 communities.

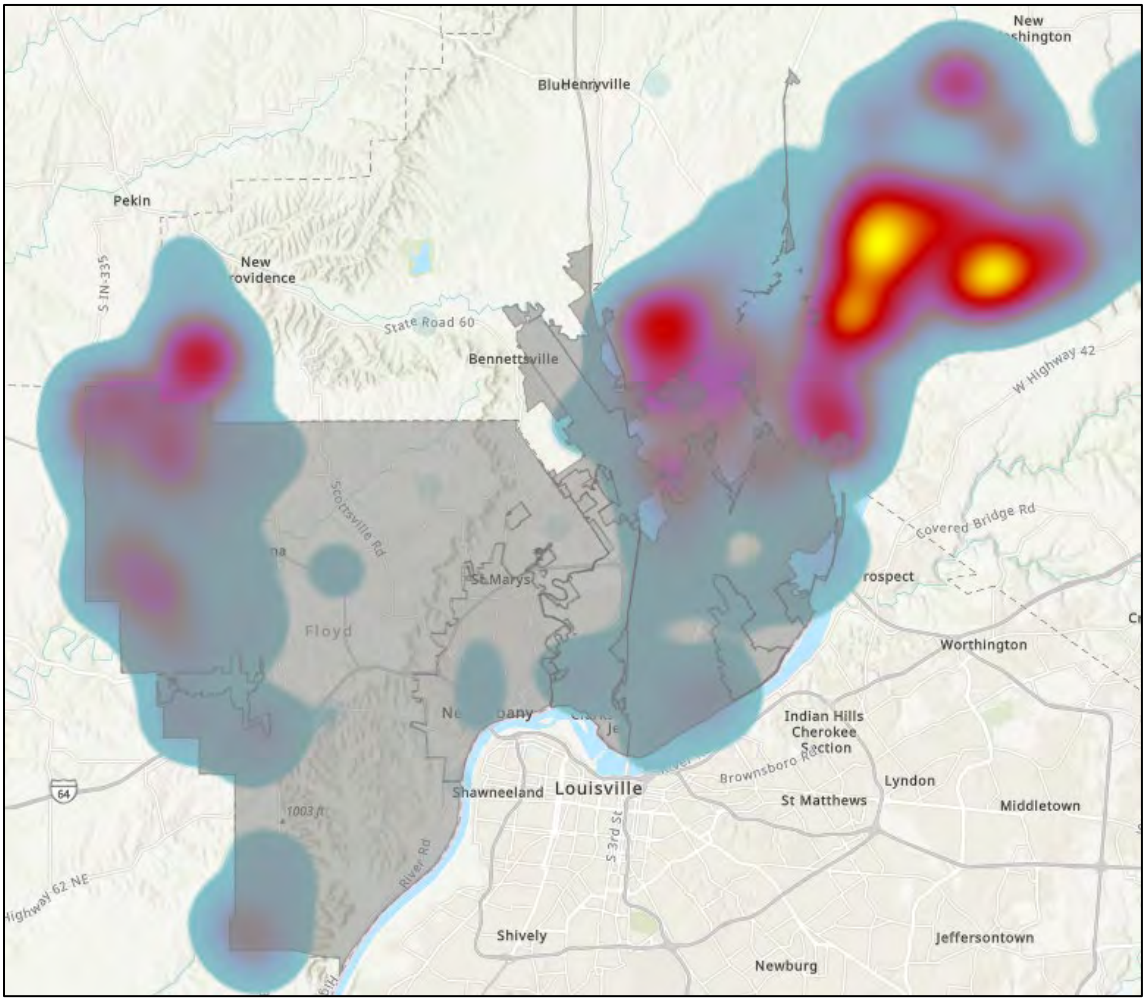

Figure 8. Karst Sinkhole Heat Map within MS4 Region

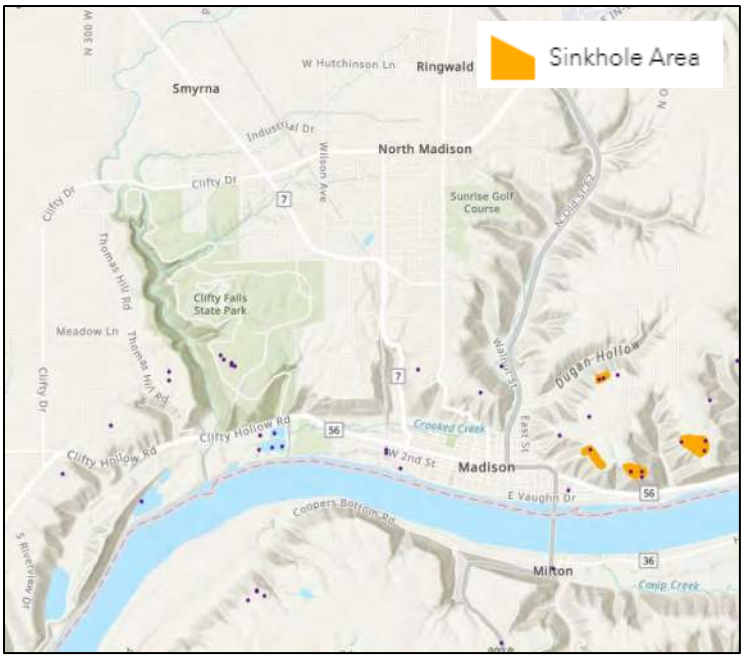

Figure 9. Madison Region Karst Areas

Sinkholes are of special concern because surface runoff is typically transported rapidly to underground channels without the benefit of filtration through soil. If sinkholes are modified to provide stormwater drainage, they are regulated under the USEPA's Underground Injection Control (UIC) Program. Parts 144 to 147 of the UIC Program describe the minimum requirements, procedures, and definition for various types of injection. The UIC program requires property owners to register the modified sinkhole as a Class V injection well.

The Construction Site Runoff Control Ordinances requires the locations of sinkholes and other areas where stormwater may be directly discharged into groundwater be included in the application for a Stormwater Quality Management Permit (SQMP), which must be issued prior to any land disturbing activities. The Post-Construction Storm Water Management Ordinances requires supportive data to justify the selection of BMPs. A discussion of the impacts a BMP will have on local karst topography is included in this requirement. The Stormwater BMP Design Manual states that BMPs such as infiltration trenches or dry wells, which allow water infiltration at a discrete point source, should be avoided. BMPs which provide infiltration opportunities over a very large area, such as filter strips, large bioretention facilities, and permeable pavement, mimic the natural process by which rainfall enters the subsurface, and may be suitable in some sinkhole areas.

4.4 Summary of Existing/Available Monitoring Data

As established in previous permitting iterations and the Indiana MS4 General Permit, individual MS4 communities must continue to review and summarize existing and available monitoring data for the MS4s receiving waters, including, as applicable, data that can be correlated from stream reach characterization and evaluation reports, chemical, biological, physical, land use, and compliant data. The following discussion provides a general evaluation of existing, accessible, and readily available water quality data and reports which individual MS4 areas should consult as characterizations and permit applications are developed. The following review is meant only to provide guidance and information relevant to all SWAC communities. Individual MS4 community-specific data and summary information has been provided in the Attachments to this report.

5.0 Water Quality Management

5.1 MS4 Program Ordinances

Land use throughout the Southern Indiana region has become increasingly more developed throughout the past decade since the initial WQCR was completed in the first permit term for the MS4 Programs. The communities in the region have continued to further enhance and refine their MS4 programs. Efforts have been taken to educate residents, students, the construction industry, elected officials, and public employees regarding stormwater pollution management, as well as the requirements and benefits of the MS4 program.

All communities in the SWAC have adopted and implemented ordinances for Illicit Discharge Detection and Elimination, Construction Site Stormwater Management, Post-Construction Stormwater Management, and Floodplain Management with either meet or exceed the requirements of the MS4 permits, and will be reviewed in 2023/2024 to ensure the ordinance meeting the requirements of the Indiana MS4 General Permit, effective December 18, 2021. These ordinances have served as the legal mechanism through which the MS4s have implemented their MS4 programs and are believed to have had a direct impact on improved water quality throughout the region.

5.2 Areas with Potential to Contribute to Poor Water Quality

An evaluation of water pollution potential areas specific to a SWAC community are described in greater detail in the individual WQCR sections in the appendices of this report.

Elevated bacteria levels in many of the waterways may be attributed to combined sewer overflows or to livestock and fertilizer usage in agriculture areas. The combined sewer issue has been known and there have been significant efforts and investment to separate these systems.

Increased sedimentation from construction areas from large developments are continually addressed and enforced. Several NOVs have been issued and complaints by MS4 coordinators have been reported, especially in the larger communities. Continued education efforts and enforcement actions are utilized to manage sediment runoff from construction sites.

Industrial areas listed as Rule 6 sites for Active Industrial Stormwater Runoff permits are described in the individual community sections.

5.3 Stream Visual Assessment Protocol

In this new permit, the SWAC Communities will continue to implement the Stream Visual Assessment Protocol (SVAP), and make possible revisions to the protocols. The goal of the SVAP is to provide an efficient and economical solution for visual inspections of stormwater infrastructure required in the Storm Water Quality Management Plan (SWQMP). Data gathered from the SVAP will allow the communities to assess MS4 receiving streams, identify locations that could potentially benefit from maintenance or remediation activities, and to identify strategies for improving water quality throughout the MS4 area.

Previous SVAP monitoring sites were selected using the MS4 map, aerial photography, watershed maps, land use and other spatial data within each drainage area. Site selection considerations included streams receiving stormwater discharges, streams adjacent to high public use areas such as parks and sensitive areas such as wetlands. These will be expanded upon to include additional outfalls during this permit term.

The SVAP manual outlines the procedures to be used to collect data. The protocol includes visually assessing stream flow, stream channel and riparian zone condition, as well as visual indicators of water pollution such as odor, color, turbidity, excessive algae and floatables. Stream channels are evaluated for evidence of channel alteration (e.g., straightening), excessive erosion and/or sediment deposition. Riparian zones are evaluated for the presence, extent and quality of riparian vegetation. Data is recorded on a paper form or hand held GPS unit and further documented with digital photographs. Each community conducts the SVAP monitoring twice per year during "leaf off" conditions, which is during early spring low flows when nutrient and sedimentation issues become apparent and during fall/winter when the lack of vegetation allows better assessments of stream bank and in-stream habitat conditions.

SVAP data is analyzed after each data collection to identify locations and streams in need of remediation or maintenance activities, such as bank stabilization, riparian buffer improvements, or litter pickup. More broadly, these data are used to develop strategies for improving or maintaining water quality throughout the MS4 area. At the end of each term, the results of the SVAP are intended to be compiled into a summary report to develop broad views of the changes within the watersheds of that community.

5.4 Permitting Entities and Sources of Monitoring Data

Individual MS4 communities are encouraged to search for water quality and related data using publicly accessible reports and databases published by government agencies such as the Indiana Department of Environmental Management (IDEM), Indiana Department of Natural Resources, US Environmental Protection Agency (USEPA), and the United States Geological Survey. Further characterization of these agencies and their capacity to assist in water body characterization can be found below.

Indiana Department of Natural Resources: Works to protect, enhance, preserve, and wisely use natural, cultural, and recreational resources for the benefit of Indiana's citizens through professional leadership, management and education. The division of water provides water resource information, generates surface and groundwater resource assessments.

United States Geological Survey: Mapping agency that collects, monitors, analyzes and provides science about natural resources. USGS assists by monitoring, assessing, and delivering information on water resources and conditions. This includes information on streamflow, groundwater, water quality, and water use and availability.

Indiana Department of Environmental Management: IDEM issues air, water, and solid and hazardous waste permits that restrict discharges to environmentally safe levels. Staff members inspect and monitor regulated entities; provide compliance and technical assistance; monitor and assess air, land, and water quality; use enforcement actions as necessary to ensure compliance; and respond to incidents involving spills to soil or waters of the state.

US Environmental Protection Agency: Researches the best practices to reduce national environmental risks are based on the best available scientific information. Setting environmental policy and enforcing federal laws protecting human health and the environment are administered and enforced fairly, effectively and as Congress intended. The EPA helps identify and ensure the cleanup of contaminated lands and toxic sites by potentially responsible parties and revitalized. They also ensure that chemicals in the marketplace are reviewed for safety.

5.5 INDOT Non-Traditional MS4 Areas

INDOT maintains certain areas adjacent to state and federal areas in Indiana. A list of areas that are maintained that are within the MS4 areas in this report has been provided in Table 11. As a MS4 program these areas are still needed to follow the MCMs laid out by the EPA. For more detailed information see the INDOT and Stormwater Quality webpage. The most recent SWQMP report was published for the 2020-2021 reporting period.

Table 11. Southeastern Indiana INDOT Non-Traditional Area

Route	Starting RP	Ending RP	Centerline Miles	Description
I-64	117.29	123.61	6.32	GEORGETOWN EXIT TO IN/KY STATE LINE
I-265	0.00	6.71	6.71	I 64 TO I 65
SR 265	6.71	8.78	2.07	I 65 TO OHIO RIVER

6.0 Recommendations

An evaluation of findings for SWAC communities are described in greater detail in the individual WQCR sections.

6.1 Summary

The Southern Indiana MS4 communities have developed a nearly 20-year partnership of educating, training, and providing programs through the Southern Indiana Stormwater Advisory Committee (SWAC), which has allowed each community to further enhance and more effectively implement their MS4 Programs. Qualified personnel have been trained to effectively inspect areas of concern, construction sites, and discharge points to report on water quality and ensure that standards are met with the SWAC QPI training. This collaboration has helped institute regionally-consistent ordinance requirements, education, and technical standards.

Communities continue to develop and invest digital mapping and reporting tools to track reports, complaints, and other information in relationships to the program. This information is reported to IDEM in an Annual Report, which is now required to be submitted each April 1st.

The contiguous nature of the SWAC MS4s means activities in one community have a high potential to impact the communities downstream or surrounding them. Pollutants continue to be an issue from these areas as the population expands and major construction projects are in the region. However, major investment has gone into trying to minimize discharges in the streams. Working together in a partnership to address pollutants remains a critical component of the SWAC.

6.2 Recommendations

The following general recommendations are provided to continue to maintain and further enhance the existing MS4 Programs in Southern Indiana Region:

1. The Qualified Professional Inspector (QPI) training program has been updated and needs to be finalized to continue training construction site operators in erosion and sediment control runoff measures, and proper BMP installation procedures. Use the EPA Construction General Permit training online may be offered as an alternative to the regional QPI training.
2. Development and adoption of new Stormwater Ordinances for each community in 2023/2024 to ensure compliance with the MS4 General Permit (INR040000) and Construction Stormwater Runoff General Permit (INRA00000).
3. Continued monitoring of construction sites ESPC measures in accordance with the regulatory agencies, MS4 General Permit, and Construction Stormwater Runoff General Permit.
4. Continue to update Stormwater Master Plans for individual communities, as it has been over ten years for many of these communities since the last update has been done.
5. Ensure the Stream Visual Assessment Protocol (SVAP) program is continued, and well documented, for outfall inspections to locate and eliminate illicit discharges, as well as regularly visually inspect the health of streams through each community.
6. Continue mapping the stormwater systems and maintain the data in a GIS database. A visual inspection component of stormwater system mapping is included in the MS4 General Permit.
7. Follow the activities in the 2023 SWQMPs submitted to IDEM by each of the individual communities.

7.0 References

Environmental Protection Agency (EPA). (1993, January). *Chapter 7: Management Measures for Wetlands, Riparian Areas, and Vegetated Treatment Systems*. Retrieved from https://www.epa.gov/sites/production/files/2015-09/documents/czara_chapter7_wetlands.pdf

Environmental Protection Agency (EPA). (2008, January). *Understanding Impaired Waters and Total Maximum Daily Load (TMDL) Requirements for Municipal Stormwater Programs*. Retrieved from https://www3.epa.gov/npdes/pubs/region3_factsheet_tmdl.pdf

Environmental Protection Agency. (2007, July). *Chapter 5: Streambank and Shoreline Erosion, National Management Measures to Control Nonpoint Source Pollution from Hydromodification*. Retrieved from https://www.epa.gov/sites/production/files/2015-09/documents/efh-frontmatter.pdf

Environmental Protection Agency. (2022, August 11). *Nutrient Pollution: Sources and Solutions*. Retrieved from https://www.epa.gov/nutrientpollution/sources-and-solutions

Indiana Department of Environmental Management, & Indiana State Department of Agriculture. (2021, February). *Indiana State Nutrient Reduction Strategy*. Retrieved from https://www.in.gov/isda/files/Indiana-State-Nutrient-Reduction-Strategy_final-Version-6_small.pdf

Indiana Department of Environmental Management. (n.d.). *E. Coli Fact Sheet*. Retrieved from https://www.in.gov/idem/files/factsheet_owq_sw_e_coli.pdf

Indiana Department of Natural Resources. (2023). Water: About Us. Retrieved from https://www.in.gov/dnr/water/about-us/

Mupepele, A.-C., & Dormann, C. (2016). Influence of forest harvest on nitrate concentration in temperate streams—a meta-analysis. *Forests*, *8*(1), 5. https://doi.org/10.3390/f8010005

Nonpoint Source. (2022). *Total Maximum Daily Load Reports*. Retrieved from https://www.in.gov/idem/nps/resources/total-maximum-daily-load-reports/

Rouge River National Wet Weather Demonstration Project. (n.d.). *Stormwater Management: Best Management Practices (BMPs)*. Retrieved January 26, 2023, from https://www.michigan.gov/-/media/Project/Websites/egle/Documents/Programs/WRD/NPS/Savvy/savvy-bmp.pdf?rev=9c8c17b9b0f54a3a9212b530cc8f60ae

Temporary construction erosion and sediment control Temporary Construction Erosion and Sediment Control, Minnesota Stormwater Manual. Minnesota Stormwater Manual. (2022, December 9). Retrieved from https://stormwater.pca.state.mn.us/index.php/Temporary_construction_erosion_and_sediment_contro

United States Deparment of Agriculture, & Enviromental Protection Agency. (2022, October 28). *The Sources and Solutions: Agriculture*. https://www.epa.gov/nutrientpollution/sources-and-solutions-agriculture

US Enviromental Protection Agency. (2008, March). *Handbook for Developing Watershed Plans to Restore and Protect Our Waters: Chapter 10. Identify Possible Managment Strategies*. Retrieved from https://www.epa.gov/sites/production/files/2015-11/documents/2008_04_18_nps_watershed_handbook_ch10.pdf

US Geological Survey. (2023). Water Resources. https://www.usgs.gov/mission-areas/water-resources

IDNR. (1996). *Appendix E.4 IDNR listing of Indiana Special Streams*. Retrieved February 6, 2023, from https://www.in.gov/dnr/water/files/Appdx_E-4.pdf

Appendix A
Tables

Table 1: NLCD Land Use Classification Descriptions

Category	Classification Description
Barren Land	Areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits and other accumulations of earthen material. Generally, vegetation accounts for less than 15% of total cover.
Cultivated Crops	Areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and also perennial woody crops such as orchards and vineyards. Crop vegetation accounts for greater than 20% of total vegetation. This class also includes all land being actively tilled.
Deciduous Forest	Areas dominated by trees generally greater than five (5) meters tall, and greater than 20% of total vegetation cover. More than 75% of the tree species shed foliage simultaneously in response to seasonal change.
Developed, High Intensity	Highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80% to 100% of the total cover.
Developed, Low Intensity	Areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20% to 49% percent of total cover. These areas most commonly include single-family housing units.
Developed, Medium Intensity	Areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50% to 79% of the total cover. These areas most commonly include single-family housing units.
Developed, Open Space	Areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20% of total cover. These areas most commonly include large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.
Emergent Herbaceous Wetlands	Areas where perennial herbaceous vegetation accounts for greater than 80% of vegetative cover and the soil or substrate is periodically saturated with or covered with water.
Evergreen Forest	Areas dominated by trees generally greater than five (5) meters tall, and greater than 20% of total vegetation cover. More than 75% of the tree species maintain their leaves all year. Canopy is never without green foliage.
Hay/Pasture	Areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20% of total vegetation.
Herbaceous	Areas dominated by gramanoid or herbaceous vegetation, generally greater than 80% of total vegetation. These areas are not subject to intensive management such as tilling but can be utilized for grazing.
Mixed Forest	Areas dominated by trees generally greater than five meters tall, and greater than 20% of total vegetation cover. Neither deciduous nor evergreen species are greater than 75% of total tree cover.
Open Water	Areas of open water, generally with less than 25% cover of vegetation or soil.
Shrub/Scrub	Areas dominated by shrubs; less than five (5) meters tall with shrub canopy typically greater than 20% of total vegetation. This class includes true shrubs, young trees in an early successional stage or trees stunted from environmental conditions.
Woody Wetlands	Areas where forest or shrubland vegetation accounts for greater than 20% of vegetative cover and the soil or substrate is periodically saturated with or covered with water.

Source: National Land Cover Database (NLCD)

Table 2: Examples of Structural Management Practices

Infiltration Basins and Infiltration Trenches- Infiltration devices drain or infiltrate water directly into the ground, providing an opportunity for groundwater recharge. Infiltration facilities are below ground; the length of time that water is allowed to be on the surface is determined by municipal codes.

Dry Wells- Dry wells collect and infiltrate roof runoff at gutter downspouts, roof valleys, and other places where large amounts of concentrated water flow off of a roof. The water is conveyed typically through an underground pipe into an excavated pit (the dry well). They help reduce erosion on your property and can reduce ponding and sitting water.

Rain Barrels- A rain barrel is a device to collect rainwater from downspouts. Rain barrels can be purchased or can be made at home. They come in all sizes and shapes. Some benefits of rain barrels include: reduction of stormwater runoff, promotion of local watershed awareness, education of neighbors about stormwater issues, lowered water bill by reducing metered water usage, and water reuse for landscaping, washing, etc.

Rain Gardens- A rain garden is a landscaped area planted with wildflowers and other native vegetation that is used to soak up rainwater from the roof, driveway, and lawn. The water slowly seeps into the ground instead of heading for the nearest storm drain. A rain garden allows for significantly more water to soak into the ground than a conventional lawn.

Pervious Pavement- Porous asphalt, porous concrete, and porous pavers are all types of pervious pavements. These are typically used with infiltration beds below the previous surfaces, which allow for temporary stormwater storage and infiltration into the ground. These technologies are used for stormwater peak rate control.

Subsurface Infiltration Bed- Temporary storage and infiltration can be attained when including subsurface infiltration beds underneath vegetated surfaces. Subsurface infiltration beds are typically filled with stones (for void space) and wrapped in geotextile fabric. Subsurface infiltration beds work well in large and generally flat spaces that are located downhill from impervious areas.

Vegetated Swale- Vegetated swales, also known as bioswales, are broad channels that are densely planted with vegetation. Designed to attenuate and sometimes infiltrate flow, vegetated swales provide peak rate control and also allow for pollutants to settle out, therefore improving water quality. In sloped areas, check dams are needed to enhance the stormwater management functions of vegetated swales.

Vegetated Filler Strip- Vegetated Filter Strips, also called buffer strips, are areas in between sources of nonpoint source pollutants and the receiving body of water. They can include native or indigenous vegetation such as grasses, shrubs, and trees. Turf grasses are also used sometimes but their functionality in stormwater management is limited. The primary stormwater function of vegetated filter strips is water quality improvement; however, some volume reduction and ground water recharge can occur depending on site conditions such as soil and slope.

Constructed Filter- A constructed stormwater filter is a structure or excavated area that is filled with material that filters stormwater. These devices can be designed to filter floatables, sediments, metals, hydrocarbons, and other pollutants. There are many variations on the constructed filter, including vegetated and non-vegetated, infiltration, contained, subsurface, and linear perimeter filters.

Infiltration Berm/Retention Grading- Infiltration berms are linear landscape features that are parallel to existing site contours in areas with moderate slopes. They are earthen embankments that divert, retain, slow down, divert, and promote the infiltration of stormwater. Berms are most effective in areas that receive runoff from small impervious areas. Retentive grading creates small depressions that store and infiltrate stormwater.

Vegetated Roof- Vegetated Roofs are roofs that are covered with specialized media and planted with vegetation; this enables the roof to hydrologically perform in a manner similar to vegetated surfaces. The media holds water, which is eventually evapotranspired by the plants. The primary function of the vegetated roof in stormwater management is volume reduction. Additional stormwater benefits include water quality improvements and some peak rate control. Environmental benefits beyond stormwater control include building temperature moderation and wildlife habitat.

Runoff Capture and Reuse- Runoff Capture and Reuse refers to the variety of techniques that are used to capture precipitation, store it for a period of time, and reuse the water. Devices used to capture and store stormwater include rain barrels, cisterns, vertical storage mechanisms, and below ground storage systems. These BMPs are most effective for use in controlling small, frequent storm events. Stormwater management benefits of runoff capture and reuse devices include volume reduction, water quality improvements, peak rate control, and groundwater recharge.

Constructed Watershed- Constructed Wetlands (CWs), also known as stormwater wetlands, are shallow aquatic systems planted with emergent vegetation. They are highly effective at removing pollutants from stormwater; they also mitigate peak flow rates and reduce runoff volume. Beyond stormwater management, CWs provide wildlife habitat and aesthetic value. Detention Basins, a basic BMP that temporarily stores stormwater, are often retrofitted into CWs to maximize stormwater management function of the space and obtain the added benefits.

Wet Pond/Retention Basin- Wet Ponds (WPs), also called retention basins, are stormwater basins that include a permanent pool of water, as well as additional capacity for the temporary storage of stormwater. They are very effective at controlling peak stormwater rates and also provide water quality benefits. Beyond stormwater management, WPs can also provide aesthetic and wildlife benefits.

Dry Extended Retention Basin- Dry Extended Detention Basins (DEDBs) are detention basins, which are designed to provide temporary stormwater storage and water quality benefits. The temporary storage of stormwater prevents downstream flooding. Water quality benefits are achieved through sediment settling out of the stormwater while held in the DEDB. DEDBs are often used in conjunction with other BMPs to maximize stormwater management benefits on site. The DEDB is a design enhancement from the Dry Detention Basin, which has been popular since the 1970s. The extended detention of stormwater maximizes water quality benefits.

Water Quality Filters/Hydrodynamic Devices- Water Quality Filters are stormwater inlets that are fitted with devices to filter pollutants from stormwater. Hydrodynamic devices are separate from inlets but serve the same function of filtering pollutants. Both Water Quality Filters and Hydrodynamic Devices rely on some form of settling and filtration to remove pollutants from runoff. There are numerous variations available commercially.

Riparian Buffer Restoration- Riparian Buffer Restoration (RBR) is the restoration of the area surrounding streams, lakes, ponds, and wetlands. The restoration of these areas provides numerous stormwater management benefits, including water quality improvement, volume reduction, groundwater recharge, and peak rate control. Ecological benefits beyond stormwater management are numerous, including providing wildlife habitat and providing aesthetic value.

Landscape Restoration- Landscape Restoration is the term used for the implementation of sustainable landscape practices outside of the Riparian Buffer and/or other specially protected areas. Landscape Restoration can include forest restoration, meadow restoration, and the conversion of turf to meadow. Native plants should be used, and the use of pesticides and herbicides should be eliminated, if possible.

Soil Amendment Restoration- The Soil Amendment & Restoration BMP refers to the process of improving disturbed soils. By reducing compaction and adding organic materials, stormwater infiltration and pollutant removal capacity can be greatly increased. In addition to the added stormwater capacity of the soil itself, soil amendment and restoration improves conditions for growing vegetation, which further improves stormwater management.

Floodplain Restoration- Floodplain Restoration aims to restore a floodplain to conditions present prior to development (pre-1600s). It is a system-based BMP that strives to mimic undisturbed conditions between groundwater, stream base flow, and vegetation. Floodplain Restoration provides substantial water quality and quantity stormwater management benefits.

Level Spreader- Level spreaders are a structural BMP that are designed to reduce the erosive energy of stormwater. Examples of Level Spreaders include earthen berms, level perforated pipes, or concrete curbs. Level spreaders are often used in conjunction with other BMPs such as Filter Strips. Filter Strips function significantly better when stormwater is distributed across the BMP.

Special Detention Areas- The implementation of Special Detention Areas entails using spaces that are not typically utilized for stormwater management, such as parking lots, to temporarily detain stormwater. A flow control structure is typically used to allow runoff to a pond. This BMP is specifically used to control peak rate volume and is more effective when combined with other BMPs that address water quality and volume reduction.

Examples and Explanations Taken Directly From The Southwestern Pennsylvania Commission Water Resource Center (https://spcwater.org/topics/stormwater-management/stormwater-best-management-practices-2/)

Table 3: Example of Non-Structural Management Practices

Riparian Corridors/Buffers - A riparian corridor includes a body of water (stream, river, pond or lake), its lower and upper banks, and the vegetation that stabilizes the area of land adjacent to the body of water. This area of land adjacent to the body of water can also be referred to as a "riparian buffer". This corridor or buffer is important because natural trees and vegetation can filter out air and water pollution, roots from tree and other vegetation can hold the soil in place providing protection from significant erosion and sedimentation, provide cover and shade, provide food and habitat for fish and wildlife, and can provide flood water retention.

Preservation and restoration of riparian corridor/buffers has been identified as one of the most important ways to protect and improve water quality by government and state agencies.

Protect Sensitive and Special Value Features - Special Value Features are those that provide exceptional value stormwater benefits. Examples include riparian areas, wetlands, hydric soils, and floodplains. Sensitive Features are those that are exceptionally vulnerable to stormwater damage. Examples include steep slopes and neighboring properties. Damage to both special value and sensitive features can exacerbate stormwater volume, rate, and quality problems. When developing a site, special attention should be paid to these areas.

Protect / Utilize Natural Flow Pathways in Overall Stormwater Planning and Design - Sites usually have areas where stormwater is being stored and/or conveyed prior to development. These features should be identified and preserved during planning and construction in order to minimize the impacts of stormwater. The preservation of such features can reduce the need for structural BMPs.

Cluster Uses at Each Site and Build on Smallest Area Possible - Through clustering uses at each site and building on the smallest area possible, additional runoff that is generated through the development process is minimized. Additional benefits of this design approach include the preservation of open space, the minimization of impervious areas, and many others. Practical examples of this non-structural BMP include reducing lot size and building vertically.

Use Smart Growth Practices - Smart Growth practices are typically used at the community, municipal, or multi-municipal level. This planning technique guides growth towards parcels that are most desirable for this use. The PA Stormwater BMP Manual describes this particular BMP as "Super Clustering." Smart Growth employs similar methods on a macro scale as clustering does on a micro (site) scale. Tools used in Smart Growth include urban growth boundaries, agricultural zoning, transfer of development rights, donation of conservation easement by owners, and many more.

Minimize Total Disturbed Area–Grading - This design approach works with the existing site topography instead of against it. By reducing the need for site grading, soil disturbance, and removal of vegetation, this planning and development approach aims to prevent the generation of stormwater. Additional benefits of Minimizing Total Disturbed Areas & Grading include reduction of areas that need to be landscaped and maintained.

Minimize Soil Compaction - Minimizing soil compaction and maintaining topsoil quality during construction provides numerous stormwater benefits. Stormwater benefits of this practice include: minimizing runoff and erosion, maximizing water retention capacity, filtering of stormwater, and reducing resources needed to maintain landscaping.

Re-Vegetate and Re-Forest Disturbed Areas - Disturbed areas should be re-vegetated with native plants, grasses, shrubs, and trees. Since these species are adapted to local climate and conditions, they require less fertilizers and pesticides and have better chances of surviving. Stormwater benefits of established native plantings include runoff volume and rate reduction as well as water quality improvements.

Reduce Street Imperviousness and Parking Imperviousness - The benefits of reducing impervious areas for streets and parking through innovative planning are numerous. Benefits include: increased infiltration, decreased stormwater volume, pollutant load reduction, and preservation of natural habitats.

Rooftop Disconnection - Rooftop disconnection is also known as downspout disconnection. Disconnecting rooftop leaders from the storm sewer system and re-directing towards vegetated areas is an effective way to manage stormwater volume. This BMP can be more effective when the flow is directed towards a structural BMP such as a rain garden.

Disconnection from Storm Sewers - Disconnecting stormwater generated from impervious areas, such as roads and driveways, from storm sewers and directing towards structural BMPs, such as bio-infiltration areas, is effective in many ways. Managing the flow near the source instead of sending it downstream via traditional piping allows for increased infiltration and evapotranspiration, increased filtration, and decreased runoff volume.

Street Sweeping – Street Sweeping is a form of source control that is key to ensuring the function of stormwater facilities and keeps local waterways free of debris and other pollutants. In order for street sweeping to be effective, the equipment used should have a vacuum filter.

Examples and Explanations Taken Directly From The Southwestern Pennsylvania Commission Water Resource Center (https://spcwater.org/topics/stormwater-management/stormwater-best-management-practices-2/)

Table 4: Water Quality Measurements and Standards: INDIANA

Physical Monitoring Assessment	Unit	Standard	Source
Turbidity	NTU	Max: 10.4 NTU U.S EPA recommendation	U.S. EPA's proposed nutrient criteria for rivers and streams for ecoregion 55 (Eastern Corn Belt Plains)
Qualitative Habitat Evaluation Index (QHEI)	N/A	>64 Habitat can support a balanced warmwater community. 51-64 Habitat is only partially. supportive of a stream's aquatic life designation <51 Poor habitat	No standard method of interpretation set by IDEM. IDEM interpretation shown here.
Dissolved Oxygen	mg/L or % Saturation	DO levels below 4 mg/L are stressful to most aquatic life. DO levels below 2 mg/L will not support fish. Levels of at least 5 to 6 mg/L are usually required for healthy growth and activity of aquatic life.	Indiana Administrative Code (IAC) 327 IAC 2-1-6 [Non-Great Lakes]
pH	N/A	Must be above 6 and below 9 (A pH range of 6.5 to 8.2 appears to provide protection for most aquatic organisms)	(IAC) 327 IAC 2-1-6 [Non-Great Lakes] IDNR, 2008
Water Temperature	°C	Maximum temperature rises above natural temperatures shall not exceed 5 °F (2.8 °C) in streams	Indiana Administrative Code (IAC) 327 IAC 2-1-6
E. Coli	CFU/100mL	The geometric mean of five (5) equally spaced samples over a 30-day period must be less than 125 CFU/100 mL. All samples must be less than 235 CFU/100 mL	Indiana Department of Natural Resources. Spring 2008. Volunteer Stream Monitoring Training Manual: Hoosier Riverwatch. Indianapolis, IN: Indiana Department of Natural Resources
Orthophosphate	mg/L	SRP concentrations of >0.005 mg/L cause eutrophic or highly productive conditions in lake system	Correll, David L. 1998. The role of phosphorus in the eutrophication of receiving waters: a review. J. Environ. Qual. 27(2):261-266.
Biochemical Oxygen Demand (BOD)	mg/L	1-2 mg/L Clean water with little organic waste 3-5 mg/L Fairly clean with some organic waste 6-9 mg/L Lots of organic material and bacteria 10+ mg/L Very poor water quality; Very large amounts of organic material in water	Hoosier Riverwatch's guidance for Biochemical Oxygen Demand levels

Table 5: Aquatic Life Use Support – Rivers and Streams (IDEM CALM)

<table>
<tr><th colspan="3">Aquatic Life Use Support - Rivers and Stream</th></tr>
<tr><td rowspan="3">Toxicants</td><td colspan="2">Data for dissolved metals (and total metals where dissolved metals data are not available), pesticides, polychlorinated biphenyls (PCBs), polynuclear aromatic hydrocarbons (PAHs), free cyanide, and ammonia were evaluated on a site-bysite basis and judged according to the magnitude of the exceedance(s) of Indiana's WQS and the number of times the exceedance(s) occurred. For any one pollutant (grab or composite samples), the following assessment criteria are applied to data sets consisting of three or more measurements.</td></tr>
<tr><td>Fully Supporting</td><td>Not Supporting</td></tr>
<tr><td>No more than one exceedance of the acute or chronic criteria for aquatic life within a three-year period.</td><td>More than one exceedance of the acute or chronic criteria for aquatic life within a three-year period.</td></tr>
<tr><td rowspan="3">Conventional inorganics</td><td colspan="2">Dissolved oxygen, pH, sulfate, and chloride were evaluated for the exceedance(s) of Indiana's WQS. For any one pollutant, the following assessment criteria are applied to data sets consisting of three or more measurements.</td></tr>
<tr><td>Fully Supporting</td><td>Not Supporting</td></tr>
<tr><td>Criteria are exceeded in less than or equal to 10% of measurements.</td><td>Criteria are exceeded in greater than 10% of measurements.</td></tr>
<tr><td>Nutrients</td><td colspan="2">Nutrient conditions were evaluated on a site-by-site basis using the benchmarks described below. In most cases, two or more of these conditions must be met on the same date in order to classify a waterbody as impaired. This methodology assumes a minimum of three sampling events:
• Total Phosphorus -- One or more measurements greater than 0.3 mg/L
• Nitrogen (measured as NO3 + NO2) – One or more measurements greater than 10.0 mg/L
• Dissolved Oxygen (DO) – One or more measurements below the water quality standard of 4.0 mg/l or measurements that are consistently at/close to the standard, in the range of 4.0-5.0 mg/L or values greater than 12.0 mg/L
• pH measurements – One or more measurements exceed the water quality standard of no more than 9.0 pH units or measurements are consistently at/close to the standard, in the range of 8.7- 9.0 pH units
• Algal Conditions -- Algae are described as "excessive" based on field observations by IDEM scientists</td></tr>
<tr><td rowspan="2">Benthic aquatic macroinvertebrate Index of Biotic Integrity (mIBI) Scores (Range of possible scores are 12-60)</td><td>Fully Supporting</td><td>Not Supporting</td></tr>
<tr><td>mIBI greater than or equal to 36</td><td>mIBI less than 36</td></tr>
<tr><td>Fish community (IBI) Scores (Range of possible scores is 0-60)</td><td>IBI greater than or equal to 36</td><td>IBI less than 36</td></tr>
</table>

Recreation Use Support (Human Health) – All Waters		
IDEM has two different methods for determining recreational use support, depending on the type of data set being used in making the assessment. For data sets consisting of five equally spaced samples over a 30-day period, IDEM applies two tests, both of which are based on the U.S. EPA's Ambient Water Quality Criteria for Bacteria - 1986 (U.S. EPA, 1986), which provides the foundation for Indiana's WQS for recreational use. For data sets with 10 or more grab samples but without the five samples equally spaced over the 30 days required to calculate a geometric mean, the 10% rule is applied. When both types of data sets are available, the assessment decision is based on the data set consisting of five samples, equally spaced over a 30-day period.		
Bacteria (E. coli): at least five equally spaced samples over 30 days. (cfu=colony forming units)	Fully Supporting	Not Supporting
	Geometric mean does not exceed 125 cfu/100mL	Geometric mean exceeds 125 cfu/100mL.
Bacteria (E. coli): grab samples (cfu = colony forming units)	Not more than 10% of measurements are greater than 576 cfu/100ml (for waters infrequently used for full body contact) or 235 cfu/100mL (for bathing beaches). And Not more than one sample is greater than 2,400 cfu/100mL.	More than 10% of samples are greater than 576 cfu/100mL or more than one sample is greater than 2,400 cfu/100mL.
Qualitative habitats use evaluation (QHEI) (Range of possible scores is 0-100)	The Qualitative Habitat Evaluation Index (QHEI) is not used to determine aquatic life- use support. Rather, the QHEI is an index designed to evaluate the lotic habitat quality important to aquatic communities and is used in conjunction with mIBI or IBI data, or both, to evaluate the role that habitat plays in waterbodies where impaired biotic communities (IBC) have been identified. QHEI scores are calculated using six metrics: substrate, instream cover, channel morphology, riparian zone, pool/riffle quality, and gradient. A higher QHEI score represents a more diverse habitat for colonization of aquatic organisms. IDEM has determined that a QHEI total score of <51 indicates poor habitat. For streams where the macroinvertebrate community (mIBI or mHab) or fish community (IBI) scores indicate IBC, QHEI scores are evaluated to determine if habitat is the primary stressor on the aquatic communities, or if there may be other stressors/pollutants causing the IBC.	

Source: 2022 List of Impaired Waters and Consolidated Assessment and Listing Methodology under Section 303(d) of the Clean Water Act

Appendix B
Endangered Species Lists

Indiana County Endangered, Threatened and Rare Species List

County: Clark

Indiana Department of Natural Resources

Species Name	Common Name	FED	STATE	GRANK	SRANK
Platyhelminthes (Flatworms)					
Sphalloplana weingartneri	Weingartner's Cave Flatworm		WL	G4	S3
Diplopoda					
Pseudotremia nefanda	Clark Cave Millepede		SE	G3G4	S2
Dipluran					
Campodea plusiochaeta	A Dipluran		SE	GNR	S1
Crustacean: Malacostraca					
Caecidotea jordani	Jordan's groundwater isopod		SE	G2G3	S1
Crangonyx ohioensis	An Amphipod			G1G2	S1
Gammarus bousfieldi	Bousfield's spring amphipod		SE	G1	S1
Stygobromus mackini	Mackin's cave amphipod		SE	G5	S1
Crustacean: Copepoda					
Diacyclops jeanneli	Jeannel's Cave Copepod		ST	G3G4	S2
Mollusk: Bivalvia (Mussels)					
Fusconaia subrotunda	Longsolid	PT	SX	G3	SX
Lampsilis fasciola	wavyrayed lampmussel		SSC	G5	S3
Potamilus capax	Fat Pocketbook	E	SE	G2	S1
Villosa lienosa	Little Spectaclecase		SSC	G5	S3
Mollusk: Gastropoda					
Fontigens cryptica	Hidden Springs Snail		SE	G1	S1
Ellipluran: Collembola					
Pseudosinella fonsa	Fountain Cave Springtail		ST	G3G4	S2
Insect: Coleoptera (Beetles)					
Batrisodes hairstoni	Krekeler's cave ant beetle		SE	G1	S1
Dryobius sexnotatus	Six-banded Longhorn Beetle		ST	GNR	S2
Pseudanophthalmus barri	Cave Beetle		SE	G1G2	S1
Insect: Lepidoptera (Butterflies & Moths)					
Celastrina nigra	Dusky Azure		SE	GU	S1
Pieris virginiensis	West Virginia white		SR	G2G3	S3
Arachnida					
Dolomedes scriptus	Lined Nursery Web Spider			G5	S1?
Fish					
Acipenser fulvescens	Lake Sturgeon		SE	G3G4	S1
Etheostoma variatum	Variegate Darter		SE	G5	S1
Amphibian					
Acris blanchardi	Blanchard's cricket frog		SSC	G5	S4
Ambystoma barbouri	streamside salamander	C	SSC	G4	S3
Cryptobranchus alleganiensis alleganiensis	hellbender	C	SE	G3T2	S1

Fed: E = Endangered; T = Threatened; C = candidate; PDL = proposed for delisting

State: SE = state endangered; ST = state threatened; SR = state rare; SSC = state species of special concern; SX = state extirpated; SG = state significant

GRANK: Global Heritage Rank: G1 = critically imperiled globally; G2 = imperiled globally; G3 = rare or uncommon globally; G4 = widespread and abundant globally but with long-term concerns; G5 = widespread and abundant globally; G? = unranked; GX = extinct; Q = uncertain rank; T = taxonomic subunit rank

SRANK: State Heritage Rank: S1 = critically imperiled in state; S2 = imperiled in state; S3 = rare or uncommon in state; S4 = widespread and abundant in state but with long-term concern; SG = state significant; SH = historical in state; SX = state extirpated; B = breeding status; S? = unranked; SNR = unranked; SNA = nonbreeding status unranked

Indiana County Endangered, Threatened and Rare Species List

County: Clark

Indiana Department of Natural Resources

Species Name	Common Name	FED	STATE	GRANK	SRANK
Reptile					
Clonophis kirtlandii	Kirtland's snake		SE	G2	S3
Crotalus horridus	timber rattlesnake		SE	G4	S2
Opheodrys aestivus	rough green snake		SSC	G5	S3
Tantilla coronata	southeastern crowned snake		SE	G5	S1
Terrapene carolina carolina	woodland box turtle		SSC	G5T5	S3
Bird					
Centronyx henslowii	Henslow's sparrow		SE	G4	S3B
Haliaeetus leucocephalus	bald eagle			G5	S3
Helmitheros vermivorus	worm-eating warbler		SSC	G5	S3B
Lanius ludovicianus	loggerhead shrike		SE	G4	S2B
Nycticorax nycticorax	Black-crowned Night-heron		SE	G5	S1B
Pandion haliaetus	Osprey		SSC	G5	S1B
Peucaea aestivalis	Bachman's Sparrow			G3	SXB
Setophaga cerulea	Cerulean Warbler		SE	G4	S3B
Tyto alba	Barn Owl		SE	G5	S2
Mammal					
Mustela nivalis	Least Weasel		SSC	G5	S2?
Myotis grisescens	Gray Bat	E	SE	G3G4	S1
Myotis sodalis	Indiana Bat	E	SE	G2	S1
Sorex fumeus	Smoky Shrew		SSC	G5	S2
Sorex hoyi	eastern pygmy shrew		SSC	G5	S2
Taxidea taxus	American Badger		SSC	G5	S2
Vascular Plant					
Asclepias viridis	green milkweed		SE	G4G5	S1
Asplenium resiliens	black-stem spleenwort		ST	G5	S2
Asplenium ruta-muraria	wallrue spleenwort		ST	G5	S3
Azolla caroliniana	Carolina mosquito-fern		ST	G5	S3
Calamagrostis porteri ssp. insperata	reed bent grass		SE	G4T3	S1
Carex eburnea	ebony sedge		ST	G5	S3
Carex straminea	straw sedge		ST	G5	S2
Chaerophyllum shortii	wild chervil		ST	G5T3T4Q	S2
Cirsium carolinianum	Carolina thistle		ST	G5	S3
Clinopodium arkansanum	calamint		ST	G5	S2
Cornus amomum ssp. amomum	silky dogwood		SE	G5	S1
Cuscuta indecora	pretty dodder		SE	G5	S1
Dichanthelium bicknellii	panic-grass		SE	G4?Q	S1
Eleocharis bifida	glades spikerush		SE	G3G4	S1
Euploca tenella	slender heliotrope		ST	G5	S2
Eurybia schreberi	Schreber's aster		SE	G4	S1

Indiana Natural Heritage Data Center
Division of Nature Preserves
Indiana Department of Natural Resources
This data is not the result of comprehensive county surveys.

Fed: E = Endangered; T = Threatened; C = candidate; PDL = proposed for delisting
State: SE = state endangered; ST = state threatened; SR = state rare; SSC = state species of special concern; SX = state extirpated; SG = state significant
GRANK: Global Heritage Rank: G1 = critically imperiled globally; G2 = imperiled globally; G3 = rare or uncommon globally; G4 = widespread and abundant globally but with long-term concerns; G5 = widespread and abundant globally; G? = unranked; GX = extinct; Q = uncertain rank; T = taxonomic subunit rank
SRANK: State Heritage Rank: S1 = critically imperiled in state; S2 = imperiled in state; S3 = rare or uncommon in state; S4 = widespread and abundant in state but with long-term concern; SG = state significant; SH = historical in state; SX = state extirpated; B = breeding status; S? = unranked; SNR = unranked; SNA = nonbreeding status unranked

Indiana County Endangered, Threatened and Rare Species List

County: Clark

Indiana Department of Natural Resources

Species Name	Common Name	FED	STATE	GRANK	SRANK
Hexalectris spicata	crested coralroot		ST	G5	S3
Hottonia inflata	featherfoil		ST	G4	S2
Hylotelephium telephioides	Allegheny stonecrop		ST	G4	S3
Iresine rhizomatosa	eastern bloodleaf		ST	G5	S3
Isoetes engelmannii	Appalachian quillwort		SE	G4	S1
Lathyrus venosus	smooth veiny pea		SE	G5	S1
Leavenworthia uniflora	Michaux's leavenworthia		SE	G4	S1
Lechea racemulosa	Illinois pinweed		SE	G5	S1
Lilium superbum	Turk's cap lily		ST	G5	S3
Linum sulcatum	grooved yellow flax		ST	G5	S3
Magnolia acuminata	cucumber magnolia		SE	G5	S1
Matelea obliqua	angle pod		ST	G4?	S3
Melica nitens	three-flower melic grass		SE	G5	S1
Melothria pendula	creeping cucumber		ST	G5?	S2
Ophioglossum engelmannii	limestone adder's-tongue		ST	G5	S3
Ophioglossum pusillum	northern adder's-tongue		ST	G5	SU
Penstemon deamii	Deam's beardtongue		SE	G1	S1
Phlox amplifolia	large-leaved phlox		ST	G3G5	S3
Rhexia mariana var. mariana	Maryland meadow beauty		ST	G5T5	S1
Sagittaria australis	longbeak arrowhead		ST	G5	S3
Solidago squarrosa	stout-ragged goldenrod		SE	G4G5	S1
Spiranthes magnicamporum	Great Plains ladies'-tresses		SE	G3G4	S1
Sullivantia sullivantii	Sullivantia		ST	G4	S2
Thalictrum pubescens	tall meadowrue		ST	G5	S3
Trifolium reflexum var. glabrum	buffalo clover		SE	G3G4T2T4Q	S1
Trifolium stoloniferum	running buffalo clover		SE	G3	S1
Viburnum molle	softleaf arrow-wood		ST	G5	S3
Viola hirsutula	southern wood violet		SE	G4	S1
High Quality Natural Community					
Barrens - bedrock limestone	Limestone Glade		SG	G4	S2S3
Barrens - bedrock siltstone	Siltstone Glade		SG	G2	S2
Forest - upland dry Highland Rim	Highland Rim Dry Upland Forest		SG	GNR	S3
Forest - upland dry-mesic Bluegrass	Bluegrass Dry-mesic Upland Forest		SG	GNR	S1
Forest - upland dry-mesic Highland Rim	Highland Rim Dry-mesic Upland Forest		SG	GNR	S3
Forest - upland mesic Bluegrass	Bluegrass Mesic Upland Forest		SG	GNR	S3
Forest - upland mesic Highland Rim	Highland Rim Mesic Upland Forest		SG	GNR	S3

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Indiana County Endangered, Threatened and Rare Species List

County: Floyd

Indiana Department of Natural Resources

Species Name	Common Name	FED	STATE	GRANK	SRANK
Platyhelminthes (Flatworms)					
Sphalloplana chandleri	Chandler's Cave Flatworm		SE	G1G2	S1
Crustacean: Malacostraca					
Caecidotea teresae	Indiana University Southeast groundwater isopod		SX	GX	SX
Crustacean: Copepoda					
Diacyclops jeanneli	Jeannel's Cave Copepod		ST	G3G4	S2
Crustacean: Ostracoda					
Pseudocandona jeanneli	Jeannel's Cave Ostracod		SE	G2	S1
Mollusk: Bivalvia (Mussels)					
Elliptio crassidens	elephantear		SSC	G5	S2
Eurynia dilatata	spike		SSC	G5	S4
Lampsilis ovata	pocketbook		SSC	G5	S2
Ligumia recta	black sandshell		SSC	G4G5	S2
Pleurobema clava	Clubshell	E	SE	G1G2	S1
Pleurobema coccineum	Round Pigtoe			G4G5	S3
Pleurobema cordatum	Ohio Pigtoe		SSC	G4	S2
Reginaia ebenus	Ebonyshell		SSC	G4G5	S3
Villosa lienosa	Little Spectaclecase		SSC	G5	S3
Insect: Lepidoptera (Butterflies & Moths)					
Catocala sordida	Huckleberry underwing		SR	G5	S2S3
Celastrina nigra	Dusky Azure		SE	GU	S1
Pieris virginiensis	West Virginia white		SR	G2G3	S3
Fish					
Acipenser fulvescens	Lake Sturgeon		SE	G3G4	S1
Amphibian					
Acris blanchardi	Blanchard's cricket frog		SSC	G5	S4
Ambystoma barbouri	streamside salamander	C	SSC	G4	S3
Cryptobranchus alleganiensis alleganiensis	hellbender	C	SE	G3T2	S1
Pseudotriton ruber ruber	northern red salamander		SE	G5T5	SH
Reptile					
Cemophora coccinea copei	northern scarlet snake		SE	G5T5	SH
Clonophis kirtlandii	Kirtland's snake		SE	G2	S3
Crotalus horridus	timber rattlesnake		SE	G4	S2
Opheodrys aestivus	rough green snake		SSC	G5	S3
Tantilla coronata	southeastern crowned snake		SE	G5	S1
Terrapene carolina carolina	woodland box turtle		SSC	G5T5	S3
Bird					
Falco peregrinus	Peregrine Falcon		SSC	G4	S2B

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Indiana County Endangered, Threatened and Rare Species List

County: Floyd

Indiana Department of Natural Resources

Species Name	Common Name	FED	STATE	GRANK	SRANK
Haliaeetus leucocephalus	bald eagle			G5	S3
Helmitheros vermivorus	worm-eating warbler		SSC	G5	S3B
Nycticorax nycticorax	Black-crowned Night-heron		SE	G5	S1B
Setophaga cerulea	Cerulean Warbler		SE	G4	S3B
Setophaga citrina	Hooded Warbler		SSC	G5	S3B
Tyto alba	Barn Owl		SE	G5	S2
Mammal					
Myotis grisescens	Gray Bat	E	SE	G3G4	S1
Vascular Plant					
Chaerophyllum shortii	wild chervil		ST	G5T3T4Q	S2
Crataegus chrysocarpa	fireberry hawthorn		SE	G5	S1
Crataegus intricata	Copenhagen hawthorn		ST	G5	S3
Cuscuta indecora	pretty dodder		SE	G5	S1
Hexalectris spicata	crested coralroot		ST	G5	S3
Isoetes engelmannii	Appalachian quillwort		SE	G4	S1
Juglans cinerea	butternut		ST	G3	S2
Lilium superbum	Turk's cap lily		ST	G5	S3
Melothria pendula	creeping cucumber		ST	G5?	S2
Penstemon deamii	Deam's beardtongue		SE	G1	S1
Phlox amplifolia	large-leaved phlox		ST	G3G5	S3
Plantago cordata	heart-leaved plantain		SE	G4	S1
Ranunculus harveyi	Harvey's buttercup		SE	G4	S1
Rorippa aquatica	lake cress		SE	G4?	S1
Sagittaria australis	longbeak arrowhead		ST	G5	S3
Uvularia perfoliata	bellwort		SE	G5	S1
High Quality Natural Community					
Barrens - bedrock siltstone	Siltstone Glade		SG	G2	S2
Forest - upland dry Highland Rim	Highland Rim Dry Upland Forest		SG	GNR	S3
Other Significant Feature					
Freshwater Mussel Concentration Area	Mussel Bed		SG	G3	SNR

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Indiana County Endangered, Threatened and Rare Species List

County: Jefferson

Indiana Department of Natural Resources

Species Name	Common Name	FED	STATE	GRANK	SRANK
Platyhelminthes (Flatworms)					
Sphalloplana weingartneri	Weingartner's Cave Flatworm		WL	G4	S3
Crustacean: Malacostraca					
Caecidotea rotunda	Northeastern Cave Isopod		SR	G2G4	S3
Crangonyx lewisi	Lewis Cave Amphipod		SR	G2	S2
Faxonius sloanii	a crayfish			G3	S1S2
Crustacean: Copepoda					
Diacyclops indianensis	Indiana Groundwater Copepod		SE	G2	S1
Diacyclops lewisi	Lewis' Groundwater Copepod		SE	G1	S1
Mollusk: Bivalvia (Mussels)					
Epioblasma triquetra	Snuffbox	E	SE	G3	S1
Lampsilis ovata	pocketbook		SSC	G5	S2
Ligumia recta	black sandshell		SSC	G4G5	S2
Obovaria subrotunda	round hickorynut	PT	SE	G4	S1
Plethobasus cyphyus	Sheepnose	E	SE	G3	S1
Pleurobema cordatum	Ohio Pigtoe		SSC	G4	S2
Ptychobranchus fasciolaris	Kidneyshell		SSC	G4G5	S2
Simpsonaias ambigua	Salamander Mussel	C	SSC	G3	S2
Toxolasma lividus	Purple Lilliput		SSC	G3	S2
Villosa lienosa	Little Spectaclecase		SSC	G5	S3
Ellipluran: Collembola					
Pseudosinella fonsa	Fountain Cave Springtail		ST	G3G4	S2
Insect: Coleoptera (Beetles)					
Atheta troglophila	a rove beetle		SR	G4	S2
Pseudanophthalmus chthonius	Cave Ground Beetle		SR	G3	S3
Arachnida					
Calymmaria cavicola	Cave Funnel-web Spider			GNR	S1
Amphibian					
Acris blanchardi	Blanchard's cricket frog		SSC	G5	S4
Ambystoma barbouri	streamside salamander	C	SSC	G4	S3
Cryptobranchus alleganiensis alleganiensis	hellbender	C	SE	G3T2	S1
Hemidactylium scutatum	four-toed salamander		SSC	G5	S3
Lithobates areolatus circulosus	northern crawfish frog		SE	G4T4	S2
Reptile					
Clonophis kirtlandii	Kirtland's snake		SE	G2	S3
Opheodrys aestivus	rough green snake		SSC	G5	S3
Terrapene carolina carolina	woodland box turtle		SSC	G5T5	S3
Bird					
Buteo platypterus	Broad-winged Hawk		SSC	G5	S3B

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Indiana County Endangered, Threatened and Rare Species List

County: Jefferson

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Centronyx henslowii	Henslow's sparrow		SE	G4	S3B
Cistothorus stellaris	sedge wren		SE	G5	S3B
Falco peregrinus	Peregrine Falcon		SSC	G4	S2B
Haliaeetus leucocephalus	bald eagle			G5	S3
Lanius ludovicianus	loggerhead shrike		SE	G4	S2B
Peucaea aestivalis	Bachman's Sparrow			G3	SXB
Setophaga cerulea	Cerulean Warbler		SE	G4	S3B
Setophaga citrina	Hooded Warbler		SSC	G5	S3B
Tyto alba	Barn Owl		SE	G5	S2
Mammal					
Lasiurus borealis	Eastern red bat		SSC	G3G4	S4
Myotis lucifugus	little brown myotis	C	SE	G3G4	S2
Myotis septentrionalis	Northern Long Eared Bat	T	SE	G2G3	S2S3
Myotis sodalis	Indiana Bat	E	SE	G2	S1
Nycticeius humeralis	Evening Bat		SE	G5	S1
Perimyotis subflavus	Tricolored Bat		SE	G3G4	S2S3
Taxidea taxus	American Badger		SSC	G5	S2
Vascular Plant					
Asplenium ruta-muraria	wallrue spleenwort		ST	G5	S3
Baptisia australis	wild false indigo		ST	G5	S3
Cardamine dissecta	divided toothwort		SE	G4?	S1
Carex eburnea	ebony sedge		ST	G5	S3
Carex seorsa	weak stellate sedge		ST	G5	S3
Carex straminea	straw sedge		ST	G5	S2
Chaerophyllum shortii	wild chervil		ST	G5T3T4Q	S2
Cornus amomum ssp. amomum	silky dogwood		SE	G5	S1
Cyperus pseudovegetus	green flatsedge		ST	G5	S3
Dichanthelium scoparium	broom panic-grass		SE	G5	S1
Eleocharis wolfii	Wolf's spike-rush		ST	G3G5	S2
Helianthus angustifolius	swamp sunflower		SE	G5	S1
Hydrocotyle americana	American water-pennywort		SE	G5	S1
Hypericum frondosum	golden St. John's-wort		SX	G4	SX
Juglans cinerea	butternut		ST	G3	S2
Juncus nodatus	stout rush		ST	G5	SU
Juniperus communis var. depressa	ground juniper		ST	G5T5	S3
Lilium canadense	Canada lily		ST	G5	S3
Lygodium palmatum	climbing fern		SE	G4	S1
Matelea obliqua	angle pod		ST	G4?	S3
Oenothera perennis	small sundrops		ST	G5	S3
Oenothera triloba	stemless evening-primrose		SX	G4	SX

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County: Jefferson

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Species Name	Common Name	FED	STATE	GRANK	SRANK
Orobanche riparia	bottomland broomrape		SE	G4?	S1
Patis racemosa	black-fruit mountain-ricegrass		ST	G5	S3
Persicaria setacea	swamp smartweed		SE	G5	S1
Phlox amplifolia	large-leaved phlox		ST	G3G5	S3
Ranunculus pusillus	Pursh's buttercup		SE	G5	S1
Rhexia mariana var. mariana	Maryland meadow beauty		ST	G5T5	S1
Sagittaria australis	longbeak arrowhead		ST	G5	S3
Schoenoplectiella purshiana	weakstalk bulrush		ST	G4G5	S3
Sida hermaphrodita	Virginia mallow		SE	G3	S1
Sullivantia sullivantii	Sullivantia		ST	G4	S2
Symphyotrichum oblongifolium	aromatic aster		ST	G5	S3
Thalictrum pubescens	tall meadowrue		ST	G5	S3
Viburnum molle	softleaf arrow-wood		ST	G5	S3
Wisteria frutescens	American wisteria		ST	G5	S3
Woodwardia areolata	netted chainfern		ST	G5	S3
High Quality Natural Community					
Forest - flatwoods bluegrass till plain	Bluegrass Till Plain Flatwoods		SG	G3	S2
Forest - upland dry Bluegrass	Bluegrass Dry Upland Forest		SG	GNR	S1
Forest - upland dry-mesic Bluegrass	Bluegrass Dry-mesic Upland Forest		SG	GNR	S1
Forest - upland mesic Bluegrass	Bluegrass Mesic Upland Forest		SG	GNR	S3
Primary - cliff limestone	Limestone Cliff		SG	GU	S1
Other Significant Feature					
Freshwater Mussel Concentration Area	Mussel Bed		SG	G3	SNR

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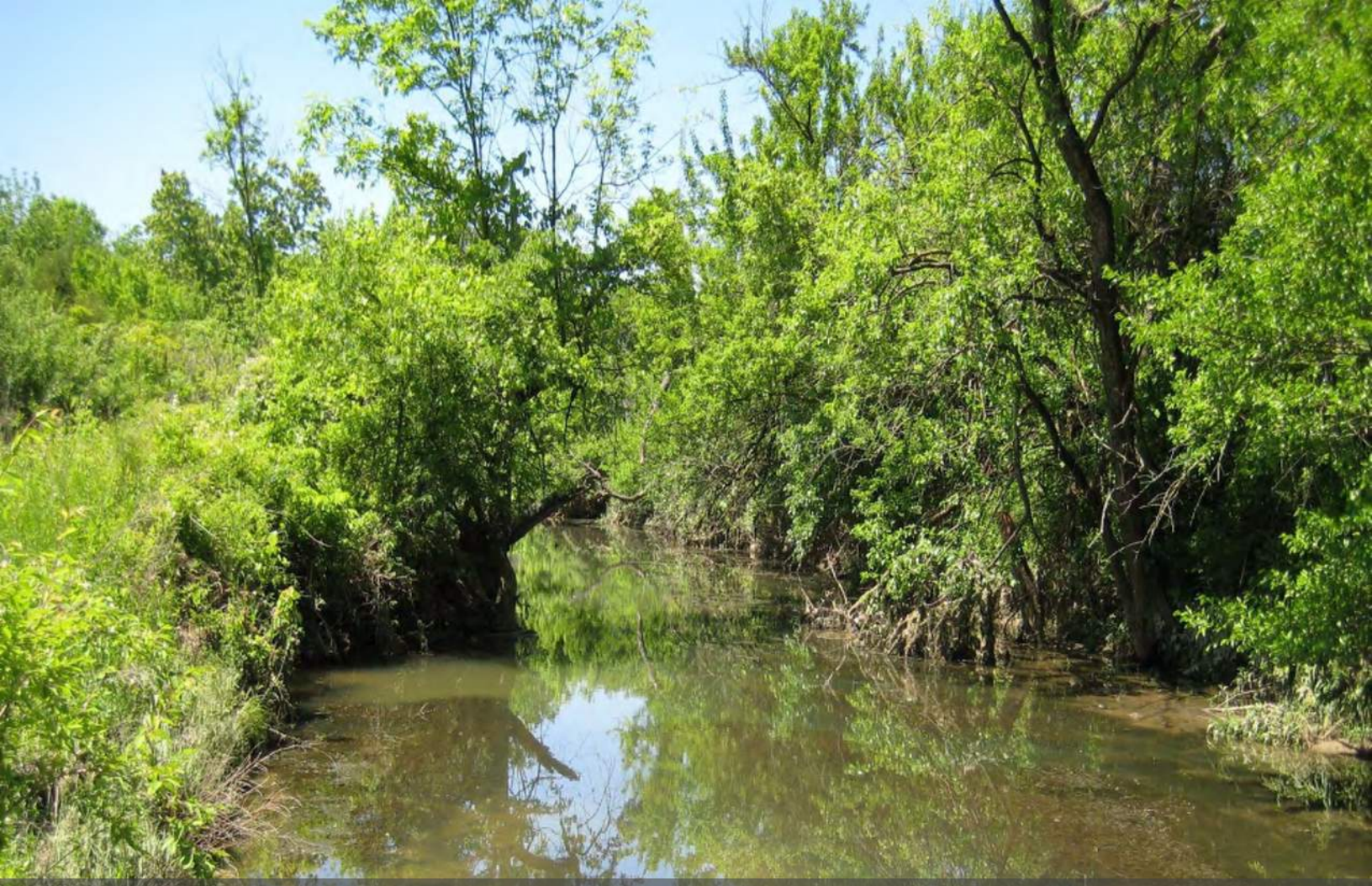


City of Jeffersonville

Water Quality Characterization Report

MS4 Permit #: INR040117

March 2023

DRAFT

Table of Contents

OHM Advisors
400 Missouri Avenue, Suite 100
Jeffersonville, IN 47130
www.OHM-Advisors.com

Table of Revisions

The following table summarizes revisions, additions, deletions, etcetera to the contents of this report:

Date	Revised Pages/Appendices	Summary of Change

Primary MS4 Contact

Andy Crouch, PE
City Engineer
500 Quartermaster Court
Jeffersonville, IN 47130
Phone: 812-285-6476

WQCR Certification

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 the 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.

Qualified Professional:

Name:	Allison Padron, PE
Title:	Project Manager, OHM Advisors
Signature:	
Date:	3/15/2023

MS4 Operator or Designee:

Name:	
Title:	
Signature:	
Date:	

1.0 Purpose

This water quality assessment report is intended to accompany the Southern Indiana Stormwater Advisory Committee (SWAC) Water Quality Characterization Report (WQCR). This component of the WQCR contains information specific to the City of Jeffersonville as a method for further analyzing water quality within the MS4 boundaries, and using that information to guide their MS4 Program as they begin implementing the Indiana MS4 General Permit (INR040000) and Indiana Construction Stormwater General Permit (INRA00000).

2.0 Assessment of Land Use

The City of Jeffersonville encompasses approximately 31 square miles, (19,811 acres). The downtown portions of Jeffersonville extend eastward along the Ohio River containing dense commercial and residential development. Industry, commercial corridors, and newer residential development occur to the north and east. Relatively new residential and subdivision developments can be found near the outer City boundaries, with a significant amount of industrial development taking place to the northeast in an area called River Ridge. River Ridge is approximately 5,100 acres (8 square miles) of land that was previously an ammunition plant, which contains significant industrial and commercial development and redevelopment. Land use acreages within the Jeffersonville MS4 area (NLCD, 2019) can be seen in Table 1. Though these data are the most current land use data available, more recent land use changes are not reflected. Figure 1 highlights recent land use conditions in Jeffersonville.

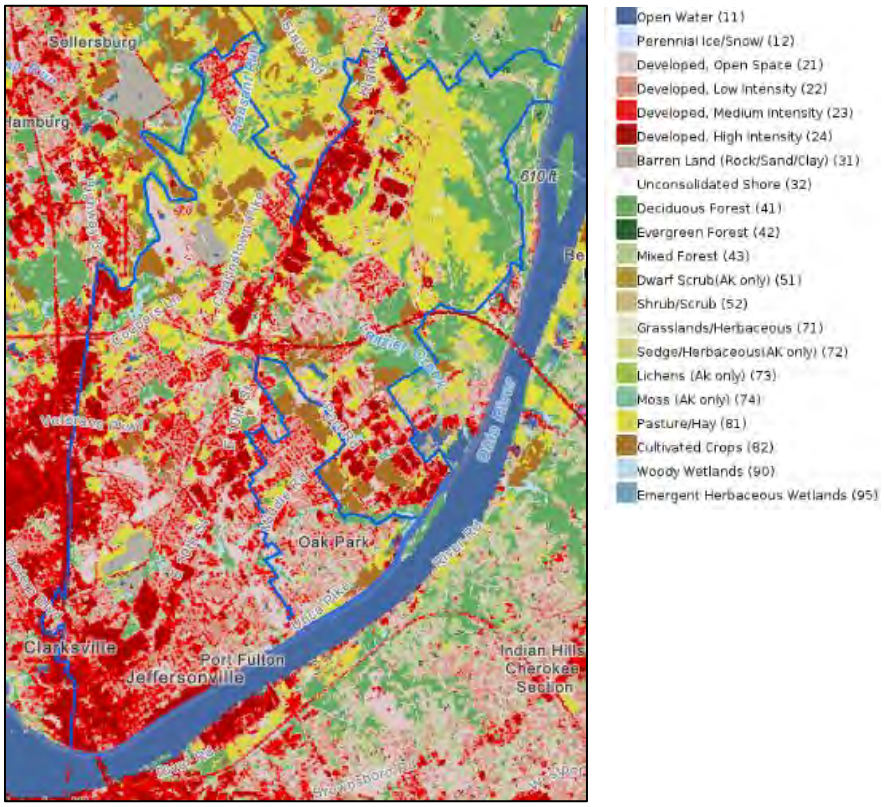


Figure 1. Land Use Map (NLCD, 2019)

TABLE 1: Land Use for Jeffersonville MS4 Area

Category	Acres	Percentage
Hay/Pasture	4057.4	20.5%
Developed, Open Space	3897.9	19.7%
Developed, Low Intensity	3410.5	17.2%
Deciduous Forest	2379.9	12.0%
Developed, Medium Intensity	2112.3	10.7%
Developed, High Intensity	1348.6	6.8%
Cultivated Crops	1024.8	5.2%
Mixed Forest	829.9	4.2%
Barren Land	277.5	1.4%
Herbaceous	173.1	0.9%
Open Water	142.6	0.7%
Woody Wetlands	95.4	0.5%
Shrub/Scrub	21.7	0.1%
Evergreen Forest	21.0	0.1%
Emergent Herbaceous Wetlands	9.8	0.0%
TOTAL:	19,802.3	100.0%

Source: National Land Cover Database (NLCD, 2019)

High intensity residential and commercial uses are centered in the downtown area, which is predominantly located in the combined sewer overflow (CSO) area. Agricultural areas are located in the north of the City. Land use beyond the boundaries of the City of Jeffersonville consists of the Town of Clarksville to the west and the Oak Park Conservancy District is embedded within the City along the southeast, both of which are densely developed. While Oak Park Conservancy District is located within the borders of Jeffersonville, the district maintains their own MS4 permit, although many components of the programs are shared through a Memorandum of Agreement (MOA). Clark County borders the remaining portions of Jeffersonville.

3.0 Best Management Practices (BMPs)

The following section describes the City's efforts to improve stormwater quality through the MS4 program by implementing the six (6) Minimum Control Measures (MCMs), including structural and non-structural BMPs. The six (6) MCMs include:

1. Public Education and Outreach
2. Public Participation and Involvement
3. Illicit Discharge Detection and Elimination
4. Construction Site Stormwater Runoff Controls
5. Post-Construction Stormwater Management
6. Municipal Operations Pollution Prevention and Good Housekeeping

3.1 Structural BMPs

The City conducts annual inspections to ensure that owners are maintaining BMPs in compliance with the Post-Construction section of the Stormwater Management Ordinance. Within the City of Jeffersonville, there are 244 reported permanent structural BMPs (City of Jeffersonville, GIS). The City's structural BMPs include dry detention basins, retention basins, underground basins, and unclassified basins.

Development and implementation of structural best management practices have seen significant improvement in the City of Jeffersonville in the time since the first permit. Within Jeffersonville, specific to the separate storm sewer system, there are 140 outfalls; 489 manholes; 10,142 catch basins/inlets/outlets; 137.6 miles (726,748.8 feet) of pipe, 119 culverts totaling 9,605.5 feet, and 76.2 miles (402,150 feet) of concrete/earthen/riprap channels/roadside ditches. Figure 2 shows the locations of outfalls and pipes/culverts that have been mapped in the City. In the 2008 SWQMP, 123 permanent structure BMPs were reported. As of March 2023, 237 structures were mapped. A summary of each type of permanent BMPs is listed in Table 2 and can be seen in Figure 3.

For more detailed information about the individual structures see Tables 8-11 that list the identification number, structural condition, and geographic coordinate at the end of the report.

TABLE 2: Permanent Structural BMPs in the City of Jeffersonville

Type of BMP	# BMPs
Detention Basin	204
Retention Basin	23
Below Ground Detention	10
TOTAL	**237**

Source: City of Jeffersonville GIS Database, March 2023

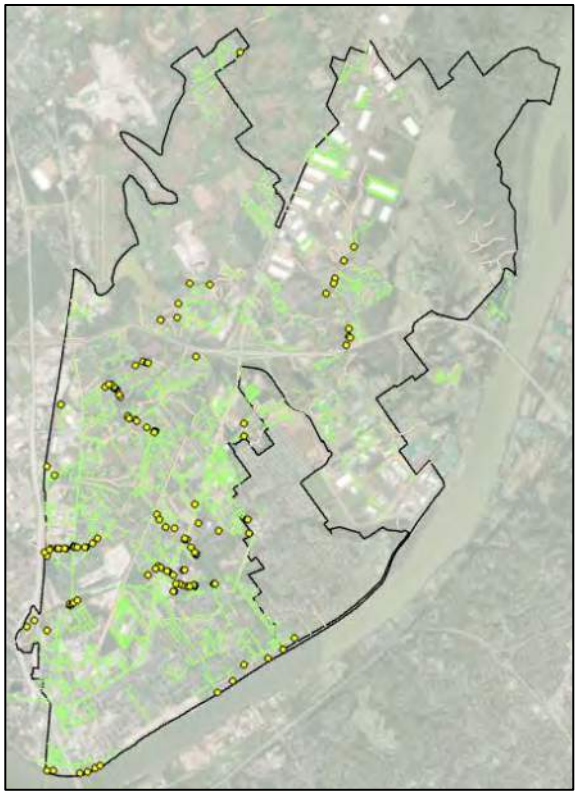


Figure 2. City of Jeffersonville Stormwater System Pipes and Outfalls

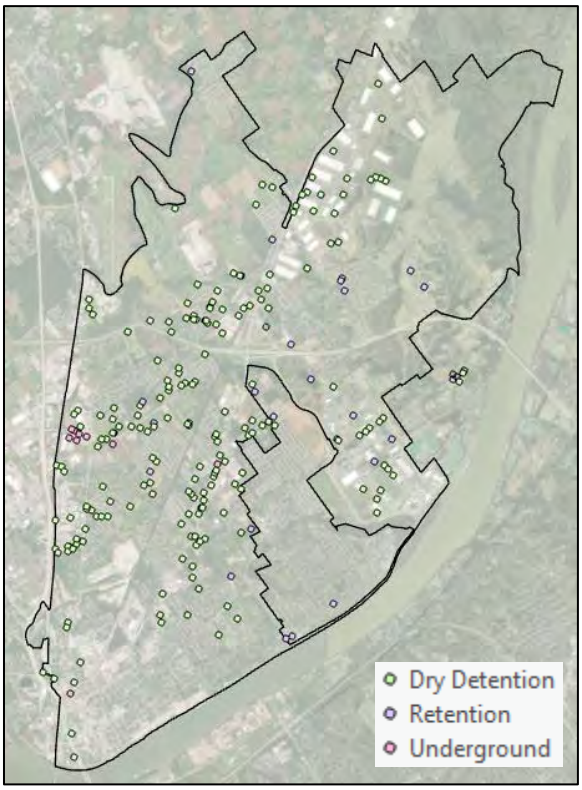


Figure 3. City of Jeffersonville Basin Locations

3.2 Non-Structural BMPs

Ordinances

The City of Jeffersonville adopted the Stormwater Ordinance on April 21, 2021. This ordinance consolidated illicit discharge, construction, and post construction requirements into a single ordinance. This ordinance was adopted in compliance with what was formerly known as Rule 13 and the amendments to Rule 5, which are now General Permits INR040000 and INRA0000. The ordinance will be reviewed in 2023/2024 to determine changes required to conform to the new general permits.

The City of Jeffersonville adopted a Stormwater Technical Standards Manual in December 2020, which includes design specifications and selection guidance for both construction and post-construction BMPs approved for installation by the City. Post-construction BMPs are required to be inspected and maintained regularly in accordance with the Operation and Maintenance Manual required to be listed for each BMP. The post-construction requirements are applied for all sites disturbing 10,000 square feet or more of total land area within the City.

MCM 1 and 2 – Public Education and Outreach

Building on success found during previous permit terms, Jeffersonville has continued to implement many non-structural BMPs. Non-structural BMPs included implementation of activities related to MCM 1 Public Education and Outreach and MCM 2 Public Participation and Involvement. The City has maintained a Memorandum of Agreement (MOA) with the Clark County Soil and Water Conservation District (SWCD) for assistance with implementing MCMs 1 and 2.

The City of Jeffersonville actively participates in the Southern Indiana Stormwater Advisory Committee (SWAC), which provides a forum for public education, outreach, participation, and involvement, as well as coordinated implementation of the MS4 program in participating communities.

The City publishes and distributes stormwater information in newsletters, flyers, and brochures focused on educating residents, commercial entities, and the construction industry. The City developed and maintains a stormwater website. Waterway identification signs have been installed by the City in high traffic areas to educate MS4 constituencies about the stormwater drainage system.

With assistance from the Clark County Soil and Water Conservation District (SWCD), the SWCD educated residents and students about stormwater at several events per year using stormwater exhibits, presentations at local schools and the annual county 4-H fair. The SWCD also initiated a storm drain marking program for volunteers. In coordination with the Clark County Solid Waste Management District, the City encouraged and tracked the amount of household hazardous waste collected.

MCM 3 – Illicit Discharge Detection and Elimination

The Stormwater Ordinance includes Illicit Discharge Detection and Elimination (IDDE) requirements, which defines and prohibits illicit discharges and establishes an escalating enforcement policy. The City mapped 100% of the stormwater drainage system and is now maintaining the data and mapping new infrastructure as it is installed due to new development. The City developed and implemented an IDDE Standard Operating Procedure (SOP) to specify procedures for identifying illicit discharges via a dry weather screening program,

conducted in conjunction with MS4 mapping. The City has educated citizens and trained public employees about the hazards associated with illicit discharges and improper waste disposal.

MCM 4 and 5 – Construction Site and Post-Construction Stormwater Runoff

The City's Stormwater Ordinance includes Construction Site Runoff Control in compliance with General Permit INR040000 and INRA0000, which govern storm water run-off associated with construction activity. The City continues to implement this ordinance, which specifies requirements for the review of construction site BMP plans, installation of erosion prevention and sediment control BMPs, inspection and escalating enforcement procedures. The City has updated the Stormwater Technical Standards Manual as of December 2020. The Technical Standards Manual serves as a guide for the planning and design of stormwater systems, erosion control structures, and associated activities for Jeffersonville. The guidelines and general design procedures in the manual were approved by the Jeffersonville Drainage Board.

Through an MOA with the Clark County SWCD, the City of Jeffersonville reviews construction plans and associated storm water pollution prevention plans (SWPPP) and issues Perimeter Control Permits and Stormwater Quality Management Permits. The City has implemented requirements for self-inspections and through the MOA with the Clark County SWCD, conducts periodic inspections of construction sites to ensure compliance with the Construction Site Runoff Control Ordinance. The City adopted requirements that construction site stormwater BMP self-inspections be conducted by a Qualified Professional (QP) via provisions in the Construction Site Runoff Controls Ordinance. More than 15 years ago, the Southern Indiana Stormwater Advisory Committee and the Clark County SWCD successfully implemented the Qualified Professional Inspector Program (QPI). The QPI program is designed to assist developers, contractors, and governmental agencies to comply with the National Pollutant Discharge Elimination System (NPDES) Stormwater General Permit for Construction by offering a one-day training course, a QPI training manual, and an exam. After passing the exam, applicants are eligible to obtain a QPI registration or license from the community prior to initiating inspection of construction site stormwater BMPs.

The SWAC, with participation from the City, has offered workshops to the construction industry, public employees, and others regarding the requirements of the Construction Site Runoff Control Ordinance. The updated Stormwater BMP Design Manual and related educational materials have been distributed and are available on the website.

MCM 6 – Municipal Operations Pollution Prevention and Good Housekeeping

The City of Jeffersonville has implemented many pollution prevention and good housekeeping practices to prevent or reduce pollutant runoff from municipal operations, such as regular stormwater drainage system maintenance and cleaning, street sweeping, and leaf and woody debris collections. Also, controls for reducing discharges from municipal facilities and operations have been put in place though implementing BMPs at municipal fueling stations, minimizing the use of herbicides, pesticides and fertilizers, salt dome and minimizing the impact of deicing material storage and utilization.

Stormwater Master Plan

The previous Stormwater Master Plan (SWMP) for the City was finalized in December 2012, which addressed future stormwater/drainage improvements, responsibilities as a MS4 community, and stormwater related issues of a consent decree from the US EPA to address Combined Sewer Overflow (CSO) problems through a Long-

Term Control Plan (LTCP). The SWMP can be downloaded on the City's website or viewed at the City Clerk's Office. An update to this plan is recommended for the new permit term.

Community Rating System (CRS) Program

The City of Jeffersonville participates in the Community Rating System (CRS) Program. The CRS program is a voluntary incentive program, run and administered by FEMA that recognizes and encourages community floodplain management practices that exceed the minimum requirements of the National Flood Insurance Program (NFIP). The goals of this program are to reduce and avoid flood damage to insurable property, strengthen and support the insurance aspects of the NFIP, and foster comprehensive flood plain management. The City received a Class 7 rating in 2022, which will go into effect in 2023.

4.0 Receiving Waters

The City of Jeffersonville has ten (10) receiving waters that receive discharges from outfalls. Table 3 lists the name, length, and each receiving waters percentage of the total receiving water area. An inventory of the City's stormwater outfalls and stormwater manholes can be seen in Tables 12 and 13 at the end of the report. The tables include outfall material, shape, diameter, and geographical location.

TABLE 3: City of Jeffersonville Receiving Waters

Receiving Water	Total Length (miles)	Percentage
Unnamed Tributaries	20.20	49.84%
Lentzier Creek	4.09	10.10%
Lick Run	3.30	8.15%
Silver Creek	3.18	7.84%
Mill Creek	2.84	7.01%
Pleasant Run	2.02	4.99%
Lancassange Creek	1.81	4.46%
Battle Creek	1.26	3.12%
Little Battle Creek	1.01	2.50%
Jenny Lind Run	0.81	2.01%
TOTAL	**40.52**	**100%**

5.0 303(d) Impaired Waters

The 2022 Integrated Water Monitoring and Assessment Report published by IDEM includes the 303(d) List of Impaired Streams for Indiana. Three (3) stream segments in the Jeffersonville MS4 area were listed on the 2022 303(d) List of Impaired Streams, shown in Table 4. There are a total of 10.6 miles of impaired streams and rivers within the City of Jeffersonville.

TABLE 4: City of Jeffersonville Impaired 303(d) Waters

Stream Name	Assessment ID	Impairment	TMDL
Silver Creek	INN0186-01 through -04	E. coli	None
Mill Creek	INN0194-T1001A	E. coli	None
Lancassange Creek	INN0165-T1010 and T1011	E. coli	None

6.0 Known Sensitive Areas

Public Beaches/ Full Body Contact Recreation: There are no beaches or lakes with public swimming or recreational facilities other than enclosed public swimming pools. The City is currently not aware of any locations within the MS4 area where full body contact recreation occurs.

Surface Drinking Water Intakes: Drinking water sources within the City are derived primarily from local groundwater resources.

Wetlands: Wetland areas are environmentally sensitive features and are protected by the Clean Water Act. The National Wetland Inventory (NWI) was used to estimate the extent and locations of wetlands and deep waters in the City of Jeffersonville. Based on these data, there are 490.9 acres of wetlands and deep-water habitats within the City boundary. Table 5 shows the different types of wetlands within the City of Jeffersonville, as classified by the NWI.

TABLE 5: Types of Wetlands in Jeffersonville County

Type	Acres
Freshwater Emergent Wetland	32.6
Freshwater Forested/Shrub Wetland	247.7
Freshwater Pond	124.2
Lake	0.6
Riverine	85.8
TOTAL	**490.9**

*Source: NWI.

Wellhead Protection Areas: There are three wellhead protection areas (WHPAs) in the City of Jeffersonville, which include the Watson Well Field, Southern Indiana Water Supply Well Field and Hertzsch Well Field. The wellfields are located along the Ohio River and the associated WHPAs intersect the MS4 boundary and CSO area (SWIS, 1999).

The City utilizes a BMP Design Manual that encourages the use of non-infiltrative BMPs in WHPAs. In addition, the City's Zoning Code includes a Wellhead Protection Overlay District (WH-OL) to protect the safety of the City's public water supply. The Zoning Code requires review and approval by the water company prior to the City's issuance of an Improvement Location Permit for proposed developments within the WH-OL.

Sinkhole Areas: 74 sinkhole areas were identified in Jeffersonville through a review of Indiana Geological Survey (IGS) data. In the Port area of Jeffersonville, there about 15 sinkhole areas that have been identified. Most of the sinkholes are located north of the city in the top right and left corners. The rest of the identified sinkholes are spread throughout the City's MS4 area in minor amounts.

Boat Launches: There are two (2) boat launches in the City of Jeffersonville, at Duffy's Landing on Utica Pike and Riverfront Park at West Riverside Drive and Spring Street. The Duffy's Landing boat launch is located within the TOT5 of the Southern Indiana Water Supply WHPA.

7.0 Existing and Available Monitoring Data

7.1 Fourteen Mile/Goose Creek Watershed Management Plan

Through the Clark County Soil and Water Conservation District (SWCD), the Fourteen Mile/Goose Creek Watershed Management Plan was developed using a Nonpoint Source Program Section 319 Grant from IDEM. These watersheds cover 108,193 acres in the eastern portions of Clark County, including part of Jeffersonville and Oak Park. The project was initiated out of concerns from residents regarding the karst topography and sinkholes, trash in the streams, septic smells, and seemingly uncontrolled development (outside of City limits). One sampling site (IDEM Site # OSK100-0001) was located on Lancassange Creek on the bridge over Allison Lane near the Jeffersonville Fire Station. Historical data indicated this site was last monitored in 2010 and tested for general water chemistry, E. coli, macroinvertebrates, and fish; the stream was determined to be impaired due to E. coli levels. Monitoring as part of the Watershed Management Plan indicated testing was performed in 2014/2015 when the site tested for:

- Nitrate: 8.26 mg/L (target < 1.5)
- Phosphorus: 0.0655 mg/L (target < 0.07)
- Turbidity: 4.75 NTU (target < 25)
- E. coli: 490.71 CFU/100ml (target <125) in 2014; 145.05 CFU/100ml in 2015
- Dissolved Oxygen (DO): 9.87 mg/L (target between 4-12)
- Biological Oxygen Demand (BOD): 3.5 mg/L (target < 2)
- pH: 5.52 (target between 6-9)
- Water Quality Index: 71.76% (target > 69%)
- Citizens Qualitative Habitat Evaluation Index (CQHEI): 59 (target > 60)
- Biological assessment Pollution Tolerance Index (PTI): Excellent Rating (2014 and 2015)

The residential and commercial nature of this monitoring site, as well as the backwater conditions from the Ohio River at this site likely contribute to the elevated nitrate, BOD, and E. coli levels.

A search for more recent (last 5 years) water quality and related data beyond the watershed study and Impaired 303(d) List from IDEM was performed using publicly accessible reports and databases published by the Indiana Department of Natural Resources (IDNR), United States Environmental Protection Agency (USEPA), and the United States Geological Survey (USGS). These agencies had not published more recent water quality data for streams in the City of Jeffersonville.

7.2 Stream Visual Assessment Protocol

The City of Jeffersonville began implementing the Stream Visual Assessment Protocol (SVAP) in 2009 as a component of the Municipal Separate Storm Sewer System (MS4) program. The intent of the program is to visually inspect and document conditions at strategic sites on streams throughout the City. Over time, this visual inspection is used to determine changes, whether positive or negative, taking place in watersheds throughout the City.

The current program consists of twelve (12) sites throughout the City, seen below in Figure 4. A list of these sites and additional recommended sites is included in Table 6.

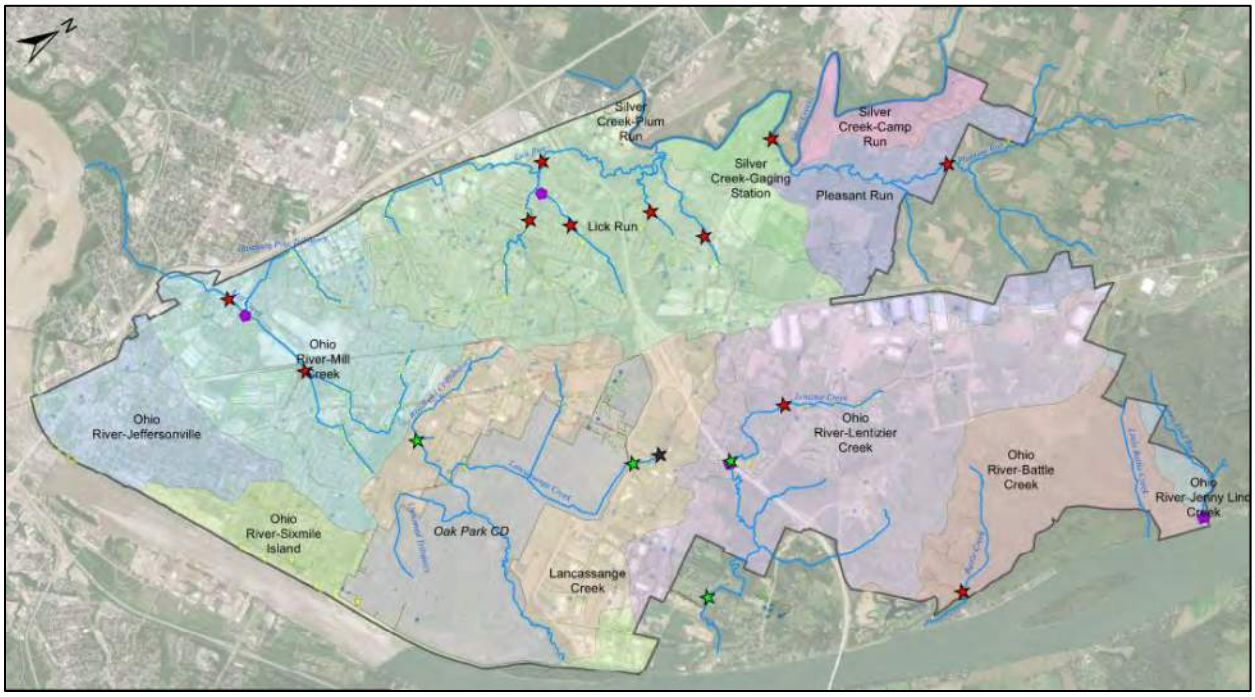


Figure 4. City of Jeffersonville SVAP Sites

TABLE 6: City of Jeffersonville SVAP Sites and Recommended Additions

HUC-14 Watershed Name	Watershed Area (acres in City) [sq miles]	# of SVAP Points (2021)	Recommendations
Lick Run	3881.7 [6.1]	5	No additional sites needed.
Lancassange Creek	2517.9 [3.9]	1	Add one (1) site: Woodland Court Relocate one (1) site: Move site on Centennial Blvd to Port Road
Pleasant Run	1322.7 [2.1]	1	No additional sites needed.
Ohio River-Lentizier Creek	4310.6 [6.7]	1	Add two (2) sites: Brookhollow Way – N. of I-265 Utica Sellersburg Road
Ohio River-Mill Creek	2831 [4.4]	2	No additional sites needed.
Ohio River-Battle Creek	1689.8 [2.6]	1	No additional sites needed.
Ohio River-Jeffersonville	1162.8 [1.8]	0	No sites needed.
Ohio River-Jenny Lind Creek	178.6 [0.3]	0	No sites needed.
Ohio River-Six Mile Island	875.8 [1.4]	0	No sites needed.
Silver Creek-Gaging Station	551.9 [0.9]	1	No additional sites needed.
Silver Creek-Camp Run	425.4 [0.7]	0	No sites needed.
Silver Creek-Plum Run	52.1 [0.1]	0	No sites needed.

Lick Run is already adequately monitored by the five (5) sites located on the tributaries in that watershed. The site on Silver Creek also monitors flows from the Camp Run watershed. Mill Creek is also adequately monitored with the two (2) current sites. It is recommended to maintain the site on Battle Creek since upstream development may occur in the future, so continued monitoring will allow future changes to be well documented.

Although the portion of Silver Creek in Jeffersonville only has one SVAP site on it, this is adequate for monitoring considering the size of the upstream drainage area, which is approximately 78,300 acres (122 square miles). The portion of the watershed inside Jeffersonville's borders is insignificant compared to the overall area, indicating the City doesn't have a considerable opportunity to significantly impact water quality on Silver Creek. Pleasant Run is also adequately represented with the site that monitors flows coming into the City's jurisdiction, as well as the downstream site on Silver Creek.

The Ohio River – Jeffersonville and Six Mile Island watersheds contain portions of Jeffersonville's CSO area and drain directly to the Ohio River, as opposed to a local stream, so it is not recommended to add sites in these watersheds. The Jenny Lind Creek watershed on the northwest border of the City is mostly undeveloped, drains directly into the Ohio River, and is not heavily impacted by activities in Jeffersonville, so it is recommended to maintain the removal of the site which was initially identified in 2009 but has since been dropped.

The majority of Lancassange Creek is monitored by Oak Park Conservancy District (OPCD). An additional site is recommended on Woodland Court to monitor impacts from the City of Jeffersonville prior to the Woodland Court Tributary flowing into Lancassange Creek. It is also recommended that the site on Centennial Blvd be shifted downstream to Port Road, because it represents more of the natural stream at that location. The site on Centennial Blvd is downstream of a detention basin and less of an indicator of natural stream conditions.

The Lentizier Creek watershed has experienced significant development since the inception of the SVAP program, but is currently only monitored at one SVAP site. However, access to Lentizier Creek is limited due to wooded areas and minimal roadway crossings or development adjacent to the stream. An additional site on Brookhollow Way, north of the recent construction of I-265, is recommended to monitor impacts from upstream development. An SVAP site was previously identified near this location in 2009, but was no longer being used as of 2021. It is unknown when the site was dropped (potentially during construction of the interstate in 2016 due to access issues). Due to the potential for additional upstream development of the watershed, an additional site further downstream on Lentizier Creek in Utica near the Utica Sellersburg Road and Fox Run Trail intersection has been identified. Although the site is outside of the Jeffersonville city limits, this location is currently the most accessible location to monitor flow discharging from the watershed.

The data from the SVAP program has been used to identify illicit discharges, choke points in need of additional maintenance prior to storm events, and maintenance projects for the City. Additional monitoring and assessments will occur during the new permit term.

8.0 Areas with Potential to Contribute to Water Quality Issues

Available data from the 303(d) impairments, Fourteen Mile/Goose Creek Watershed Management Plan, and SVAP monitoring indicate that Mill Creek, Silver Creek, and Lancassange Creek, in the more densely urbanized areas of the City, are more heavily impacted. These studies indicated issues associated with elevated bacteria, biological impairment, and potentially elevated nutrients. Mill Creek, especially, is located in a Combined Sewer Overflow (CSO) portion of the City, although strategic efforts have been made to separate the systems. It is important to note that at this time, the relative contribution of stormwater versus historically acceptable development practices and CSO discharges are not readily understood. The more recent heavily industrial area of River Ridge to the north is also continually monitored through inspections due to the activities there which with potential for negative impacts to water quality.

In order to gain a better understanding of how the City of Jeffersonville's MS4 impacts the overall quality of nearby surface waters, the City will continue to implement and enhance the Stream Visual Assessment Protocol (SVAP). Data gathered from the SVAP will continue to allow the City to identify remediation and improvement projects under the purview and jurisdiction of the MS4 program.

The sources of water quality reduction in Mill Creek, Silver Creek, and Lancassange Creek can generally be attributed to the high-density development and, in Mill Creek, to CSO discharges. The City will continue to invest in mapping, operating and maintaining the MS4. In addition, Long Term Maintenance and Operation Agreements are in effect to ensure proper operation of structural BMPs owned by other entities. The City continues to invest in Capital Improvement Projects such as a regional detention basin, stream bank stabilization and scour remediation.

Within the City of Jeffersonville, there are twenty-three (23) facilities that discharge stormwater from industrial activities regulated under Rule 6 (IDEM, 2023). Of those facilities, ten (10) were renewed or added in the 2021-2022 reporting term. These facilities are shown in Table 7.

TABLE 7: NPDES Active Industrial Stormwater Permits in the City of Jeffersonville

NPDES ID	Permit Name	Effective Date	Expiration Date	Location Address	SIC	Permit SIC Description
INRM02263	POSCO AAPC	9/8/2017	9/7/2022	5140 Loop Rd	3315	Steel Wire And Related Products
INRM02326	Amazon Fulfillment SDF8	3/28/2018	3/27/2023	900 Patrol Rd	4225	General Warehousing And Storage
INRM00306	Krunchers Inc	7/9/2018	7/8/2023	125 Peacely St	2096	Potato Chips And Similar Snacks
INRM02434	Jeffersonville Marine Facility	8/10/2018	8/9/2023	1030 E Market St	4225	General Warehousing And Storage
INRM01137	Federal Express Ground Jeffersonville	9/19/2018	9/18/2023	5153 Maritime Rd	4215	Courier Services, Except By Air
INRM02525	C & W Fabrication dba G. F. Munich Welding	9/21/2018	9/20/2023	211 Eastern Blvd	3499	Fabricated Metal Products
INRM00972	Roll Forming Corporation	9/15/2019	9/14/2024	1205 N Access Rd	3449	Miscellaneous Metal Work
INRM00323	Idemitsu Lubricants America	6/25/2019	6/24/2024	701 Port Rd	2992	Lubricating Oils And Greases
INRM01757	Delaco Kasle Processing LLC	8/18/2019	8/17/2024	5146 Maritime Rd	3316	Cold Finishing Of Steel Shapes
INRM01814	Altec Aluminum Technologies	10/6/2019	10/5/2024	242 America Pl	3354	Aluminum Extruded Products

INRM00185	Chemtrusion Inc	8/24/2020	8/23/2025	1403 Port Rd	3087	Custom Compound Purchased Resins
INRM00153	Dallas Group Of America Inc	9/17/2020	9/16/2025	1402 Fabricon Blvd	2819	Industrial Inorganic Chemicals
INRM02745	Advance Ready Mix Concrete Incorporated	2/22/2021	2/21/2026	5000 Keystone Blvd	3273	Ready-Mixed Concrete
INRM02739	Blue Ball Recycling	3/12/2021	3/11/2026	200 Willinger Ln	5093	Scrap And Waste Materials
INRM00470	Cronimet Corporation	5/27/2021	5/26/2026	5147 Loop Rd	5093	Scrap And Waste Materials
INRM00378	Voss Clark dba PGP Corporation	5/23/2021	5/22/2026	701 Loop Rd	3399	Primary Metal Products
INRM02080	Tenneco Automotive	7/26/2021	7/25/2026	800 Trey St	3714	Motor Vehicle Parts And Accessories
INRM01993	Smyrna Ready Mix Concrete Plant#204	8/2/2021	8/1/2026	2220 Hamburg Pike	3273	Ready-Mixed Concrete
INRM02103	Champion Trucking Company, Inc.	12/6/2021	12/5/2026	4900 Keystone Blvd	4212	Local Trucking, Without Storage
INRM02100	Autoneum North America Incorporated	11/21/2021	11/20/2026	100 River Ridge Pkwy	3714	Motor Vehicle Parts And Accessories
INRM02158	Steel Dynamics Incorporated	1/9/2022	1/8/2027	5134 Loop Rd	3479	Metal Coating And Allied Services
INRM00583	Consolidated Grain & Barge Company	4/30/2022	4/29/2027	5130 Port Rd	5153	Grain And Field Beans
INRM02849	Superior River Terminal	4/27/2022	4/26/2027	5146 Loop Rd	4491	Marine Cargo Handling

9.0 Recommendations

Based on the findings discussed, the City plans to continue to implement and enhance the MS4 program. The following additional BMPs are recommended for consideration.

- Finalize the development of the 2023 Qualified Professional program and implement the plan the new permit term.
- Continue to implement the SVAP monitoring protocol to collect additional data in potentially impacted streams to help distinguish between stormwater, point and non-point pollution sources. When annexations occur, identify new strategic locations for SVAP screening in this area.
- Continue to discover, analyze, design, and execute stormwater capital improvement projects through an updated Stormwater Master Plan. Consideration should be given for city-wide and/or watershed-based stormwater master planning to assist with identification, prioritization, scheduling, and implementation of capital improvement projects.
- Continue inspecting and monitoring stormwater management activities occurring and BMPs being implemented at municipal facilities and during municipal operations.
- Further enhance the outreach and public participation program to educate residents, contractors, developers, and visitors about stormwater quality.

TABLE 8 : City of Jeffersonville Dry Detention Basin Inventory

Basin I.D	Basin Type (Ownership)	Basin Name	City Maint.	Longitude	Latitude
stb00015	Dry Detention (City)	City Services	Yes	-85.71813264	38.30858159
stb00023	Dry Detention (City)	Meadow Springs	Yes	-85.72735132	38.34226995
stb00051	Dry Detention (Residential)	Ashley Square 1	No	-85.71696621	38.31544726
stb00073	Dry Detention (HOA)	Emerald Pointe 1	No	-85.71502967	38.35229324
stb00074	Dry Detention (HOA)	Emerald Pointe 2	No	-85.71519427	38.35202272
stb00076	Dry Detention (Comm Dev)	Hallmark Apartments	No	-85.70780764	38.31090366
stb00077	Dry Detention (Comm Dev)	Heartland Payments 1	No	-85.68552706	38.32800661
stb00078	Dry Detention (Comm Dev)	Heartland Payments 2	No	-85.68519632	38.32765427
stb00070	Dry Detention (Comm Dev)	Eastside Christian Church 2	No	-85.73343226	38.33030872
stb00043	Dry Detention (HOA)	Courtyards of Buttonwood 2	No	-85.72758331	38.32381121
stb00045	Dry Detention (HOA)	Stone Creek 1	No	-85.72800258	38.33035232
stb00164	Dry Detention (HOA)	Stone Creek 2	No	-85.72970403	38.32943752
stb00028	Dry Detention (HOA)	Nicole Station 1	No	-85.71443115	38.35310499
stb00161	Dry Detention (City)	Woehrle Athletic Complex	Yes	-85.7131846	38.355175
stb00178	Dry Detention (Residential)	Raintree Ridge 1	No	-85.70424704	38.37091062
stb00177	Dry Detention (Residential)	Windy Pines 2	No	-85.70063344	38.37428696
stb00094	Dry Detention (HOA)	Spring Gate Circle 1	No	-85.74257837	38.31484235
stb00165	Dry Detention (HOA)	Spring Gate Circle 3	No	-85.74380234	38.31507463
stb00166	Dry Detention (City)	Summerlin Place 3	Yes	-85.73890888	38.31376912
stb00187	Dry Detention (City)	Ken Ellis Ctr	Yes	-85.74524082	38.28699336
stb00163	Dry Detention (HOA)	Armstrong Farms 6	No	-85.72086543	38.33825075
stb00033	Dry Detention (Residential)	Rolling Ridge 1	No	-85.70604231	38.32860413
stb00034	Dry Detention (Residential)	Rolling Ridge 2	No	-85.70523037	38.32917644
stb00037	Dry Detention (Residential)	Rolling Ridge 5	No	-85.70528	38.33140066
stb00019	Dry Detention (Residential)	Landsberg Cove 2	No	-85.71853188	38.33853075

Basin I.D	Basin Type (Ownership)	Basin Name	City Maint.	Longitude	Latitude
stb00016	Dry Detention (Residential)	Jeff High School	No	-85.71169981	38.31435951
stb00121	Dry Detention (Residential)	Holman's Lane 1	No	-85.72006321	38.33096403
stb00125	Dry Detention (Residential)	Georgia Crossing 3	No	-85.72454818	38.34952699
stb00013	Dry Detention (City)	Fire House 4	Yes	-85.70380275	38.3550926
stb00001	Dry Detention (HOA)	Armstrong Farms 1	No	-85.7246401	38.33680589
stb00004	Dry Detention (HOA)	Armstrong Farms 4	No	-85.7218016	38.33786375
stb00050	Dry Detention (HOA)	Armstrong Farms 5	No	-85.72675915	38.33557696
stb00006	Dry Detention (Residential)	Buttonwood 2	No	-85.73056927	38.31953984
stb00190	Dry Detention (Comm Dev)	Conger Signs	No	-85.70142804	38.3518934
stb00082	Dry Detention (Indust Park)	Industrial Park 2 (Hoosier Penn Oil)	No	-85.74749465	38.30806356
stb00081	Dry Detention (Indust Park)	Industrial Park 3 (Hoosier Penn Oil)	No	-85.74779363	38.30826924
stb00080	Dry Detention (Indust Park)	Industrial Park 4 (Transform Network)	No	-85.748209	38.30822575
stb00017	Dry Detention (Indust Park)	Industrial Park 7 (Brecht / Givens)	No	-85.75109108	38.30790637
stb00071	Dry Detention (Indust Park)	Industrial Park 8 (Storage)	No	-85.74611463	38.3086861
stb00194	Dry Detention (Indust Park)	Industrial Park 10 (Gilford)	No	-85.74613325	38.30973852
stb00098	Dry Detention (Comm Dev)	Dairy Queen (10th St / Allison Ln)	No	-85.71403361	38.32117157
stb00065	Dry Detention (Comm Dev)	Centra Credit Union	No	-85.73739354	38.32913954
stb00199	Dry Detention (Comm Dev)	State Farm	No	-85.73778135	38.32904763
stb00200	Dry Detention (Comm Dev)	Dollar General	No	-85.74109935	38.32653598
stb00091	Dry Detention (Comm Dev)	Hoskins / 10th Street	No	-85.71484906	38.31953846
stb00053	Dry Detention (Comm Dev)	BB & T	No	-85.7165555	38.31815652
stb00201	Dry Detention (Comm Dev)	Claysburg	No	-85.74668761	38.28337566
stb00202	Dry Detention (Comm Dev)	Eastern Heights Baptist Church	No	-85.70529363	38.33796016
stb00173	Dry Detention (Port)	Port 1 (Idemitsu)	No	-85.67620191	38.31690027

Basin I.D	Basin Type (Ownership)	Basin Name	City Maint.	Longitude	Latitude
stb00158	Dry Detention (Comm Dev)	Fountain Crest	No	-85.74069128	38.33222622
stb00219	Dry Detention (Comm Dev)	Family Health Center	No	-85.75119347	38.28402457
stb00084	Dry Detention (Indust Park)	Industrial Park 5 (Directv)	No	-85.74799458	38.30737573
stb00003	Dry Detention (HOA)	Armstrong Farms 2	No	-85.72497822	38.33877444
stb00204	Dry Detention (HOA)	Armstrong Farms 3	No	-85.72454003	38.3375983
stb00126	Dry Detention (Residential)	Georgia Crossing 2	No	-85.72408829	38.34754104
stb00064	Dry Detention (Comm Dev)	Castleton Apts	No	-85.71386479	38.32836627
stb00041	Dry Detention (Residential)	Woods of Northaven	No	-85.72183728	38.31238821
stb00205	Dry Detention (Comm Dev)	Circle K Hwy 62	No	-85.70304366	38.35349884
stb00208	Dry Detention (Port)	Port 6 (SDI) 1	No	-85.67238386	38.32130257
stb00206	Dry Detention (Port)	Port 8 (SDI) 3	No	-85.67422766	38.32306541
stb00176	Dry Detention (River Ridge)	River Ridge Regional 3	No	-85.68632829	38.38090721
stb00061	Dry Detention (River Ridge)	River Ridge 5 (Standard Register)	No	-85.69235336	38.3733069
stb00059	Dry Detention (River Ridge)	River Ridge 7 (Olon)	No	-85.69355651	38.37284579
stb00067	Dry Detention (Comm Dev)	Diamond Billiards	No	-85.677734	38.33003533
stb00160	Dry Detention (Residential)	Creekstone Ridge 2	No	-85.71787137	38.35628144
stb00007	Dry Detention (Residential)	Carriage House Court	No	-85.72025801	38.29576833
stb00124	Dry Detention (Residential)	Georgia Crossing 1	No	-85.72911346	38.34978061
stb00011	Dry Detention (City)	Fields Crossing	Yes	-85.71767367	38.30052002
stb00038	Dry Detention (City)	Summerlin Place 1	Yes	-85.74138487	38.31384259
stb00039	Dry Detention (City)	Summerlin Place 2	Yes	-85.74026447	38.31380389
stb00040	Dry Detention (HOA)	Country Club Estates	No	-85.73820789	38.31644918
stb00182	Dry Detention (Residential)	Ashley Square 2	No	-85.71872818	38.31714356
stb00183	Dry Detention (Residential)	Ashley Square 3	No	-85.71929142	38.31782265
stb00184	Dry Detention (Residential)	Ashley Square 4	No	-85.71989096	38.31846597

Basin I.D	Basin Type (Ownership)	Basin Name	City Maint.	Longitude	Latitude
stb00032	Dry Detention (Comm Dev)	Keystone 1	No	-85.70717155	38.35189903
stb00031	Dry Detention (Comm Dev)	Keystone 2 (Champion)	No	-85.70830877	38.35064411
stb00215	Dry Detention (Comm Dev)	Keystone 4 (USF Holland)	No	-85.7135159	38.34905596
stb00128	Dry Detention (Comm Dev)	Sacred Heart Church	No	-85.71295294	38.29194023
stb00157	Dry Detention (Comm Dev)	SE Christian Church 1	No	-85.75068802	38.32313896
stb00212	Dry Detention (Comm Dev)	BADD Inc.	No	-85.67470204	38.33193532
stb00221	Dry Detention (Comm Dev)	SE Christian Church 2	No	-85.74969659	38.32292355
stb00222	Dry Detention (Comm Dev)	SE Christian Church 3	No	-85.74898459	38.32208977
stb00129	Dry Detention	Ellingsworth Commons	No	-85.69991483	38.33052549
stb00132	Dry Detention (HOA)	Williams Crossing 4	No	-85.71556829	38.34929877
stb00133	Dry Detention (HOA)	Williams Crossing 3	No	-85.71617634	38.34960353
stb00134	Dry Detention (Residential)	Cottages of Buttonwood	No	-85.72900858	38.31984055
stb00135	Dry Detention (Comm Dev)	Circle K	No	-85.72598633	38.29962474
stb00136	Dry Detention (Comm Dev)	Circle K	No	-85.71372013	38.32891743
stb00137	Dry Detention (Comm Dev)	CCAA 1	No	-85.71756648	38.31432235
stb00138	Dry Detention (Comm Dev)	CCAA 2	No	-85.72002411	38.3141723
stb00213	Dry Detention (Comm Dev)	East Bridge Center	No	-85.70157875	38.35572409
stb00075	Dry Detention (Comm Dev)	First Baptist Church	No	-85.71605276	38.30955968
stb00139	Dry Detention (Comm Dev)	GCCS	No	-85.72674174	38.29576819
stb00140	Dry Detention (Comm Dev)	Interroll Axmann Automation	No	-85.67886998	38.3293011
stb00185	Dry Detention (Comm Dev)	Orchard Hills 2	No	-85.71727991	38.32289121
stb00141	Dry Detention (Comm Dev)	KDC Development	No	-85.70686039	38.33010136
stb00143	Dry Detention (Comm Dev)	New Covenant Church	No	-85.73139438	38.32992677
stb00092	Dry Detention (Comm Dev)	Recovery Center	No	-85.75381505	38.28518294

Basin I.D	Basin Type (Ownership)	Basin Name	City Maint.	Longitude	Latitude
stb00026	Dry Detention (Comm Dev)	Scott Funeral Home	No	-85.73194282	38.33236406
stb00055	Dry Detention (Comm Dev)	Sherman Williams	No	-85.67561827	38.3312018
stb00056	Dry Detention (River Ridge)	River Ridge 1 (UTC Aerospace)	No	-85.69560998	38.36960961
stb00057	Dry Detention (River Ridge)	River Ridge 2 (UTC Aerospace)	No	-85.69511476	38.3707093
stb00063	Dry Detention (River Ridge)	River Ridge 4 (C.M.E)	No	-85.68919283	38.37278473
stb00062	Dry Detention (River Ridge)	River Ridge 6 (Crossdock)	No	-85.69127072	38.37595504
stb00058	Dry Detention (River Ridge)	River Ridge Regional 1	No	-85.69228109	38.35942369
stb00210	Dry Detention (River Ridge)	River Ridge Regional 2	No	-85.68405362	38.37281945
stb00211	Dry Detention (River Ridge)	River Ridge Regional 4	No	-85.67491145	38.38683196
stb00174	Dry Detention (Port)	Port 2 (Metals USA)	No	-85.67519757	38.31854541
stb00083	Dry Detention (Indust Park)	Industrial Park 1 (Warehouse)	No	-85.74697478	38.30786093
stb00085	Dry Detention (Indust Park)	Industrial Park 6 (Rubber Co.)	No	-85.75043634	38.30709125
stb00072	Dry Detention (Indust Park)	Industrial Park 9 (Storage)	No	-85.74473662	38.30925609
stb00168	Dry Detention (Indust Park)	Industrial Park 12 (Heritage Hardwood)	No	-85.74742496	38.31352529
stb00144	Dry Detention (SCBC)	Kieslers Defense 1	No	-85.74336639	38.35187517
stb00145	Dry Detention (SCBC)	Kieslers Defense 2	No	-85.74224532	38.35073693
stb00146	Dry Detention (SCBC)	Secure Space Storage	No	-85.7431619	38.35361295
stb00046	Dry Detention (Comm Dev)	A2O	No	-85.73927921	38.32786978
stb00220	Dry Detention	Accentfx	No	-85.68010858	38.32864168
stb00048	Dry Detention (Comm Dev)	Aldi's	No	-85.71320869	38.32742945
stb00020	Dry Detention (Residential)	Allanah Gardens	No	-85.71913119	38.33814791
stb00009	Dry Detention (City)	Creighton Cove (Water Tower)	Yes	-85.68622759	38.33769517
stb00024	Dry Detention (City)	Kingsfield 1	Yes	-85.73754581	38.33356626
stb00148	Dry Detention (HOA)	Armstrong Farms 7	No	-85.72226979	38.3400254
stb00149	Dry Detention (HOA)	Armstrong Farms 8	No	-85.72236199	38.34102207

Basin I.D	Basin Type (Ownership)	Basin Name	City Maint.	Longitude	Latitude
stb00027	Dry Detention (HOA)	Nicole Station 2	No	-85.71214239	38.35167433
stb00095	Dry Detention (HOA)	Spring Gate Circle 2	No	-85.7437812	38.31558941
stb00005	Dry Detention (Residential)	Buttonwood 1	No	-85.72853619	38.31786885
stb00047	Dry Detention (Residential)	Charlestown Court	No	-85.72495762	38.33175674
stb00008	Dry Detention (Residential)	Creekstone Ridge 1	No	-85.72038023	38.35301273
stb00127	Dry Detention (Residential)	Crimson Point	No	-85.72044896	38.35011153
stb00010	Dry Detention (Residential)	Elk Pointe	No	-85.74010881	38.31921075
stb00186	Dry Detention (Residential)	Holman's Lane 3	No	-85.7199945	38.33051321
stb00217	Dry Detention (Residential)	Holman's Lane 2	No	-85.72022706	38.33063786
stb00012	Dry Detention (Residential)	Indian Springs	No	-85.72314144	38.3702478
stb00150	Dry Detention (Residential)	Kingsfield 2	No	-85.73759483	38.33153037
stb00123	Dry Detention (Residential)	Landsberg Cove 1	No	-85.71613044	38.34352768
stb00021	Dry Detention (Residential)	Liberty Pointe 1	No	-85.71909411	38.30453099
stb00022	Dry Detention (Residential)	Liberty Pointe 2	No	-85.71904057	38.30249724
stb00119	Dry Detention (Residential)	Orchard Hills 1	No	-85.718459	38.32066586
stb00035	Dry Detention (Residential)	Rolling Ridge 3	No	-85.70270973	38.33044381
stb00036	Dry Detention (Residential)	Rolling Ridge 4	No	-85.70141319	38.33122097
stb00162	Dry Detention (Residential)	Teakwood Landing	No	-85.73431335	38.34773731
stb00100	Dry Detention (Residential)	Willow Trace 1	No	-85.74798476	38.29425519
stb00169	Dry Detention (Residential)	Willow Trace 2	No	-85.74828899	38.29342605
stb00179	Dry Detention (Residential)	Windy Pines 1	No	-85.70286653	38.37460098
stb00151	Dry Detention (Comm Dev)	AT&T Store	No	-85.71281747	38.32489299
stb00152	Dry Detention (Comm Dev)	Dollar General	No	-85.72142502	38.30600614

Basin I.D	Basin Type (Ownership)	Basin Name	City Maint.	Longitude	Latitude
stb00069	Dry Detention (Comm Dev)	Eastside Christian Church 1	No	-85.73612306	38.33028766
stb00198	Dry Detention (Comm Dev)	Hamburg Pike Church of Christ	No	-85.74413162	38.31138667
stb00214	Dry Detention (Comm Dev)	Keystone 3 (A&R)	No	-85.71206441	38.34746752
stb00066	Dry Detention (Comm Dev)	Mortenson Family Dentist	No	-85.713867	38.32169095
stb00086	Dry Detention (Comm Dev)	Meijer 2	No	-85.70756831	38.32189462
stb00223	Dry Detention (Comm Dev)	Big O Tires	No	-85.70912131	38.31965505
stb00153	Dry Detention (Comm Dev)	Meijer 1	No	-85.71145713	38.32375622
stb00089	Dry Detention (Comm Dev)	O'Reilly Auto Parts	No	-85.72640857	38.29428492
stb00025	Dry Detention (Comm Dev)	St. Stephen Baptist Church 1	No	-85.73138969	38.33406939
stb00096	Dry Detention (Comm Dev)	Storage Express 1	No	-85.71924885	38.31012754
stb00097	Dry Detention (Comm Dev)	Storage Express 2	No	-85.71677586	38.31549546
stb00189	Dry Detention (Comm Dev)	Veteran Station	No	-85.74034415	38.32797951
stb00090	Dry Detention (Comm Dev)	Walgreens	No	-85.71367153	38.32236003
stb00054	Dry Detention (Comm Dev)	What A Wash	No	-85.71647142	38.31664611
stb00209	Dry Detention (Comm Dev)	Chillers	No	-85.7079005	38.31884805
stb00060	Dry Detention (River Ridge)	River Ridge 3 (Manitowoc)	No	-85.69085281	38.3698413
stb00122	Dry Detention (Port)	Port 3 (Mill Steel)	No	-85.6791886	38.31889502
stb00207	Dry Detention (Port)	Port 7 (SDI) 2	No	-85.67339575	38.32246241
stb00167	Dry Detention (Indust Park)	Industrial Park 11 (Twists N Turns)	No	-85.75109899	38.31304181
stb00154	Dry Detention (JTC)	Menards	No	-85.74530983	38.33028045
stb00096	Dry Detention (Comm Dev)	Storage Express 1	No	-85.71924885	38.31012754
stb00097	Dry Detention (Comm Dev)	Storage Express 2	No	-85.71677586	38.31549546
stb00189	Dry Detention (Comm Dev)	Veteran Station	No	-85.74034415	38.32797951
stb00090	Dry Detention (Comm Dev)	Walgreens	No	-85.71367153	38.32236003
stb00054	Dry Detention (Comm Dev)	What A Wash	No	-85.71647142	38.31664611

Basin I.D	Basin Type (Ownership)	Basin Name	City Maint.	Longitude	Latitude
stb00209	Dry Detention (Comm Dev)	Chillers	No	-85.7079005	38.31884805
stb00060	Dry Detention (River Ridge)	River Ridge 3 (Manitowoc)	No	-85.69085281	38.3698413
stb00122	Dry Detention (Port)	Port 3 (Mill Steel)	No	-85.6791886	38.31889502
stb00207	Dry Detention (Port)	Port 7 (SDI) 2	No	-85.67339575	38.32246241
stb00167	Dry Detention (Indust Park)	Industrial Park 11 (Twists N Turns)	No	-85.75109899	38.31304181
stb00154	Dry Detention (JTC)	Menards	No	-85.74530983	38.33028045
stb00042	Dry Detention (HOA)	Courtyards of Buttonwood 1	No	-85.72830939	38.32454093
stb00188	Dry Detention (Comm Dev)	Accent	No	-85.74570095	38.33310253
stb00155	Dry Detention (JTC)	TCB Regional	No	-85.74681003	38.33254284
stb00156	Dry Detention (River Ridge)	River Ridge @ Lewman Way/NWWTP	No	-85.68673611	38.36387416
stb00226	Dry Detention (River Ridge)	River Ridge 2 @ Lewman Way/NWWTP	No	-85.68506598	38.36408223
stb00227	Dry Detention (River Ridge)	Medline 1 @ River Ridge	No	-85.67398342	38.37530648
stb00228	Dry Detention (River Ridge)	Medline 2 @ River Ridge	No	-85.67521038	38.37571082
stb00229	Dry Detention (River Ridge)	Medline 3 @ River Ridge	No	-85.67644887	38.37604205
stb00230	Dry Detention (River Ridge)	Medline 4 @ River Ridge	No	-85.67751655	38.37559383
stb00142	Dry Detention (Comm Dev)	Kroger Regional Basin	No	-85.71168526	38.33291472
stb00232	Dry Detention (Comm Dev)	McDonald's	No	-85.70112439	38.35829165
stb00203	Dry Detention (River Ridge)	River Ridge 8 (Fuji Seal)	No	-85.68314483	38.37571597
stb00233	Dry Detention (River Ridge)	Enjoy Life	No	-85.68605261	38.36936867
stb00159	Dry Detention (Residential)	Penny Lane Condos	No	-85.71823051	38.34992541
stb00131	Dry Detention (HOA)	Williams Crossing 1	No	-85.71890374	38.35060539
stb00234	Dry Detention (HOA)	Williams Crossing 2	No	-85.71873156	38.35001477
stb00236	Dry Detention (HOA)	Williams Crossing 5	No	-85.71583629	38.34980831
stb00240	Dry Detention	Heritage Place	No	-85.70328496	38.4202721
stb00241	Dry Detention (City)	Police Station 2	Yes	-85.71732414	38.30910839
stb00172	Dry Detention (City)	Police Station 1	Yes	-85.71839381	38.31023072
stb00242	Dry Detention (Port)	Idemitsu 2	No	-85.67619788	38.31449358

Basin I.D	Basin Type (Ownership)	Basin Name	City Maint.	Longitude	Latitude
stb00243	Dry Detention	Serenity Oaks	No	-85.68925369	38.41013902
stb00244	Dry Detention	Golfe Pointe	No	-85.73357648	38.31565786
stb00245	Dry Detention (River Ridge)	River Ridge Genpak	No	-85.67580897	38.39322626
stb00246	Dry Detention	The Harbors/Riverpointe Plz/I65	No	-85.74674066	38.26949885
stb00247	Dry Detention	Bachman Auto/Indiana Ave/I65	No	-85.74717726	38.27384046
stb00248	Dry Detention	Red Tail Ridge 3	No	-85.70768773	38.35783639
stb00249	Dry Detention	Red Tail Ridge 2	No	-85.70816419	38.35797902
stb00250	Dry Detention	Red Tail Ridge 1	No	-85.70960657	38.35841406
stb00251	Dry Detention	Hopkins Cottages		-85.70866653	38.29500431
stb00252	Dry Detention	Manors @ Old Salem 4	No	-85.65692685	38.33857328
stb00253	Dry Detention	Manors @ Old Salem 5	No	-85.65600502	38.3400661
stb00256	Dry Detention	Water Tower Rd		-85.70583448	38.35239971
stb00170	Dry Detention (Residential)	Substation 8th St/Hopkins Ln	No	-85.71089986	38.29731418

TABLE 9: City of Jeffersonville Retention Basin Inventory

Basin I.D	Basin Type (Ownership)	Basin Name	City Maint	Longitude	Latitude
stb00101	Retention	Allison Courtyards	No	-85.7054	38.31147
stb00109	Retention	Riverbend	No	-85.7281	38.33097
stb00110	Retention	Courtyards of Buttonwood 3	No	-85.729	38.322
stb00180	Retention	Raintree Ridge 2	No	-85.7005	38.36466
stb00181	Retention	Skyline Acres	No	-85.7194	38.3955
stb00193	Retention	Crystal Springs 3	No	-85.6837	38.35525
stb00175	Retention	Port 4 (Delaco Kasle)	No	-85.6768	38.3239
stb00106	Retention	Port 5 (FedEx)	No	-85.6727	38.32789
stb00105	Retention	North Port/Centennial	No	-85.6916	38.33886
stb00130	Retention	Ellingsworth Commons	No	-85.7003	38.3322
stb00103	Retention	City Aquatic Center	Yes	-85.7102	38.3027
stb00104	Retention	Northport Development	No	-85.6818	38.33223
stb00171	Retention	Villages of Perrin Pointe 1	No	-85.6972	38.29136
stb00147	Retention	Villages of Perrin Pointe 2	No	-85.696	38.29175
stb00216	Retention	St. Stephen Baptist Church 2	No	-85.7307	38.33479
stb00191	Retention	Crystal Springs 1	No	-85.6842	38.35759
stb00192	Retention	Crystal Springs 2	No	-85.6844	38.35697
stb00224	Retention	River Ridge	No	-85.6652	38.35579

stb00225	Retention	River Ridge	No	-85.6683	38.35888
stb00231	Retention	River Commons	?	-85.6862	38.29784
stb00111	Retention	Stonebridge	No	-85.7045	38.33669
stb00237	Retention	Ridges of Old Salem	No	-85.6585	38.33888
stb00254	Retention	Xscape Movie Theatre		-85.6961	38.34541

TABLE 10: City of Jeffersonville Underground Basin Inventory

Basin I.D	Basin Type (Ownership)	Basin Name	City Maint	Longitude	Latitude
stb00117	Underground	North Rite Aid	No	-85.7133	38.3233
stb00118	Underground	Clark Memorial Hospital	No	-85.7476	38.28117
stb00195	Underground	Jeff Marketplace 3 (Marathon)	No	-85.7458	38.32937
stb00112	Underground	Jeff Town Center 1	No	-85.7479	38.32817
stb00113	Underground	Jeff Town Center 2	No	-85.746	38.32765
stb00115	Underground	Jeff Town Center 4	No	-85.7455	38.32876
stb00114	Underground	Jeff Town Center 3	No	-85.7439	38.32851
stb00196	Underground	Jeff Marketplace 2 (AT&T)	No	-85.7467	38.32963
stb00197	Underground	Jeff Marketplace 1 (Tire Discounters)	No	-85.7473	38.32974
stb00218	Underground	Benjamin Moore Paint	No	-85.7377	38.32699

TABLE 11: City of Jeffersonville Unclassified Basin Inventory

Basin I.D	Basin Type (Ownership)	Basin Name	City Maint	Longitude	Latitude
stb00235	Not specified	Manors @ Old Salem 1	No	-85.6558	38.34046
stb00238	Not specified	Manors @ Old Salem 2	No	-85.6576	38.33933
stb00239	Not specified	Manors @ Old Salem 3	No	-85.6583	38.33979
stb00255	Not specified	Fairfield Inn		-85.7021	38.34859

TABLE 12: City of Jeffersonville Stormwater Manhole Inventory

Manhole ID	Manhole Material	Manhole Diameter (in.)	ROW	Longitude	Latitude
stmnode80001	Concrete	24	No	-85.70064325	38.37249
stmnode80002	Concrete	24	No	-85.67934809	38.34618
stmnode80004	Cast Iron	23	No	-85.68981233	38.34951
stmnode80008	Concrete	24	No	-85.71713269	38.35538
stmnode80016	Cast Iron	24	No	-85.70910047	38.32168
stmnode80017	Cast Iron	24	No	-85.71054716	38.3217
stmnode80018	Cast Iron	24	No	-85.70952098	38.3217
stmnode80019	Cast Iron	15	No	-85.72427276	38.32173

Manhole ID	Manhole Material	Manhole Diameter (in.)	ROW	Longitude	Latitude
stmnode80020	Cast Iron	24	No	-85.71143059	38.32198
stmnode80021	Cast Iron	24	No	-85.70878994	38.32207
stmnode80022	Cast Iron	24	No	-85.71100643	38.32222
stmnode80023	Cast Iron	24	No	-85.70858941	38.32227
stmnode80024	Cast Iron	24	No	-85.70830313	38.32235
stmnode80025	Cast Iron	24	No	-85.71129519	38.32254
stmnode80026	Cast Iron	24	No	-85.71031238	38.32254
stmnode80027	Cast Iron	24	No	-85.71329142	38.32258
stmnode80028	Cast Iron	24	No	-85.71328198	38.32267
stmnode80029	Cast Iron	24	No	-85.70742954	38.3228
stmnode80030	Cast Iron	24	No	-85.71156965	38.32287
stmnode80031	Cast Iron	24	No	-85.70976055	38.32302
stmnode80032	Cast Iron	24	No	-85.71092458	38.3232
stmnode80033	Cast Iron	24	No	-85.710057	38.32332
stmnode80034	Cast Iron	24	No	-85.70803466	38.32345
stmnode80035	Cast Iron	24	No	-85.71134488	38.32364
stmnode80036	Concrete	18	No	-85.72616955	38.32386
stmnode80037	Cast Iron	24	No	-85.70863344	38.32411
stmnode80038	Cast Iron	24	No	-85.74317154	38.3243
stmnode80040	Concrete	60	No	-85.68251086	38.32454
stmnode80041	Cast Iron	24	No	-85.70915214	38.32466
stmnode80042	Cast Iron	24	No	-85.70965353	38.32484
stmnode80043	Cast Iron	24	No	-85.70952558	38.32485
stmnode80045	Cast Iron	26	Yes	-85.72474203	38.32556
stmnode80046	Cast Iron	26	No	-85.72491774	38.32559
stmnode80048	Cast Iron	24	Yes	-85.71204768	38.32605
stmnode80049	Cast Iron	24	No	-85.67927875	38.32606
stmnode80050	Cast Iron	26	Yes	-85.72779379	38.32618
stmnode80052	Cast Iron	24	Yes	-85.72749331	38.32679
stmnode80053	Cast Iron	26	No	-85.72767351	38.32684
stmnode80055	Cast Iron	22	Yes	-85.72450086	38.32697
stmnode80056	Cast Iron	21	No	-85.72306225	38.3271
stmnode80057	Cast Iron	24	No	-85.72759054	38.3271
stmnode80058	Cast Iron	24	No	-85.72773842	38.32712
stmnode80059	Cast Iron	26	No	-85.73766603	38.32712
stmnode80060	Cast Iron	24	Yes	-85.73791719	38.32737
stmnode80061	Cast Iron	24	No	-85.72742262	38.32742
stmnode80062	Cast Iron	22	No	-85.72379633	38.32744
stmnode80064	Cast Iron	24	No	-85.72724977	38.32775
stmnode80066	Cast Iron	26	No	-85.72198088	38.32791

Manhole ID	Manhole Material	Manhole Diameter (in.)	ROW	Longitude	Latitude
stmnode80068	Cast Iron	24	No	-85.72439242	38.32807
stmnode80069	Cast Iron	24	No	-85.72707378	38.3281
stmnode80070	Cast Iron	24	No	-85.72719318	38.32814
stmnode80072	Cast Iron	24	No	-85.72498713	38.32864
stmnode80073	Cast Iron	24	No	-85.72667013	38.32891
stmnode80074	Cast Iron	12	No	-85.72678085	38.32892
stmnode80075	Cast Iron	24	Yes	-85.7426293	38.3291
stmnode80076	Cast Iron	24	Yes	-85.74289942	38.32918
stmnode80077	Cast Iron	24	No	-85.72650398	38.32925
stmnode80079	Cast Iron	24	Yes	-85.74260093	38.32941
stmnode80080	Cast Iron	24	Yes	-85.74287534	38.32942
stmnode80081	Cast Iron	24	Yes	-85.74285215	38.32968
stmnode80082	Cast Iron	26	No	-85.67934984	38.3298
stmnode80083	Concrete	24	No	-85.70159603	38.37347
stmnode80086	Cast Iron	24	No	-85.73477984	38.3312
stmnode80088	Cast Iron	24	No	-85.72647304	38.33335
stmnode80089	Cast Iron	30	No	-85.68828624	38.3343
stmnode80093	Cast Iron	0	No	-85.68860148	38.33941
stmnode80096	Cast Iron	23	No	-85.71241952	38.34767
stmnode80098	Cast Iron	0	Yes	-85.71240499	38.35108
stmnode80108		0	Yes	-85.72907836	38.29141
stmnode80109		0	No	-85.73873875	38.28336
stmnode80110		0	No	-85.73630583	38.28424
stmnode80112		0	No	-85.74134212	38.28253
stmnode80113		0	Yes	-85.74342774	38.26932
stmnode80115		0	Yes	-85.74724769	38.26936
stmnode80116		0	Yes	-85.7472516	38.26932
stmnode80117		0	Yes	-85.75017119	38.2732
stmnode80119		0	Yes	-85.74713567	38.27052
stmnode80120		0	Yes	-85.71290373	38.28418
stmnode80121		0	Yes	-85.74698959	38.272
stmnode80123		0	Yes	-85.73312892	38.29051
stmnode80124		0	No	-85.73346414	38.2909
stmnode80125		0	No	-85.73376508	38.29123
stmnode80126		0	No	-85.73429453	38.29183
stmnode80127		0	No	-85.7348044	38.2924
stmnode80128		0	No	-85.73531921	38.29297
stmnode80129		0	No	-85.73554034	38.29322
stmnode80130		0	No	-85.73581812	38.29353
stmnode80131		0	No	-85.73614572	38.29389

Manhole ID	Manhole Material	Manhole Diameter (in.)	ROW	Longitude	Latitude
stmnode80132		0	No	-85.73644017	38.29423
stmnode80133		0	No	-85.73637392	38.29484
stmnode80134		0	Yes	-85.73341666	38.30036
stmnode80135		0	No	-85.73326975	38.29195
stmnode80136		0	No	-85.7327832	38.29265
stmnode80137		0	No	-85.73291514	38.29168
stmnode80138		0	No	-85.73236358	38.29247
stmnode80139		0	Yes	-85.7332693	38.29068
stmnode80140		0	No	-85.73308866	38.29095
stmnode80141		0	No	-85.73210332	38.29236
stmnode80143		0	No	-85.73268617	38.29153
stmnode80145		0	No	-85.73240388	38.29135
stmnode80146		0	No	-85.73284093	38.29071
stmnode81002		0	Yes	-85.71807253	38.28754
stmnode81003		0	No	-85.71886103	38.28845
stmnode81004	Cast Iron	29	No	-85.74584568	38.26876
stmnode81005		0	Yes	-85.74491913	38.26922
stmnode81006		0	Yes	-85.74492795	38.26928
stmnode81007		0	Yes	-85.7447071	38.2693
stmnode81008		0	Yes	-85.74417843	38.26935
stmnode81009		0	Yes	-85.74364975	38.26941
stmnode81010		0	Yes	-85.74357374	38.26941
stmnode81011		0	Yes	-85.74344515	38.26941
stmnode81012		0	Yes	-85.74331128	38.26943
stmnode81013		0	Yes	-85.74247136	38.2695
stmnode81014		0	Yes	-85.74221269	38.26953
stmnode81015		0	Yes	-85.74211808	38.26954
stmnode81017		0	Yes	-85.74322658	38.2681
stmnode81018		0	No	-85.74320082	38.26795
stmnode81019		0	Yes	-85.72438998	38.29957
stmnode81023		0	Yes	-85.72203127	38.29596
stmnode81025		0	Yes	-85.71916643	38.29286
stmnode81026		0	Yes	-85.7236599	38.29878
stmnode81027		0	Yes	-85.72552034	38.30056
stmnode81028		0	No	-85.72865609	38.30129
stmnode81029		0	No	-85.72151212	38.29641
stmnode81031		0	Yes	-85.71672443	38.29017
stmnode81032		0	Yes	-85.71509033	38.28842
stmnode81033		0	Yes	-85.71507288	38.28845
stmnode81034		0	Yes	-85.74824538	38.29034

Manhole ID	Manhole Material	Manhole Diameter (in.)	ROW	Longitude	Latitude
stmnode81035		0	Yes	-85.74993317	38.29305
stmnode81037		0	Yes	-85.7470354	38.28487
stmnode81038		0	Yes	-85.74642879	38.2841
stmnode81040		0	Yes	-85.7458867	38.28337
stmnode81041		0	Yes	-85.74793868	38.28603
stmnode81042		0	Yes	-85.74842042	38.28666
stmnode81044		0	Yes	-85.74785352	38.28592
stmnode81045		0	Yes	-85.74831551	38.28788
stmnode81047		0	Yes	-85.74023206	38.28036
stmnode81048		0	Yes	-85.74184789	38.28026
stmnode81049		0	Yes	-85.74136028	38.2798
stmnode81050		0	Yes	-85.74146796	38.27975
stmnode81051		0	Yes	-85.74109922	38.27927
stmnode81052		0	Yes	-85.74070236	38.27876
stmnode81053		0	Yes	-85.73926678	38.27909
stmnode81054		0	Yes	-85.73978338	38.27886
stmnode81055		0	Yes	-85.74019711	38.27866
stmnode81057		0	Yes	-85.73958124	38.27729
stmnode81058		0	Yes	-85.73962801	38.27738
stmnode81059		0	Yes	-85.74020388	38.27812
stmnode81060		0	Yes	-85.74054428	38.27848
stmnode80118		0	Yes	-85.75029868	38.27193
stmnode81061		0	Yes	-85.75053134	38.26953
stmnode81062		0	Yes	-85.74943354	38.26946
stmnode81063		0	Yes	-85.74941814	38.26952
stmnode81064		0	Yes	-85.75019173	38.27589
stmnode81065		0	Yes	-85.75025471	38.27247
stmnode81066		0	Yes	-85.75020685	38.27284
stmnode81067		0	Yes	-85.75030994	38.27174
stmnode81068		0	Yes	-85.7505641	38.26912
stmnode81069		0	Yes	-85.74726719	38.26933
stmnode80010	Steel	0	No	-85.74110892	38.30827
stmnode80104		0	Yes	-85.72989396	38.29228
stmnode80105		0	Yes	-85.7297643	38.29215
stmnode81071	cast iron	24	Yes	-85.75018124	38.28438
stmnode81072	Cast iron	24	Yes	-85.75117866	38.28442
stmnode81073	Cast iron	24	Yes	-85.75124931	38.28432
stmnode81074	Cast iron	24	Yes	-85.75015832	38.28448
stmnode81075	Cast iron	24	No	-85.74989066	38.28268
stmnode81076	Cast iron	24	Yes	-85.74790827	38.2831

Manhole ID	Manhole Material	Manhole Diameter (in.)	ROW	Longitude	Latitude
stmnode81078	cast iron	24	No	-85.72256639	38.28711
stmnode81081		0	No	-85.74234015	38.28815
stmnode81082		0	No	-85.74162257	38.288
stmnode81083		0	No	-85.74192343	38.28742
stmnode81084		0	No	-85.74201753	38.28741
stmnode81085		0	No	-85.74242284	38.28735
stmnode81086		0	Yes	-85.74726201	38.26927
stmnode81088		0	Yes	-85.74724982	38.27297
stmnode81089		0	No	-85.74746615	38.27285
stmnode80114		0	Yes	-85.7505114	38.26957
stmnode81090		0	Yes	-85.74050978	38.2697
stmnode81091		0	Yes	-85.74085319	38.27012
stmnode81092		0	Yes	-85.74077206	38.27003
stmnode81093		0	Yes	-85.74076056	38.27002
stmnode81095		0	Yes	-85.74201381	38.26955
stmnode81099		0	Yes	-85.72746374	38.27763
stmnode81100		0	Yes	-85.72791544	38.27813
stmnode81101		0	Yes	-85.72801499	38.27815
stmnode81102		0	Yes	-85.72809707	38.27824
stmnode81103		0	Yes	-85.72859285	38.27878
stmnode81106		0	Yes	-85.7301462	38.28055
stmnode81107		0	Yes	-85.73031906	38.28074
stmnode81108		0	Yes	-85.73090579	38.28138
stmnode81109		0	Yes	-85.73111406	38.28161
stmnode81110		0	Yes	-85.73162321	38.28217
stmnode81111		0	Yes	-85.73184324	38.28242
stmnode81112		0	Yes	-85.73210502	38.28268
stmnode81056		0	Yes	-85.74056286	38.27857
stmnode81113		0	Yes	-85.74046868	38.27845
stmnode81114		0	Yes	-85.74106587	38.27822
stmnode81117		0	Yes	-85.74297943	38.27731
stmnode81118		0	Yes	-85.74283376	38.2773
stmnode81119		0	Yes	-85.74282963	38.27725
stmnode81120		0	Yes	-85.7428384	38.27737
stmnode81121		0	Yes	-85.74259027	38.27694
stmnode81122		0	Yes	-85.74353063	38.27803
stmnode81123		0	Yes	-85.74355524	38.27702
stmnode81124		0	Yes	-85.74349881	38.27705
stmnode81125		0	Yes	-85.74297393	38.27626
stmnode81126		0	Yes	-85.74323577	38.27661

Manhole ID	Manhole Material	Manhole Diameter (in.)	ROW	Longitude	Latitude
stmnode81127		0	Yes	-85.74407634	38.27677
stmnode81128		0	Yes	-85.7442428	38.27675
stmnode81129		0	Yes	-85.74440343	38.27673
stmnode81130		0	Yes	-85.74486464	38.27677
stmnode81131		0	Yes	-85.74542743	38.27685
stmnode81132		0	Yes	-85.74543264	38.27681
stmnode81133		0	Yes	-85.74535725	38.27768
stmnode81134		0	Yes	-85.74538299	38.27687
stmnode81135		0	Yes	-85.7460073	38.27685
stmnode81136		0	Yes	-85.74647846	38.27688
stmnode80003	Concrete	24	No	-85.67991275	38.34698
stmnode80099	Cast Iron	0	No	-85.71197278	38.35115
stmnode80100	Cast Iron	24	Yes	-85.7126361	38.35123
stmnode81138		0	No	-85.72346294	38.34786
stmnode80101	Cast Iron	0	No	-85.71456844	38.35312
stmnode81140		0	No	-85.6911766	38.36417
stmnode81139		0	No	-85.69063026	38.36456
stmnode80097	Cast Iron	23	No	-85.71189846	38.34809
stmnode80095	Cast Iron	0	No	-85.71146958	38.34764
stmnode80092	Cast Iron	24	No	-85.72519168	38.33879
stmnode80094	Cast Iron	23	No	-85.72765104	38.34174
stmnode80090	Cast Iron	24	No	-85.73574015	38.33491
stmnode80047	Cast Iron	24	No	-85.7237781	38.32594
stmnode80071	Cast Iron	24	No	-85.72446877	38.32829
stmnode80067	Cast Iron	24	No	-85.72335188	38.32791
stmnode80078	Cast Iron	24	No	-85.72661275	38.32923
stmnode80063	Cast Iron	24	No	-85.72752752	38.32744
stmnode80065	Cast Iron	24	No	-85.72735437	38.32778
stmnode80054	Cast Iron	26	No	-85.72111147	38.32693
stmnode80039	Cast Iron	24	No	-85.72659701	38.32439
stmnode80044	Cast Iron	26	No	-85.74062507	38.32491
stmnode80011	Cast Iron	26	No	-85.74010043	38.31141
stmnode80015	Cast Iron	23	Yes	-85.74429805	38.32055
stmnode81142		0	No	-85.74327804	38.32137
stmnode80014	Cast Iron	23	Yes	-85.74357064	38.3205
stmnode81143		0	Yes	-85.74359012	38.32028
stmnode81144		0	Yes	-85.74334493	38.32082
stmnode80102		0	No	-85.70529765	38.33111
stmnode81024		0	Yes	-85.72063285	38.29445
stmnode81145		0	Yes	-85.74548208	38.26921

Manhole ID	Manhole Material	Manhole Diameter (in.)	ROW	Longitude	Latitude
stmnode81146		0	Yes	-85.74494823	38.26927
stmnode80103		0	Yes	-85.73008471	38.29249
stmnode81147		0	Yes	-85.73194949	38.28114
stmnode81148		0	Yes	-85.74256101	38.29784
stmnode81150		0	No	-85.71190545	38.39308
stmnode81154		0	Yes	-85.74542142	38.28286
stmnode81155		0	No	-85.74736011	38.27896
stmnode81151		0	No	-85.72355061	38.32542
stmnode81152		0	No	-85.72362014	38.32554
stmnode81158		0	No	-85.74725718	38.28334
stmnode81159		0	No	-85.74392016	38.28359
stmnode81157		0	Yes	-85.74477981	38.2832
stmnode81162		0	No	-85.74002084	38.28237
stmnode81163		0	No	-85.7397907	38.28248
stmnode81164		0	No	-85.73871711	38.28299
stmnode81165		0	No	-85.73853059	38.28312
stmnode81166		0	No	-85.73818369	38.28325
stmnode81167		0	No	-85.73934104	38.28269
stmnode81169		0	No	-85.74414695	38.28481
stmnode81170		0	No	-85.74377328	38.28375
stmnode81171		0	Yes	-85.74439317	38.28326
stmnode81172		0	Yes	-85.74544314	38.28278
stmnode81173		0	Yes	-85.74623431	38.28224
stmnode81174		0	No	-85.74699731	38.28118
stmnode81175		0	Yes	-85.74723869	38.28077
stmnode81176		0	Yes	-85.7473588	38.2807
stmnode81179		0	No	-85.72662707	38.31595
stmnode81105		0	Yes	-85.72908425	38.27937
stmnode81104		0	Yes	-85.72900306	38.2793
stmnode81094		0	Yes	-85.74170263	38.26958
stmnode81180		0	Yes	-85.73762855	38.28351
stmnode81181		0	Yes	-85.72797084	38.27817
stmnode80122		0	Yes	-85.71278733	38.28406
stmnode81182		0	Yes	-85.74091724	38.27482
stmnode81183		0	Yes	-85.71216938	38.30081
stmnode81184		0	Yes	-85.74159722	38.27128
stmnode81185		0	Yes	-85.74101178	38.27156
stmnode81039		0	Yes	-85.74613762	38.28373
stmnode81186		0	No	-85.7326795	38.2876
stmnode81141		0	No	-85.69207052	38.36354

Manhole ID	Manhole Material	Manhole Diameter (in.)	ROW	Longitude	Latitude
stmnode81188		0	Yes	-85.74146	38.29661
stmnode81191		0	Yes	-85.69532475	38.29318
stmnode81080	cast iron	24	Yes	-85.71212606	38.28307
stmnode81079	cast iron	24	Yes	-85.71193155	38.28317
stmnode81197		0	Yes	-85.74915132	38.28793
stmnode81196		0	Yes	-85.74927214	38.28794
stmnode81195		0	Yes	-85.75035457	38.2881
stmnode81194		0	Yes	-85.74907374	38.28414
stmnode81193		0	Yes	-85.74820035	38.28395
stmnode81234		0	Yes	-85.71288204	38.32402
stmnode81193		0	No	-85.74361086	38.28061
stmnode81235		0	Yes	-85.74170044	38.27123
stmnode81178		0	No	-85.74796378	38.2795
stmnode81168		0	No	-85.74443894	38.28583
stmnode81233		0	No	-85.74451184	38.28582
stmnode81198		0	No	-85.70435599	38.33531
stmnode81199		0	No	-85.70263142	38.33445
stmnode81200		0	No	-85.70022859	38.33339
stmnode81201		0	No	-85.70028001	38.33377
stmnode81202		0	No	-85.70056105	38.33409
stmnode81203		0	No	-85.70043203	38.33082
stmnode81204		0	No	-85.70072876	38.33113
stmnode81205		0	No	-85.70070768	38.3312
stmnode81206		0	No	-85.70038089	38.33138
stmnode81207		0	No	-85.6990101	38.33081
stmnode81208		0	No	-85.69636182	38.33188
stmnode81211		0	No	-85.71503927	38.34869
stmnode81212		0	No	-85.71551555	38.34899
stmnode81213		0	Yes	-85.70222022	38.36728
stmnode81214		0	Yes	-85.70177668	38.36679
stmnode81215		0	No	-85.70074832	38.36712
stmnode81216		0	No	-85.72850651	38.31999
stmnode81217		0	No	-85.69964877	38.36932
stmnode81218		0	No	-85.72421166	38.31486
stmnode81219		0	No	-85.72399129	38.3146
stmnode81220		0	No	-85.72381921	38.3141
stmnode81221		0	Yes	-85.72349313	38.31372
stmnode81222		0	No	-85.72391433	38.3135
stmnode81223		0	No	-85.72390051	38.31311
stmnode81224		0	Yes	-85.70040334	38.36811

Manhole ID	Manhole Material	Manhole Diameter (in.)	ROW	Longitude	Latitude
stmnode81225		0	No	-85.713046	38.33435
stmnode81226		0	No	-85.71313928	38.33423
stmnode81227		0	No	-85.71068415	38.33233
stmnode81228		0	No	-85.71067031	38.33235
stmnode81229		0	No	-85.68044867	38.38916
stmnode81230		0	No	-85.67998516	38.38901
stmnode81231		0	No	-85.67961561	38.38893
stmnode81232		0	No	-85.67933311	38.38889
stmnode81236		0	No	-85.67902443	38.38885
stmnode81237		0	No	-85.6788891	38.38944
stmnode81238		0	No	-85.67883845	38.38955
stmnode81239		0	No	-85.67850419	38.38881
stmnode81240		0	No	-85.67824378	38.38882
stmnode81241		0	No	-85.67807219	38.38908
stmnode81242		0	No	-85.67800471	38.38922
stmnode81243		0	No	-85.67781576	38.3896
stmnode81244		0	No	-85.6774268	38.39036
stmnode81245		0	No	-85.67711043	38.39099
stmnode81246		0	No	-85.67703981	38.39113
stmnode81247		0	No	-85.67685287	38.39151
stmnode81248		0	No	-85.67634447	38.39209
stmnode81249		0	No	-85.6776296	38.38877
stmnode81250		0	No	-85.67709702	38.38874
stmnode81251		0	No	-85.67655376	38.38862
stmnode81252		0	Yes	-85.67770464	38.39809
stmnode81253		0	Yes	-85.67780605	38.39768
stmnode81254		0	Yes	-85.67793385	38.39714
stmnode81255		0	Yes	-85.67802064	38.39674
stmnode81256		0	Yes	-85.67809977	38.39632
stmnode81257		0	Yes	-85.67830028	38.3949
stmnode81258		0	Yes	-85.6782885	38.39515
stmnode81259		0	Yes	-85.67820597	38.39573
stmnode81260		0	No	-85.67757026	38.39905
stmnode81261		0	No	-85.67734072	38.39974
stmnode81262		0	No	-85.67722554	38.40007
stmnode81263		0	No	-85.67715184	38.40027
stmnode81264		0	No	-85.68238527	38.3772
stmnode81265		0	No	-85.68277588	38.37645
stmnode81266		0	No	-85.67607537	38.38841
stmnode81267		0	No	-85.67562409	38.3882

Manhole ID	Manhole Material	Manhole Diameter (in.)	ROW	Longitude	Latitude
stmnode81268		0	No	-85.67525009	38.38801
stmnode81269		0	Yes	-85.68432613	38.37588
stmnode81270		0	No	-85.70270219	38.33621
stmnode81271		0	No	-85.7034283	38.3358
stmnode81272		0	No	-85.70455195	38.33551
stmnode81273		0	Yes	-85.70588238	38.35082
stmnode81274		0	Yes	-85.70604422	38.35049
stmnode81275		0	Yes	-85.70617073	38.35023
stmnode81276		0	Yes	-85.70626744	38.35004
stmnode81277		0	Yes	-85.70641075	38.34977
stmnode81278		0	No	-85.70576087	38.34991
stmnode81279		0	No	-85.70538985	38.34982
stmnode81209		0	No	-85.71719608	38.35095
stmnode81280		0	No	-85.71466355	38.34859
stmnode81281		0	No	-85.71533759	38.34911
stmnode81210		0	No	-85.71396071	38.34918
stmnode81282		0	No	-85.74827114	38.27874
stmnode81189		0	No	-85.74779357	38.27911
stmnode81283		0	No	-85.74688628	38.27875
stmnode81284		0	No	-85.74718736	38.27885
stmnode81285		0	No	-85.74723905	38.27895
stmnode81286		0	No	-85.74722936	38.27905
stmnode81287		0	No	-85.74687546	38.27903
stmnode81137		0	Yes	-85.74639221	38.27784
stmnode81288		0	Yes	-85.74743184	38.27805
stmnode81289		0	Yes	-85.74640568	38.27769
stmnode81290		0	No	-85.7469218	38.27829
stmnode81291		0	No	-85.70545162	38.34967
stmnode81292		0	Yes	-85.70481689	38.34942
stmnode81293		0	No	-85.6580334	38.34001
stmnode81294		0	No	-85.69369533	38.37326
stmnode81295		0	No	-85.68600148	38.36279
stmnode81036		0	No	-85.71606305	38.3132
stmnode81296		0	No	-85.64771355	38.35183
stmnode81297		0	No	-85.68992113	38.41032
stmnode81298		0	No	-85.70026403	38.40473
stmnode81299		0	No	-85.72599766	38.36943
stmnode81301		0	No	-85.67585145	38.40114
stmnode81302		0	No	-85.67510126	38.4
stmnode81303		0	No	-85.67540326	38.39899

Manhole ID	Manhole Material	Manhole Diameter (in.)	ROW	Longitude	Latitude
stmnode81304		0	No	-85.67536948	38.39853
stmnode81305		0	No	-85.67502747	38.39797
stmnode81306		0	No	-85.67336522	38.39638
stmnode81307		0	No	-85.67316762	38.39618
stmnode81308		0	No	-85.67187606	38.39476
stmnode81309		0	No	-85.67079332	38.39357
stmnode81310		0	No	-85.67038018	38.39313
stmnode81311		0	No	-85.66995507	38.3927
stmnode81312		0	No	-85.66952094	38.39227
stmnode81313		0	No	-85.66894103	38.39147
stmnode81314		0	No	-85.66847305	38.391
stmnode81315		0	No	-85.66822557	38.39075
stmnode81096		0	Yes	-85.72701805	38.27712
stmnode81098		0	Yes	-85.72736596	38.27751
stmnode81097		0	Yes	-85.72728171	38.27743
stmnode81316		0	No	-85.67636294	38.36729
stmnode81317		0	No	-85.67665526	38.36702
stmnode81318		0	No	-85.67702876	38.36685
stmnode81319		0	No	-85.67746027	38.36672
stmnode81320		0	No	-85.67810849	38.36654
stmnode81321		0	No	-85.67855182	38.36642
stmnode81322		0	No	-85.67899849	38.36628
stmnode81323		0	No	-85.6794027	38.36606
stmnode81324		0	No	-85.67971351	38.36577
stmnode81325		0	No	-85.679906	38.36541
stmnode81326		0	No	-85.67996464	38.36503
stmnode81327		0	No	-85.67989551	38.36468
stmnode81328		0	No	-85.67973495	38.36435
stmnode81329		0	No	-85.67968486	38.36405
stmnode81330		0	No	-85.67978062	38.36375
stmnode81331		0	No	-85.67963882	38.3637
stmnode81332		0	Yes	-85.75242715	38.29166
stmnode81333		0	Yes	-85.74755799	38.27411
stmnode81087		0	Yes	-85.74698248	38.27296
stmnode81334		0	Yes	-85.74719529	38.27331
stmnode81335		0	Yes	-85.74671669	38.27256
stmnode81336		0	Yes	-85.74664063	38.27245
stmnode81337		0	Yes	-85.70744017	38.35794
stmnode81338		0	Yes	-85.70888875	38.35914
stmnode81339		0	No	-85.70958808	38.35895

Manhole ID	Manhole Material	Manhole Diameter (in.)	ROW	Longitude	Latitude
stmnode81340		0	Yes	-85.7100997	38.35973
stmnode81341		0	Yes	-85.70863715	38.29484
stmnode80111		0	No	-85.7358389	38.2845
stmnode81342		0	Yes	-85.73089732	38.28711
stmnode81343		0	Yes	-85.73122193	38.28693
stmnode81344		0	Yes	-85.73162634	38.2867
stmnode81345		0	Yes	-85.73187564	38.28655
stmnode81346		0	Yes	-85.73214938	38.28639
stmnode81347		0	Yes	-85.73258983	38.28615
stmnode81187		0	No	-85.7329934	38.28623
stmnode81348		0	Yes	-85.73295422	38.28593
stmnode81349		0	Yes	-85.73330983	38.28574
stmnode81350		0	Yes	-85.73356185	38.28559
stmnode81351		0	Yes	-85.73401311	38.28534
stmnode81046		0	Yes	-85.74758321	38.28783
stmnode81352		0	No	-85.74649911	38.2878
stmnode81353		0	Yes	-85.74600032	38.28963
stmnode81354		0	Yes	-85.74564056	38.28858
stmnode81355		0	Yes	-85.74501885	38.28664
stmnode81356		0	Yes	-85.7453131	38.28759
stmnode81357		0	Yes	-85.74535408	38.28771
stmnode81358		0	Yes	-85.73474916	38.28491
stmnode81359		0	Yes	-85.7348492	38.28502
stmnode81360		0	No	-85.73897197	38.32545
stmnode81361		0	No	-85.73945822	38.32537
stmnode81192		0	Yes	-85.75340727	38.29232
stmnode81362		0	Yes	-85.73514578	38.28485
stmnode81363		0	Yes	-85.71058736	38.29799
stmnode81364		0	Yes	-85.71222135	38.3007
stmnode81365		0	No	-85.71101906	38.30098
stmnode81366		0	No	-85.66603594	38.35843
stmnode81367		0	No	-85.66616316	38.35829
stmnode81368		0	No	-85.66617207	38.35818
stmnode81369		0	No	-85.66618862	38.35794
stmnode81370		0	No	-85.66623099	38.35751
stmnode81371		0	No	-85.66591398	38.35729
stmnode81372		0	No	-85.66439502	38.35845
stmnode81373		0	No	-85.66407043	38.35842
stmnode81374		0	No	-85.66384002	38.35837
stmnode81375		0	No	-85.73917046	38.32434

TABLE 13: City of Jeffersonville Stormwater Outfall Inventory

Outfall ID	Outfall Material	Outfall Shape	Outfall Diameter (in.)	Longitude	Latitude
sto01058	Grass / Earthen	Open ditch	30	-85.71649396	38.30745845
sto01067	Brick	circular	42	-85.75060727	38.26832707
sto01077	concrete	parabolic	36	-85.75535069	38.29438566
sto01076	earthen	Parabolic	48	-85.75360576	38.29548078
sto01035	Grass / Earthen	Open ditch	24	-85.7231789	38.3044084
sto01037	Grass / Earthen	Open ditch	0	-85.72279468	38.30429007
sto01003	RCP	Outfall	12	-85.71248739	38.30214965
sto01061	CMP	Circular	24	-85.72165279	38.30378663
sto01057	PVC	Circular	15	-85.71661732	38.30752726
sto01087			0	-85.71164321	38.28249637
sto01097			0	-85.7491097	38.26821619
sto01099	HDPE	Circular	18	-85.74548445	38.2981832
sto01095	Concrete	Circular	18	-85.73963038	38.26860994
sto01103	Concrete	Open Ditch 4'x2'	0	-85.74783145	38.30846903
sto01098	HDPE	Circular	18	-85.74541702	38.2984029
sto01121			0	-85.73844707	38.26916403
sto01122			0	-85.68247546	38.36078922
sto01123			0	-85.72555881	38.31462058
sto01124			0	-85.72481624	38.31372755
sto01125			0	-85.72357557	38.31242386
sto01126			0	-85.72140602	38.31209851
sto00006	Corrugated Plastic	Circular	30	-85.68120288	38.3470123
sto00007	Corrugated Plastic	Circular	15	-85.68105038	38.34673347
sto00008	Corrugated Plastic	Circular	42	-85.68142684	38.34825834
sto00009	Corrugated Plastic	Circular	12	-85.68203926	38.34525375
sto00011	Corrugated Plastic	Circular	24	-85.72075385	38.35029086
sto00015	Concrete	Circular	15	-85.68464041	38.35740327
sto00016	Corrugated Plastic	Circular	18	-85.68487976	38.3566183
sto00018	Corrugated Plastic	Circular	12	-85.68645017	38.35464873
sto00044	Concrete	Circular	24	-85.7178224	38.35658513
sto00045	Concrete	Circular	12	-85.718085	38.35663484
sto00047	Corrugated Plastic	Circular	15	-85.72465694	38.34990272
sto00050	Concrete	Circular	16	-85.72066461	38.35300545
sto00053	Concrete	U-Shaped	60	-85.74179781	38.30877653
sto00079	Corrugated Plastic	Circular	60	-85.72586811	38.329824
sto00080	Concrete	Circular	18	-85.72621504	38.32984301
sto00103	Concrete	Circular	24	-85.7304386	38.33177356
sto01127			0	-85.73021075	38.33163626

Outfall ID	Outfall Material	Outfall Shape	Outfall Diameter (in.)	Longitude	Latitude
sto00106	HDPE	Circular	14	-85.73216085	38.3323207
sto00108	Concrete	Concrete-Lined Ditch	18	-85.73393874	38.33598644
sto00113	Concrete	Flat	0	-85.73426379	38.33650476
sto00115	Concrete	Circular	12	-85.73492566	38.33731823
sto00116	Concrete	Circular	15	-85.73508113	38.33750327
sto00117	Concrete	Circular	15	-85.73524081	38.33764893
sto00119	Concrete	Circular	18	-85.73539651	38.33779615
sto01128			0	-85.73549762	38.33785749
sto01129			0	-85.73609087	38.33817401
sto00120	Concrete	Elliptical	0	-85.73746238	38.33783776
sto00121	Concrete	Circular	15	-85.73664154	38.33821019
sto00123	Corrugated Plastic	Circular	18	-85.73051989	38.34171476
sto00125	Corrugated Plastic	Circular	48	-85.70642995	38.39835294
sto00129	Concrete	Circular	24	-85.72856204	38.34230809
sto00131	Corrugated Plastic	circular	24	-85.71649734	38.34336071
sto00132	Corrugated Plastic	circular	18	-85.71651843	38.34332779
sto01034	HDPE	Outfall	18	-85.71681121	38.30180334
sto01015	Steel	Outfall	15	-85.71665085	38.30174477
sto01130			0	-85.71673374	38.30174617
sto01016	RCP	Outfall	36	-85.71843689	38.30165338
sto01017		Outfall	48	-85.72151903	38.30074355
sto01018		Outfall	15	-85.72156873	38.30067408
sto01019	HDPE	Circular	18	-85.72588413	38.304863
sto01020	HDPE	Cicular	48	-85.72515017	38.30522901
sto01021	HDPE	Circular	15	-85.72469166	38.30511656
sto01022	Concrete	Circular	24	-85.7450613	38.29833176
sto01023	Concrete	Cicular	18	-85.74460264	38.29861809
sto01024	CMP	Circular	48	-85.74372054	38.29911352
sto01028	Concrete	Trapezoid	54	-85.72607165	38.3295623
sto01029	HDPE	Circular	18	-85.71690011	38.30191635
sto01030	HDPE	Circular	18	-85.71699251	38.30190833
sto01031	Concrete	Open ditch	30	-85.7185364	38.30173071
sto01032	Earthen	Open ditch	24	-85.72117496	38.30214232
sto01036	Grass / Earthen	Open ditch	24	-85.72315987	38.30443765
sto01038	HDPE	Circular	15	-85.71975978	38.30191931
sto01131			0	-85.72015658	38.30205266
sto01039	HDPE	Circular	15	-85.72112362	38.30213245
sto01040	HDPE	Circular	12	-85.73218375	38.33242663
sto01041	Earthen	Open ditch	18	-85.7318766	38.33206117

Outfall ID	Outfall Material	Outfall Shape	Outfall Diameter (in.)	Longitude	Latitude
sto01047	RCP	Circular	24	-85.72792583	38.33058105
sto01052	CMP	CMP	48	-85.75084133	38.29369938
sto01055	PVC	Circular	8	-85.71601742	38.3131823
sto01056	CMP	Circular	18	-85.71866385	38.31009542
sto01132			0	-85.71862057	38.31004828
sto01133			0	-85.71912969	38.31019994
sto01134			0	-85.71895982	38.31033641
sto01059	Concrete	Flat	72	-85.71685171	38.30777823
sto01060	PVC	Circular	12	-85.71939131	38.30467543
sto01135			0	-85.71915158	38.30467733
sto01062	PVC	Circular	14	-85.68654515	38.3547395
sto01063	CMP	Outfall	15	-85.7278633	38.34221512
sto01064	RCP	Outfall	24	-85.72745977	38.34221637
sto01065	HDPE	Circular	8	-85.75069942	38.30717427
sto01066	HDPE	Circular	8	-85.75121815	38.30790969
sto01073	PVC	Circular	30	-85.70553674	38.33120669
sto01074	PVC	Circular	12	-85.70547371	38.32881088
sto01075	PVC	Circular	12	-85.70548619	38.32893365
sto01078	RCP	Circular	36	-85.75066446	38.3234512
sto01081	RCP	Circular	30	-85.69981966	38.28861819
sto01082	RCP	circular	36	-85.70481071	38.31370217
sto01136			0	-85.70460131	38.31368681
sto01083	HDPE	Circular	18	-85.70555819	38.2874746
sto01084	RCP	Circular	30	-85.70792731	38.28439209
sto01086	HDPE	Circular	30	-85.71798545	38.30171822
sto01089	HDPE	Circular	12	-85.71663181	38.31654718
sto01090	Concrete	Eliptical 8'x6'	0	-85.71116707	38.31183433
sto01091			0	-85.70434669	38.31137263
sto01093	HDPE	Circular	24	-85.74316349	38.26770974
sto01094	Concrete	Circular	18	-85.7413125	38.26801367
sto01100	Concrete	Circular	24	-85.75000245	38.30838525
sto01101	Earthen	Open Ditch 6'x4'	0	-85.75020211	38.30834354
sto01102	HDPE	Circular	12	-85.74829324	38.30840195
sto01104	HDPE	Circular	12	-85.74784426	38.30842973
sto01137			0	-85.7482737	38.30850231
sto01105	HDPE	Circular	12	-85.74469243	38.30886324
sto01106	HDPE	Circular	12	-85.74628727	38.3085461
sto01107	Earthen	Open Ditch 6'x4'	0	-85.74660382	38.30854555
sto01108	HDPE	Circular	24	-85.74452679	38.308803
sto01109	HDPE	Circular	24	-85.74466572	38.30880989

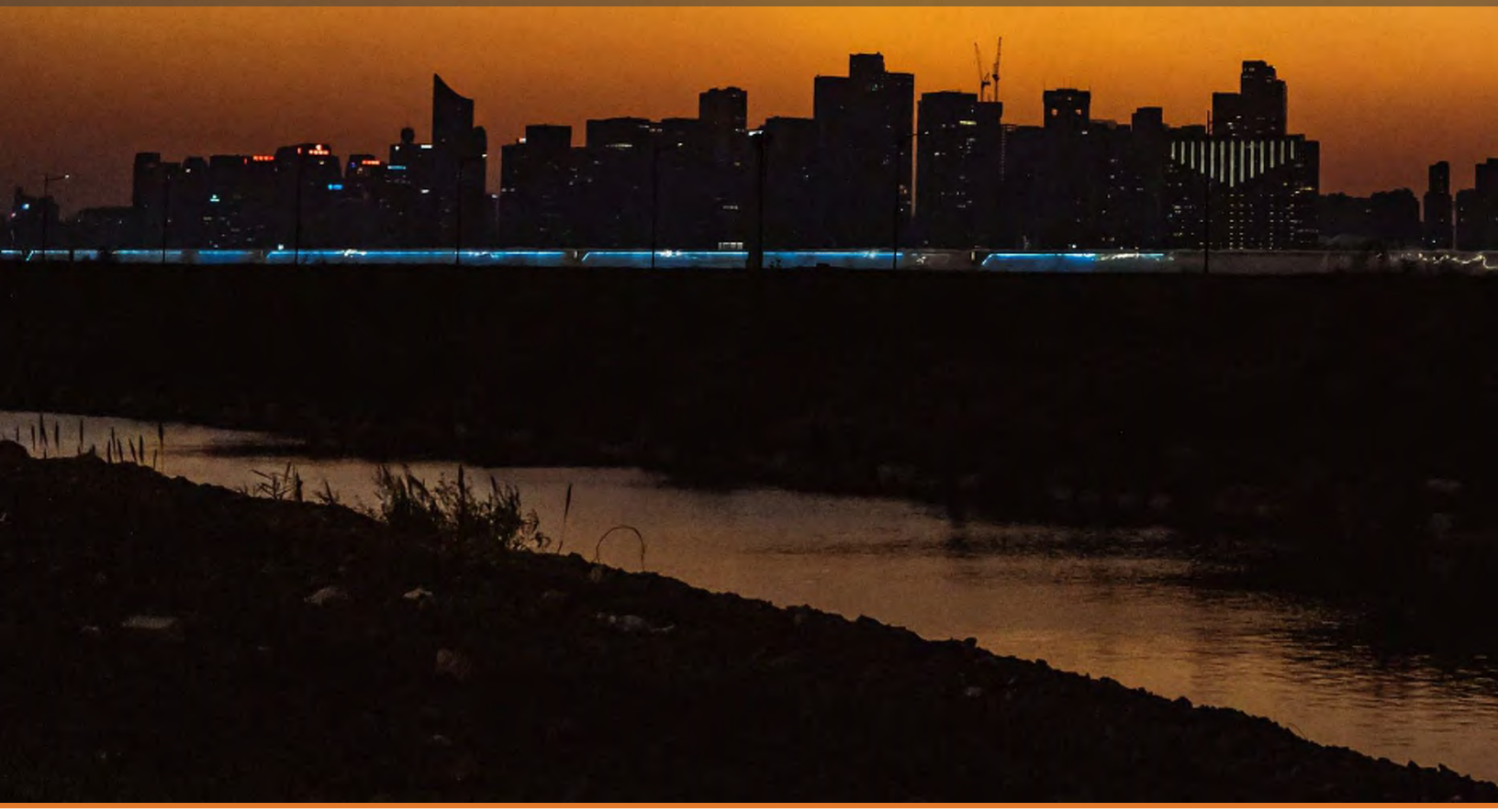
Outfall ID	Outfall Material	Outfall Shape	Outfall Diameter (in.)	Longitude	Latitude
sto01110	HDPE	Circular	24	-85.74467582	38.30877747
sto01111	HDPE	Circular	24	-85.74448795	38.30877187
sto01112	Earthen	Open Ditch 4'X5"	0	-85.74381062	38.30865608
sto01113	Concrete	Circular	24	-85.74198976	38.30880279
sto01114	Concrete	Circular	24	-85.74031539	38.30942282
sto01115	Concrete	Eliptical 48'x52'	0	-85.73926468	38.31026426
sto01138			0	-85.72122953	38.30219994
sto01139			0	-85.72582304	38.30485026
sto01140			0	-85.72572712	38.30489735
sto01141			0	-85.72572026	38.30488887
sto01142			0	-85.72581422	38.30484178
sto01143			0	-85.72754243	38.30378218
sto01144			0	-85.717723	38.30879032
sto01145			0	-85.71318991	38.35636971
sto01088	Concrete	Circular	72	-85.69652156	38.29016844
sto01146			0	-85.74906858	38.32179039
sto01147	Concrete	Circular	0	-85.69378432	38.29232386
sto01148	Concrete	Circular	0	-85.6938023	38.29229463
sto01149		Circular	36	-85.68013553	38.36317805
sto01150		Circular	36	-85.68008341	38.36312261
sto01151		Circular	18	-85.6802734	38.36332998
sto01152		Headwall	24	-85.7120402	38.30209824

City of New Albany

Water Quality Characterization Report

MS4 Permit #: INR040077

March 2023



OHM Advancing Communities®

Table of Contents

OHM Advisors
400 Missouri Avenue, Suite 100
Jeffersonville, IN 47130
www.OHM-Advisors.com

Table of Revisions

The following table summarizes revisions, additions, deletions, etcetera to the contents of this report:

Date	Revised Pages/Appendices	Summary of Change

Primary MS4 Contact

Phil Aldridge
Stormwater Coordinator
2113 Grant Line Road
New Albany, IN 47150
Phone: 812-945-1989

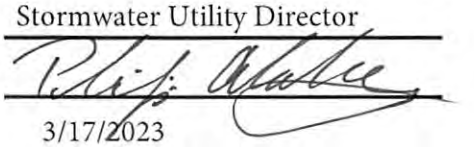
WQCR Certification

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 the 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.

Qualified Professional:

Name:	Allison Padron, PE
Title:	Project Manager, OHM Advisors
Signature:	
Date:	3/17/2023

MS4 Operator or Designee:

Name:	Philip Aldridge
Title:	Stormwater Utility Director
Signature:	
Date:	3/17/2023

1.0 Purpose

This water quality assessment report is intended to accompany the Southern Indiana Stormwater Advisory Committee (SWAC) Regional Water Quality Characterization Report (WQCR). This component of the WQCR contains information specific to the City of New Albany as a method for further analyzing water quality within the MS4 boundaries, and using that information to guide their MS4 Program as they begin implementing the Indiana MS4 General Permit (INR040000) and Indiana Construction Stormwater General Permit (INRA00000).

2.0 Assessment of Land Use

The City of New Albany is located in the central portion of southern Indiana along the north shore of the Ohio River and west of Interstate 65. The downtown New Albany area extends along the Ohio River across from Louisville, Kentucky, and is bounded to the north and west by the urbanized area of Floyd County and to the east by Silver Creek and the Town of Clarksville. New Albany is the largest city in Floyd County and encompasses approximately 15.05 square miles (9,630 acres). For the purposes of this report, the City of New Albany's Municipal Separate Storm Sewer System (MS4) area refers to the entirety of the City's municipal boundaries as shown in Figure 1.

Below in Table 1, is a breakdown of land use within the City of New Albany. The City is primarily residential, with developed land accounting for nearly 70% of land in the MS4 area. The rest of the land consists of forested and agricultural areas.

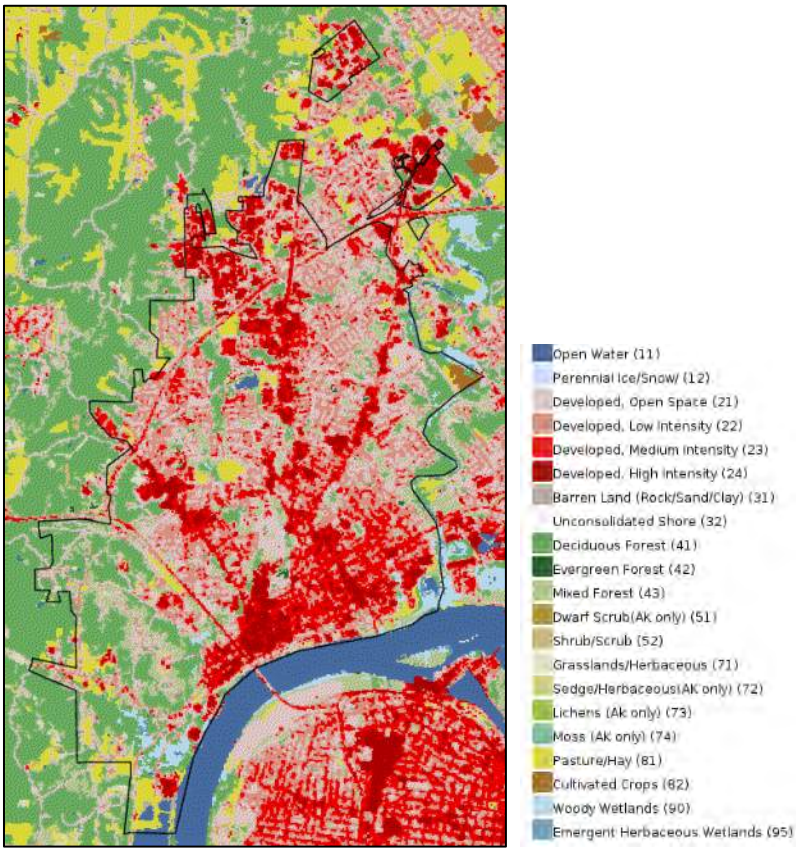


Figure 1. Land Use Map (NLCD, 2019)

Table 1: Land Use for New Albany MS4 Area

Category	Acres	Percentage
Developed, Low Intensity	2571.9	26.7%
Developed, Medium Intensity	2065.3	21.4%
Developed, Open Space	1390.1	14.4%
Deciduous Forest	1289.6	13.4%
Developed, High Intensity	1051.6	10.9%
Mixed Forest	575.4	6.0%
Hay/Pasture	350.3	3.6%
Woody Wetlands	139.8	1.5%
Open Water	74.7	0.8%
Herbaceous	37.5	0.4%
Emergent Herbaceous Wetlands	30.4	0.3%
Cultivated Crops	25.8	0.3%
Shrub/Scrub	16.1	0.2%
Barren Land	8.1	0.1%
Evergreen Forest	3.8	0.0%
TOTAL:	**9,630.4**	**100.0%**

Source: National Land Cover Database (NLCD, 2019)

3.0 Best Management Practices (BMPs)

The following section describes the City of New Albany's efforts to improve stormwater quality through the MS4 program by implementing the six (6) Minimum Control Measures (MCMs), including structural and non-structural BMPs.

3.1 Structural BMPs

Within the City of New Albany's storm sewer system, there are 280 outfalls; 423 manholes; 4107 catch basins/inlets; 66.3 miles (350,134.9 feet) of pipe; and 102.8 miles (542,965.7 feet) of concrete/earthen/riprap channels/roadside ditches. The MS4 system managed by the City does not include the 33.5 miles of natural stream channels within the City. Figure 2 shows the locations of outfalls, manholes, and detention/retention basins and pipes/culverts that have been mapped in New Albany (New Albany, GIS). Within New Albany, there are 13 reported detention/retention basin structural BMPs (New Albany, GIS). For more detailed information about the individual structures see Tables 8 and 9 that list the identification number, structural condition, and geographic coordinate at the end of the report.

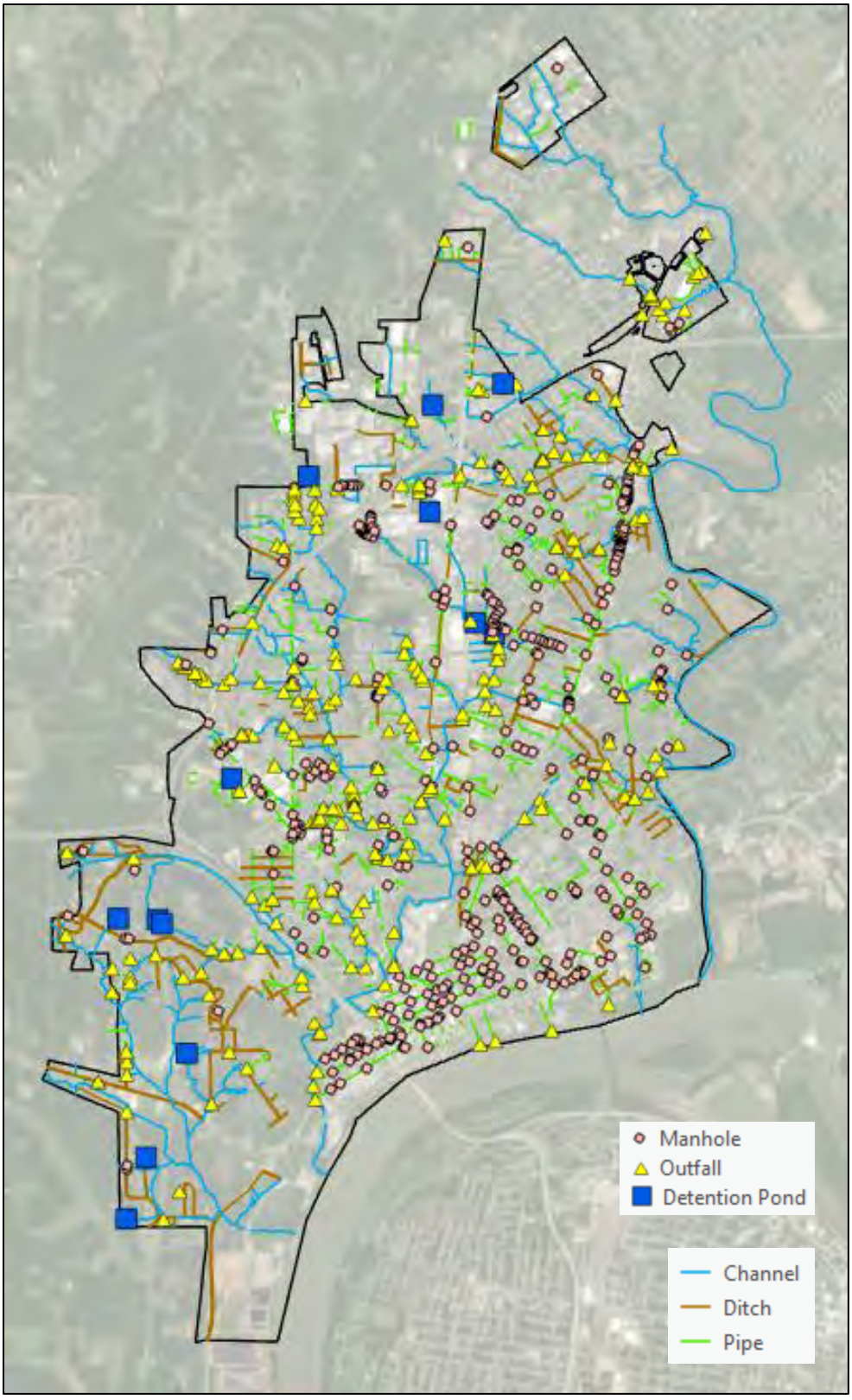


Figure 2. Mapped Detention Basins, Outfalls, Manholes, Pipes, and Channels (New Albany, GIS)

3.2 Non-Structural BMPs

3.1.1 Ordinances

The City of New Albany maintains legal authority to administer the MS4 program and ensure compliance through adopted ordinances. The City of New Albany utilizes the following ordinances:

- Construction Site Runoff Control Ordinance (Ord. Z-06-09)
- Stormwater Illicit Discharge Control Ordinance (Ord. G-06-10)
- Post-Construction Runoff Quality Control Ordinance (Ord. G-06-12)

In April 2015, the City adopted the Stormwater BMP Design Manual which includes design specifications and selection guidance for both construction and post construction BMPs approved for installation by the City. The BMP manual includes fact sheets that describe BMP operations and maintenance requirements to be implemented by the final BMP owner.

3.1.2 Partnerships

The City actively participates in the Southern Indiana Stormwater Advisory Committee (SWAC), which provided a forum for public education, outreach, participation and involvement as well as coordinated implementation of the MS4 program in participating communities. Participating communities currently include: the City of Jeffersonville, the Town of Clarksville, the Town of Sellersburg, Floyd County, the Oak Park Conservancy District, the Town of Georgetown, and the City of Madison.

3.1.3 MCM 1 & 2 – Public Education and Outreach; Participation and Involvement

The City's Stormwater website (newalbanystormwater.org) is linked from the City's main website (cityofnewalbany.com), and contains: Developers Design Manual, the MS4 permit, previous annual reports, MS4 Program audit results, a form to submit a concern, links to the Facebook page and SWAC website, ordinances, information and activities for kids, information specific to developers for permitting, and news on repairs and projects taking place. Community information is also posted on the website for: Pharmaceutical drop-off events, procedures for paint disposal, Household Hazardous Waste disposal, ways to eliminate water pollution, upcoming events, Stormwater Board agendas, and media related to stormwater.

In coordination with the Floyd County Solid Waste District, the City encouraged and tracked the amount of household hazardous waste collected. Automotive fluids were collected at two (2) drop-off centers, and an event to dispose of expired and unused pharmaceuticals was organized. Through the SWAC, the annual Stormwater Awareness Week encourages residents to learn about stormwater quality and culminates in the ORSANCO River Sweep event to clean debris from the shores of the Ohio River.

3.1.4 MCM 3 – Illicit Discharge Detection and Elimination

The City adopted the Illicit Discharge Ordinance in April 2006, which defines and prohibits illicit discharges to the MS4 and establishes an escalating enforcement policy. The City has mapped 100% of the stormwater drainage system, including outfalls and conveyances, and continues to do updates as stormwater system infrastructure is added. Through the SWAC, the City developed and implements an Illicit Discharge Detection

and Elimination Standard Operating Procedure (SOP) to specifies procedures for identifying illicit discharges via a dry weather screening program, conducted in conjunction with MS4 mapping. The City has educated citizens and trained public employees about the hazards associated with illicit discharges and improper waste disposal.

3.1.5 MCM 4 – Construction Site Stormwater Runoff

In April of 2015, New Albany released a Stormwater Design Manual for the planning and design of stormwater systems and erosion control structures. This was to provide further clarity and regulations to the stormwater city ordinances.

The City adopted the Construction Site Runoff Control Ordinance in April 2006 (Ordinance No. G-06-10), which governs stormwater run-off associated with construction activity. The City continues to implement this ordinance, which specifies the requirements for submitting stormwater pollution prevention plans (SWPPP), reviewing construction site BMP plans, installing erosion prevention and sediment control BMPs, as well as inspecting sites and implementing enforcement procedures. Updates to the ordinance are anticipated in 2023/2024 to meet the new MS4 General Permit and Construction Stormwater Runoff General Permit.

3.1.6 MCM 5 – Post-Construction Stormwater Runoff

The City of New Albany adopted the Post-Construction Stormwater Management Ordinance (Ordinance No. G-06-12) in April 2006. The program includes plan submittal, review, site inspections, compliance and escalating enforcement authorities. This Ordinance includes the post-construction requirements for all projects disturbing one (1) or more acres of land within the City. As part of the Post-Construction Stormwater Management Ordinance, the owners of approved BMPs are required to provide general routine maintenance. BMP owners are also required to maintain a perpetual, non-exclusive easement that allows access for inspection and maintenance.

The City of New Albany adopted a Stormwater BMP Design Manual which includes design specifications and selection guidance for both construction and post-construction BMPs approved for installation by the City. The BMP Manual includes fact sheets that describe BMP operations and maintenance requirements to be implemented by the final BMP owner.

Within the City of New Albany, a number of existing BMPs for stormwater management have been installed through other regulatory programs, but these measures were not documented prior to the City of New Albany's Phase II designation. The City has initiated a Post-Construction Stormwater Quality Plan review to identify and evaluate these BMPs.

Through a local engineering consultant, the City of New Albany reviews construction plans and associated SWPPPs and issues Perimeter Control Permits and Stormwater Quality Management Permits. The Construction Site Runoff Control Ordinance implements additional controls to minimize the impact of construction site wastes on stormwater runoff by requiring appropriate waste management BMPs.

The SWAC, through the Clark County SWCD, has implemented the Qualified Professional Inspector (QPI) Program with workshops for the construction industry, public employees, and others regarding the requirements of the Construction and Post-Construction ordinance. The BMP Manual and related educational materials have been distributed and are available on the City's stormwater website.

3.1.7 MCM 6 - Municipal Operations Pollution Prevention and Good Housekeeping

The City of New Albany has implemented many pollution prevention and good housekeeping practices to prevent or reduce pollutant runoff from municipal operations, such as regular stormwater drainage system maintenance and cleaning, street sweeping, and leaf and woody debris collections.

The City has an online portal that shows the weekly street sweeping routes that run Monday through Friday. The New Albany Street Sweeper Route on their website allows residents to see the streets and dates these routes serve.

Also, controls for reducing discharges from municipal facilities and operations have been put in place though developing and implementing an SOP to address Stormwater Municipal Operations and Maintenance (SMOPs) plans, minimizing the use of herbicides, pesticides, and fertilizers, and minimizing the impact of deicing material storage and utilization. Through the SWAC, the City also provides annual Pollution Prevention Training to educate public employees on the impacts that municipal activities have on stormwater quality.

3.1.8 Flood Control

Floodwall - The City of New Albany Flood Control Department is responsible for maintaining 3.5 miles of flood wall, consisting of 2.81 miles of earth levee and 0.69 miles of concrete wall.

Pump Plants - There are six pumping plants, one sandbag closure, three service openings, seven movable closures and numerous drainage structures. It is Flood Control's responsibility to make sure pumping plants are in operating condition at all times, movable closers have all pieces accounted for and positioned in their proper storage units, and all drainage structures clear of debris.

Landscaping – New Albany Flood Control Department is responsible for keeping the landscape properly manicured. These tasks are accomplished with a five-member crew and one administrator. In the event of a flood, it is our responsibility, with the help of the New Albany Fire Department, to make sure all pumping plants, while in operation, are manned 24 hours a day, all closures are adequately installed, and all drainage structures are closed.

4.0 Receiving Waters

The City of New Albany has 23 receiving waters, shown in Table 2 below, which breaks down the names, lengths, and the percentage of each receiving water. There is a total of 33.52 miles of natural stream channels within the City MS4 limits. With the majority of New Albany consisting of residential, commercial, and industrial area, the City has a significant ability to influence water quality in the receiving waters. Shown in Figure 3 are the major receiving waters and watersheds that are impacted by New Albany. Silver Creek which borders the eastern side of the City drains much of the city's stormwater infrastructure. The City drains two watersheds: Jacobs Creek-Silver Creek and Fall Run-Ohio River. The streams in the City are strongly impacted by backwater from the Ohio River.

Table 2: City of New Albany Receiving Waters

Receiving Water	Total Length (miles)	Percentage
Unnamed Tributaries	10.02	29.91%
Fall Run	5.33	15.91%
Falling Run	3.35	9.99%
Slate Run	2.23	6.67%
Vincennes Run	1.43	4.25%
Blackiston Run	1.03	3.08%
Rail Run	1.02	3.04%
Silvercrest Run	0.93	2.78%
Green Run	0.93	2.77%
Silver Creek	0.90	2.68%
County Run	0.80	2.39%
Land Run	0.69	2.05%
Bald Knob Creek	0.67	2.00%
Lost Knob Brook	0.66	1.96%
Fork Run	0.65	1.93%
State Run	0.52	1.55%
Coryden Run	0.49	1.47%
Town Run	0.49	1.46%
Grace Run	0.39	1.17%
Jacobs Creek	0.36	1.07%
Flat Run	0.31	0.92%
Friendship Run	0.16	0.47%
Hill Brook	0.16	0.47%

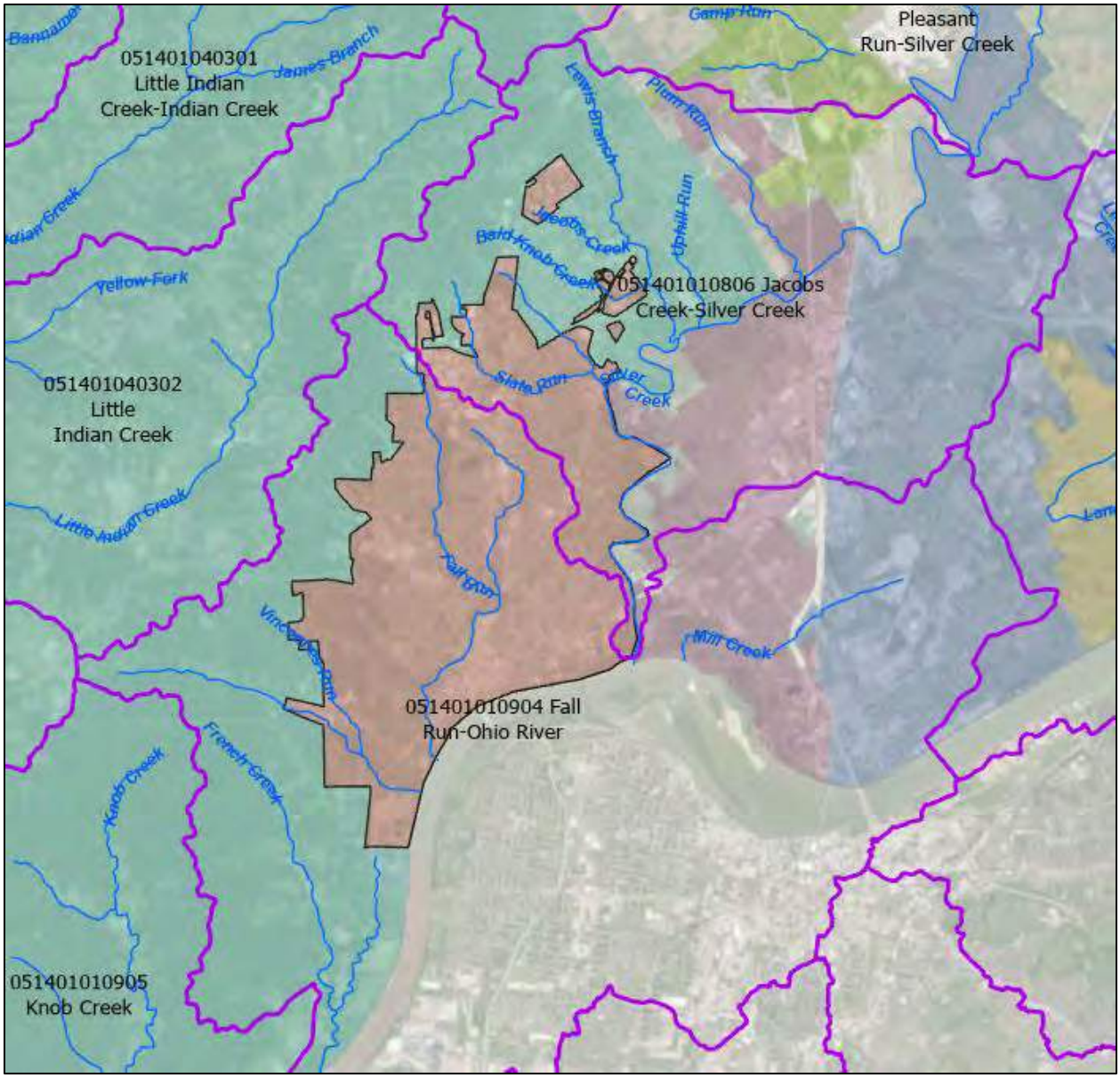


Figure 3. Major Receiving Waters and Watersheds for the City of New Albany

5.0 303(d) Impaired Waters

The 2022 Integrated Water Monitoring and Assessment Report published by IDEM includes the 303(d) List of Impaired Streams for Indiana. Two (2) stream segments in the New Albany MS4 area were listed on the 2022 303(d) List of Impaired Streams, shown on the map in Figure 4 and in Table 3. There are a total of 10.6 miles of impaired streams and river within the City of New Albany. A 7.75 mile segment of Falling Run within City limits was listed as impaired due to elevated E. coli bacteria and dissolved oxygen. A 2.86 mile segment of Silver Creek was listed as impaired due to E. coli and PCBs. Dissolved oxygen is more common in streams with backwater influence from the Ohio River.

Table 3: City of New Albany Impaired 303(d) Waters

Stream Name	Assessment ID	Impairment	TMDL
Falling Run	INN019_T1002	Low DO, E. coli	None
Silver Creek	INN0186_08	PCBs, E. coli	None

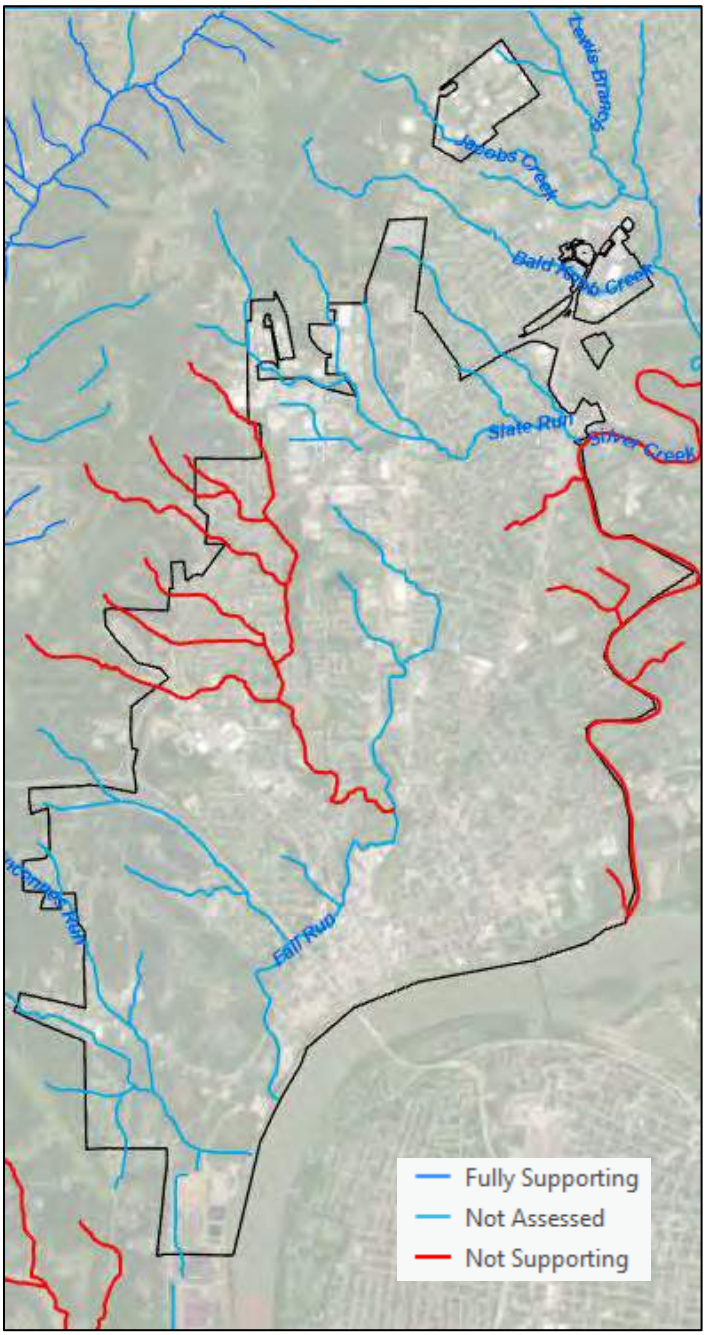


Figure 4. 303(d) Impaired Waters of the City of New Albany

6.0 Known Sensitive Areas

Public Beaches/ Full Body Contact Recreation: There are no beaches or lakes with public swimming or recreational facilities other than enclosed public swimming pools. The City is currently not aware of any locations within the MS4 area where full body contact recreation occurs. Due to the proximity and location of the Ohio River boat launch and outfall as discussed below, this is a priority within the MS4 area.

Surface Drinking Water Intakes: Drinking water sources within the City are derived primarily from local groundwater resources. Also, according to the Public Water Supply Information System maintained by the IDEM, the nearest surface water intake on the Ohio River is more than twenty (20) miles downstream of the City of New Albany.

Wetlands: Wetland areas are considered to be environmentally sensitive features and are protected by the Clean Water Act. National Wetland Inventory (NWI) was used to estimate the extent and locations of wetlands and deep waters in New Albany. Based on these data, there are 247.76 acres of wetlands and deep-water habitats within the City. The following table shows the different types of wetlands within, as classified by the NWI.

Table 4: Types of Wetlands in New Albany

Type	Acres
Freshwater Emergent Wetland	28.26
Freshwater Forested/Shrub Wetland	105.11
Freshwater Pond	78.88
Lake	35.49
Total	**247.76**

Source: NWI, 2021.

Wellhead Protection Areas: There are no wellhead protection areas (WHPAs) in the City of New Albany. The Indiana American Water Company (IAWC) is the primary drinking water service provider for the majority of southern Indiana, including the City of New Albany. The IWAC relies on groundwater withdrawn from nineteen (19) wells east of the City of New Albany located along the Ohio River corridor within the City of Jeffersonville, Indiana.

Sinkhole Areas: Three (3) sinkhole areas were identified in New Albany through a review of Indiana Geological Survey (IGS) data. There is one sinkhole area located near I-64 and W Spring Street. The other two sinkhole areas are located near residential areas, one off Daisy Lane and one near State Street.

Boat Launches: There is one (1) known boat launch within the City of New Albany just east of the I-64 Bridge on East Water Street.

7.0 Existing and Available Monitoring Data

Complete Silver Creek Watershed Management Plan (2009): The Clark County Soil and Water Conservation District (SWCD) received a Nonpoint Source Section 319 Grant from IDEM in January 2007 to develop a watershed management plan for the Silver Creek Watershed. The study was completed and approved in April 2009. Silver Creek flows along 36.4 miles prior to discharging into the Ohio River, with New Albany at the discharge location. The report stated that sources of E. coli in water systems are likely attributed to failing septic systems, livestock in creeks, and sanitary sewer overflows. The closest data collection site to New Albany was on Blackiston Mill Bridge (OSK140-0007). The following data was collected at this site:

- Macroinvertebrate Collection (MBI) Score: 47.22 – Fair
- Habitat Assessment (QHEI): 44.5 & 58.5 – Fair to Poor

Table 5: Results from Silver Creek Watershed Management Plan Study (2009) for Site at Blackiston Mill

Site 1 Blackiston Mill at Dam												
Date	**9/26/07**	**10/30/07**	**11/28/07**	**12/18/07**	**1/28/08**	**2/27/08**	**4/2/08**	**4/30/08**	**5/28/08**	**6/24/08**	**7/30/08**	**8/27/08**
E. coli	37.9 MPN	116.2 MPN	913.9 MPN	4.0 MPN	1.0 MPN	88.8 MPN	142.1 MPN	93.3 MPN	116.2 MPN	50.4 MPN	18.9 MPN	15.6 MPN
Nitrate	0.06mg/L	2.60mg/L	1.98mg/L	2.04mg/L	2.09mg/L	1.18mg/L	0.81mg/L	0.82mg/L	0.91 mg/L	1.03mg/L	0.01 mg/L	.16 mg/L
Nitrite	ND	0.031 mg/L	0.008 mg/L	0.005 mg/L	0.006 mg/L	ND	ND	0.0006 mg/L	0.006 mg/L	0.004 mg/L	0.004 mg/L	0.008 mg/L
Solids, Suspended	10mg/L	13mg/L	25mg/L	15mg/L	4.0mg/L	NA	35.0mg/L	7.0mg/L	13 mg/L	9 mg/L	7 mg/L	9 mg/L
Solids, Total	384mg/L	492mg/L	315mg/L	230mg/L	291mg/L	NA	209mg/L	308mg/L	234 mg/L	370 mg/L	283 mg/L	545 mg/L
Solids, Dissolved	360mg/L	446mg/L	274mg/L	200mg/L	270mg/L	NA	156mg/L	277mg/L	207 mg/L	345 mg/L	259 mg/L	519 mg/L
Nitrogen-Ammonia	0.1mg/L	<0.1mg/L	0.1mg/L	0.1mg/L	0.1mg/L	0.1mg/L	0.1mg/L	0.1mg/L	0.1 mg/L	NA	0.1 mg/L	0.1 mg/L
TKN	0.6mg/L	0.5mg/L	0.8mg/L	0.4mg/L	0.2mg/L	0.5mg/L	0.4mg/L	0.3mg/L	0.4 mg/L	NA	0.7 mg/L	0.6 mg/L
Phosphorus, Total	0.04mg/L	0.07mg/L	0.09mg/L	0.04mg/L	0.08mg/L	0.07mg/L	0.06mg/L	0.06mg/L	0.07 mg/L	NA	0.06 mg/L	0.05 mg/L
Conductivity	625 us/cm	686 us/cm	423 us/cm	320 us/cm	395 us/cm	247 us/cm	187 us/cm	485 us/cm	331 us/cm	567 us/cm	525 us/cm	830 us/cm
Dissolved Oxygen	6.01 mg/L	10.27 mg/L	11.84 mg/L	13.25 mg/L	15.50 mg/L	13.56 mg/L	10.50 mg/L	8.98 mg/L	6.16 mg/L	5.65 mg/L	5.79 mg/L	5.72 mg/L
Flow	0.15 ft/sec	0.4ft/sec	1.2ft/sec	0.882 ft/sec	0.7ft/sec	3.0ft/sec	0.5ft/sec	1.5ft/sec	1.5 ft/sec	0.5 ft/sec	0.3 ft/sec	1.0 ft/sec
pH	7.92 su	7.26 su	7.50 su	7.45 su	7.78 su	7.12 su	6.50 su	7.44 su	7.41 su	7.89 su	7.31 su	7.06 su
TDS (Done in Field)	310ppm	346ppm	213ppm	170ppm	220ppm	124ppm						
Temperature	23.8 C	11.7 C	7.9 C	4.5 C	0.9 C	3.5 C	11.7 C	15.3 C	20.3 C	24.4 C	27.1 C	21.6 C
Turbidity	5.93NTU	10.50NTU	23.00NTU	13.70NTU	4.11NTU	42.1NTU	30.00NTU	4.91NTU	8.80 NTU	5.82 NTU	4.22 NTU	6.04NTU

IDEM Data and Reports (2008): Indiana's 2008 Integrated Water Monitoring and Assessment Report provided an assessment of subwatersheds and listed impaired waterbodies (IDEM, 2008). Silver Creek, which receives stormwater discharge from the City of New Albany just prior to discharging to the Ohio River, has

been continually listed on the 303(d) List of Impaired Streams. A 6.4 mile segment of Silver Creek in the Silver Creek—Slate Run subwatershed (Assessment Unit INN01EH_T1003) was impaired for mercury and PCBs in fish tissue. PCBs and mercury are considered legacy pollutants that have been transported to streams from non-stormwater discharges, including direct discharges from industrial facilities or wastewater treatment plants and air deposition. Consequently, streams with these impairments are not likely to be considered a major priority for the City of New Albany's Stormwater Program.

USGS (2000): Physical, chemical, and bacterial monitoring data were collected from Silver Creek at Blackiston Mill, Site # OSK140-0007, near the City of New Albany. Five (5) samples were collected during July and August of 2000. Data are summarized in Table 6 below.

Table 6. Water Quality Data Summary for Silver Creek at Blackiston Mill

Parameter	USGS Data Range	Indiana Water Quality Criterion
Dissolved Oxygen (mg/L)	7.31 to 9.27	Greater than or equal to 4.0
Temperature (Deg C)	25.68 to 27.29	Less than 32.2
pH (SU)	7.84 to 8.22	Between 6.0 and 9.0
Specific Conductivity (µS/cm)	528 to 900	1,200
Turbidity (NTU)	12.35 to 18.62	NA
E. coli (CFU/100mL)	19 to 1,567	Geomean < 125 / 100 ml and no single sample can exceed 576 / 100 ml

Sources: USGS, 2000; 327 IAC 2

These data show acceptable levels of dissolved oxygen, temperature, pH, and conductivity as well as potentially elevated levels of *E. coli*. The geometric mean of the five samples was 66 CFU/100 ml, which is below the Indiana water quality criteria, but one sample exceeded the single sample maximum concentration of 576 CFU / 100 ml.

Wet Weather Impact Study: The Ohio River Sanitation Commission (ORSANCO) performed a Wet Weather Impact Study of the Ohio River in the Louisville/Southern Indiana area, which focused on the sources of bacteria in the Ohio and included an examination of Silver Creek and Mill Creek. The results of the study indicate that tributaries contribute significant bacterial loads to the Ohio River. These findings were primarily based on testing performed in the mixing zone, at the mouth or just downstream of the study tributary. The study did not identify the portion of the bacterial loads to the Ohio River that could be attributed to stormwater discharges from the City of New Albany.

Volunteer Monitoring (2001): A number of volunteer monitoring groups are active in Indiana, many organized as Hoosier Riverwatch. Chemical, biological and habitat data were collected from Fall Run Creek at three (3) sampling locations within the City of New Albany in June of 2001.

A search more recent (last 5 years) for water quality and related data was performed using publicly accessible reports and databases published by the Indiana Department of Environmental Management (IDEM), Indiana Department of Natural Resources (IDNR), United States Environmental Protection Agency (USEPA), and the United States Geological Survey (USGS). No monitoring data or reports for streams in the City of New Albany were found from IDNR and USEPA. These agencies had not published more recent water quality data for streams in the City of New Albany.

8.0 Areas with Potential to Contribute to Water Quality Issues

USGS data collected in 2000 from Silver Creek in the City of New Albany showed potentially elevated levels of *E. coli* bacteria. Hoosier Riverwatch found potentially low levels of dissolved oxygen, as well as potentially impacted habitats and macroinvertebrate communities in Fall Run Creek during sampling in 2001. A study conducted by ORSANCO suggested that tributaries, including Silver Creek and Mill Creek, contribute bacterial loads to the Ohio River. The Silver Creek Watershed Management Plan study concluded that the primary BMPs needed to improve water quality would be removing sources of E. coli such as failing septic systems, bank stabilization, prescribed grazing for agricultural areas, agricultural buffers/filter strips to reduce sedimentation and nutrients, and urban buffers. The impairment from E. coli originates upstream of the City of New Albany, but minimizing sanitary sewer or combined sewer overflows is more applicable to the City. (Steps have been taken to reduce these.) Methods to reduce E. coli sources include: educating the public about the importance of maintaining septic systems and reducing untreated animal waste from reaching the creeks. Many of Silver Creeks' impairments are the result of upstream activities.

The City of New Albany's Stream Visual Assessment Protocol (SVAP) efforts have identified potential illicit discharges, as well as areas in need of maintenance or remediation. In order to gain a better understanding of how the City of New Albany's MS4 impacts the overall quality of nearby surface waters, the City will continue to implement and enhance the SVAP. Data gathered from the SVAP will allow the City to identify remediation and improvement projects under the purview and jurisdiction of the MS4 program.

While the City has required structural BMPs for new developments, flooding and stormwater issues occur at locations throughout the City of New Albany. Efforts to address these issues are underway through the 2022/2023 Stormwater Master Planning project. This project is anticipated to result in identification and long-term implementation of additional structural BMPs.

Available monitoring data for the City's MS4 receiving waters indicate potentially elevated levels of bacteria, potentially low levels of dissolved oxygen, and potentially impacted habitats and macroinvertebrate communities, which are common problems for waterbodies in densely populated areas. Also, growth and development throughout the City has led to flooding and stormwater related problems. Additional information regarding stormwater quality problem areas can be seen in the Silver Creek Watershed Project and the City of New Albany's SVAP enhancement efforts.

Industrial sites are also monitored within the City because of their point-source potential to impact water quality. Within the City of New Albany, there are fourteen (14) facilities that discharge stormwater from industrial activities regulated under Rule 6 (IDEM, 2023). Only two (2) of these permits were issued between 2021 and 2022. These facilities are shown in Table 7.

Table 7. NPDES Active Industrial Stormwater Permits in the City of New Albany

NPDES ID	Permit Name	Effective Date	Expiration Date	Location Address	SIC	Permit SIC Description
INRM00206	Auto Warehouse Inc	1/30/2021	1/29/2026	5426 Grantline Rd	5015	Motor Vehicle Parts, Used
INRM00400	Irving Materials Incorporated	8/4/2017	8/3/2022	1732 Lincoln Ave	3273	Ready-Mixed Concrete
INRM00684	Padgett Incorporated	5/20/2018	5/19/2023	901 E 4th St	3441	Fabricated Structural Metal
INRM01089	J & J Pallet Incorporated	9/17/2018	9/16/2023	1903 E Main St	2448	Wood Pallets And Skids
INRM01094	Hitachi Cable Indiana Incorporated	4/1/2019	3/31/2024	5300 Grant Line Rd	3492	Fluid Power Valves & Hose Fittings
INRM01453	Forth Technologies Inc	8/11/2018	8/10/2023	20 E 9th St Bldg 2	2869	Industrial Organic Chemicals
INRM01590	WM Kelley Company Incorporated	9/12/2018	9/11/2023	620 Durgee Rd	3535	Conveyors And Conveying Equipment
INRM02074	TG Missouri Corporation	11/22/2021	11/21/2026	5331 Foundation Blvd	3714	Motor Vehicle Parts And Accessories
INRM02352	W-M Lumber and Wood Products IN.	6/25/2018	6/24/2023	1801 E Main St	2448	Wood Pallets And Skids
INRM02377	Blue Grass Chemical Specialties LLC	7/12/2018	7/11/2023	895 Industrial Blvd	2899	Chemical Preparations
INRM02450	Sazerac of Indiana LLC	8/23/2018	8/22/2023	707 Pillsbury Ln	2085	Distilled And Blended Liquors
INRM02590	NYX Inc	7/29/2019	7/28/2024	999 Progress Blvd	3089	Plastics Products
INRM02636	FireKing International	1/28/2020	1/27/2025	900 Park Pl	2522	Office Furniture, Except Wood
INRM02711	River Metals Recycling	11/2/2020	11/1/2025	1600 Grant Line Rd	5093	Scrap And Waste Materials

9.0 Recommendations

Based on the findings discussed, the City of New Albany plans to continue to implement and enhance the MS4 program. The following additional BMPs are recommended for consideration.

- Finalize the development of the 2023 Qualified Professional program and implement the plan the new permit term.
- Continue to implement the SVAP monitoring protocol to collect additional data in potentially impacted streams to help distinguish between stormwater, point and non-point pollution sources.
- Utilize the nearly-completed updated Stormwater Master Plan to continue to discover, analyze, design, and execute stormwater capital improvement projects. The plan is city-wide to assist with identification, prioritization, scheduling, and implementation of capital improvement projects.
- Continue inspecting and monitoring stormwater management construction activities occurring in the City.
- Monitor and quarterly inspection BMPs being implemented at municipal facilities and during municipal operations.
- Further enhance the outreach and public participation program to educate residents and visitors about stormwater quality.

Table 8 : City of New Albany Detention Basin Inventory

ID #	Outlet Face Type	Outlet Condition	Type	Latitude	Longitude
448	Open Channel	Unknown	Dry Detention Outlet	38.31906	-85.8142
613	Open Channel	Sound	Wet Detention Outlet	38.32009	-85.8163
1134	n/a	Sound	Dry Detention Outlet	38.30646	-85.8432
1441	Unknown	Sound	Wet Detention Outlet	38.29424	-85.8558
1567	Unknown	Sound	Wet Detention Outlet	38.29414	-85.8514
1590	Unknown	Sound	Wet Detention Outlet	38.29378	-85.8509
1729	Unknown	Sound	Wet Detention Outlet	38.28248	-85.8482
2305	n/a	Sound	Wet Detention Pond	38.32976	-85.8214
2986	Unknown	Sound	Wet Detention Outlet	38.27341	-85.8527
3164	Unknown	Sound	Wet Detention Outlet	38.26806	-85.8548
4190	Unknown	Sound	Wet Detention Outlet	38.33283	-85.8348
6277	Unknown	Unknown	Wet Detention Outlet	38.33905	-85.8211
7214	Unknown	Unknown	Wet Detention Outlet	38.34093	-85.8133

Table 9: City of New Albany Stormwater Outfall Inventory

ID #	Diameter	Condition	Shape	Material	Latitude	Longitude
18	36	Sound	Circular	Unknown	38.31406	-85.8342
33	24	Sound	Circular	Concrete	38.31303	-85.8324
36	24	Other	Circular	Concrete	38.31021	-85.8325
39	24	Full Collapse	Circular	Concrete	38.31307	-85.8325
42	24	Sound	Circular	Concrete	38.31352	-85.8318
55	36	Sound	Circular	Concrete	38.31741	-85.8318
123		Sound	Unknown	Unknown	38.31515	-85.8221
124		Sound	Unknown	Unknown	38.31654	-85.8231
125		Sound	Unknown	Unknown	38.31853	-85.8239
128		Sound	Unknown	Unknown	38.31598	-85.8226
155		Sound	Unknown	Unknown	38.31529	-85.8295
189	12	Sound	Unknown	Concrete	38.3107	-85.8259
219	18	Sound	Unknown	Concrete	38.31039	-85.8422
220	18	Sound	Unknown	Unknown	38.31032	-85.8422
224	12	Sound	Unknown	Concrete	38.31041	-85.8414
320	24	Unknown	Unknown	Unknown	38.3119	-85.8241
393	18	Sound	Circular	Concrete	38.31485	-85.8369
424	36	Sound	Circular	Concrete	38.3148	-85.8364
425	24	Sound	Unknown	Concrete	38.31486	-85.8364
445	15	Sound	Flared	Concrete	38.30097	-85.8237
462	14	Sound	Circular	Concrete	38.3038	-85.8315

ID #	Diameter	Condition	Shape	Material	Latitude	Longitude
468	15	Cracking	Circular	Concrete	38.30749	-85.8271
486		Unknown	Unknown	Unknown	38.31495	-85.8401
493	15	Sound	Circular	ADS	38.30284	-85.8264
498	18	Sound	Circular	ADS	38.30321	-85.8235
508		Sound	Unknown	Unknown	38.30204	-85.8254
538	24	Sound	Circular	Concrete	38.3103	-85.841
544	18	Sound	Circular	ADS	38.31122	-85.8376
554	18	Sound	Circular	Concrete	38.30401	-85.8331
612	24	Sound	Circular	Concrete	38.32021	-85.816
623	24	Sound	Circular	Concrete	38.30384	-85.8332
640		Unknown	Unknown	Unknown	38.30505	-85.83
667	14	Sound	Circular	Concrete	38.30342	-85.8294
679		Sound	Circular	Concrete	38.30458	-85.8223
685	18	Sound	Circular	ADS	38.3027	-85.8277
691	18	Sound	Circular	Concrete	38.30511	-85.8297
700	12	Sound	Circular	Concrete	38.30588	-85.83
719	10	Full Collapse	Circular	Steel	38.30441	-85.8297
740	18	Sound	Circular	Concrete	38.30767	-85.8385
748	18	Cracking	Circular	Concrete	38.31116	-85.8375
798	n/a	Unknown	Unknown	Unknown	38.30424	-85.8297
807	12	Sound	Circular	Steel	38.30771	-85.832
811	18	Sound	Circular	ADS	38.30296	-85.8337
813	4	Sound	Circular	PVC	38.30275	-85.8345
817	36	Sound	Circular	Concrete	38.29624	-85.841
837	12	Partial Collapse	Circular	Concrete	38.29552	-85.8396
852	18	Sound	Circular	PVC	38.2901	-85.8284
861	15	Sound	Circular	Concrete	38.30283	-85.8339
867	36	Sound	Circular	ADS	38.2967	-85.8343
899	18	Sound	Circular	ADS	38.29397	-85.8383
901	12	Cracking	Circular	Concrete	38.29593	-85.8387
902	12	Sound	Circular	Concrete	38.29604	-85.8387
924	10	Sound	Circular	Steel	38.29584	-85.8286
937	15	Sound	Circular	ADS	38.29015	-85.83
947	18	Sound	Circular	ADS	38.29324	-85.8294
980	24	Sound	Circular	Steel	38.28179	-85.8548
1019	18	Sound	Circular	Concrete	38.29113	-85.8516
1032	12	Sound	Circular	ADS	38.30545	-85.8424
1033	12	Sound	Circular	Concrete	38.28792	-85.8565
1036	24	Sound	Circular	Concrete	38.28853	-85.8354
1097		Unknown	Unknown	Unknown	38.29677	-85.8321

ID #	Diameter	Condition	Shape	Material	Latitude	Longitude
1109		Unknown	Unknown	Unknown	38.2926	-85.829
1110		Unknown	Unknown	Unknown	38.2886	-85.8263
1115		Sound	Circular	Concrete	38.29083	-85.8544
1116	12	Sound	Unknown	Concrete	38.28921	-85.8545
1117		Sound	Unknown	Concrete	38.28875	-85.8545
1165	12	Sound	Circular	ADS	38.30546	-85.8424
1170	48	Sound	Circular	Concrete	38.30288	-85.8337
1195		Sound	Unknown	Unknown	38.27053	-85.8489
1228	n/a	Unknown	Unknown	Unknown	38.31484	-85.8366
1262	n/a	Unknown	Unknown	Unknown	38.30416	-85.8297
1269	8	Full Collapse	Circular	Unknown	38.31335	-85.8359
1271	12	Sound	Circular	Unknown	38.31275	-85.8347
1274	18	Full Collapse	Circular	Unknown	38.31218	-85.8346
1287		Sound	Unknown	Unknown	38.28996	-85.8564
1306	224	Partial Collapse	Circular	Concrete	38.33421	-85.8157
1340		Unknown	Unknown	Unknown	38.33508	-85.8076
1365	24	Sound	Circular	ADS	38.30474	-85.8091
1370	30	Sound	Circular	Steel	38.30402	-85.809
1378	24	Sound	Circular	Steel	38.30317	-85.8108
1458	12	Sound	Circular	Concrete	38.30862	-85.7963
1476	24	Unknown	Unknown	Unknown	38.33322	-85.813
1514	24	Sound	Circular	ADS	38.30503	-85.7997
1595				Concrete	38.31378	-85.8
1596				Concrete	38.31381	-85.7999
1608				Concrete	38.31377	-85.8
1613		Sound	Unknown	Unknown	38.34003	-85.8032
1625				Concrete	38.31381	-85.7999
1630		Unknown	Unknown	Unknown	38.33255	-85.8013
1689	36	Sound	Circular	Concrete	38.30619	-85.8041
1750		Sound	Unknown	Unknown	38.29171	-85.8455
1759		Sound	Unknown	Unknown	38.32748	-85.8055
1761		Unknown	Unknown	Unknown	38.32678	-85.8073
1794		Sound	Unknown	Unknown	38.29959	-85.8541
1838		Sound	Unknown	Unknown	38.31623	-85.8364
1839		Sound	Unknown	Unknown	38.31661	-85.8317
1857		Sound	Unknown	Unknown	38.29141	-85.8425
1880	24	Sound	Circular	ADS	38.3152	-85.8269
1931	12	Sound	Circular	Concrete	38.31747	-85.8242
1938	24	Sound	Circular	Concrete	38.31112	-85.8234
1961	18	Sound	Circular	Concrete	38.31009	-85.8325

ID #	Diameter	Condition	Shape	Material	Latitude	Longitude
1966	10	Sound	Circular	PVC	38.30998	-85.8361
1989		Sound	Unknown	Unknown	38.31449	-85.8266
1991		Sound	Unknown	Unknown	38.31518	-85.8262
2152	24	Sound	Circular	Concrete	38.29446	-85.8316
2215	12	Sound	Circular	Concrete	38.29995	-85.8241
2220	15	Sound	Circular	Concrete	38.29966	-85.827
2221	24	Sound	Circular	Concrete	38.29996	-85.8272
2234	15	Sound	Circular	Concrete	38.30002	-85.8274
2251	24	Sound	Circular	Concrete	38.30715	-85.8347
2261	24	Sound	Unknown	Concrete	38.30311	-85.8335
2296	24	Sound	Circular	Concrete	38.33156	-85.8225
2298	18	Sound	Circular	Concrete	38.33201	-85.8225
2300	24	Sound	Circular	ADS	38.33223	-85.8225
2307	10	Sound	Circular	Steel	38.29317	-85.8253
2339	24	Sound	Circular	Concrete	38.27744	-85.8548
2353	48	Partial Collapse	Circular	Concrete	38.27817	-85.8454
2355	18	Sound	Circular	Concrete	38.28268	-85.8435
2373	18	Sound	Circular	PVC	38.28962	-85.8466
2379	18	Sound	Circular	Concrete	38.2892	-85.8486
2406	10	Partial Collapse	Circular	PVC	38.33704	-85.8089
2407	15	Sound	Circular	Steel	38.33706	-85.8089
2420	18	Sound	Circular	ADS	38.2813	-85.8415
2432	12	Sound	Circular	Steel	38.28273	-85.8548
2441	15	Sound	Circular	Concrete	38.30007	-85.8615
2512		Sound	Unknown	Unknown	38.3139	-85.811
2524	12	Sound	Circular	PVC	38.28067	-85.8548
2552	15	Spalling	Circular	Concrete	38.32637	-85.805
2590	12	Sound	Circular	ADS	38.3396	-85.8008
2644	18	Unknown	Circular	Steel	38.33646	-85.807
2705	24	Sound	Circular	Concrete	38.30487	-85.7988
2726	12	Sound	Circular	Steel	38.30731	-85.7957
2734	12	Unknown	Unknown	Unknown	38.33268	-85.8126
2736		Unknown	Unknown	Unknown	38.33304	-85.8103
2835	12	Sound	Unknown	Concrete	38.28771	-85.8457
2976		Sound	Unknown	Unknown	38.30778	-85.8018
3115		Unknown	Unknown	Unknown	38.28928	-85.8355
3323	18	Sound	Circular	ADS	38.29877	-85.8167
3331	36	Sound	Circular	Concrete	38.29907	-85.8156
3636		Sound	Unknown	Unknown	38.30543	-85.7971
3754		Unknown	Unknown	Unknown	38.30958	-85.8447

ID #	Diameter	Condition	Shape	Material	Latitude	Longitude
4028	n/a	Unknown	Unknown	Unknown	38.29887	-85.8151
4103		Sound	Unknown	Unknown	38.35352	-85.8198
4217		Unknown	Unknown	Unknown	38.31049	-85.8365
4293		Sound	Unknown	Unknown	38.3318	-85.8316
4351		Unknown	Unknown	Unknown	38.3354	-85.7946
4357		Sound	Unknown	Unknown	38.33447	-85.7986
4359		Sound	Unknown	Unknown	38.33363	-85.7976
4380	60	Sound	Circular	Steel	38.28687	-85.8015
4386	36	Sound	Circular	Steel	38.2846	-85.8078
4441	12	Sound	Circular	ADS	38.31473	-85.8442
4522	15	Sound	Circular	Concrete	38.32691	-85.8383
4523	12	Unknown	Circular	Concrete	38.32673	-85.8376
4844	12	Sound	Circular	Concrete	38.27976	-85.8342
4849	24	Sound	Circular	Concrete	38.27858	-85.8339
4863	24	Sound	Circular	Concrete	38.29037	-85.8253
4866	12	Sound	Circular	Concrete	38.29018	-85.825
4904	24	Sound	Circular	ADS	38.31546	-85.8467
4905	24	Sound	Circular	ADS	38.31527	-85.8464
4906	24	Sound	Circular	ADS	38.31507	-85.8461
4911	18	Sound	Circular	ADS	38.31564	-85.8468
4916	15	Sound	Circular	ADS	38.31579	-85.8474
4917	15	Sound	Circular	ADS	38.31576	-85.8474
4923	15	Sound	Circular	ADS	38.31625	-85.8485
4927	15	Sound	Circular	ADS	38.31653	-85.8488
4928	15	Sound	Circular	Concrete	38.31653	-85.8489
4933	12	Sound	Circular	Concrete	38.3167	-85.8492
4954	15	Sound	Circular	ADS	38.32919	-85.7985
5016	15	Sound	Circular	Steel	38.33046	-85.8341
5019	15	Sound	Circular	Steel	38.32923	-85.8339
5022	12	Sound	Circular	PVC	38.32943	-85.7977
5052	24	Sound	Circular	Concrete	38.3145	-85.7958
5080	15	Sound	Circular	Steel	38.31477	-85.7966
5129	24	Sound	Circular	Concrete	38.31381	-85.8001
5212	15	Sound	Circular	Concrete	38.32925	-85.8359
5215	15	Sound	Circular	Steel	38.32843	-85.8339
5217		Sound	Circular	Concrete	38.33014	-85.8336
5238	12	Sound	Circular	Steel	38.33146	-85.8364
5243	12	Sound	Circular	PVC	38.33087	-85.8364
5251	12	Sound	Circular	PVC	38.32989	-85.8363
5254	24	Sound	Circular	Cast Iron	38.33046	-85.8363

ID #	Diameter	Condition	Shape	Material	Latitude	Longitude
5284		Sound	Rectangular	Concrete	38.30309	-85.8197
5405	12	Unknown	Unknown	Concrete	38.30957	-85.7938
5511	48	Sound	Unknown	Unknown	38.32434	-85.8064
5633	12	Sound	Unknown	Unknown	38.31527	-85.8434
5713	24	Sound	Circular	Concrete	38.281	-85.8338
5987	60	Sound	Circular	Concrete	38.31179	-85.8178
6006	10	Sound	Circular	Concrete	38.31298	-85.8151
6019	36	Sound	Circular	Concrete	38.31222	-85.8177
6029	15	Sound	Circular	ADS	38.31422	-85.8152
6033	24	Sound	Circular	ADS	38.31535	-85.8154
6042	24	Sound	Circular	Concrete	38.31753	-85.8137
6048	15	Sound	Circular	Concrete	38.31907	-85.8144
6051	12	Sound	Circular	Concrete	38.31521	-85.8142
6063	24	Unknown	Circular	Concrete	38.31696	-85.8139
6064	24	Unknown	Circular	Concrete	38.318	-85.8138
6133	48	Sound	Circular	Concrete	38.34038	-85.8156
6186	24	Sound	Circular	PVC	38.33777	-85.8235
6227	36	Sound	Circular	Steel	38.29182	-85.84
6314		Unknown	Unknown	Unknown	38.3395	-85.8352
6395	18	Sound	Circular	ADS	38.33469	-85.802
6397	30	Sound	Circular	ADS	38.33467	-85.8023
6399	15	Sound	Circular	ADS	38.33477	-85.8062
6406	18	Sound	Circular	Concrete	38.33436	-85.8088
6409	12	Sound	Circular	Concrete	38.33428	-85.809
6410	36	Sound	Circular	Concrete	38.33438	-85.8091
6411	12	Sound	Circular	Concrete	38.33439	-85.809
6415	15	Sound	Circular	ADS	38.33475	-85.804
6420	10	Sound	Circular	ADS	38.33219	-85.8245
6455	12	Sound	Circular	Concrete	38.33446	-85.8089
6458	20	Sound	Circular	Steel	38.33199	-85.8101
6514	12	Sound	Circular	PVC	38.33173	-85.8341
6604		Unknown	Unknown	Unknown	38.33399	-85.7988
6605		Unknown	Unknown	Unknown	38.33474	-85.7989
6606		Unknown	Unknown	Unknown	38.33381	-85.7989
6635	15	Sound	Circular	PVC	38.32851	-85.8001
6636	15	Sound	Circular	PVC	38.32847	-85.8001
6642	36	Sound	Circular	Concrete	38.32863	-85.7997
6713		Sound	Oval	Concrete	38.30547	-85.8215
6788	24	Sound	Circular	Steel	38.33297	-85.818
6805	36	Sound	Circular	Steel	38.34053	-85.8161

ID #	Diameter	Condition	Shape	Material	Latitude	Longitude
6872	12	Sound	Circular	Steel	38.30935	-85.8445
6947	15	Sound	Circular	Concrete	38.2969	-85.8322
6951	15	Sound	Circular	ADS	38.29502	-85.8293
6991	24	Sound	Circular	Concrete	38.28342	-85.8157
6992	48	Sound	Circular	Concrete	38.28369	-85.814
7036	10	Sound	Circular	Steel	38.3027	-85.8311
7051	12	Sound	Circular	Steel	38.34097	-85.8119
7058	12	Sound	Circular	Steel	38.28526	-85.8341
7059	24	Sound	Circular	Steel	38.28434	-85.8335
7062	18	Sound	Circular	ADS	38.28441	-85.8334
7079		Unknown	Unknown	Unknown	38.31045	-85.8421
7080		Unknown	Unknown	Unknown	38.31039	-85.8422
7121		Unknown	Unknown	Unknown	38.30581	-85.8212
7138		Unknown	Unknown	Unknown	38.28632	-85.8276
7142	15	Unknown	Unknown	Concrete	38.29576	-85.8341
7145	12	Unknown	Unknown	Unknown	38.29949	-85.826
7147	15	Unknown	Unknown	ADS	38.26808	-85.8507
7149	18	Unknown	Unknown	ADS	38.29285	-85.8616
7157		Unknown	Unknown	Unknown	38.32016	-85.841
7160		Unknown	Unknown	Unknown	38.33783	-85.8234
7170		Unknown	Unknown	Unknown	38.3046	-85.8223
7173		Unknown	Unknown	Unknown	38.30748	-85.8271
7174		Unknown	Unknown	Unknown	38.30399	-85.8331
7177		Unknown	Unknown	Unknown	38.31547	-85.8222
7181		Unknown	Unknown	Unknown	38.2912	-85.8439
7182		Unknown	Unknown	Unknown	38.29127	-85.8441
7187		Unknown	Unknown	Unknown	38.31261	-85.8141
7191		Unknown	Unknown	Unknown	38.29881	-85.8167
7193		Unknown	Unknown	Unknown	38.30484	-85.7986
7194		Unknown	Unknown	Unknown	38.33178	-85.8363
7199		Unknown	Unknown	Unknown	38.29021	-85.8253
7205		Unknown	Unknown	Unknown	38.33436	-85.8088
7215	12	Unknown	Unknown	Unknown	38.30396	-85.8321
7216		Unknown	Unknown	Unknown	38.32656	-85.8026
7217		Unknown	Unknown	Unknown	38.32662	-85.8026
7221	36	Sound	Circular	Concrete	38.33204	-85.81
7239	36	Sound	Circular	ADS	38.32677	-85.8073
7256	15	Full Collapse	Circular	Concrete	38.30973	-85.8014
7470					38.31411	-85.8375
7790					38.31912	-85.8143

ID #	Diameter	Condition	Shape	Material	Latitude	Longitude
7823					38.32033	-85.8169
7952	10				38.28009	-85.858
7953	10				38.28009	-85.858
8212					38.31035	-85.8231
8213					38.3088	-85.8218
8253					38.34746	-85.7932
8255					38.34701	-85.7956
8257	15 in				38.34754	-85.796
8259	8in				38.34811	-85.7953
8260	15in				38.3484	-85.7967
8262	15 in				38.34881	-85.7968
8263	20in				38.34874	-85.7968
8264	2 in				38.34882	-85.797
8266	20 in				38.35021	-85.7992
8271	24 in				38.35038	-85.7922
8279					38.35089	-85.7913
8280	22 in				38.35067	-85.7917
8293					38.35419	-85.7909
8339					38.34708	-85.7979

Floyd County

Water Quality Characterization Report

MS4 Permit #: INR040078

March 2023

OHM Advancing Communities®

Table of Contents

OHM Advisors
400 Missouri Avenue, Suite 100
Jeffersonville, IN 47130
www.OHM-Advisors.com

Table of Revisions

The following table summarizes revisions, additions, deletions, etcetera to the contents of this report:

Date	Revised Pages/Appendices	Summary of Change

Primary MS4 Contact

Chris Moore
MS4 Coordinator
2524 Corydon Pike, Ste. 201
New Albany, IN 47150
Phone: 812-948-5466

WQCR Certification

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 the 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.

Qualified Professional:

Name: Allison Padron, PE

Title: Project Manager, OHM Advisors

Signature: 

Date: 3/17/2023

MS4 Operator or Designee:

Name: Timothy Kamer

Title: Commissioner President

Signature: 

Date: 3/21/23

1.0 Purpose

This water quality assessment report is intended to accompany the Southern Indiana Stormwater Advisory Committee (SWAC) Water Quality Characterization Report (WQCR). This component of the WQCR contains information specific to Floyd County as a method for further analyzing water quality within the MS4 boundaries, and using that information to guide their MS4 Program as they begin implementing the Indiana MS4 General Permit (INR040000) and Indiana Construction Stormwater General Permit (INRA00000).

2.0 Assessment of Land Use

Floyd County is in the central portion of southern Indiana along the north shore of the Ohio River, east of Harrison County and west of Clark County, as shown on the MS4 map in Figure 1. The County encompasses approximately 131 square miles (83,804.7 acres). Incorporated areas include the City of New Albany, the Town of Georgetown, and the Town of Greenville, which are excluded from Floyd County's MS4 area. Over 85% of the Floyd County MS4 area is forested or agricultural, while developed areas account for less than 11.1% of the MS4 area. Land use acreages within the Floyd County MS4 area can be seen in Table 1.

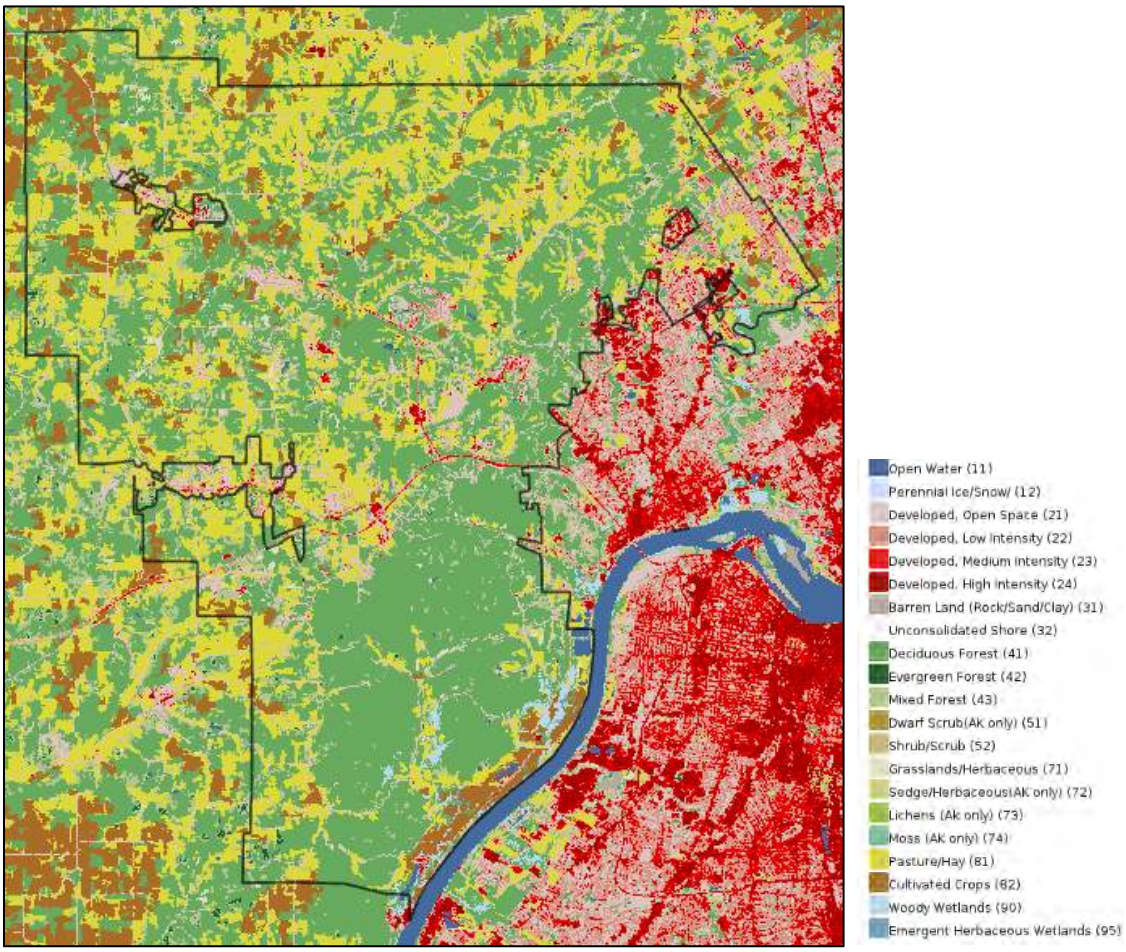


Figure 1. Land Use Map (NLCD, 2019)

Table 1: Land Use for Floyd County MS4 Area

Category	Acres	Percentage
Deciduous Forest	40,098.0	47.8%
Hay/Pasture	20,299.8	24.2%
Developed, Open Space	7,392.4	8.8%
Cultivated Crops	5,291.0	6.3%
Mixed Forest	4,471.6	5.3%
Developed, Low Intensity	2,705.5	3.2%
Developed, Medium Intensity	1,327.1	1.6%
Woody Wetlands	587.3	0.7%
Herbaceous	545.9	0.7%
Open Water	403.8	0.5%
Developed, High Intensity	266.9	0.3%
Shrub/Scrub	182.0	0.2%
Emergent Herbaceous Wetlands	116.2	0.1%
Evergreen Forest	79.1	0.1%
Barren Land	46.1	0.1%
TOTAL:	**83,804.7**	**100.0%**

Source: Land Cover for Indiana, NLCD (2019)

Developed land uses (residential, commercial, industrial) tend to occur around the incorporated areas of Floyd County, near the City of New Albany, Town of Georgetown, and Town of Greenville. Forested areas occur on the steep slopes of the knobs and agricultural areas occur in eastern Floyd County and the ridgetops and valleys of the Floyd Knobs.

3.0 Best Management Practices (BMPs)

The following section describes the County's efforts to improve stormwater quality through the MS4 program by implementing the six (6) Minimum Control Measures (MCMs), including structural and non-structural BMPs.

3.1 Structural BMPs

Within Floyd County's storm sewer system, they have mapped outfalls, manholes, catch basins/inlets, pipe, and concrete/earthen/riprap channels/roadside ditches, with the data stored in GIS. The County has also mapped structural BMPs, such as detention/retention basins. The stormwater system is regularly inspected and maintained.

3.2 Non-Structural BMPs

3.1.1 Ordinances

Floyd County maintains legal authority to administer the MS4 program and ensure compliance through adopted ordinances. Floyd County utilizes the following ordinances:

- IDDE, EPSC, Post-Construction: Stormwater Ordinance, FCO-2019-25, adopted October 2019.
- Maintenance Standards and Controls: Ordinance Establishing Storm Water Drainage Maintenance Standards and Control, CFO-2013-IV, adopted February 19, 2013.
- Stormwater User Fees: Ordinance Authorizing and Establishing a System of Stormwater Management User Fees, FCO-2021-30, adopted December 21, 2021.

The County utilizes the Floyd County Stormwater Design Manual, which was adopted in November 2020, which contains methodologies for determining runoff rates, storage volumes, and BMP sizing. It also contains design standards and specifications for open channels, construction site stormwater pollution prevention standards, and controlling peak flows.

Floyd County adopted the Stormwater Ordinance in October 2019. This Ordinance consolidated illicit discharge, construction, and post-construction requirements into one ordinance. The post-construction requirements are for all projects disturbing one (1) or more acres of land within the County.

As part of the Post-Construction Stormwater Management Ordinance, the owners of approved BMPs are required to execute a Long-Term Maintenance and Operations Agreements with the County. The Agreements are required to be filed with the property deed.

3.1.2 Partnerships

Floyd County actively participates in the Southern Indiana Stormwater Advisory Committee (SWAC), which provides a forum for public education, outreach, participation and involvement as well as coordinated implementation of the MS4 program in participating communities. Participating communities include: Floyd County, the City of Jeffersonville, the Town of Sellersburg, the Town of Clarksville, the City of New Albany, the Oak Park Conservancy District, and the City of Madison.

3.1.3 MCM 1 & 2 – Public Education and Outreach; Participation and Involvement

The County publishes and distributes stormwater information in flyers and brochures focused on educating residents including children, commercial entities, the construction industry. The County maintains a stormwater webpage with relevant information regarding the MS4 program. The SWAC also maintains a website and social media page where the educational content developed by the group are made available for download.

The County typically educates residents and students about stormwater at several events per year using stormwater exhibits at the annual county 4-H fair. Through the SWAC, the County hosts Stormwater Awareness Week each year, culminating in a volunteer event, the ORSANCO River Sweep, to clean the shores of the Ohio River.

3.1.4 MCM 3 – Illicit Discharge Detection and Elimination

The Stormwater Ordinance includes Illicit Discharge Detection and Elimination (IDDE) requirements, which defines and prohibits illicit discharges and establishes an escalating enforcement policy. The County has mapped 100% of the stormwater drainage system, including outfalls and conveyances, and utilizes the IDDE Standard Operating Procedure (SOP) to specify procedures for identifying illicit discharges via a dry weather screening

program, conducted in conjunction with MS4 mapping. Illicit discharges that are detected through citizen complaints or municipal staff are investigated and eliminated. Floyd County continues to educate citizens and trained public employees about the hazards associated with illicit discharges and improper waste disposal.

3.1.5 MCM 4 & 5 – Construction Site and Post-Construction Stormwater Runoff

The County's Stormwater Ordinance includes the Construction Site Runoff Control requirements which govern storm water run-off associated with construction activity. The County continues to implement this ordinance, which specifies requirements for review of construction site BMP plans, installation of erosion prevention and sediment control BMPs, inspection and escalating enforcement procedures. Floyd County has successfully updated the Stormwater Design Manual as of November 2020. The Design Manual serves as a guide for the planning and design of stormwater systems, erosion control structures, and associated activities for Floyd County. The guidelines and general design procedures in the manual were approved by the Floyd County Stormwater Board.

Via a MOA with a local engineering firm, Floyd County reviews construction plans, and associated storm water pollution prevention plans (SWPPP) and issues Perimeter Control Permits and Stormwater Quality Management Permits. The County has implemented requirements for self-inspections and formal inspections of construction sites to ensure compliance with the Construction Site Runoff Control Ordinance. Floyd County adopted requirements that construction site stormwater BMP self-inspections be conducted by a Qualified Professional (QP) via provisions in the Construction Site Runoff Controls Ordinance. Floyd County successfully implemented the Qualified Professional Inspector Program (QPI). The QPI program is designed to train developers, contractors, and governmental agencies to comply with the National Pollutant Discharge Elimination System (NPDES) Stormwater General Permit for Construction by offering a one-day training course, a QPI training manual, and an exam. After passing the exam, applicants are eligible to obtain a QPI registration or license from the community prior to initiating inspection of construction site stormwater BMPs.

3.1.6 MCM 6 - Municipal Operations Pollution Prevention and Good Housekeeping

Floyd County implements pollution prevention and good housekeeping practices to prevent or reduce pollutant runoff from municipal operations, such as regular stormwater drainage system maintenance and cleaning, street sweeping, and leaf and woody debris collections. Also, controls for reducing discharges from county facilities and operations have been put in place though implementing BMPs at municipal fueling stations, minimizing the use of herbicides, pesticides and fertilizers, and minimizing the impact of deicing material storage and utilization.

Floyd County maintains an oil-water separator at the Public Works Facility that is regularly pumped out. The County conducts a formal annual inspection of their municipal facilities to ensure that stormwater BMPs are maintained in compliance with the Post-Construction Stormwater Management Ordinance. Self-inspections are required on a quarterly basis for municipal facilities.

4.0 Receiving Waters

Floyd County has 56 receiving waters totaling 344.34 miles. Table 2 lists the name, length and each receiving waters percentage of the total receiving water area.

Table 2: Floyd County Receiving Waters

Receiving Water	Total Length (miles)	Percentage
Unnamed Tributaries	228.02	66.21%
Little Indian Creek	17.33	5.03%
Indian Creek	14.00	4.07%
Knob Creek	9.90	2.87%
Richland Creek	6.44	1.87%
Georgetown Creek	4.80	1.39%
French Creek	4.11	1.19%
Yellow Fork	3.63	1.05%
Jacobs Creek	3.61	1.05%
Corn Creek	3.26	0.95%
Lewis Branch	2.81	0.81%
Middle Fork Indian Creek	2.51	0.73%
Bald Knob Creek	2.41	0.70%
Jersey Park Creek	2.34	0.68%
Silver Creek	1.97	0.57%
Black Creek	1.86	0.54%
Bannamon Creek	1.78	0.52%
Uphill Run	1.77	0.51%
James Branch	1.76	0.51%
Woertz Creek	1.75	0.51%
Miller Branch	1.69	0.49%
Elk Run	1.57	0.46%
Lazy Creek	1.51	0.44%
Atkins Run	1.33	0.39%
Pine Run	1.30	0.38%
Chapel Branch	1.27	0.37%
Crooked Run	1.25	0.36%
Clear Fork	1.24	0.36%
Bear Creek	1.22	0.35%
Campbell Branch	1.14	0.33%
Buck Creek	1.07	0.31%
Thompson Creek	1.05	0.30%
Lost Knob Brook	1.00	0.29%
Flat Run	0.91	0.26%
Blackiston Run	0.87	0.25%
Carters Run	0.75	0.22%

Receiving Water	Total Length (miles)	Percentage
Falling Run	0.73	0.21%
Friendship Run	0.73	0.21%
Bow Run	0.70	0.20%
East Fork Pilot Grove Creek	0.68	0.20%
War Run	0.68	0.20%
Slate Run	0.65	0.19%
Saint Marys Run	0.64	0.18%
Hill Brook	0.57	0.17%
Lamb Run	0.53	0.15%
Jay Run	0.52	0.15%
Floyds Creek	0.49	0.14%
Arrow Run	0.49	0.14%
Vincennes Run	0.49	0.14%
Church Run	0.47	0.14%
Green Run	0.29	0.08%
Union Creek	0.23	0.07%
Cross Brook	0.12	0.04%
Fork Run	0.11	0.03%
Plum Run	0.03	0.01%
Rail Run	0.00	0.00%
TOTAL	**433.34**	**100%**

Floyd County is bisected by many different watersheds, with a primary watershed being the Indian Creek watershed which drains into Harrison County. The majority of the remaining portion of the county drains directly to the Ohio River, although may pass through the incorporated City of New Albany first. A map showing the major receiving waters and watersheds can be seen in Figure 2 below.

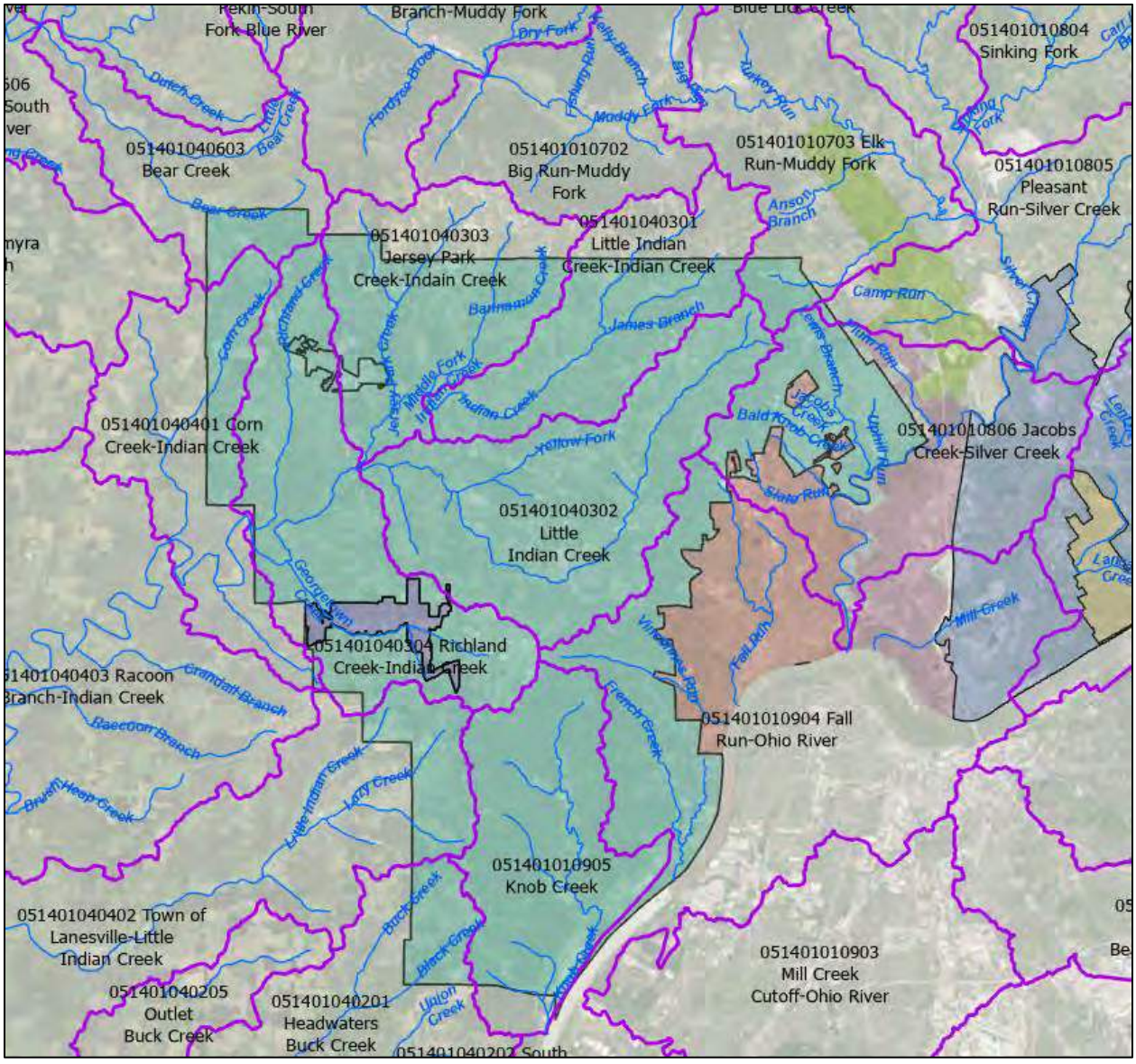


Figure 2. Major Receiving Waters and Watersheds for Floyd County

5.0 303(d) Impaired Waters

The 2022 Integrated Water Monitoring and Assessment Report published by IDEM includes the 303(d) List of Impaired Streams for Indiana. Four (4) stream segments in the Floyd County MS4 area were listed on the 2022 303(d) List, seen in Figure 3. A 1.9-mile segment of Indian Creek on the western side of the county was list as being impaired due to elevated E. coli bacteria. Another 17.7-mile segment of Indian Creek was listed as being impaired due to elevated E. coli bacteria as well as elevated nutrient levels. Several beginning segments of tributaries of Falling Run Creek are located in the Floyd County MS4 area, although the vast majority of the stream is located in New Albany, which is impaired due to E. coli, as well as low dissolved oxygen. Floyd County's MS4 area likely has little impact to Falling Run Creek. A 12.2-mile segment of French Creek is

impaired due to E. coli bacteria. A 4.6-mile segment of Bear Creek was listed as being impaired due to elevated E. Coli bacteria and has a TMDL associated with it. However, Floyd County is at the very top of the watershed for Bear Creek with the majority of the creek being located in a neighboring county. Floyd County likely has very little impact on the water quality within Bear Creek.

Table 3: Floyd County Impaired 303(d) Waters

Stream Name	Assessment ID	Length (miles)	Impairment	TMDL
Bear Creek	INN0463_01/T1001/T1002A	4.6	E. coli	Yes
Falling Run	INN0104_T1002	3.8	E. coli, Low DO	None
French Creek	INN0194_T1006A	12.2	E. coli	None
Indian Creek	INN0431_01 through _04	17.7	E. coli, Nutrients	None
Indian Creek	INN0434_02 INN0333_01	1.9	E. coli	None
Silver Creek	INN0186_06 and _07	2.7	E. coli, PBCs	None

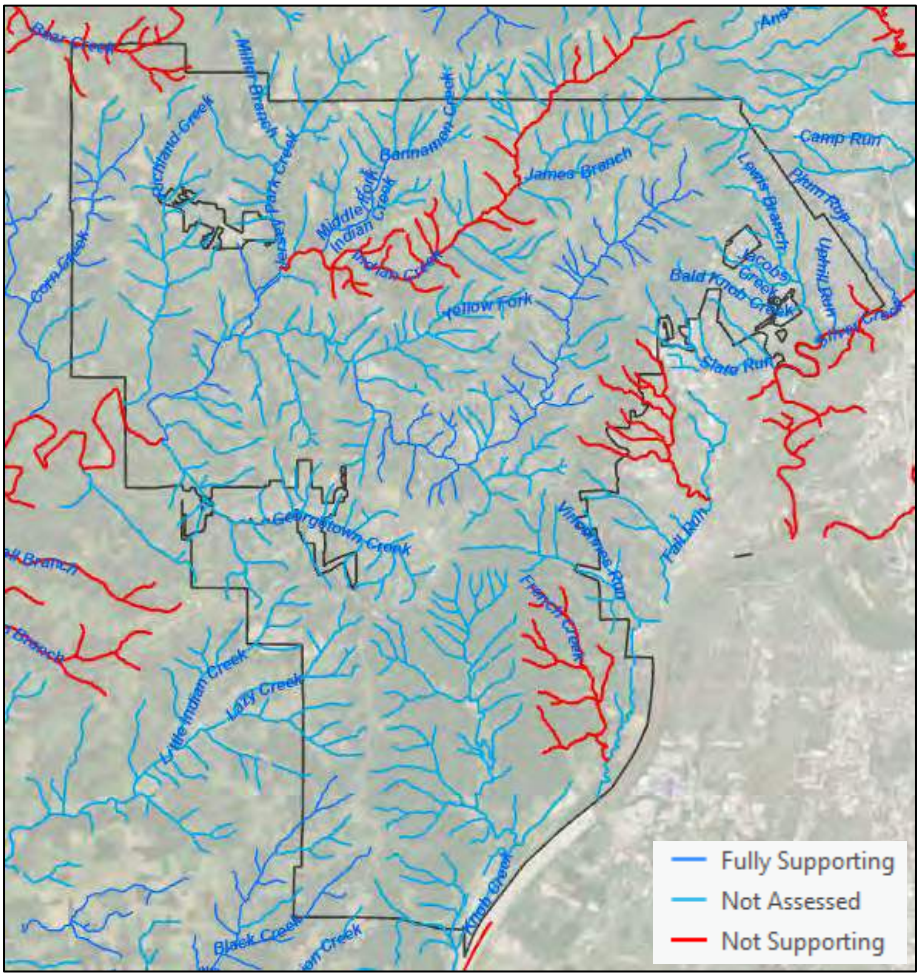


Figure 2. 303(d) Impaired Waters of Floyd County

6.0 Known Sensitive Areas

Public Beaches/ Full Body Contact Recreation: There are no beaches or lakes with public swimming or recreational facilities other than enclosed public swimming pools. The County is currently not aware of any locations within the MS4 area where full body contact recreation occurs.

Surface Drinking Water Intakes: Drinking water sources within the Floyd County MS4 area are derived primarily from local groundwater resources.

Wetlands: Wetland areas are considered to be environmentally sensitive features and are protected by the Clean Water Act. The National Wetland Inventory (NWI) was used to estimate the extent and locations of wetlands and deep waters in Floyd County. Based on these data, there are 1,480.1 acres of wetlands and deep-water habitats within the County boundary, as shown on the Regional WQCR. The following Table 3 shows the different types of wetlands within Floyd County, as classified by the NWI (NWI, 2021).

Table 3: Types of Wetlands in Floyd County

Type	Square Miles	Acres
Freshwater Emergent Wetland	0.219	140.7
Freshwater Forested/Shrub Wetland	0.689	441.0
Freshwater Pond	1.151	737.1
Lake	0.252	161.3

Source: NWI, 2021.

Wellhead Protection Areas: The wellhead protection area (WHPA) for the Edwardsville Well Field is in the Floyd County MS4 area. The wellfield is located in the southern portion of the County near the Ohio River, and the associated WHPA intersects the MS4 boundary. To date, two (2) stormwater outfalls have been mapped in the WHPA. Floyd County adopted a Stormwater BMP Design Manual that encourages the use of non-infiltrative BMPs in WHPAs.

Sinkhole Areas: 231 sinkhole areas were identified in Floyd County through a review of Indiana Geological Survey (IGS) data. Most of the County's sink hole areas are clustered along the western border.

Boat Launches: There are no known boat launches within Floyd County.

7.0 Existing and Available Monitoring Data

In 2004, Harrison County to the west of Floyd County filed for a Section 205(j) funding grant to develop a Complete Indian Creek Watershed Management Plan. The plan was completed by a local firm and approved by IDEM in 2008 and includes a large portion of Floyd County and the Town of Georgetown. There was one (1) monitoring station set up in Georgetown and two (2) in Floyd County. The following results were obtained from Site 1: Indian Creek North at Banet Road, and Site 3: Indian Creek above Georgetown Creek in the County:

- Bacteria results (E. coli indicator): 147.2 (max 430) – criteria not met

- Dissolved oxygen: 5.7 mg/L – criteria met
- Habitat scores: 46 – Poor rating; 61 – Good Rating

The report identified direct sources of E. coli for the Indian Creek watershed as: cattle in creek, straight pipes, non-compliant wastewater treatments plants, sanitary sewer overflows (CSOs), stormwater discharges and dry-weather discharges from an illegal sanitary sewer connection. Indirect sources of E. coli bacterial contamination may be from overland runoff from pastures, manure piles, pet waste, wildlife, and failing septic systems.

While these monitoring data do not conclusively show that MS4 discharges from Floyd County are adversely impacting the quality of nearby surface water bodies, continued development of the SVAP will allow the County to monitor stormwater quality.

In November 2014, Washington County Soil and Water Conservation District (SWCD) received Section 205(j) funding for the South Fork Blue River Watershed Management Plan. The plan was approved in October 2017. A Total Maximum Daily Load (TMDL) has been developed for this watershed by IDEM. None of the water quality monitoring sites for the study were located in Floyd County. One site (Site 4) was located further downstream along Bear Creek, but was the closest to Floyd County. The following Table 4 was included in the report for this monitoring site, when the samples were taken in 2015.

Table 4: Water Quality Monitoring Data from South Fork Blue River Watershed Management Plan for Site 4 – Downstream of Floyd County (Data collected in 2015)

Parameter	Mean/Score	Unit	# of Times Does Not Meet Target	% Does Not Meet Target
pH	8.21	SU	0/12	0%
Dissolved Oxygen	10.2	mg/L	0/12	0%
Temp	18.9	Celsius	0/12	0%
Nitrate+Nitrite	2.2	mg/L	7/7	100%
TKN	.19	mg/L	0/7	0%
TSS	4.4	mg/L	0/7	0%
Turbidity	7.80	NTU	1/12	8%
Total Phosphorus	.024	mg/L	0/7	0%
E.coli	355.1	Colonies/100 mL	8/10	80%
Fish IBI	34	-	1/1	100%
QHEI(IBI)	64	-	0/1	0%
mIBI	46	-	0/1	0%
QHEI(mIBI)	47	-	0/1	100%

According to the report, sources of E. coli within the Bear Creek watershed include: livestock in streams, overgrazing, manure applied to cropland, and failing septic systems. Education on fixing and maintaining septic systems and the use of buffers around agricultural and pasture area are potential ways to mitigates sources of E. coli from reaching waterways.

The Final Total Maximum Daily Load (TMDL) Report for the South Fork Blue River Watershed was published by IDEM in August 2017. The TMDL report utilized the data from the Complete Watershed Management Plan. The portion of the South Fork Blue River Watershed located in Floyd County is minimal

so the County has minimal opportunity to improve water quality through activities taking place within the County. Measures will continue to be taken by the County to minimize negative impacts to Bear Creek, such as inspections and educating residents.

A search for more recent (last 5 years) water quality and related data beyond the watershed studies and Impaired 303(d) List from IDEM was performed using publicly accessible reports and databases published by the Indiana Department of Natural Resources (IDNR), United States Environmental Protection Agency (USEPA), and the United States Geological Survey (USGS). These agencies had not published more recent water quality data for streams in Floyd County.

8.0 Areas with Potential to Contribute to Water Quality Issues

IDEM data collected in 2022 for the 303(d) tool showed the presence of impaired biotic communities, as well as potentially high levels of *E. coli* and nutrients. The Indian Creek Watershed Management Plan and South Fork Blue River Watershed Management Plan found that, while difficult to quantify, failing and inadequate septic systems may be a likely source of E. coli and bacteria. Proper care and maintenance of septic systems is a primary way to keep incidental discharges from reaching local streams and water bodies. Education of residents regarding maintenance is a way to help mitigate this source of pollutant.

Within the Floyd County MS4 area, there are no known facilities that discharge stormwater from industrial activities regulated under Rule 6 (IDEM, 2023). There are fourteen active industrial stormwater permits within the City of New Albany, but these are not under the jurisdiction of Floyd County.

Floyd County has a well-maintained MS4 system that effectively addresses stormwater and drainage issues. Limited monitoring data for the County's MS4 receiving waters indicate the presence of impaired biotic communities, and potentially high levels of bacteria or nutrients. While elevated levels of *E. coli* and nutrients are common problems for waterbodies in highly agricultural areas, none of these studies were able to draw conclusions concerning the quality of stormwater from Floyd County.

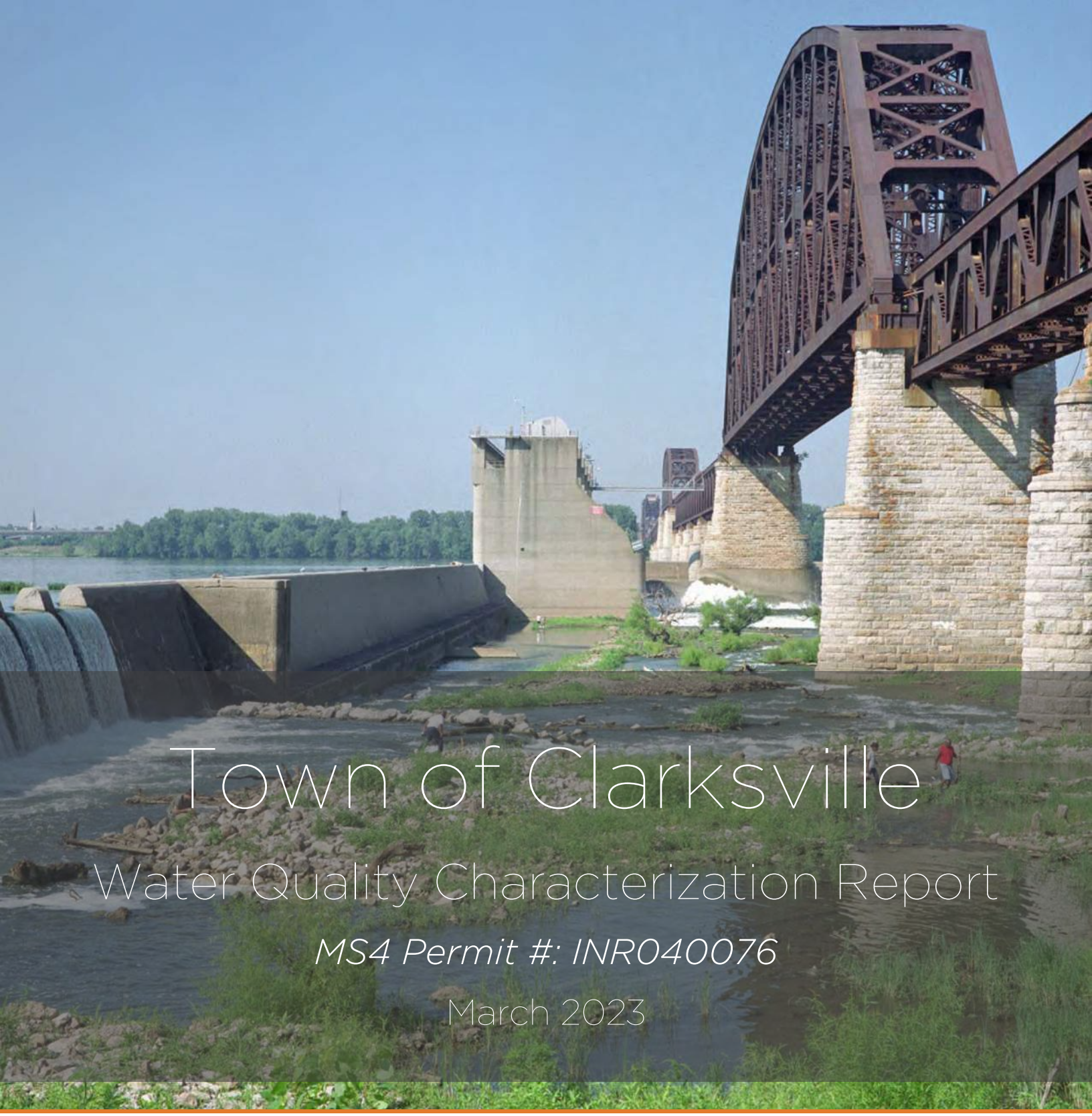
The implementation of structural BMPs in new developments, as well as the continued implementation of the SVAP will ensure the continued monitoring of water quality in Floyd County. Also, ongoing public education and illicit discharge detection and elimination efforts by the County will be crucial to the continued success of the County's MS4 Program.

9.0 Recommendations

Based on the findings of this water quality characterization report, Floyd County plans to continue to implement and enhance the MS4 program. The following additional BMPs are recommended for consideration.

- Finalize the development of the 2023 Qualified Professional program and implement the plan the new permit term.

- Continue to implement the SVAP monitoring protocol to collect additional data in potentially impacted streams to help distinguish between stormwater, point and non-point pollution sources.
- Utilize the Indian Creek Watershed Plan, South Fork Blue River Watershed Management Plan, and TMLD for the South Fork Blue River Watershed to assist with identification, prioritization, scheduling, and implementation of areas in need of further monitoring, education efforts, and inspection.
- Continue inspecting and monitoring stormwater management activities occurring and BMPs being implemented at municipal facilities and during municipal operations.
- Further enhance the outreach and public participation program to educate residents and visitors about stormwater quality.



Town of Clarksville

Water Quality Characterization Report

MS4 Permit #: INR040076

March 2023

CLARKSVILLE INDIANA

OHM Advancing Communities®

Table of Contents

OHM Advisors
400 Missouri Avenue, Suite 100
Jeffersonville, IN 47130
www.OHM-Advisors.com

Table of Revisions

The following table summarizes revisions, additions, deletions, etcetera to the contents of this report:

Date	Revised Pages/Appendices	Summary of Change

Primary MS4 Contact

Tom Clevidence
and
James Webber
Stormwater Coordinator
3 Leuthart Drive
Clarksville, IN 47129
Phone: 812-283-8233

WQCR Certification

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 the 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.

Qualified Professional:

Name: Allison Padron, PE

Title: Project Manager, OHM Advisors

Signature:

Date: 3/17/2023

MS4 Operator or Designee:

Name: Kevin Baity

Title: Town Manager

Signature:

Date: 3/29/2023

1.0 Purpose

This water quality assessment report is intended to accompany the Southern Indiana Stormwater Advisory Committee (SWAC) Regional Water Quality Characterization Report (WQCR). This component of the WQCR contains information specific to the Town of Clarksville as a method for further analyzing water quality within the MS4 boundaries, and using that information to guide their MS4 Program as they begin implementing the Indiana MS4 General Permit (INR040000) and Indiana Construction Stormwater General Permit (INRA00000).

2.0 Assessment of Land Use

The Town of Clarksville encompasses approximately 10.1 sq. miles (6,482 acres). The vast majority of the town (75%) is developed with commercial, industrial, and residential properties. The forested areas are primarily parks or open space that is being turned into parks within the town. The Town is bordered by New Albany and Floyd County to the west, Sellersburg to the north, and Jeffersonville to the east. The Town is located on the Ohio River, with views of Louisville, Kentucky across the river. See Figure 1 and Table 1 for more information.

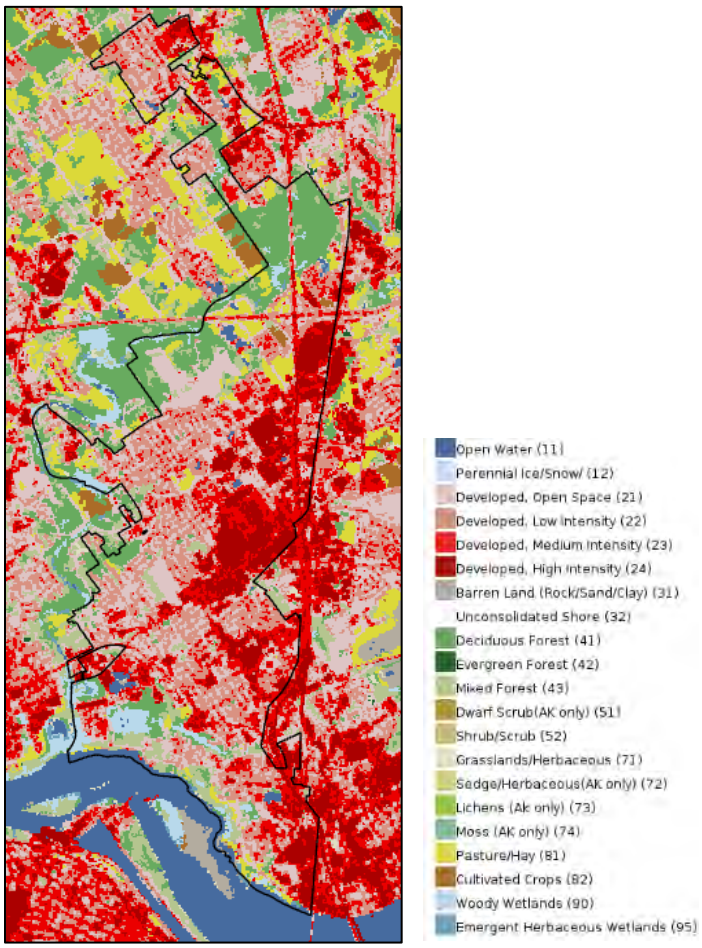


Figure 1. Land Use Map (NLCD, 2019)

Table 1: Land Use for Clarksville MS4 Area

Category	Acres	Percentage
Developed, Low Intensity	1683.9	26.0%
Developed, Medium Intensity	1379.8	21.3%
Developed, High Intensity	1068.1	16.5%
Developed, Open Space	748.7	11.6%
Deciduous Forest	746.2	11.5%
Hay/Pasture	279.2	4.3%
Mixed Forest	198.8	3.1%
Woody Wetlands	171.9	2.7%
Open Water	121.1	1.9%
Emergent Herbaceous Wetlands	24.4	0.4%
Cultivated Crops	20.1	0.3%
Herbaceous	17.4	0.3%
Barren Land	15.8	0.2%
Shrub/Scrub	1.5	0.0%
TOTAL:	**6,476.9**	**100.0%**

Source: National Land Cover Database (NLCD, 2019)

3.0 Best Management Practices (BMPs)

The following section describes the Town of Clarksville's efforts to improve stormwater quality through the MS4 program by implementing the six (6) Minimum Control Measures (MCMs), including structural and non-structural BMPs.

3.1 Structural BMPs

Within Clarksville's storm sewer system, there are 111 outfalls; 347 manholes; 2,929 catch basins/inlets/yard drains; and 181 outlets (non-outfalls). There is 62 miles (327,376.8 feet) of pipe; 3.1miles (16,337 feet) of open ditches; and 0.47 miles (2,482 feet) of paved ditches. Figure 2 shows the locations of outfalls, manholes, public detention basins, as well as pipes/culverts and ditches that have been mapped in Clarksville (Clarksville, GIS). Within the Town of Clarksville, there are 22 public detention/retention basins, and 75 privately-maintained detention/retention basins. For more detailed information about the individual structures see Tables 11 and 12 that list the identification number, name, ownership, structural condition, and geographic coordinate at the end of the report.

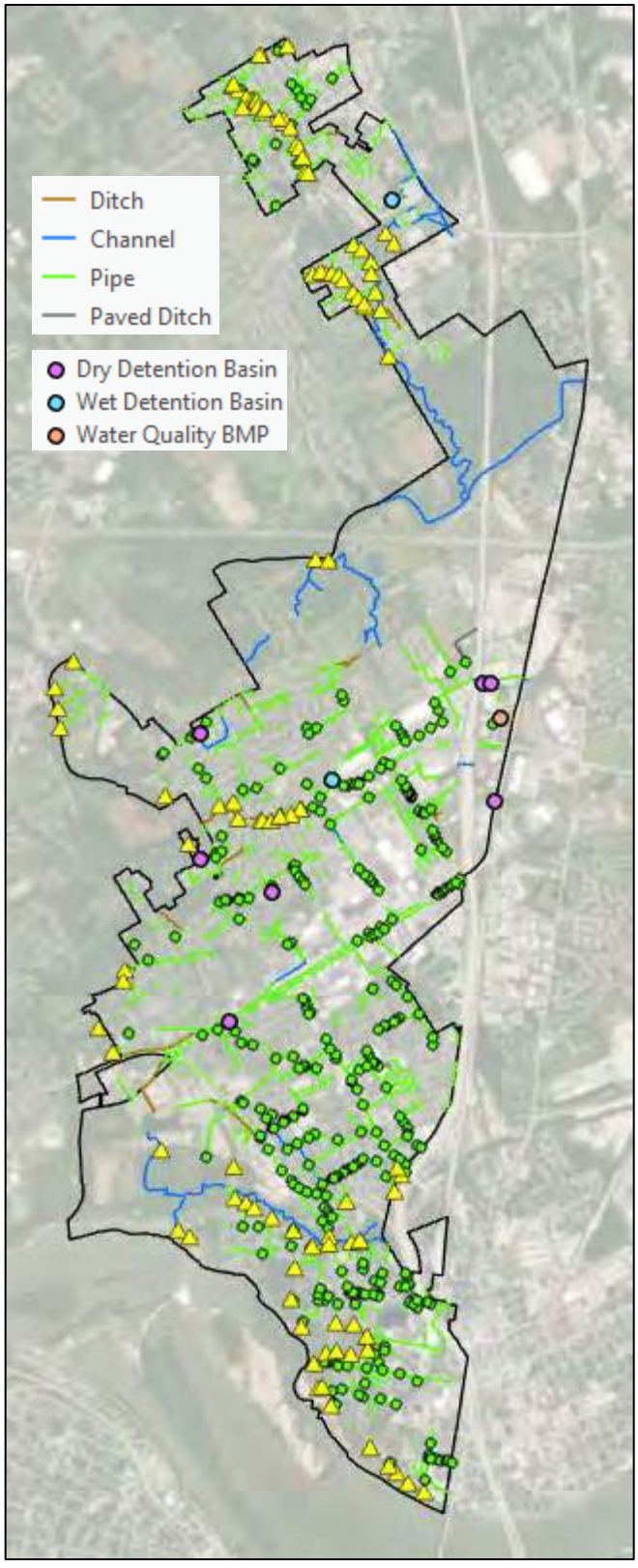


Figure 2. Mapped Stormwater Infrastructure (Town of Clarksville, GIS)

3.2 Non-Structural BMPs

3.1.1 Ordinances

The Town of Clarksville maintains legal authority to administer the MS4 program and ensure compliance through adopted ordinances. The Town of Clarksville utilizes the following ordinances:

- IDDE: Stormwater Illicit Discharge Control Ordinance, Ord. 2004-SW-01, adopted Nov. 9, 2004.
- EPSC: Construction Site Runoff Control Ordinance, Ord. 2004-SW-02, adopted Nov. 9, 2004.
- Post-Construction: Post-Construction Stormwater Management, Ord. 2005-SW-03, adopted Dec. 13, 2005.
- Floodplain Management: Flood Damage Prevention Ordinance, Ord. No. 2022-Z-08.

The Town utilizes the Indiana Drainage Handbook and Indiana Storm Water Quality Manual, which contains methodologies for determining runoff rates, storage volumes, and BMP sizing. It also contains design standards and specifications for open channels, construction site stormwater pollution prevention standards, and controlling peak flows.

3.1.2 Partnerships

Clarksville actively participates in the Southern Indiana Stormwater Advisory Committee (SWAC), which provides a forum for public education, outreach, participation, and involvement, as well as coordinated implementation of the MS4 program in participating communities. Participating communities include: City of Clarksville, Floyd County, the Town of Sellersburg, the City of New Albany, the City of Madison, the City of Jeffersonville, the Oak Park Conservancy District, and the Town of Georgetown.

The SWAC maintains a stormwater website containing detailed information on the MS4 Program, as well as all of the materials developed by the SWAC over the years, such as guidebooks, brochures, manuals, and Standard Operating Procedures.

The SWAC, in partnership with the Clark County SWCD, offers the Qualified Professional Inspector (QPI) training program to train contractors and developers in proper erosion prevention and sediment control (EPSC) practices.

3.1.3 Town MS4 Program

As part of the Town's MS4 Program, the Town regularly publishes and distributes stormwater information in newsletters, flyers, and brochures focused on educating residents, commercial entities, and the construction industry. The Town maintains a webpage specifically dedicated to stormwater quality. Waterway identification signs have been installed by the Town in high traffic areas to educate MS4 constituencies about the stormwater drainage system. The Town also regularly screens for illicit discharges and performs investigations if a suspected illicit discharge is reported.

The Town of Clarksville has implemented many pollution prevention and good housekeeping practices to prevent or reduce pollutant runoff from municipal operations, such as regular stormwater drainage system cleaning, maintenance and start sweeping. Controls for reducing discharges from Town-owned facilities and operations have been put in place though implementing BMPs at municipal fueling stations, eliminating the

use of herbicides, pesticides and applying fertilizers only to revegetation areas, and storing de-icing materials in a covered facility.

3.1.4 Stormwater Master Plan

The previous Stormwater Master Plan (SWMP) for the City was finalized in December 2008, which addressed future stormwater/drainage improvements, responsibilities as a MS4 community, and stormwater related issues. An update to this plan is under consideration for 2023 to guide capital improvement projects, infrastructure upgrades, and stormwater programs through the next 10-15 years.

3.1.5 Community Rating System (CRS) Program

The Town of Clarksville participates in the Community Rating System (CRS) Program. The CRS program is a voluntary incentive program, run and administered by FEMA that recognizes and encourages community floodplain management practices that exceed the minimum requirements of the National Flood Insurance Program (NFIP). The goals of this program are to reduce and avoid flood damage to insurable property, strengthen and support the insurance aspects of the NFIP, and foster comprehensive flood plain management. The Town has maintained a Class 8 rating since joining the program in 2015.

4.0 Receiving Waters

The Town of Clarksville has six (6) main receiving waters, the rest are unnamed tributaries. Table 2 below breaks down the length and the percentage of the total receiving water area. The receiving waters and watersheds can be seen in Figure 3. The two (2) watersheds impacted by Clarksville are the Jacobs Creek-Silver Creek and Fall Run-Ohio River watersheds. All of the waters in Clarksville drain to the Ohio River.

Table 2: Town of Clarksville Receiving Waters

Receiving Water	Total Length	Percentage
Unnamed Tributaries	3.54	33.54%
Plum Run	2.58	24.44%
Silver Creek	2.26	21.43%
Mill Creek	1.59	15.11%
Cane Run	0.53	5.04%
Big Drain	0.04	0.40%
Carters Run	0.00	0.04%
TOTAL	10.54	100%

Source: National Land Cover Database (NLCD, 2019)

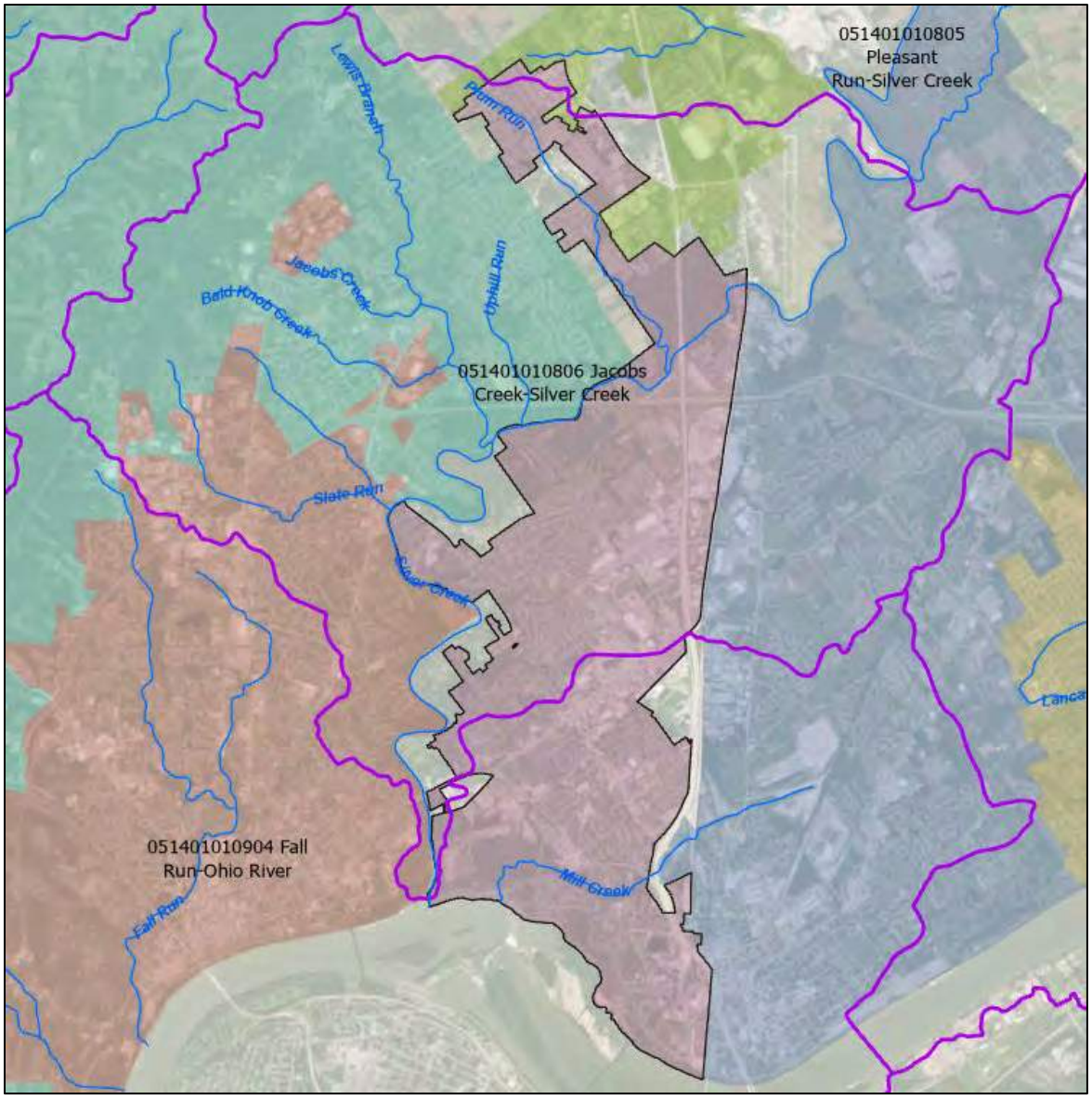


Figure 3. Major Receiving Waters and Watersheds for the Town of Clarksville

5.0 303(d) Impaired Waters

The 2022 Integrated Water Monitoring and Assessment Report published by IDEM includes the 303(d) List of Impaired Streams for Indiana. Two (2) streams in the Town of Clarksville MS4 area were listed on the 2022 303(d) for E. coli impairments, as seen in Table 4. One stream, Silver Creek, is also listed for polychlorinated biphenyls (PBCs) which implies pollutants from industrial or commercial sources. Figure 4 shows the impaired waters and tributaries as well.

Table 4: Town of Clarksville Impaired 303(d) Waters

Stream Name	Assessment ID	Impairment	TMDL
Mill Creek	INN0194_T1001A	E. coli	None
Silver Creek	INN0186_03 through _06 & _08	PCBs, E. coli	None

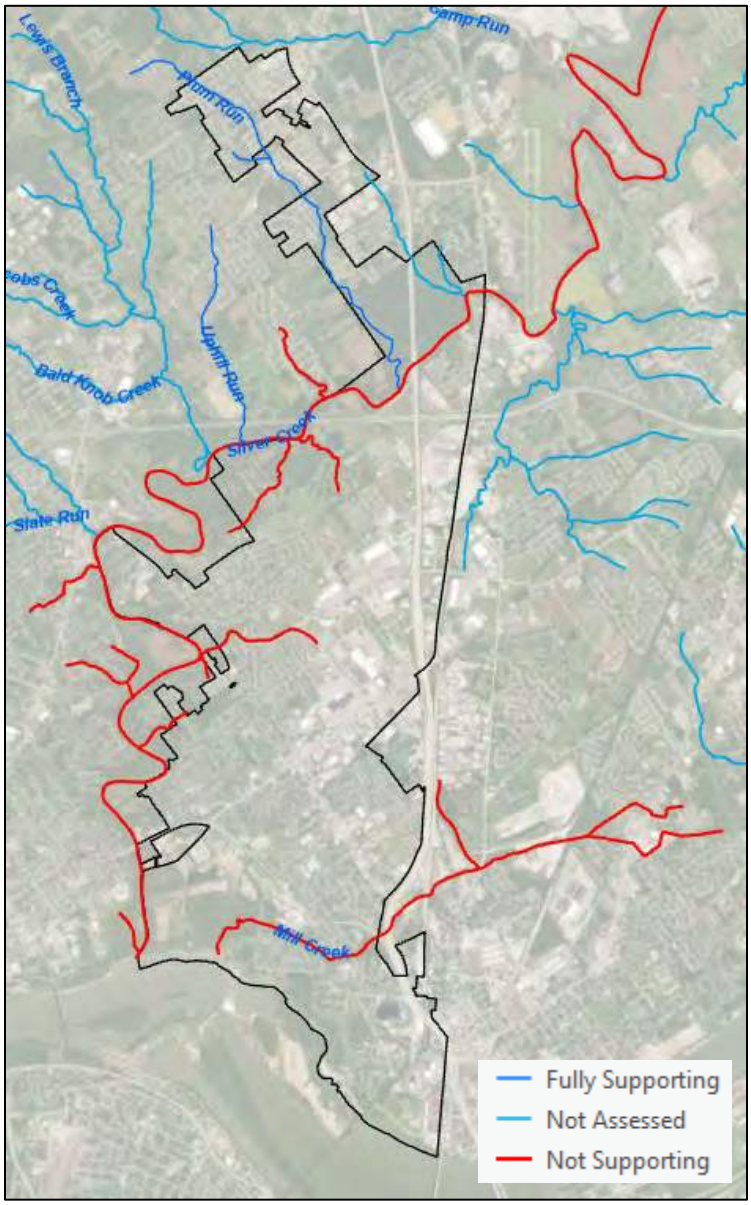


Figure 4. 303(d) Impaired Waters of the Town of Clarksville

6.0 Known Sensitive Areas

Public Beaches/ Full Body Contact Recreation: There are no beaches or lakes with public swimming or recreational facilities other than enclosed public swimming pools. The Town is currently not aware of any locations within the MS4 area where full body contact recreation occurs.

Surface Drinking Water Intakes: Drinking water sources within the Town are derived primarily from local groundwater resources.

Wetlands: Wetland areas are considered to be environmentally sensitive features and are protected by the Clean Water Act. National Wetland Inventory (NWI) was used to estimate the extent and locations of wetlands and deep waters in Clarksville. Based on these data, there are 385.9 acres of wetlands and deep water habitats within the Town. Table 5 shows the different types of wetlands within, as classified by the NWI.

Table 5: Types of Wetlands in Clarksville

Type	Acres
Freshwater Emergent Wetland	14.7
Freshwater Forested/Shrub Wetland	190.7
Freshwater Pond	94.7
Lake	0.0
Riverine	85.8
Total	**385.9**

Source: NWI.

Wellhead Protection Areas: There are no wellhead protection areas (WHPAs) in the Town of Clarksville.

Sinkhole Areas: Five (5) sinkhole areas were identified in Clarksville through a review of Indiana Geological Survey (IGS) data. IGS data show 4 sinkhole areas near the southern border of the Town in a residential area. The last sinkhole area is located near the northern border near the Clark County airport which is outside of Town limits.

Boat Launches: There is one (1) boat launch owned by IDNR on Harrison Avenue.

7.0 Existing and Available Monitoring Data

Complete Silver Creek Watershed Management Plan (2009): The Clark County Soil and Water Conservation District (SWCD) received a Nonpoint Source Section 319 Grant from IDEM in January 2007 to develop a watershed management plan for the Silver Creek Watershed. The study was completed and approved in April 2009. Silver Creek flows along 36.4 miles prior to discharging into the Ohio River, with Clarksville near the discharge location. The report stated that sources of E. coli in water systems are likely attributed to failing septic systems, livestock in creeks, and sanitary sewer overflows. The closest data collection site to Clarksville was on Blackiston Mill Bridge (OSK140-0007). The following data was collected at this site, as well as Table 6:

- Macroinvertebrate Collection (MBI) Score: 47.22 – Fair
- Habitat Assessment (QHEI): 44.5 & 58.5 – Fair to Poor

Table 6: Results from Silver Creek Watershed Management Plan Study (2009) for Site at Blackiston Mill

Site-1 Blackiston Mill at Dam												
Date	**9/26/07**	**10/30/07**	**11/28/07**	**12/18/07**	**1/28/08**	**2/27/08**	**4/2/08**	**4/30/08**	**5/28/08**	**6/24/08**	**7/30/08**	**8/27/08**
E. coli	37.9 MPN	116.2 MPN	913.9 MPN	4.0 MPN	1.0 MPN	88.8 MPN	142.1 MPN	93.3 MPN	116.2 MPN	50.4 MPN	18.9 MPN	15.6 MPN
Nitrate	0.06mg/L	2.60mg/L	1.98mg/L	2.04mg/L	2.09mg/L	1.18mg/L	0.81mg/L	0.82mg/L	0.91 mg/L	1.03mg/L	0.01 mg/L	.16 mg/L
Nitrite	ND	0.031 mg/L	0.008 mg/L	0.005 mg/L	0.006 mg/L	ND	ND	0.0006 mg/L	0.006 mg/L	0.004 mg/L	0.004 mg/L	0.008 mg/L
Solids, Suspended	10mg/L	13mg/L	25mg/L	15mg/L	4.0mg/L	NA	35.0mg/L	7.0mg/L	13 mg/L	9 mg/L	7 mg/L	9 mg/L
Solids, Total	384mg/L	492mg/L	315mg/L	230mg/L	291mg/L	NA	209mg/L	308mg/L	234 mg/L	370 mg/L	283 mg/L	545 mg/L
Solids, Dissolved	360mg/L	446mg/L	274mg/L	200mg/L	270mg/L	NA	156mg/L	277mg/L	207 mg/L	345 mg/L	259 mg/L	519 mg/L
Nitrogen-Ammonia	0.1mg/L	<0.1mg/L	0.1mg/L	0.1mg/L	0.1mg/L	0.1mg/L	0.1mg/L	0.1mg/L	0.1 mg/L	NA	0.1 mg/L	0.1 mg/L
TKN	0.6mg/L	0.5mg/L	0.8mg/L	0.4mg/L	0.2mg/L	0.5mg/L	0.4mg/L	0.3mg/L	0.4 mg/L	NA	0.7 mg/L	0.6 mg/L
Phosphorus, Total	0.04mg/L	0.07mg/L	0.09mg/L	0.04mg/L	0.08mg/L	0.07mg/L	0.06mg/L	0.06mg/L	0.07 mg/L	NA	0.06 mg/L	0.05 mg/L
Conductivity	625 us/cm	686 us/cm	423 us/cm	320 us/cm	395 us/cm	247 us/cm	187 us/cm	485 us/cm	331 us/cm	567 us/cm	525 us/cm	830 us/cm
Dissolved Oxygen	6.01 mg/L	10.27 mg/L	11.84 mg/L	13.25 mg/L	15.50 mg/L	13.56 mg/L	10.50 mg/L	8.98 mg/L	6.16 mg/L	5.65 mg/L	5.79 mg/L	5.72 mg/L
Flow	0.15 ft/sec	0.4ft/sec	1.2ft/sec	0.882 ft/sec	0.7ft/sec	3.0ft/sec	0.5ft/sec	1.5ft/sec	1.5 ft/sec	0.5 ft/sec	0.3 ft/sec	1.0 ft/sec
pH	7.92 su	7.26 su	7.50 su	7.45 su	7.78 su	7.12 su	6.50 su	7.44 su	7.41 su	7.89 su	7.31 su	7.06 su
TDS (Done in Field)	310ppm	346ppm	213ppm	170ppm	220ppm	124ppm						
Temperature	23.8 C	11.7 C	7.9 C	4.5 C	0.9 C	3.5 C	11.7 C	15.3 C	20.3 C	24.4 C	27.1 C	21.6 C
Turbidity	5.93NTU	10.50NTU	23.00NTU	13.70NTU	4.11NTU	42.1NTU	30.00NTU	4.91NTU	8.80 NTU	5.82 NTU	4.22 NTU	6.04NTU

The Clarksville Town Council funded two additional sites, both near the discharge location into the Ohio River. One of the additional sites was tested in June and October 2008, and one was tested just in October 2008. The monitoring was done with the University of Louisville's Environmental Analysis Lab. Data are summarized below in Table 7.

Table 7: Results from Silver Creek Watershed Management Plan Study (2009) for Additional Sites

Water Quality Monitoring Results Summary Additional Tests Performed by U of L Environmental Analysis Lab Not Done by Stantec						
Test Name	**Units**	**# Results**	**Minimum Value**	**Average Value**	**Maximum Value**	**Criteria or Comparison Value**
Chloride	mg/L	18	7.25	42.06	146.09	< 100 mg/L
Chlorophyll a	ug/L	18	0.287	5.236	28.811	<5 ug/L
Dissolved Organic Carbon	mg/L	18	3.16	5.59	8.53	>7 mg/L
Orthophos-phate	mg/L	18	0.009	0.028	0.079	Less than To-tal Phosphate
Pheophytin a	mg/L	18	0.283	1.66	6.601	Less than Chlorophyll a
% Saturation of Oxygen	%	18	39.9	68.58	94.3	----
Silicon Dioxide	mg/L	18	4.65	7.69	10.53	----
Total Nitrogen	mg/L	18	0.326	1.167	1.713	> 2.5 mg/L

USGS (2000): Physical, chemical, and bacterial monitoring data were collected from Silver Creek at Blackiston Mill, Site # OSK140-0007, near the City of Clarksville. Five (5) samples were collected during July and August of 2000. Data are summarized in Table 8 below**.**

Table 8: Water Quality Data Summary for Silver Creek at Blackiston Mill

Parameter	USGS Data Range	Indiana Water Quality Criterion
Dissolved Oxygen (mg/L)	7.31 to 9.27	Greater than or equal to 4.0
Temperature (Deg C)	25.68 to 27.29	Less than 32.2
pH (SU)	7.84 to 8.22	Between 6.0 and 9.0
Specific Conductivity (µS/cm)	528 to 900	1,200
Turbidity (NTU)	12.35 to 18.62	NA
E. coli (CFU/100mL)	19 to 1,567	Geomean < 125 / 100 ml and no single sample can exceed 576 / 100 ml

Sources: USGS, 2000; 327 IAC 2

These data show acceptable levels of dissolved oxygen, temperature, pH, and conductivity as well as potentially elevated levels of *E. coli*. The geometric mean of the five samples was 66 CFU/100 ml, which is below the Indiana water quality criteria, but one sample exceeded the single sample maximum concentration of 576 CFU / 100 ml.

Wet Weather Impact Study: The Ohio River Sanitation Commission (ORSANCO) performed a Wet Weather Impact Study of the Ohio River in the Louisville/Southern Indiana area, which focused on the sources of bacteria in the Ohio and included an examination of Silver Creek and Mill Creek. The results of the study indicate that tributaries contribute significant bacterial loads to the Ohio River. These findings were primarily based on testing performed in the mixing zone, at the mouth or just downstream of the study tributary. The study did not identify the portion of the bacterial loads to the Ohio River that could be attributed to stormwater discharges from the Town of Clarksville.

Indiana STORET: Monitoring Report was completed by Indiana STORET from data collected on Mill Creek, Site # OSK-09-0002 in the City of Clarksville. Thirteen (13) samples were collected throughout 2019. Data are summarized in Table 9 below.

Table 9: Results from Indiana STORET (2019) for Site # OSK-09-0002

Parameter	Average of Values
Escherichia Coli	240.32 MPN / 100 ml
Nitrate/Nitrite	4.1 mg/L
Total Phosphorus	0.81 mg/L
Dissolved Oxygen	7.88 mg/L
pH	7.67
Total Suspended Solids	14.67mg/L
Turbidity	11.38 NTU

8.0 Areas with Potential to Contribute to Water Quality Issues

A study conducted by ORSANCO suggested that tributaries, including Silver Creek and Mill Creek, contribute bacterial loads to the Ohio River. On a local level, the Silver Creek Watershed Management Plan study concluded that the primary BMPs needed to improve water quality would be removing sources of E. coli such as failing septic systems, bank stabilization, prescribed grazing for agricultural areas, agricultural buffers/filter strips to reduce sedimentation and nutrients, and urban buffers. The impairment from E. coli originates upstream of the Town of Clarksville, but minimizing sanitary sewer overflows is more applicable to the Town. Methods to reduce E. coli sources include: educating the public about the importance of maintaining septic systems and reducing untreated animal waste from reaching the creeks. Many of Silver Creeks' impairments are the result of upstream activities.

Clarksville has nine (9) active facilities that discharge stormwater from industrial activities under Rule 6 (IDEM, 2023). Two of the facilities permits expired in 2021 and 2022, although one (Irving Materials) has been administratively continued. These facilities are shown in Table 10.

Table 10. NPDES Active Industrial Stormwater Permits in the Town of Clarksville

NPDES ID	Permit Name	Effective Date	Expiration Date	Location Address	SIC	Permit SIC Description
INRM02414	Kentuckiana Trucking Inc	7/27/2018	7/26/2023	380 Emery Crossing Rd	4213	Trucking, Except Local
INRM00122	Innovative Crushing & Aggregate Incorporated	8/13/2018	8/12/2023	1030 Sames Rd	1422	Crushed And Broken Limestone
INRM01096	PQ Corporation	6/28/2019	6/27/2024	1101 Quartz Rd	2819	Industrial Inorganic Chemicals
INRM01952	Bi-Co Transfer Station Republic Services of Indiana	9/14/2019	9/13/2024	1020 Sames Rd	4953	Refuse Systems
INRM00233	United Parcel Service Clarksville	3/14/2021	3/13/2026	2234 Koetter Dr	4215	Courier Services, Except By Air

9.0 Recommendations

Based on the findings discussed, the Town of Clarksville plans to continue to implement and enhance the MS4 program. The following additional BMPs are recommended for consideration.

- Finalize the development of the 2023 Qualified Professional program and implement the plan the new permit term.
- Continue to implement the Stream Visual Assessment Protocol (SVAP) monitoring protocol to collect additional data in potentially impacted streams to help distinguish between stormwater, point and non-point pollution sources.
- Continue to discover, analyze, design, and execute stormwater capital improvement projects through an updated Stormwater Master Plan. Consideration should be given for town-wide and/or watershed-based stormwater master planning to assist with identification, prioritization, scheduling, and implementation of capital improvement projects.
- Continue inspecting and monitoring stormwater management activities occurring and BMPs being implemented at municipal facilities and during municipal operations.
- Further enhance the outreach and public participation program to educate residents and visitors about stormwater quality.

Table 11: Town of Clarksville Detention Basin Inventory

ID	Owner	Name
PUB_1	PUBLIC	Plum Run Subd. Dry Detention Basin
PUB_2	PUBLIC	Eagle Ridge Subd. Dry Detention Basin
PUB_3	PUBLIC	Wooded View Lake #1
PUB_4	PUBLIC	Wooded View Lake #2
PUB_5	PUBLIC	Municipal Center Retention Pond #1
PUB_6	PUBLIC	Municipal Center Retention Pond #2
PUB_7	PUBLIC	Ray Lawrence Retention Pond
PUB_8	PUBLIC	Blackiston Ridge Subd. Dry Detention Basin
PUB_9	PUBLIC	Indot Constructed Wetlands
PUB_10	PUBLIC	Indot Constructed Wetlands
PUB_11	PUBLIC	Municipal Center Bio-Retention Basin #1
PUB_12	PUBLIC	Municipal Center Bio-Retention Basin #2
PUB_13	PUBLIC	Municipal Center Bio-Retention Basin #3
PUB_14	PUBLIC	Municipal Center Bio-Retention Basin #4
PUB_15	PUBLIC	Stormwater Departments Rain Garden
PUB_16	PUBLIC	Wooded View Gc Rain Garden
PUB_17	PUBLIC	Ray Lawrence Dry Basin
PUB_18	PUBLIC	Treatment Plant Dry Basin
PUB_19	PUBLIC	Gateway Park Rain Garden
PUB_20	PUBLIC	Gateway Park Detention Dry Basin #1
PUB_22	PUBLIC	Gateway Park Detention Dry Basin #2
PRI_1	PRIVATE	Villa Circle Dry Detention Basin #1
PRI_2	PRIVATE	Villa Circle Dry Detention Basin #2
PRI_3	PRIVATE	Medical Center Dry Detention Basin
PRI_4	PRIVATE	Plum Lake
PRI_5	PRIVATE	Plum Creek Subd. Dry Detention Basin #1
PRI_6	PRIVATE	Plum Creek Subd. Dry Detention Basin #2
PRI_7	PRIVATE	Plum Creek Subd. Dry Detention Basin #3
PRI_8	PRIVATE	Hamburg Way Subd. Dry Detention Basin.
PRI_9	PRIVATE	Remc Lake
PRI_10	PRIVATE	Meyer Manor Subd. Dry Detention
PRI_11	PRIVATE	Medical Center Dry Detention
PRI_12	PRIVATE	Koch Pond
PRI_13	PRIVATE	Private Pond
PRI_14	PRIVATE	Silver Lakes #1
PRI_15	PRIVATE	Silver Lakes #2
PRI_16	PRIVATE	Silver Lakes 33
PRI_17	PRIVATE	Carter's Hole Wetlands
PRI_18	PRIVATE	Kopp Lake #1

PRI_19	PRIVATE	Kopp Lake #2
PRI_20	PRIVATE	Kopp Lake #3
PRI_21	PRIVATE	Kopp Lake #4
PRI_22	PRIVATE	Addmore Lake
PRI_23	PRIVATE	Wellington Green MHP Dry Detention Basin
PRI_24	PRIVATE	Westminster Wet Retention Pond
PRI_25	PRIVATE	Walmart / Sams Dry Detention Basin
PRI_26	PRIVATE	Estes Pond
PRI_27	PRIVATE	Lowes Plaza Wet Retention Basin
PRI_28	PRIVATE	Lowes Dry Detention Basin
PRI_29	PRIVATE	Waterford North Dry Detention #1
PRI_30	PRIVATE	Waterford North Dry Detention #2
PRI_31	PRIVATE	Waterford North Dry Detention #3
PRI_32	PRIVATE	Fairington Apt. Wet Retention Pond
PRI_33	PRIVATE	Waterford South Underground Detention
PRI_35	PRIVATE	Riverfalls Dry Detention Basin
PRI_34	PRIVATE	Broadway Heights Wet Retention Basin
PRI_37	PRIVATE	Corbitt Pond
PRI_38	PRIVATE	Pond
PRI_39	PRIVATE	Hansford Pond
PRI_40	PRIVATE	Pond
PRI_41	PRIVATE	Pond
PRI_42	PRIVATE	Pond
PRI_43	PRIVATE	Pond
PRI_44	PRIVATE	Major Addition Dry Detention Basin
PRI_45	PRIVATE	Greentree Mall Dry Detention Basin #1
PRI_46	PRIVATE	Greentree Mall Dry Detention Basin #2
PRI_47	PRIVATE	HQ Dry Detention Pond
PRI_48	PRIVATE	Beirman Sand Pit #1
PRI_49	PRIVATE	Beirman Sand Pit #2
PRI_50	PRIVATE	Beirman Sand Pit #3
PRI_51	PRIVATE	Vectren Sand Pit #4
PRI_52	PRIVATE	Ettlel Lane Baptist Dry Detention Basin
PRI_53	PRIVATE	Salvation Army Dry Detention Basin
PRI_54	PRIVATE	River Chase Apt. Dry Detention Basin #1
PRI_55	PRIVATE	River Chase Apt. Dry Detention Basin #2
PRI_56	PRIVATE	River Chase Apt. Dry Detention Basin #3
PRI_57	PRIVATE	River Chase Apt. Dry Detention Basin #4
PRI_58	PRIVATE	River Chase Apt. Dry Detention Basin #5
PRI_59	PRIVATE	River Chase Apt. Dry Detention Basin #6
PRI_60	PRIVATE	River Chase Apt. Dry Detention Basin #7

PRI_61	PRIVATE	River Chase Apt. Wet Retention Basin #8
PRI_62	PRIVATE	Holiday Inn Lake
PRI_63	PRIVATE	Coyle Commons Underground Detention
PRI_64	PRIVATE	Majestic Manor Dry Detention Basin
PRI_65	PRIVATE	Villa Circle Detention Dry Basin #3
PRI_66	PRIVATE	Hunters Trace Condominium Dry Detention
PRI_67	PRIVATE	Kentuckiana Medical Center Dry Detention Basin #1
PRI_68	PRIVATE	Kentuckiana Medical Center Dry Detention Basin #2
PRI_69	PRIVATE	Independence Place Dry Basin
PRI_70	PRIVATE	St. Anthony Credit Union Dry Detention Basin
PRI_71	PRIVATE	Kentuckiana Medical Center Dry Detention Basin #3
PRI_72	PRIVATE	Kentuckiana Medical Center Underground Detention.
-	PRIVATE	Renaissance Detention Dry Basin #2
-	PRIVATE	Renaissance Detention Dry Basin #1
-	PRIVATE	Traditions Detention Basin
PRI_76	PRIVATE	Floyd Medical Detention Basin

Table 12: Town of Clarksville Stormwater Outfall Inventory

ID	Owner	Structural Assessment	Diameter	Shape	Material	Latitude	Longitude
1	Town					38.26955	-85.7534
2	IDNR	Sound	15	Circular	HDPE	38.27592	-85.7634
3	Town	Sound	24			38.27728	-85.7648
4						38.27739	-85.7644
5	Colgate Company		Unknown			38.27922	-85.7654
6	Town	Sound	24	Circular	Cast Iron	38.28012	-85.7643
7	Flood Commission		8	Circular	VCT	38.28032	-85.7632
8	Town	Sound	18	Circular	CMP	38.28016	-85.7618
9	Town	Sound	36	Circular	RCP	38.28061	-85.7601
10	Town		84	Circular	RCP	38.28163	-85.7602
11	Town		12	Circular	RCP	38.28256	-85.7617
12	Town	Sound	18	Circular	VCP	38.28258	-85.7635
13	Town		15			38.28209	-85.767
14	Town		30	Circular	CMP	38.28421	-85.7682
15	Town	Sound	30			38.28674	-85.768
16	Town	Sound	32x48	Rectangular	Concrete	38.28863	-85.7789
17	Town	Sound	12	Circular	Unknown	38.29195	-85.7746

18	Town		15	Circular	PVC	38.29167	-85.7734
19	Town		12	Circular	CMP	38.29131	-85.7726
20	Town	Sound	30	Circular	Corr. Plastic	38.29059	-85.7707
21	Town					38.2897	-85.7685
22	Town	Sound	12	Circular	RCP	38.28856	-85.7664
23	Town		24	Cir		38.28884	-85.7648
24	Town		24			38.28913	-85.7625
25	Town	Sound	15	Circular	Corr. Metal	38.2891	-85.7617
26	Town		>24		Ditch	38.28933	-85.7617
27	INDOT	Sound	24	Circular		38.29233	-85.7633
28	Town		12	Circular		38.29341	-85.7585
29			48		RCP	38.29475	-85.7579
30	Town		15		RCP	38.29531	-85.7584
31	Town	Sound				38.28944	-85.7648
32	Town		30		RCP	38.29448	-85.775
33	Private					38.29541	-85.7824
34	Town	Sound	36	Circular		38.30295	-85.788
35	Town	Sound	30	Circular	CMP	38.30479	-85.7896
36	Town					38.30958	-85.7874
37	Town					38.32232	-85.777
38						38.32229	-85.7745
39						38.32239	-85.7747
40						38.32233	-85.7737
41						38.32266	-85.7729
42	Town		42		RCP	38.32275	-85.7728
43						38.32283	-85.7728
44			18			38.32294	-85.7717
45						38.32345	-85.7708
46						38.32348	-85.7707
47	Town		36		RCP	38.32361	-85.7776
48						38.32326	-85.779
49	Town	Sound	12	Circular	Corr. Plastic	38.32372	-85.7846
50	Town	Cracking	24	Circular	Steel	38.32858	-85.7957
51	Town	Sound	12	Circular	Concrete	38.3301	-85.7961
52		Sound	12	Circular	Concrete	38.33175	-85.7965
53		Sound	24	Circular	Concrete	38.33399	-85.7949
54						38.34348	-85.771
55						38.34347	-85.7697

56	Town	Sound	24	Circular	Corr. Plastic	38.36015	-85.7651
57	Town	Sound		Ditch		38.36394	-85.7678
58	Town	Sound	15	Circular	Concrete	38.3642	-85.768
59	Town	Sound	18	Circular	HDPE	38.36463	-85.7686
60					Concrete	38.3651	-85.7692
61						38.36599	-85.7703
62						38.36635	-85.7708
63						38.36646	-85.7715
64			15	Cir		38.3664	-85.7721
65	Town					38.36653	-85.7726
66	Town			Cir	RCP	38.36626	-85.7734
67	Town					38.36378	-85.7662
68	Town	Sound	18	Circular	Corr. Plastic	38.36518	-85.7669
69	Town	Sound	12	Circular	Corr. Plastic	38.36666	-85.7675
70	Town	Sound	12	Circular	Corr. Plastic	38.36757	-85.7676
71	Town	Sound	24	Circular	Corr. Plastic	38.36852	-85.7686
72	Town	Sound	18	Circular	Corr. Plastic	38.36886	-85.7695
73						38.36998	-85.7663
74	Town	Sound	12	Circular	Concrete	38.37432	-85.7746
75	Town	Sound	15	Circular	Concrete	38.37441	-85.7749
76	Town	Sound	24	Circular	Corr. Plastic	38.37555	-85.7753
77	Town	Sound	24	Circular	Concrete	38.37631	-85.7757
78	Town	Sound	112	Circular	Concrete	38.37657	-85.776
79	Town	Sound	30	Circular	Concrete	38.37785	-85.7767
80	Town	Sound	24	Circular	Concrete	38.37822	-85.7773
81	Town	Sound	18	Circular	Corr. Metal	38.37851	-85.7775
82	Town	Sound	36	Circular	Corr. Metal	38.37854	-85.7779
83	Town	Sound	18	Circular	Corr. Plastic	38.37923	-85.7794
84	Town	Sound	12	Circular	Concrete	38.37892	-85.7797
85	Town	Sound	30	Circular	Corr. Plastic	38.37935	-85.7802
86	Town		48		RCP	38.37919	-85.7817
87	Town	Sound	18	Circular	Corr. Metal	38.37985	-85.7803

88	Town	Sound	18	Circular	Corr. Plastic	38.37985	-85.7805
89	Town	Sound	18	Circular	Corr. Plastic	38.37992	-85.7808
90	Town	Sound	12	Circular	Concrete	38.38002	-85.7814
91	Town	Sound	12	Circular	Corr. Plastic	38.38055	-85.7823
92	Town	Sound	18	Circular	Corr. Plastic	38.38088	-85.7829
93	Town	Sound	60	Circular	Concrete	38.38089	-85.7829
94						38.38105	-85.7828
96	Town	Sound	15	Circular	HDPE	38.3835	-85.7804
97	Town	Sound	18	Circular	CMP	38.38351	-85.7802
98	Town	Sound		Circular	Steel	38.38438	-85.7776
99	Private		30	Circular	RCP	38.36918	-85.7654
103	Town		30	Circular		38.3087	-85.7875
104	Town		84	Circular	Steel	38.28169	-85.7603
105	Town		15	Circular	RCP	38.32002	-85.7819
106	Town		12	Circular	RCP	38.27017	-85.755
107	Town		12	Circular	RCP	38.27093	-85.7562
108	Town		12	Circular	RCP	38.27145	-85.7571
109	Town		12	Circular	RCP	38.27281	-85.7591
1000	Town	Sound	24	Circular		38.28911	-85.7801

Town of Sellersburg

Water Quality Characterization Report

MS4 Permit #: INR040116

March 2023

TOWN OF SELLERSBURG 1890

OHM Advancing Communities®

Table of Contents

OHM Advisors
400 Missouri Avenue, Suite 100
Jeffersonville, IN 47130
www.OHM-Advisors.com

Table of Revisions

The following table summarizes revisions, additions, deletions, etcetera to the contents of this report:

Date	Revised Pages/Appendices	Summary of Change

Primary MS4 Contact

Bart Meyer
MS4 Compliance Coordinator
316 E. Utica Street
Sellersburg, IN 47172
Phone: 812-246-3821

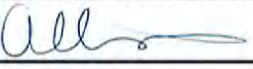
WQCR Certification

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 the 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.

Qualified Professional:

Name: Allison Padron, PE

Title: Project Manager, OHM Advisors

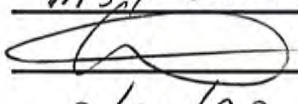
Signature: 

Date: 3/17/2023

MS4 Operator or Designee:

Name: BART Meyer

Title: MS4 Coordinator

Signature: 

Date: 3/21/23

1.0 Purpose

This water quality assessment report is intended to accompany the Southern Indiana Stormwater Advisory Committee (SWAC) Regional Water Quality Characterization Report (WQCR). This component of the WQCR contains information specific to the Town of Sellersburg as a method for further analyzing water quality within the MS4 boundaries, and using that information to guide their MS4 Program as they begin implementing the Indiana MS4 General Permit (INR040000) and Indiana Construction Stormwater General Permit (INRA00000).

2.0 Assessment of Land Use

The Town of Sellersburg is a 7.4 square mile (4753 acre) area located along Interstate I-65 north of the City of Jeffersonville and the Town of Clarksville. Interstate I-65 and US-31 form a corridor that encompasses the majority of the urbanized portion of the Town of Sellersburg, with additional incorporated areas extending past I-65 to the northwest, called Covered Bridge, and toward the Clark County Airport to the southeast. The Town consists of primarily low intensity residential and agricultural land uses with pockets of industrial and commercial uses. The Town of Sellersburg's MS4 area refers to the entirety of the Town's corporate boundaries seen in Figure 1. Below in Table 1, is a breakdown of land use within the Town of Sellersburg.

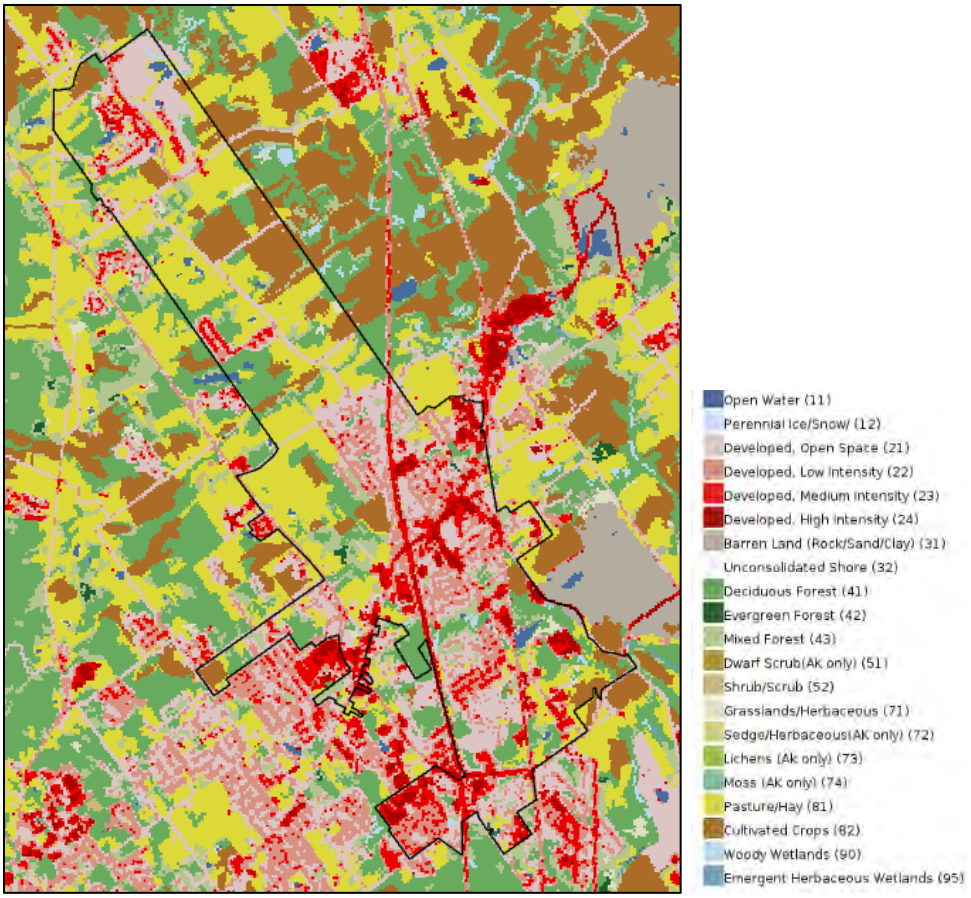


Figure 1. Land Use Map (NLCD, 2019)

Table 1: Land Use for Sellersburg MS4 Area

Category	Acres	Percentage
Hay/Pasture	1001.5	21.1%
Developed, Low Intensity	882.7	18.6%
Developed, Medium Intensity	645.9	13.6%
Developed, Open Space	608.5	12.8%
Deciduous Forest	592.7	12.5%
Cultivated Crops	420.5	8.9%
Developed, High Intensity	271.7	5.7%
Mixed Forest	188.3	4.0%
Herbaceous	41.2	0.9%
Open Water	36.8	0.8%
Woody Wetlands	29.2	0.6%
Barren Land	9.4	0.2%
Evergreen Forest	6.3	0.1%
Shrub/Scrub	5.4	0.1%
Emergent Herbaceous Wetlands	1.8	0.0%
TOTAL:	**4,741.7**	**100.0%**

Source: National Land Cover Database (NLCD, 2019)

Land use beyond the boundaries of the Town of Sellersburg consists of the City of Jeffersonville to the south and the Town of Clarksville to the southwest, both of which are highly developed. To the north and east of the Town are mostly rural areas in Clark County.

3.0 Best Management Practices (BMPs)

The following section describes the Town of Sellersburg's efforts to improve stormwater quality through the MS4 program by implementing the six (6) Minimum Control Measures (MCMs), including structural and non-structural BMPs.

3.1 Structural BMPs

Within Sellersburg's storm sewer system, there are 56 outfalls; 196 outlets; 115 manholes; and 609 catch basins/inlets; 7.85 miles (41,450.6 feet) of pipe/culvert; 0.36 miles (1,902 feet) of concrete channel; and 0.88 miles (4,638 feet) of earthen/riprap/roadside ditches or channels. This does not include natural open channels flowing through the Town. Figure 2 shows the locations of outfalls, manholes, detention basins, and pipes/culverts that have been mapped in Sellersburg (Sellersburg, GIS). Within the Town of Sellersburg, there are 5 mapped detention/retention basin structural BMPs. For more detailed information about the individual structures see Tables 8 and 9 that list the identification number, structural condition, and geographic coordinate at the end of the report.

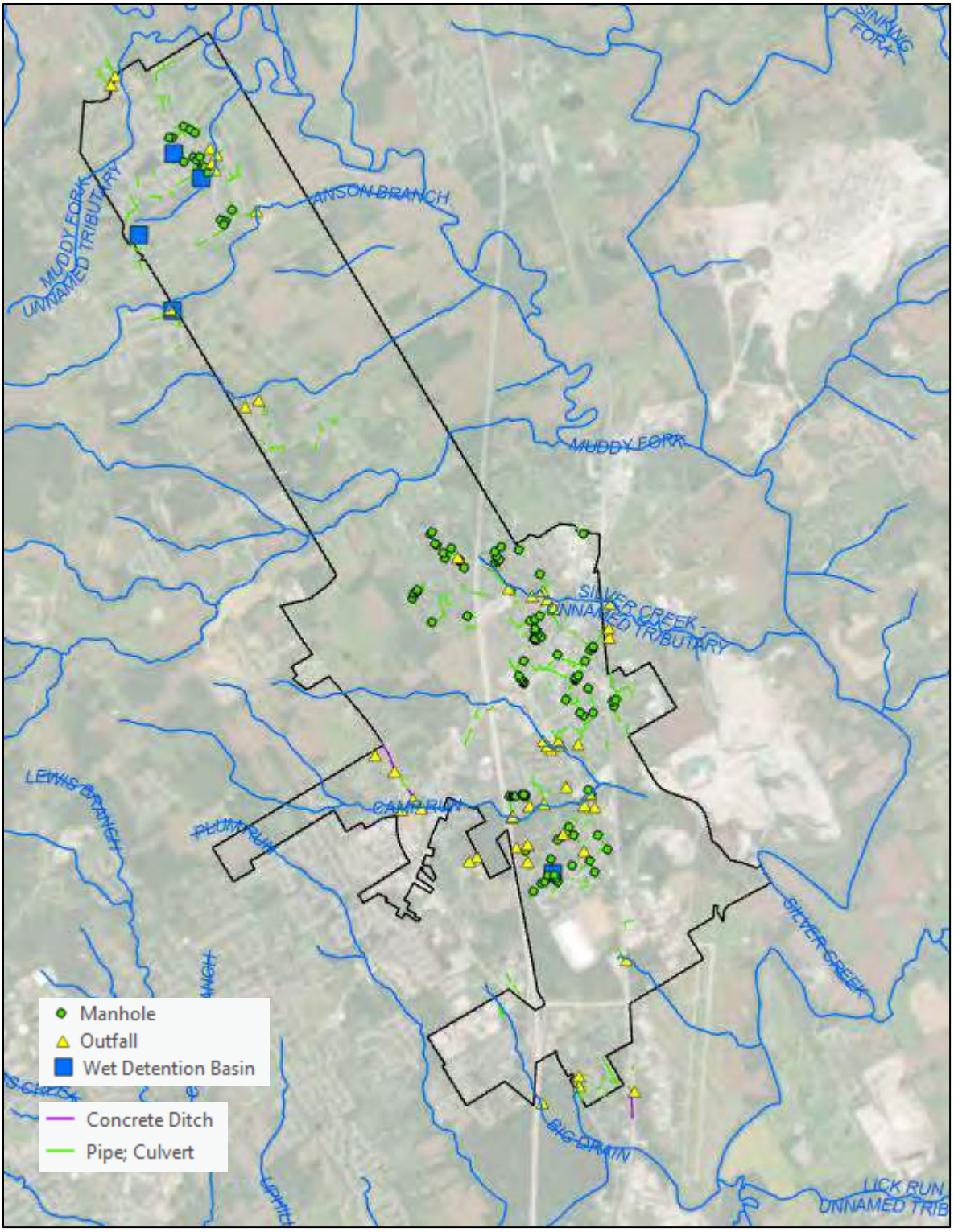


Figure 2. Mapped Detention Basins, Outfalls, Manholes, Pipes, and Channels (Sellersburg, GIS)

3.2 Non-Structural BMPs

3.1.1 Ordinances

The Town of Sellersburg maintains legal authority to administer the MS4 program and ensure compliance through adopted ordinances. The Town of Sellersburg utilizes the following ordinances:

- IDDE, EPSC, Post-Construction, Quantity: Sellersburg Stormwater Ordinance, adopted January 2021

In January 2021, the Town adopted the Stormwater Technical Standards Manual for the Town of Sellersburg, Indiana, which contains methodologies for determining runoff rates, storage volumes, and BMP sizing. It also contains design standards and specifications for open channels, construction site stormwater pollution prevention standards, and controlling peak flows.

3.1.2 Partnerships

The Town actively participates in the Southern Indiana Stormwater Advisory Committee (SWAC), which provides a forum for public education, outreach, participation, and involvement, as well as coordinated implementation of the MS4 program in participating communities. Participating communities include: Town of Sellersburg, the City of Jeffersonville, Floyd County, the Town of Clarksville, the Town of Georgetown, the City of New Albany, the Oak Park Conservancy District, and the City of Madison.

Sellersburg has an effective Memorandum of Agreement (MOA) with Clark County SWCD to team together on stormwater and water conservation activities regarding public outreach and participation, as well as construction site inspection and stormwater pollution prevention (SWPPP) plan reviews. This has benefitted the citizens of Sellersburg through programmatic additions involving outreach, training, and testing. The agreement has been in place since the first permit term.

3.1.3 MCM 1 & 2 – Public Education and Outreach; Participation and Involvement

The Town maintains a website with information on the stormwater and MS4 programs, as well as on their social media pages. The SWAC has developed and maintained a stormwater website and social media page as well. The SWAC website contains all of the brochures, guidebooks, and manuals developed by the SWAC, which are available for download. Waterway identification signs have been installed by the Town in high traffic areas to educate MS4 constituencies about the stormwater drainage system.

Through the MOA with the SWCD, the Town has educated residents and students about stormwater at several events per year using stormwater exhibits and the annual county 4-H fair and the Sellersburg Celebrates Festival. In coordination with the Clark County Solid Waste Management District (SWMD), the Town encouraged and tracked the amount of household hazardous waste (HHW) collected.

3.1.4 MCM 3 – Illicit Discharge Detection and Elimination

The Town Stormwater Ordinance includes Illicit Discharge Detection and Elimination (IDDE) requirements, which defines and prohibits illicit discharges and establishes an escalating enforcement policy. The Town previously mapped 100% of the stormwater drainage system, including outfalls and conveyances, and continues to map infrastructure as it is built. The Town of Sellersburg developed and implemented an Illicit Discharge

Detection and Elimination Standard Operating Procedure (SOP) to specify procedures for identifying illicit discharges via a dry weather screening program, conducted in conjunction with MS4 mapping. The Town has educated citizens and trained public employees about the hazards associated with illicit discharges and improper waste disposal.

3.1.5 MCM 4 – Construction Site Stormwater Runoff

The Town of Sellersburg adopted the Stormwater Ordinance in January 2021. This ordinance includes construction and post-construction stormwater runoff requirements. The Town continues to implement this ordinance, which specifies requirements for review of construction site BMP plans, installation of erosion prevention and sediment control BMPs, inspection of active sites, and escalating enforcement procedures. The Town of Sellersburg adopted a Stormwater Technical Standards Manual in January 2021, which includes design specifications and selection guidance for both construction and post-construction BMPs approved for installation by the Town.

The Town, regardless of the amount of land disturbance, can require pre-treatment BMPs for proposed hot spot developments in accordance with provisions contained in the Stormwater Technical Manual. Post-construction BMPs are required to be inspected and maintained regularly in accordance with the Operation and Maintenance Manual required to be prepared for each BMP.

3.1.6 MCM 5 – Post-Construction Stormwater Runoff

Through a MOA with the Clark County SWCD, the Town of Sellersburg reviews construction plans, and associated stormwater pollution prevention plans (SWPPP), and issues Perimeter Control Permits and Stormwater Quality Management Permits. The Town has implemented requirements for self-inspections, and with assistance from the Clark County SWCD, conducts inspections of construction sites to ensure compliance with the Sellersburg Stormwater Ordinance.

The Town continues the implementation of the Qualified Professional Inspector (QPI) program, which trains individuals in proper construction and post-construction stormwater runoff BMP installation and inspections. Provisions of the Sellersburg Stormwater Ordinance specify the requirements for training, education and certification of individuals involved with self-inspection at construction sites. The QPI Training Program was developed and implemented through the SWAC and the Clark County SWCD.

3.1.7 MCM 6 - Municipal Operations Pollution Prevention and Good Housekeeping

The Town of Sellersburg has implemented many pollution prevention and good housekeeping practices to prevent or reduce pollutant runoff from municipal operations, such as regular stormwater drainage system maintenance and cleaning, street sweeping, and leaf and woody debris collections. Also, controls for reducing discharges from municipal facilities and operations have been put in place, such as implementing BMPs at the vehicular maintenance facility, minimizing the use of herbicides, pesticides, and fertilizers, and storing deicing materials under cover. Municipal staff are regularly training in pollution prevent practices.

4.0 Receiving Waters

The Town of Sellersburg has seven (7) receiving waters. Table 2 below breaks down the length and the percentage each receiving water makes up of the total receiving water area. Most of Camp Run is located within Sellersburg limits. Outside of the Town limits, most of the tributaries discharge to Muddy Fork, which discharges to Silver Creek, and eventually to the Ohio River. The Town is intersected by three watersheds, Elk Run-Muddy Fork, Pleasant Run-Silver Creek, and Jacobs Creek-Silver Creek, seen in Figure 3.

Table 2: Town of Sellersburg Receiving Waters

Receiving Water	Total Length (miles)	Percentage
Unnamed Tributaries	8.25	63.10%
Camp Run	2.02	15.48%
Anson Branch	1.17	8.97%
Elk Run	1.08	8.23%
Muddy Fork	0.27	2.10%
Plum Run	0.19	1.44%
Silver Creek	0.09	0.67%
TOTAL	**13.07**	**100%**

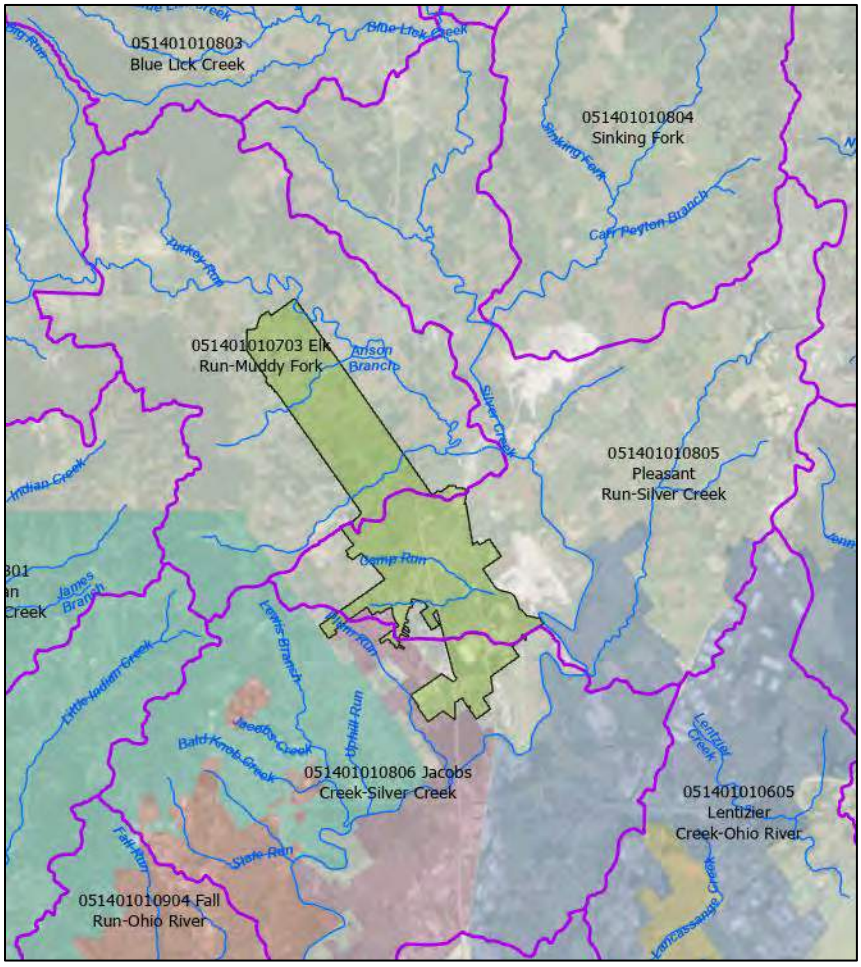


Figure 3. Major Receiving Waters and Watersheds for the Town of Sellersburg

5.0 303(d) Impaired Waters

The 2022 Integrated Water Monitoring and Assessment Report published by IDEM includes the 303(d) List of Impaired Streams for Indiana. One (1) stream segment on the border of Town of Sellersburg was listed on the 2022 303(d), seen in Table 3 and shown on the map in Figure 4. The impaired stream of Silver Creek is classified as impaired due to elevated levels of E. coli. The waters flowing through the town boundary of Sellersburg are either not assessed for impairments or do not have impairments. The impairments of E. coli in Silver Creek originate upstream of the Town's discharge locations.

Table 3: Sellersburg Impaired 303(d) Waters

Stream Name	Assessment ID	Impairment	TMDL
Silver Creek	INN0185_06	E. coli	None

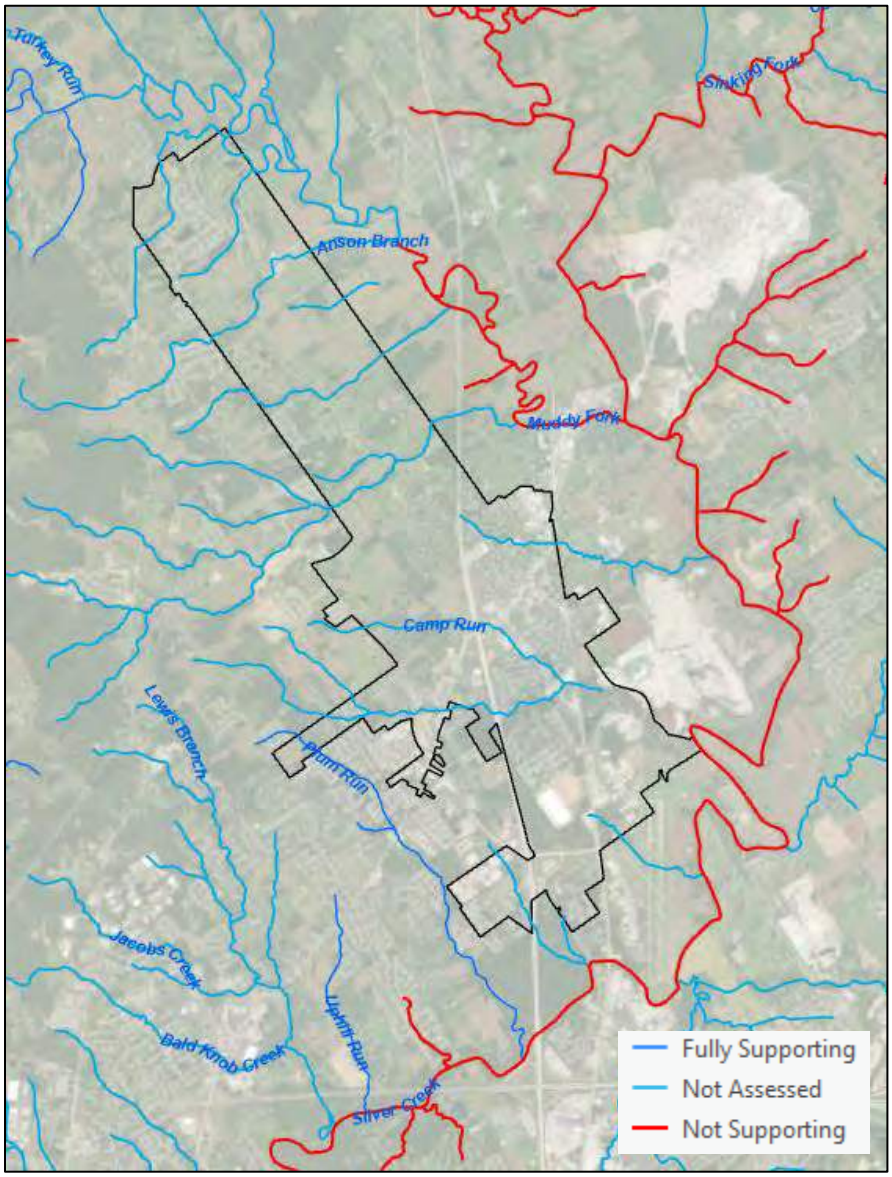


Figure 4. 303(d) Impaired Waters of the Town of Sellersburg

6.0 Known Sensitive Areas

Public Beaches/ Full Body Contact Recreation: There are no beaches or lakes with public swimming or recreational facilities other than enclosed public swimming pools. The Town is currently not aware of any locations within the MS4 area where full body contact recreation occurs.

Surface Drinking Water Intakes: Drinking water sources within the Town are derived primarily from local groundwater resources.

Wetlands: Wetland areas are considered to be environmentally sensitive features and are protected by the Clean Water Act. National Wetland Inventory (NWI) was used to estimate the extent and locations of wetlands and deep waters in Sellersburg. Based on these data, there are 207.4 acres of wetlands and deep water habitats within the Town. Table 4 shows the different types of wetlands within, as classified by the NWI.

Table 4: Types of Wetlands in Sellersburg

Type	Acres
Freshwater Emergent Wetland	5.1
Freshwater Forested/Shrub Wetland	87.7
Freshwater Pond	79.4
Lake	0.0
Riverine	35.2
Total	**207.4**

Source: NWI.

Wellhead Protection Areas: There are no wellhead protection areas (WHPAs) in the Town of Sellersburg.

Sinkhole Areas: Six (6) sinkhole areas were identified in Sellersburg through a review of Indiana Geological Survey (IGS) data. There are two sinkholes located west of I-65 by St. Joe Road. The rest of the sinkholes are located in the Southeast corner of the Sellersburg MS4 area.

Boat Launches: There are no boat launches within the Town of Sellersburg.

7.0 Existing and Available Monitoring Data

Complete Silver Creek Watershed Management Plan (2009): The Clark County Soil and Water Conservation District (SWCD) received a Nonpoint Source Section 319 Grant from IDEM in January 2007 to develop a watershed management plan for the Silver Creek Watershed. The study was completed and approved in April 2009. Silver Creek flows along 36.4 miles prior to discharging into the Ohio River, with Sellersburg near the center of the watershed. The report stated that sources of E. coli in water systems are likely attributed to failing septic systems, livestock in creeks, and sanitary sewer overflows. The closest data collection site to Sellersburg was on Utica Sellersburg Road Bridge (OSK140-0006). The following data and Table 5 results were collected at this site and included in the Silver Creek WMP:

- Macroinvertebrate Collection (MBI) Score: 53.18 – Fair
- Habitat Assessment (QHEI): 48 & 61.5 – Fair to Good

Table 5: Results from Silver Creek Watershed Management Plan Study (2009) for Site at Utica/Sellersburg Road Bridge

Site 2 Bridge on Utica/Sellersburg Road												
Date	**9/26/07**	**10/30/07**	**11/28/07**	**12/18/07**	**1/28/08**	**2/27/08**	**4/2/08**	**4/30/08**	**5/28/08**	**6/24/08**	**7/30/08**	**8/27/08**
E. coli	93.3 MPN	73.3 MPN	251.2 MPN	13.5 MPN	18.9 MPN	113.7 MPN	88.6 MPN	141.4 MPN	613.1 MPN	344.1 MPN	689.3 MPN	88.2 MPN
Nitrate	0.11 mg/L	2.27mg/L	2.27mg/L	2.10mg/L	1.75mg/L	1.27mg/L	0.89mg/L	0.48mg/L	0.92 mg/L	0.74 mg/L	0.44 mg/L	0.1 mg/L
Nitrite	ND	0.021 mg/L	0.004 mg/L	0.005 mg/L	0.005 mg/L	ND	ND	0.004 mg/L	0.008 mg/L	0.01 mg/L	0.011 mg/L	0.004 mg/L
Solids, Suspended	5.0mg/L	12mg/L	15mg/L	18mg/L	5.0mg/L	NA	35.0mg/L	10.0mg/L	12.0 mg/L	11.0 mg/L	8.0 mg/L	9 mg/L
Solids, Total	1580mg/L	528mg/L	330mg/L	224mg/L	252mg/L	NA	208mg/L	215mg/L	288 mg/L	271 mg/L	884 mg/L	325 mg/L
Solids, Dissolved	1450mg/L	479mg/L	297mg/L	198mg/L	229mg/L	NA	152mg/L	190mg/L	258 mg/L	297 mg/L	822 mg/L	304 mg/L
Nitrogen-Ammonia	0.1mg/L	<0.1mg/L	0.1mg/L	0.1mg/L	0.1mg/L	0.1mg/L	0.1mg/L	0.1mg/L	0.1 mg/L	NA	0.1 mg/L	0.1 mg/L
TKN	0.6mg/L	0.6mg/L	0.6mg/L	0.4mg/L	0.2mg/L	0.5mg/L	0.4mg/L	0.2mg/L	0.4 mg/L	NA	0.5 mg/L	0.4 mg/L
Phosphorus, Total	0.06mg/L	0.04mg/L	0.06mg/L	0.04mg/L	0.03mg/L	0.05mg/L	0.1mg/L	0.03mg/L	0.04 mg/L	NA	0.03 mg/L	0.04 mg/L
Conductivity	2448 us/cm	751 us/cm	500 us/cm	310 us/cm	327 us/cm	270 us/cm	169 us/cm	326 us/cm	426 us/cm	454 us/cm	1379 us/cm	494 us/cm
Dissolved Oxygen	4.46 mg/L	8.65 mg/L	10.86 mg/L	12.81 mg/L	14.98 mg/L	13.49 mg/L	10.28 mg/L	7.78 mg/L	5.91 mg/L	3.53 mg/L	4.3 mg/L	3.4 mg/L
Flow	No report	0.3ft/sec	1.2ft/sec	2.087 ft/sec	0.5ft/sec	0.8ft/sec	4.0ft/sec	1.5ft/sec	1.0 ft/sec	1 ft/sec	0.3 ft/sec	0.3 ft/sec
pH	7.52 su	7.14 su	7.20 su	7.79 su	7.80 su	6.97 su	6.70 su	7.18 su	7.51 su	7.28 su	6.99 su	6.78 su
TDS (Done in Field)	1222ppm	375ppm	343ppm	155ppm	180ppm	134ppm						
Temperature	22.2 C	11.4 C	8.5 C	4.8 C	1.9 C	3.0 C	10.8 C	14.1 C	19.5 C	22.9 C	25.4 C	21.2 C
Turbidity	5.93NTU	10.44NTU	13.00NTU	12.70NTU	6.81NTU	32.7NTU	25.7NTU	7.06NTU	9.20 NTU	8.54 NTU	7.93NTU	5.53NTU

Indiana STORET: The Monitoring Report was reviewed by Indiana STORET from data collected from Silver Creek, Site #OSK-08-0022 in the Town of Sellersburg. Eight (8) samples were collected throughout 2022. Data are summarized in Table 6 below. These data show acceptable levels of dissolved oxygen, temperature, pH, and conductivity.

Table 6: Results from Indiana STORET (2022) for Site # OSK-08-0022

Parameter	Average of Values	Indiana Water Quality Criterion
Dissolved Oxygen (DO)	8.02 mg/L	Greater than or equal to 4.0
Dissolved Oxygen Saturation	80.29%	--
Specific Conductance	287.09 uS/cm	<1,200
Temperature, water	16.80 deg C	Less than 32.2
Turbidity	12.501 NTU	--
pH	7.36	Between 6.0 and 9.0

8.0 Areas with Potential to Contribute to Water Quality Issues

On a watershed-level, the Silver Creek Watershed Management Plan study concluded that the primary BMPs needed to improve water quality would be removing sources of E. coli such as failing septic systems, bank stabilization, prescribed grazing for agricultural areas, agricultural buffers/filter strips to reduce sedimentation and nutrients, and urban buffers. The impairment from E. coli originates upstream of the Town of Sellersburg, but minimizing sanitary sewer overflows and potentially failing septic systems is more applicable to the Town, although most of the Town is connected to the sanitary sewer system. Methods to reduce E. coli sources include: educating the public about the importance of maintaining septic systems and reducing untreated animal waste from reaching the creeks. Many of Silver Creeks' impairments are the result of upstream activities.

In order to gain a better understanding of how the Town of Sellersburg's MS4 impacts the overall quality of nearby surface waters, the Town will continue to implement and enhance the Stream Visual Assessment Protocol (SVAP). The SVAP is used to visually assess physical characteristics of receiving water conditions at strategic locations throughout the Town for streams flowing into, through, and out of the Town's jurisdiction. Screenings are performed at four (4) locations every spring and fall, during leaf-off conditions. Data gathered from the SVAP will continue to allow the Town to identify remediation and improvement projects under the purview and jurisdiction of the MS4 program.

Sellersburg previously had three (3) active facilities that discharge stormwater from industrial activities under Rule 6 (IDEM, 2021). Two of the facilities permits expired in 2022 and one expired in 2020, all of which do not appear to have been renewed. These facilities are shown in Table 7.

Table 7. NPDES Active Industrial Stormwater Permits in the Town of Sellersburg

NPDES ID	Permit Name	Effective Date	Expiration Date	Location Address	SIC	Permit SIC Description
INRM00197	Manitowoc Beverage Equipment Incorp.	12/21/2015	12/20/2020	2701 Progressive Blvd	3556	Food Products Machinery
INRM02224	Clark County Regional Airport	6/08/2017	6/07/2022	7001 Airport Dr	4581	Airports, Flying Fields, & Services
INRM00617	LKQ Keystone Automotive	6/11/2017	6/10/2022	2100 Future Dr	5015	Motor Vehicle Parts

9.0 Recommendations

Based on the findings discussed, the Town of Sellersburg plans to continue to implement and enhance the MS4 program. The following additional BMPs are recommended for consideration.

- Finalize the development of the 2023 Qualified Professional Inspector (QPI) program and implement the plan the new permit term.
- Continue to implement the SVAP monitoring protocol to collect additional data in potentially impacted streams to help distinguish between stormwater, point and non-point pollution sources.

- Continue to discover, analyze, design, and execute stormwater capital improvement projects through a Stormwater Master Plan. Consideration should be given for town-wide and/or watershed-based stormwater master planning to assist with identification, prioritization, scheduling, and implementation of capital improvement projects.
- Perform additional mapping and structure assessments of the stormwater system, as required by the new MS4 General Permit.
- Continue inspecting and monitoring stormwater management activities occurring and BMPs being implemented at active construction sites, during post-construction activities, and at municipal facilities and during municipal operations.
- Further enhance the outreach and public participation program to educate residents and visitors about stormwater quality.

Table 8: Town of Sellersburg Detention Basin Inventory

ID #	Owner	Structural Assessment	Erosion	Outlet Face Type	Latitude	Longitude
42	Town	Sound	None	Headwall-Grate	38.43724	-85.79931
83	Town	Sound	None	N/A	38.4354	-85.79628
163	Town	Sound	None	Headwall-Grate	38.43043	-85.80231
210	Town	Sound	None	Headwall-Grate	38.42449	-85.79826
323	Town	Sound	None	Open Channel	38.38099	-85.75494

Table 9: Town of Sellersburg Stormwater Outfall Inventory

ID #	Owner	Structural Assessment	Erosion Present	Diameter (inches)	Shape	Material	Latitude	Longitude
93	Town	Sound	None	24	Circular	Cor. Plastic	38.4379	-85.796
97	Town	Sound	None	36	Circular	Concrete	38.4367	-85.795
100	Town	Sound	None	66	Circular	Concrete	38.4362	-85.795
111	Town	Sound	None	15	Circular	Cor. Plastic	38.4374	-85.795
181	Town	Sound	None	24	Circular	Cor. Plastic	38.4433	-85.806
195	Town	Sound	None	24	Circular	Cor. Plastic	38.4425	-85.806
211	Town	Sound	None	24	Circular	Cor. Plastic	38.4245	-85.798
217	Town	Sound	None	72	Circular	Concrete	38.4246	-85.799
218	Town	Sound	None	18	Circular	Concrete	38.4247	-85.799
242	Town	Sound	None	15	Circular	Cor. Plastic	38.4171	-85.79
251	Town	Sound	None	30	Circular	Cor. Plastic	38.4178	-85.789
282	Town	Sound	None	12	Circular	Cor. Plastic	38.4331	-85.79
302	Town	Sound	Moderate	36	Circular	Cor. Plastic	38.383	-85.752
344	Town	Sound	None	18	Circular	Cor. Plastic	38.3896	-85.774
351	Town	Sound	None	18	Circular	Cor. Plastic	38.3647	-85.751
364	Town	Sound	None	15	Circular	Cor. Plastic	38.3639	-85.751
375	Town	Sound	None	N/A	N/A	Unknown	38.3884	-85.772
396	Town	Sound	Moderate	N/A	Rectangular	Concrete	38.3638	-85.745
407	Town	Sound	None	N/A	N/A	Unknown	38.4033	-85.751
428	Town	Sound	None	12	Circular	Cor. Plastic	38.3819	-85.763
429	Town	Sound	None	24	Circular	Cor. Plastic	38.3815	-85.764
430	Town	Sound	None	N/A	N/A	Unknown	38.3863	-85.77
447	Town	Sound	None	36	Circular	CMP	38.3744	-85.747
458	Town	Unassessed	Unassessed	N/A	Unknown	Unknown	38.3623	-85.754
514	Town	Unassessed	Unassessed	N/A	Unknown	Unknown	38.3818	-85.758
528	Town	Unassessed	Unassessed	N/A	Unknown	Unknown	38.3829	-85.759
531	Town	Unassessed	Unassessed	N/A	Unknown	Unknown	38.3832	-85.758

ID #	Owner	Structural Assessment	Erosion Present	Diameter (inches)	Shape	Material	Latitude	Longitude
533	Town	Unassessed	Unassessed	N/A	Unknown	Unknown	38.3833	-85.758
545	Town	Unassessed	Unassessed	N/A	Unknown	Unknown	38.3843	-85.754
555	Town	Unassessed	Unassessed	N/A	Unknown	Unknown	38.3853	-85.771
556	Town	Unassessed	Unassessed	N/A	Unknown	Unknown	38.3853	-85.76
558	Town	Unassessed	Unassessed	N/A	Unknown	Unknown	38.3854	-85.76
560	Town	Unassessed	Unassessed	N/A	Unknown	Unknown	38.3855	-85.759
563	Town	Unassessed	Unassessed	N/A	Unknown	Unknown	38.3856	-85.769
568	Town	Unassessed	Unassessed	N/A	Unknown	Unknown	38.3864	-85.758
573	Town	Unassessed	Unassessed	N/A	Unknown	Unknown	38.3866	-85.756
574	Town	Unassessed	Unassessed	N/A	Unknown	Unknown	38.3866	-85.751
575	Town	Unassessed	Unassessed	N/A	Unknown	Unknown	38.3867	-85.752
597	Town	Unassessed	Unassessed	N/A	Unknown	Unknown	38.3876	-85.752
600	Town	Unassessed	Unassessed	N/A	Unknown	Unknown	38.3877	-85.752
608	Town	Unassessed	Unassessed	N/A	Unknown	Unknown	38.3881	-85.754
626	Town	Unassessed	Unassessed	N/A	Unknown	Unknown	38.3911	-85.756
628	Town	Unassessed	Unassessed	N/A	Unknown	Unknown	38.3913	-85.756
631	Town	Unassessed	Unassessed	N/A	Unknown	Unknown	38.3915	-85.755
633	Town	Unassessed	Unassessed	N/A	Unknown	Unknown	38.3917	-85.753
634	Town	Unassessed	Unassessed	N/A	Unknown	Unknown	38.3917	-85.757
635	Town	Unassessed	Unassessed	N/A	Unknown	Unknown	38.3918	-85.755
833	Town	Unassessed	Unassessed	N/A	Unknown	Unknown	38.4005	-85.751
867	Town	Unassessed	Unassessed	N/A	Unknown	Unknown	38.4013	-85.751
905	Town	Sound	None	24	Circular	Unknown	38.4026	-85.757
929	Town	Sound	None	N/A	Unknown	Unknown	38.4032	-85.757
933	Town	Sound	None	N/A	Unknown	Unknown	38.4034	-85.759
940	Town	Sound	None	N/A	Unknown	Unknown	38.4039	-85.762
941	Town	Sound	None	N/A	Unknown	Unknown	38.4039	-85.758
953	Town	Sound	None	N/A	Unknown	Unknown	38.4058	-85.763
962	Town	Sound	None	N/A	Unknown	Unknown	38.4062	-85.767

Town of Georgetown

Water Quality Characterization Report

MS4 Permit #: INR040096

March 2023

Town of GEORGETOWN INDIANA

OHM Advancing Communities®

Table of Contents

OHM Advisors
400 Missouri Avenue, Suite 100
Jeffersonville, IN 47130
www.OHM-Advisors.com

Table of Revisions

The following table summarizes revisions, additions, deletions, etcetera to the contents of this report:

Date	Revised Pages/Appendices	Summary of Change

Primary MS4 Contact

Bob Woosley, PE
Town Engineer w/ Heritage Engineering
603 North Shore Drive #204
Jeffersonville, IN 47130
Phone: 502-727-0079

WQCR Certification

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 the 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.

Qualified Professional:

Name:	Allison Padron, PE
Title:	Project Manager, OHM Advisors
Signature:	
Date:	3/17/2023

MS4 Operator or Designee:

Name:	Robert L. Woosley Jr., P.E.
Title:	Town Engineer
Signature:	
Date:	03/24/2023

1.0 Purpose

This water quality assessment report is intended to accompany the Southern Indiana Stormwater Advisory Committee (SWAC) Water Quality Characterization Report (WQCR). This component of the WQCR contains information specific to the Town of Georgetown as a method for further analyzing water quality within the MS4 boundaries, and using that information to guide their MS4 Program as they begin implementing the Indiana MS4 General Permit (INR040000) and Indiana Construction Stormwater General Permit (INRA00000).

2.0 Assessment of Land Use

The Town of Georgetown encompasses approximately 2.2 sq. miles (1,401 acres). Land use beyond the boundaries of the Town of Georgetown consists of Floyd County which is primarily rural. Harrison County is located along the western border. The developed areas of Georgetown generally follow I-64 and are commercial and residential. Figure 1 shows the land use within Georgetown, and Table 1 shows the breakdown of land use categories.

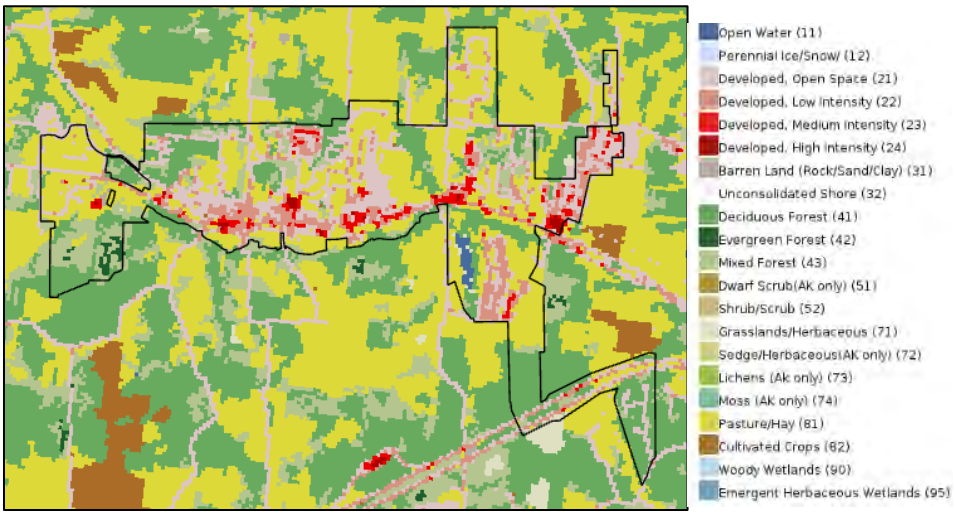


Figure 1. Land Use Map (NLCD, 2019)

Table 1: Land Use for Georgetown MS4 Area

Category	Acres	Percentage
Developed, Open Space	341.3	24.4%
Hay/Pasture	325.9	23.3%
Deciduous Forest	288.0	20.6%
Developed, Low Intensity	222.2	15.9%
Mixed Forest	99.7	7.1%
Developed, Medium Intensity	87.5	6.3%
Developed, High Intensity	16.6	1.2%
Herbaceous	8.1	0.6%
Evergreen Forest	7.3	0.5%
Open Water	2.7	0.2%
TOTAL:	**1399.3**	**100.0%**

Source: National Land Cover Database (NLCD, 2019)

3.0 Best Management Practices (BMPs)

The following section describes the Town of Georgetown's efforts to improve stormwater quality through the MS4 program by implementing the six (6) Minimum Control Measures (MCMs), including structural and non-structural BMPs.

3.1 Structural BMPs

Within Georgetown's storm sewer system, they have mapped outfalls, manholes, catch basins/inlets, pipe, and concrete/earthen/riprap channels/roadside ditches, with the data stored in GIS. The Town has also mapped structural BMPs, such as detention/retention basins. The stormwater system is regularly inspected and maintained.

3.2 Non-Structural BMPs

3.1.1 Ordinances

The Town of Georgetown maintains legal authority to administer the MS4 program and ensure compliance through adopted ordinances. The Town of Georgetown utilizes the following ordinances:

- IDDE, EPSC, Post-Construction: Ordinance Regulating the Oversight and Management of Storm Water, Ord. No. G-12-2, adopted January 17, 2012.

The Town utilizes the Indiana Storm Water Quality Manual, which contains methodologies for determining runoff rates, storage volumes, and BMP sizing. It also contains design standards and specifications for open channels, construction site stormwater pollution prevention standards, and controlling peak flows.

3.1.2 Partnerships

The Town actively participates in the Southern Indiana Stormwater Advisory Committee (SWAC), which provides a forum for public education, outreach, participation and involvement, as well as coordinated implementation of the MS4 program in participating communities. Participating communities include: Town of Georgetown, the Town of Sellersburg, the City of Jeffersonville, Floyd County, the Town of Clarksville, the City of New Albany, the Oak Park Conservancy District, and the City of Madison.

3.1.3 MCM 1 & 2 – Public Education and Outreach; Participation and Involvement

The Town maintains a website with a section on stormwater to educate residents about the stormwater and MS4 Program. The SWAC also maintains a website and social media pages to educate the public on stormwater quality. Each year, the SWAC hosts a Stormwater Awareness Week with multiple outreach messages regarding water quality, which culminates in the ORSANCO River Sweep event to encourage volunteers to clean debris from the shores of the Ohio River. Waterway identification signs have previously been installed by the Town in high traffic areas to educate MS4 constituencies about the stormwater drainage system.

3.1.4 MCM 3 – Illicit Discharge Detection and Elimination

The Town has educated citizens and trained public employees about the hazards associated with illicit discharges and improper waste disposal. The Town utilizes the SWAC SOP for outfall investigation to screen for illicit discharges and perform investigations.

3.1.5 MCM 4 and 5 – Construction Site and Post-Construction Stormwater Runoff

The city engineer reviews construction plans, and associated stormwater pollution prevention plans (SWPPP). During construction, inspections of construction sites to ensure compliance with the Stormwater Ordinance.

The SWAC, through Clark County, has developed the Qualified Professional Inspector (QPI) Program to train construction site inspectors responsible for inspecting construction and post-construction water quality BMPs. The updated Stormwater BMP Design Manual and related educational materials have been distributed and are available on the website.

3.1.6 MCM 6 - Municipal Operations Pollution Prevention and Good Housekeeping

The Town of Georgetown has implemented many pollution prevention and good housekeeping practices to prevent or reduce pollutant runoff from municipal operations, such as regular stormwater drainage system maintenance and cleaning, street sweeping, and leaf and woody debris collections. Also, controls for reducing discharges from municipal facilities and operations have been put in place, such as minimizing the use of herbicides, pesticides, and fertilizers, and minimizing the usage of deicing materials.

4.0 Receiving Waters

The Town of Georgetown has one (1) main receiving water, Georgetown Creek, with a number of unnamed tributaries flowing into Georgetown Creek. Table 2 below breaks down the length and the percentage of the total receiving water area. The vast majority of the Town of Georgetown is located in the Richland Creek-Indian Creek (HUC 051401040304) watershed, which flows west on Indian Creek into Harrison County. A small amount of the town is located in the Little Indian Creek (HUC 051401040302) watershed. The receiving waters and watershed can be seen in Figure 2.

Table 2: Town of Georgetown Receiving Waters

Receiving Water	Total Length	Percentage
Unnamed Tributaries	4.98	71.75%
Georgetown Creek	1.96	28.25%
TOTAL	**6.94**	**100%**

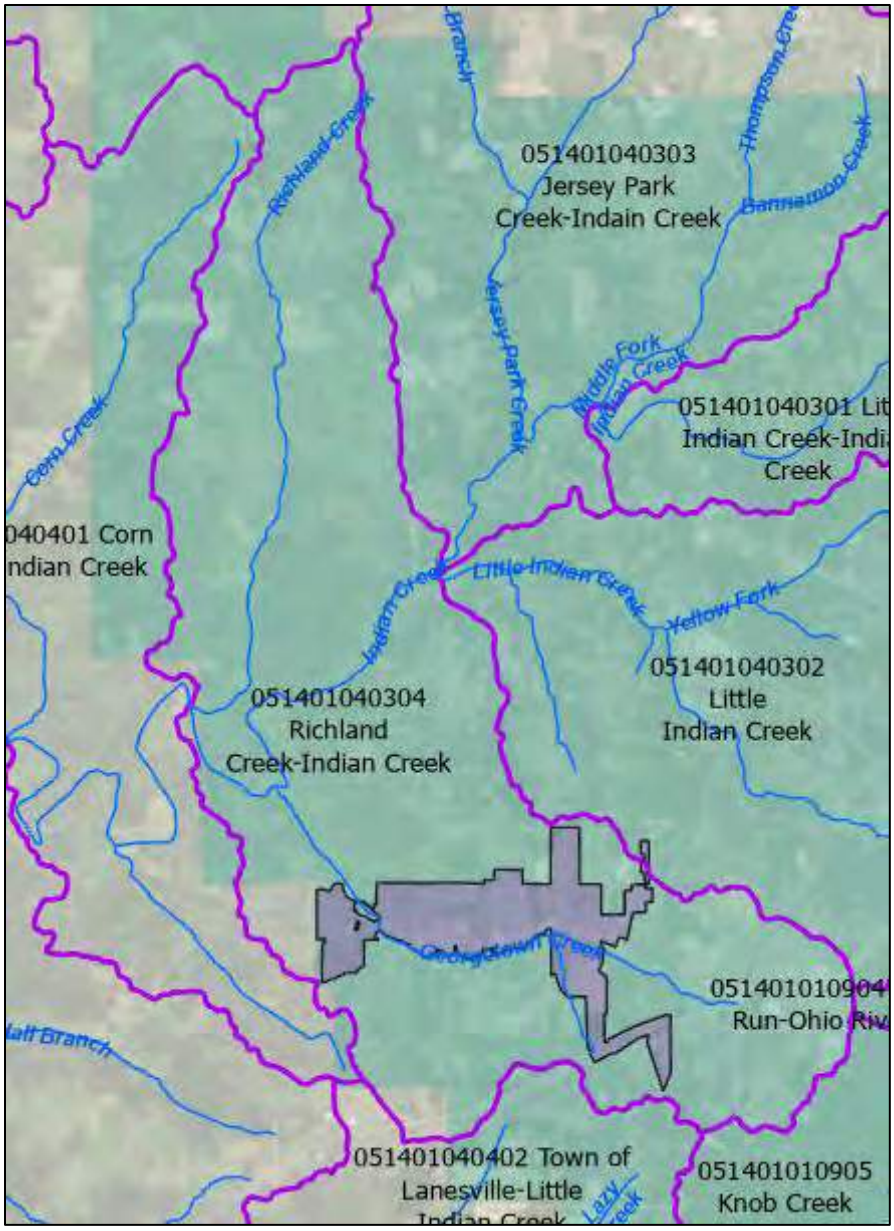


Figure 2. Receiving Waters and Watersheds for the Town of Georgetown

5.0 303(d) Impaired Waters

The 2022 Integrated Water Monitoring and Assessment Report published by IDEM includes the 303(d) List of Impaired Streams for Indiana. No stream segments in the Town of Georgetown MS4 area were listed on the 2022 303(d) list. The receiving waters and unassessed streams can be seen in Figure 3.

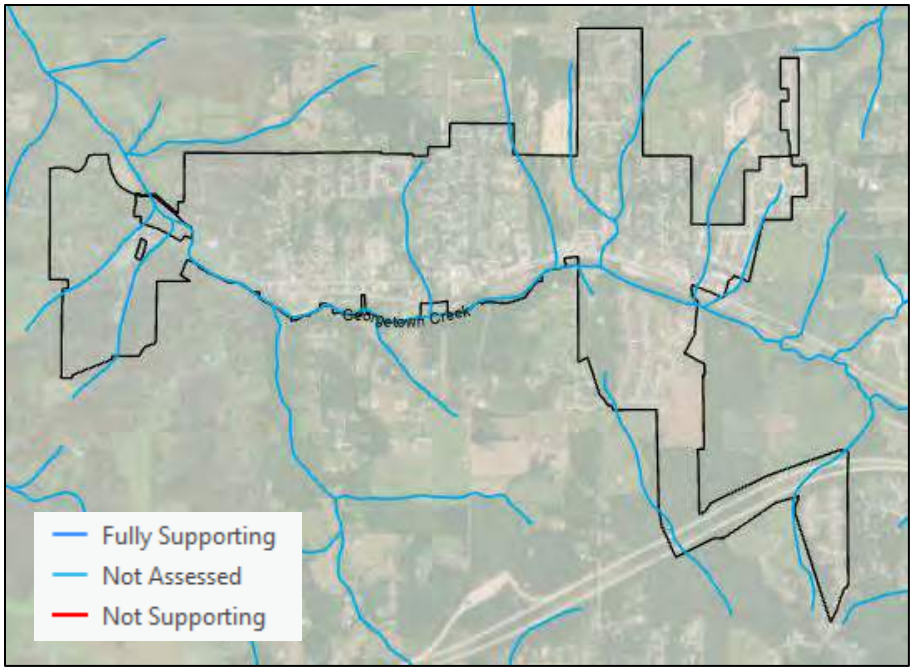


Figure 2. Receiving and Impaired Waters of Georgetown

6.0 Known Sensitive Areas

Public Beaches/ Full Body Contact Recreation: There are no beaches or lakes with public swimming or recreational facilities other than enclosed public swimming pools. The Town is currently not aware of any locations within the MS4 area where full body contact recreation occurs.

Surface Drinking Water Intakes: Drinking water sources within the Town are derived primarily from local groundwater resources through Indiana American Water.

Wetlands and Waterbodies: Wetland areas are considered to be environmentally sensitive features and are protected by the Clean Water Act. National Wetland Inventory (NWI) was used to estimate the extent and locations of wetlands and deep waters in Georgetown. Based on these data, there are 43.6 acres of wetlands and deep water habitats within the Town, as shown on the MS4 map in the Regional WQCR. The different types of wetlands, as classified by the NWI, as shown in Table 3.

Table 3: Types of Wetlands and Waterbodies in Georgetown

Type	Acres
Freshwater Emergent Wetland	1.3
Freshwater Forested/Shrub Wetland	10.9
Freshwater Pond	15.4
Lake	0.0
Riverine	16.0
TOTAL	**43.6**

Source: NWI.

Wellhead Protection Areas: There are no wellhead protection areas (WHPAs) in the Town of Georgetown.

Sinkhole Areas: Two (2) sinkhole areas were identified in Georgetown through a review of Indiana Geological Survey (IGS) data. IGS data show one sinkhole areas to near the west border and another area in the southeast corner.

Boat Launches: There are no boat launches within Georgetown.

7.0 Existing and Available Monitoring Data

In 2004, Harrison County to the west of Georgetown filed for a Section 205(j) funding grant to develop a Complete Indian Creek Watershed Management Plan. The plan was completed by a local firm and approved by IDEM in 2008 and includes a portion of Floyd County and the Town of Georgetown. There was one (1) monitoring station set up in Georgetown and two (2) in Floyd County. The following results were obtained:

- Bacteria results: 194 (max 300) – criteria not met
- Dissolved oxygen: 7.4 mg/L – criteria met
- Habitat score: 39.5 – Poor rating

The report identified direct sources of E. coli for the Indian Creek watershed as: cattle in creek, straight pipes, non-compliant wastewater treatments plants, sanitary sewer overflows (CSOs), stormwater discharges and dry-weather discharges from an illegal sanitary sewer connection. Indirect sources of E. coli bacterial contamination may be from overland runoff from pastures, manure piles, pet waste, wildlife, and failing septic systems.

A search for more recent (last 5 years) water quality and related data beyond the watershed study and Impaired 303(d) List from IDEM was performed using publicly accessible reports and databases published by the Indiana Department of Natural Resources (IDNR), United States Environmental Protection Agency (USEPA), and the United States Geological Survey (USGS). These agencies had not published more recent water quality data for streams in the Town of Georgetown.

8.0 Areas with Potential to Contribute to Water Quality Issues

Within Georgetown, there are zero (0) permitted active facilities that discharge stormwater from industrial activities under Rule 6 (IDEM, 2023).

The Indian Creek Watershed Management Plan found that, while difficult to quantify, failing and inadequate septic systems may be a source of E. coli and bacteria. Proper care and maintenance of septic systems is a primary way to keep incidental discharges from reaching local streams and water bodies.

Educating residents, businesses, and visitors about the importance of pollution prevention and ways to reduce potential pollutants from reaching waterways is a primary means of maintaining water quality.

9.0 Recommendations

Based on the findings of this water quality characterization report, the Town of Georgetown plans to continue to implement and enhance the MS4 program. The following additional BMPs are recommended for consideration.

- Finalize the development of the 2023 Qualified Professional Inspector (QPI) program for contractors and developers, and implement the plan for the new permit term.
- Continue to implement the SVAP monitoring protocol to collect additional data in potentially impacted streams to help distinguish between stormwater, point and non-point pollution sources.
- Continue inspecting and monitoring stormwater management activities occurring during construction.
- Routinely inspect and maintain BMPs being implemented at municipal facilities and during municipal operations.
- Further enhance the outreach and public participation program to educate residents and visitors about stormwater quality.

Oak Park Conservancy District

Water Quality Characterization Report

MS4 Permit #: INR040001

March 2023

OAK PARK CONSERVANCY DISTRICT

WASTEWATER / STORMWATER

OHM Advancing Communities®

Table Of Contents

OHM Advisors
400 Missouri Avenue, Suite 100
Jeffersonville, IN 47130
www.OHM-Advisors.com

Table of Revisions

The following table summarizes revisions, additions, deletions, etcetera to the contents of this report:

Date	Revised Pages/Appendices	Summary of Change

Primary MS4 Contact

Keith Ingram, Superintendent of Wastewater Treatment Operations
4230 Portage Place
Jeffersonville, IN 47130
Phone: 812-283-3960

WQCR Certification

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 the 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.

Qualified Professional:

Name: _Allison Padron, PE_____

Title: ___Project Manager, OHM Advisors_____

Signature: _____

Date:_____3/16/2023_____

MS4 Operator or Designee:

Name Bruce Herdt

Title: Chairman

Signature: _____

Date: 3-29-2023

1.0 Purpose

This water quality assessment report is intended to accompany the Southern Indiana Stormwater Advisory Committee (SWAC) Water Quality Characterization Report (WQCR). This component of the WQCR contains information specific to the Oak Park Conservancy District as a method for further analyzing water quality within the MS4 boundaries, and using that information to guide their MS4 Program as they begin implementing the Indiana MS4 General Permit (INR040000) and Indiana Construction Stormwater General Permit (INRA00000).

2.0 Assessment of Land Use

The Oak Park Conservancy District (OPCD) consists of approximately 2,183.4 acres of land. Land uses are primarily high density residential with a few commercial businesses, four schools, a large park, and some agricultural use. Below in Table 1, is a breakdown of land use within the OPCD. Over 65% of OPCD land is devoted to developed, residential areas. Figure 1 and Table 1 depicts semi-recent land use conditions in Oak Park.

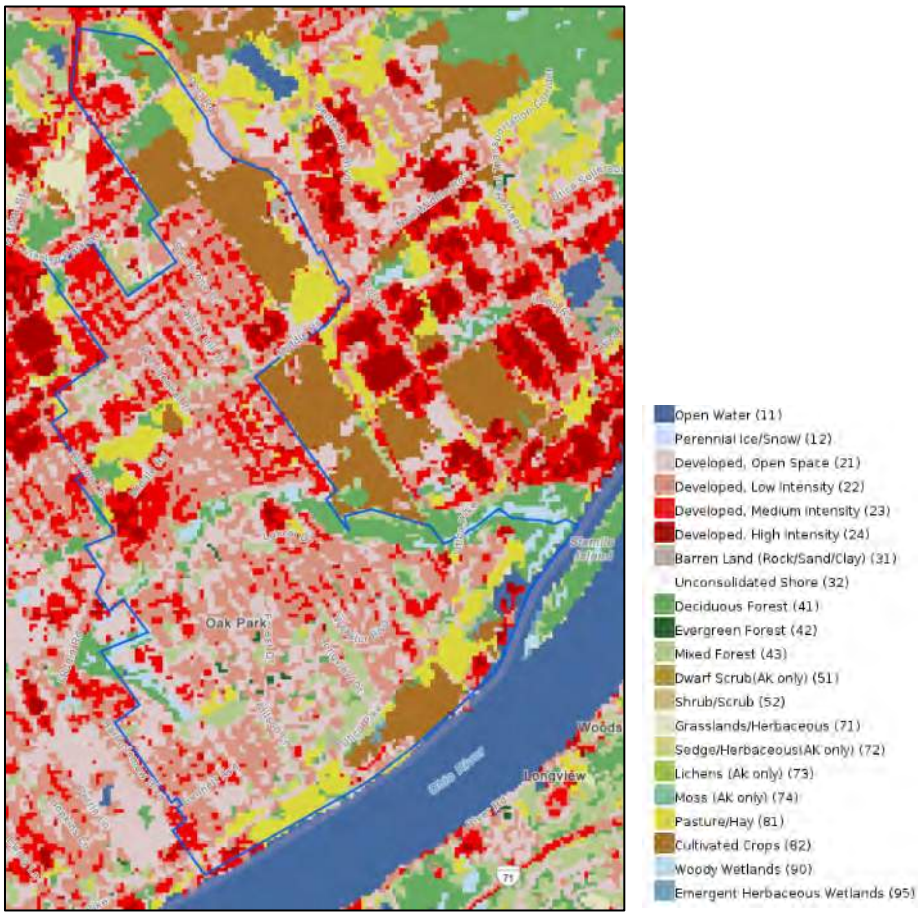


Figure 1. Land Use Map (NLCD, 2019)

Table 1. Land Use for Oak Park MS4 Area

Category	Acres	Percentage
Developed, Low Intensity	712.3	32.7%
Developed, Open Space	475.7	21.8%
Developed, Medium Intensity	277.2	12.7%
Cultivated Crops	181.6	8.3%
Hay/Pasture	169.9	7.8%
Deciduous Forest	153.5	7.0%
Mixed Forest	118.6	5.4%
Woody Wetlands	31.4	1.4%
Developed, High Intensity	28.7	1.3%
Open Water	17.5	0.8%
Barren Land	6.1	0.3%
Emergent Herbaceous Wetlands	3.1	0.1%
Evergreen Forest	2.9	0.1%
Herbaceous	1.3	0.1%
TOTAL:	**2180.0**	**100.0%**

Source: National Land Cover Database (NLCD, 2019)

While Oak Park Conservancy District is located within the borders of Jeffersonville, the district maintains their own MS4 permit, although many components of the programs are shared through a Memorandum of Agreement (MOA). The Jeffersonville area is a mix of agricultural, residential, institutional, industrial and commercial land uses, some of which contribute to the drainage area within Oak Park.

3.0 Best Management Practices (BMPs)

The following section describes Oak Park's efforts to improve stormwater quality through the MS4 program by implementing the six (6) Minimum Control Measures (MCMs) of the MS4 Program, including structural and non-structural BMPs.

2.1 Structural BMPs

Within Oak Park's storm sewer system, there are 146 outfalls; 78 manholes; 569 catch basins/inlets; 13.8 miles (72,924.8 feet) of pipe; and 5 miles (26,394 feet) of concrete/earthen/riprap channels/roadside ditches. Figure 2 shows the locations of outfalls and pipes/culverts that have been mapped in Oak Park (Oak Park, GIS). Within the Oak Park Conservation District, there are 7 reported detention/retention basin structural BMPs (City of Jeffersonville, GIS). The basins are primarily managed by the City of Jeffersonville. For more detailed information about the individual structures see Tables 5 and 6 that list the identification number, structural condition, and geographic coordinate at the end of the report.

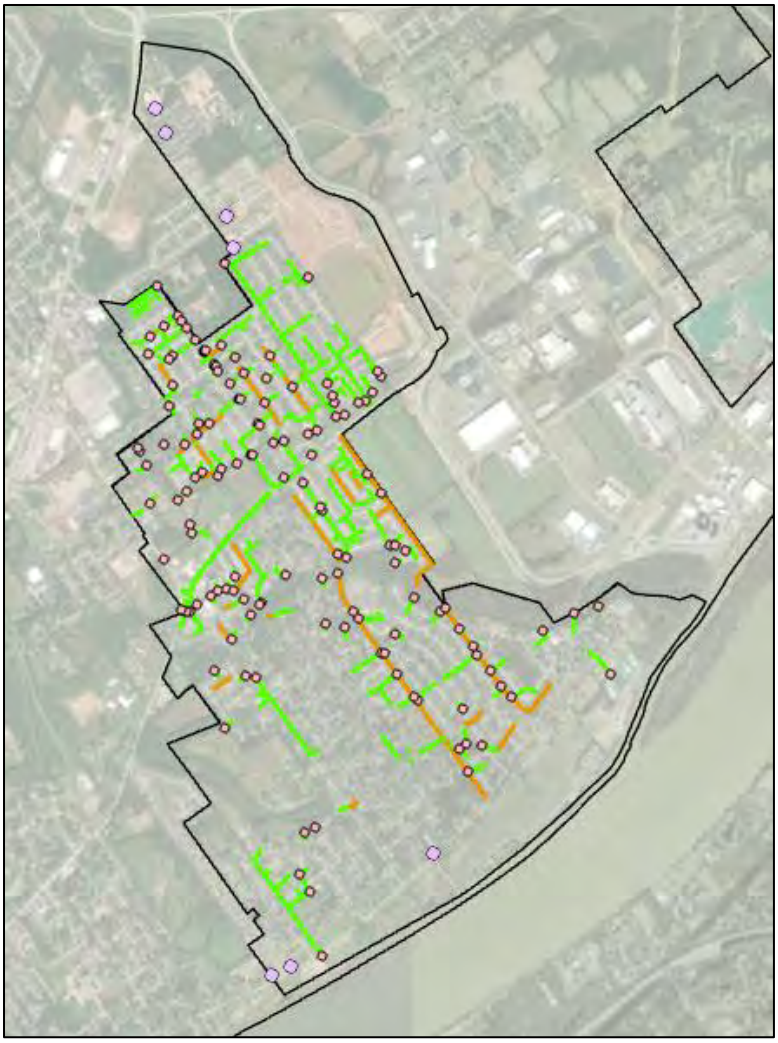


Figure 2. Mapped Detention Basins, Outfalls, Pipes, and Channels (Oak Park CD, GIS)

Due to the residential character of Oak Park, few intentionally constructed structural BMPs currently exist within the jurisdictional boundaries of the district. These structural BMPs are the standard requirements by the Indiana Department of Natural Resources for erosion and sediment control. Vegetated swales, rip rap for bank stabilization, and silt fences are a few of these requirements currently in use in Oak Park.

The structural BMPs are functioning well, with an exception some of the vegetated swales in established neighborhoods have disappeared due to numerous property fences being placed in the easements. This appears to be a widespread issue only causing serious drainage problems in a few places. Secondly, portions of vegetated swales and ditches clear of fences are not being maintained by property owners (and it has been shown in their deeds that these swales/ditches are to be maintained by the property owners). These swales/ditches are becoming blocked by trash, yard waste, and a generalized overgrowth of plants. This is leading to numerous drainage and safety concerns in these specific areas relating to mosquito breeding and the flooding of yards. Also, to be noted, Oak Park has been working with the power line company to remove limbs that they cut to keep them from blocking drainage in the district.

Overall, the existing structural BMPs have been very effective in helping lessen the impact of soil erosion along Lancassange Creek. Drainage in certain areas has been impeded by property fences in easements along vegetated swales.

2.2 Non-Structural BMPs

2.2.1 Ordinances

Oak Park utilizes City of Jeffersonville Stormwater Management Ordinance per an Interlocal Agreement. The City of Jeffersonville adopted the Stormwater Ordinance on April 21, 2021. This ordinance consolidated illicit discharge, construction, and post-construction requirements into a single ordinance. This ordinance was adopted in compliance with what was formerly known as Rule 13 and the amendments to Rule 5, which are now General Permit INR040000 and INRA0000. The ordinance will be reviewed in 2023/2024 to determine changes required to conform to the new general permits.

Oak Park adopted the City of Jeffersonville's Stormwater Technical Standards Manual, finalized in December 2020, which includes design specifications and selection guidance for both construction and post-construction BMPs approved for installation by the District. Post-construction BMPs are required to be inspected and maintained regularly in accordance with the Operation and Maintenance Manual required to be listed for each BMP. The post-construction requirements are applied for all sites disturbing 10,000 square feet or more of total land area within the City and Conservancy District.

2.2.2 Partnerships

In addition to the primary partnership with the City of Jeffersonville, the Clark County Soil and Water Conservation District (SWCD) provides Clark County communities, including Oak Park, with educational information concerning stormwater management. The SWCD educates residents and students about stormwater at several events per year using stormwater exhibits, presentations at local schools, and the annual county 4-H fair. A curbside recycling program for Clark County residents is also in place. The Clark County SWCD also promotes a free household hazardous waste and motor oil collection campaign available to all residents in Oak Park.

The Oak Park Conservancy District actively participates on the Southern Indiana Stormwater Advisory Committee (SWAC), which provids a forum for public education, outreach, participation and involvement as well as coordinated implementation of the MS4 program in participating communities. Participating communities include: the City of Jeffersonville, Floyd County, the Town of Sellersburg, the Town of Clarksville, the City of New Albany, the Oak Park Conservancy District, and the City of Madison.

4.0 Receiving Waters

Oak Park has one (1) main receiving water, Lancassange Creek. The rest of Oak Park's receiving waters are unnamed tributaries. Table 2 lists the name, length, and total percentage of the receiving waters.

Table 2: Oak Park's Receiving Waters

Receiving Water	Total Length	Percentage
Lancassange Creek	4.01	67.80%
Unnamed Tributaries	1.90	32.20%
TOTAL	**5.91**	**100%**

5.0 303(d) Impaired Waters

The 2022 Integrated Water Monitoring and Assessment Report published by IDEM includes the 303(d) List of Impaired Streams for Indiana. One (1) stream segment in the Oak Park MS4 area was listed on the 2022 303(d) List of Impaired Streams, shown in Table 3 and Figure 3. The listed stream is Lancassange stream, and 2.39 miles of the stream is impaired due to elevated E. coli bacteria.

Table 3: Oak Park Conservancy District Impaired 303(d) Waters

Stream Name	Assessment ID	Impairment	TMDL
Lancassange Creek	INN0165-T1010 and T1011	E. coli	None

Figure 3. 303(d) Impaired Waters of Oak Park

6.0 Known Sensitive Areas

Public Beaches/ Full Body Contact Recreation: Oak Park recognizes the significant recreational value of the Ohio River for boating, swimming and fishing. The storm water quality management plan has taken the recreational water quality standards into consideration in this planning document for BMPs particular to the River.

Surface Drinking Water Intakes: Drinking water sources within Oak Park are derived primarily from local groundwater resources.

Wetlands: Wetland areas are considered to be environmentally sensitive features and are protected by the Clean Water Act. The National Wetland Inventory (NWI) data was used to estimate the extent and locations of wetlands and deep waters in Oak Park. Based on these data, there are 89 acres of wetlands and lake or riverine habitats within the District. Table 4 shows the different types of wetlands within, as classified by the NWI.

Table 4: Types of Wetlands in Oak Park

Type	Acres
Freshwater Emergent Wetland	18.6
Freshwater Forested/Shrub Wetland	38.4
Freshwater Pond	16.6
Lake	0.0
Riverine	15.4
Total	**89**

Source: NWI, 2014.

Wellhead Protection Areas: There are two wellhead protection areas (WHPAs) in Oak Park which include the Watson Well Field and Southern Indiana Water Supply Well Field. The wellfields are located along the Ohio River and the associated WHPAs intersect the MS4 boundary and CSO area (SWIS, 1999). To date, one (1) stormwater outfall has been mapped in a WHPA within the City, located within the Watson Rural Water Company Well Field Five (5) Year Time of Travel Area (TOT5).

Oak Park utilizes the City of Jeffersonville's BMP Design Manual that encourages the use of non-infiltrative BMPs in WHPAs. In addition, the City of Jeffersonville's Zoning Code includes a Wellhead Protection Overlay District (WH-OL) to protect the safety of the City's public water supply. The Zoning Code requires review and approval by the water company prior to the City's issuance of an Improvement Location Permit for proposed developments within the WH-OL.

Sinkhole Areas: Two (2) sinkhole areas were identified in Oak Park through a review of Indiana Geological Survey (IGS) data. There is one sinkhole area located near the Ohio river. The other sinkhole is located in the northern part of the Oak Park boundary. Both sinkhole areas are located in residential areas.

Boat Launches: There are multiple boat launches, as well as private homes, with access the Ohio River along the river shores. The Admirals Anchor Marina is located on the Ohio River, with in-water docking and winter storage.

7.0 Existing and Available Monitoring Data

7.1 Fourteen Mile/Goose Creek Watershed Management Plan

Through the Clark County Soil and Water Conservation District (SWCD), the Fourteen Mile/Goose Creek Watershed Management Plan was developed using a Nonpoint Source Program Section 319 Grant from IDEM. These watersheds cover 108,193 acres in the eastern portions of Clark County, including part of Jeffersonville and Oak Park. The project was initiated out of concerns from residents regarding the karst topography and sinkholes, trash in the streams, septic smells, and seemingly uncontrolled development (outside of City limits). One sampling site (IDEM Site # OSK100-0001) was located on Lancassange Creek on the bridge over Allison Lane in Oak Park. Historical data indicated this site was last monitored in 2010 and tested for general water chemistry, E. coli, macroinvertebrates, and fish; the stream was determined to be impaired due to E. coli levels. Monitoring as part of the Watershed Management Plan indicated testing was performed in 2014/2015 when the site tested for:

- Nitrate: 8.26 mg/L (target < 1.5)
- Phosphorus: 0.0655 mg/L (target < 0.07)
- Turbidity: 4.75 NTU (target < 25)
- E. coli: 490.71 CFU/100ml (target <125) in 2014; 145.05 CFU/100ml in 2015
- Dissolved Oxygen (DO): 9.87 mg/L (target between 4-12)
- Biological Oxygen Demand (BOD): 3.5 mg/L (target < 2)
- pH: 5.52 (target between 6-9)
- Water Quality Index: 71.76% (target > 69%)
- Citizens Qualitative Habitat Evaluation Index (CQHEI): 59 (target > 60)
- Biological assessment Pollution Tolerance Index (PTI): Excellent Rating (2014 and 2015)

The residential and commercial nature of this monitoring site, as well as the backwater conditions from the Ohio River at this site likely contribute to the elevated nitrate, BOD, and E. coli levels.

A search for more recent (last 5 years) water quality and related data beyond the watershed study and Impaired 303(d) List from IDEM was performed using publicly accessible reports and databases published by the Indiana Department of Natural Resources (IDNR), United States Environmental Protection Agency (USEPA), and the United States Geological Survey (USGS). These agencies had not published more recent water quality data for streams in the Oak Park Conservancy District.

8.0 Areas with Potential to Contribute to Water Quality Issues

Available data from the 303(d) impairments, Fourteen Mile/Goose Creek Watershed Management Plan, and SVAP monitoring indicate that Lancassange Creek, being a more densely urbanized area, is more heavily impacted. These studies indicated issues associated with elevated bacteria, biological impairment, and potentially elevated nutrients. Although outside the jurisdiction, the more recent heavily industrial area of River Ridge to the north flows into Lancassange Creek and is also continually monitored through inspections due to the activities there which with potential for negative impacts to water quality.

In order to gain a better understanding of how Oak Park's MS4 program impacts the overall quality of nearby surface waters, the District will continue to implement and enhance the Stream Visual Assessment Protocol (SVAP). Data gathered from the SVAP will continue to allow the District to identify remediation and improvement projects under the purview and jurisdiction of the MS4 program.

The sources of water quality reduction in Lancassange Creek can generally be attributed to the high-density development and residential area. Within Oak Park, there are zero (0) facilities that discharge stormwater from industrial activities regulated under Rule 6 (IDEM, 2023). Oak Park will continue to invest in mapping, operating and maintaining the MS4. In addition, Long Term Maintenance and Operation Agreements are in effect to ensure proper operation of structural BMPs owned by other entities. Oak Park continues to invest in Capital Improvement Projects such as stream bank stabilization and scour remediation.

9.0 Recommendations

Based on the findings discussed, the Conservancy District plans to continue to implement and enhance the MS4 program. The following additional BMPs are recommended for consideration.

- Finalize the development of the 2023 Qualified Professional program and implement the plan the new permit term.
- Continue to implement the SVAP monitoring protocol to collect additional data in potentially impacted streams to help distinguish between stormwater, point and non-point pollution sources.
- Continue to discover, analyze, design, and execute stormwater capital improvement projects through an updated Stormwater Master Plan in combination with the City of Jeffersonville. Consideration should be given for city-wide and/or watershed-based stormwater master planning to assist with identification, prioritization, scheduling, and implementation of capital improvement projects.
- Continue inspecting and monitoring stormwater management activities occurring and BMPs being implemented at municipal facilities and during municipal operations.
- Further enhance the outreach and public participation program to educate residents and visitors about stormwater quality.

Table 5: Oak Park Detention/Retention Basin Inventory

Basin I.D	Basin Type (Ownership)	Basin Name	Oak Park Maintained	Longitude	Latitude
stb00202	Dry Detention (Comm Developer)	Eastern Heights Baptist Church	No	-85.7053	38.33795
stb00129	Dry Detention	Ellingsworth Commons	No	-85.6999	38.33052
stb00130	Retention	Ellingsworth Commons	No	-85.7003	38.33219
stb00171	Retention	Villages of Perrin Pointe 1	No	-85.6972	38.29136
stb00147	Retention	Villages of Perrin Pointe 2	No	-85.696	38.29174
stb00231	Retention	River Commons	No	-85.6862	38.29783
stb00111	Retention	Stonebridge	No	-85.7045	38.33669

Table 6: Oak Park Stormwater Outfall Inventory

Outfall ID	Outfall Material	Structural Condition	Outfall Diameter (in.)	Latitude	Longitude
1	Concrete	Sound		317056.2	1121879
46	Concrete	Sound	30	317443.9	1121314
55	Concrete	Sound		317198.7	1121094
63	Concrete	Sound		316921.6	1120898
79	Concrete	Sound		317542.3	1121187
84	Cor. Plastic	Sound	30	317616.7	1121067
99	Concrete	Sound		316871.5	1120537
105	CPP	Sound		317792.7	1120821
120	Cor. Plastic	Sound	12	317353.2	1120502
127	Cor. Plastic	Sound	15	317293.5	1120453
139	Cor. Plastic	Sound	18	317362.6	1119925
151	Concrete	Sound	15	317295.3	1119531
158	Concrete	Sound		317982.6	1120611
159	Concrete	Sound		317975.2	1120606
160	Concrete	Sound	60	317969.4	1120601
167	Cor. Plastic	Sound	12	317973	1120587
173	Cor. Plastic	Sound	12	317993	1120602
181	Cor. Plastic	Sound	24	318295.3	1120727
200	Cor. Plastic	Sound	12	318588.6	1120476
208	Concrete	Sound	66	318181.2	1120337
209	Concrete	Sound	66	318174.1	1120333
210	Concrete	Sound	54	318168.7	1120329
217	Cor. Plastic	Sound	12	318171.9	1120313
219	Cor. Plastic	Sound	12	318197.3	1120323
227	Cor. Plastic	Sound	15	318257.6	1120209
232	Cor. Plastic	Sound	42	320572.8	1119309
345	Concrete	Sound	30	318377.6	1122330
385	Concrete	Sound		320023.9	1122064
434	Concrete	Sound		321130.3	1119641
482	Cor. Plastic	Sound	15	320404.3	1119954
497	Cor. Plastic	Sound	12	320504.9	1119726
506	Concrete	Sound	18	320995.1	1119589
513	Grass/Earthen	Sound		320719	1119353
514	Cor. Plastic	Sound	15	320540.8	1119584
520	Concrete	Sound	18	321289.8	1119801
525	Concrete	Sound	18	321448	1120088

542	Concrete	Sound	12	321151.2	1119613
547	Concrete	Sound	36	321149.2	1119623
548	Concrete	Sound	36	321146.4	1119628
549	Concrete	Sound	36	321143	1119633
550	Concrete	Sound	36	321139	1119638
559	Cor. Plastic	Sound	18	321395.3	1120194
561	Cor. Plastic	Sound	18	318298.3	1118296
572	Cor. Plastic	Sound	18	318629.6	1118397
583	Cor. Plastic	Sound	15	318874.6	1118560
594	Concrete	Sound	24	319047.3	1119131
595	Concrete	Sound	12	317845.1	1118984
603	Cast Iron	Sound		318072.8	1119195
611	Concrete	Sound	18	318659.2	1119666
621	Concrete	Sound	12	317883.1	1119197
622	Cor. Plastic	Sound	15	319338	1118816
627	Concrete	Sound	30	319032.4	1119182
634	Concrete	Sound	12	318681.6	1119670
639	Concrete	Sound	12	318485.6	1119972
644	Concrete	Sound		318749.2	1120164
651	Cor. Plastic	Sound	12	319161.9	1119574
658	Concrete	Sound	42	320182.8	1119029
684	Cor. Plastic	Sound	12	319196.7	1120056
697	Concrete	Sound		319268.1	1120514
705	Concrete	Cracking		319697	1119899
708	Concrete	Sound	24	319546.4	1118828
717	Concrete	Sound	12	320091.7	1118558
732	PVC	Sound	6	316923.5	1117613
740	Cor. Plastic	Sound	12	316848.5	1118368
750	Steel	Sound	12	317196.6	1118766
753	Cor. Plastic	Sound	15	317595.5	1118768
760	Cor. Plastic	Sound	12	316713.7	1118627
764	Cor. Plastic	Partial Collapse	4	316659.2	1118690
768	Concrete	Sound		317452.4	1117676
771	Concrete	Sound		317639.6	1117836
776	Concrete	Sound		317783.2	1118118
793	Concrete	Sound		317920.4	1118211
810	Cor. Plastic	Sound	18	318243.6	1118144
813	Concrete	Sound	24	317744	1117040
820	Concrete	Sound	24	317607.6	1115478
825	Concrete	Sound		317711.4	1115506
841	Cor. Plastic	Sound	15	317615.9	1115511
852	Concrete	Sound	30	317844	1115625
857	Cor. Plastic	Sound	12	317542.1	1115522
952	Concrete	Sound	15	318931.3	1118550
968	PVC	Sound	12	319542.1	1118108
969	Steel	Sound	24	318361.9	1113218
974	Unknown	Sound	8	318178.2	1114347
981	Steel	Sound	12	318782.1	1114222
998	Concrete	Sound		321713.2	1116464
1005	Concrete	Sound		321928.2	1116679
1008	Cor. Plastic	Sound	12	321715.6	1116796
1023	Concrete	Sound		321632.8	1116789
1032	Concrete	Sound	15	321447.9	1117807

1033	Cor. Plastic	Sound	36	321180	1118191
1091	Concrete	Sound		320591.9	1116619
1096	Concrete	Sound		320764.3	1116551
1111	Concrete	Sound		320258.9	1117541
1116	Concrete	Sound		320276.5	1117461
1123	Concrete	Sound		319898.2	1118022
1150	Cor. Plastic	Sound	12	319569.8	1116210
1165	Concrete	Sound		318982.6	1114191
1167	Concrete	Settlement		319085	1115669
1198	Cast Iron	Sound	12	318255.1	1115916
1201	Steel	Sound	15	318411.7	1115942
1204	Steel	Sound	15	318565	1115918
1205	Cor. Plastic	Sound	15	318599.2	1116180
1208	Concrete	Sound		318740.5	1115746
1214	Steel	Sound	12	318092.1	1115798
1221	PVC	Sound	8	318898.6	1115436
1224	Steel	Sound	12	318500.6	1114965
1231	Steel	Sound	15	320273.7	1116160
1234	Steel	Sound	12	320354.9	1115250
1239	Concrete	Sound	12	320737.3	1115172
1263	Steel	Sound	12	321448.2	1114691
1264	Concrete	Sound		321505	1114670
1265	Concrete	Sound	12	321765.8	1114254
1273	Concrete	Sound	12	322087.2	1113810
1281	Concrete	Sound		320918.4	1115487
1286	Concrete	Sound		321013.7	1115345
1297	Concrete	Sound	21	321717.9	1115054
1309	Concrete	Sound		322151.8	1113764
1317	Cor. Plastic	Partial Collapse	8	323071.1	1113591
1345	Steel	Sound	24	322596.9	1115508
1346	Steel	Sound	48	322981.5	1115159
1349	Steel	Sound	15	323243.2	1114819
1350	Concrete	Sound		323320	1114652
1351	Concrete	Sound		323600.6	1114322
1352	PVC	Sound	12	323820.6	1114015
1362	Concrete	Full Collapse	18	322092.8	1115759
1373	Concrete	Sound		323133.8	1112892
1382	Concrete	Partial Collapse		323435.2	1112853
1389	Concrete	Sound		322998.6	1112802
1392	Concrete	Sound		323154.9	1112354
1405	Cor. Plastic	Sound	18	323996.5	1113820
1418	Steel	Partial Collapse	15	325949	1114272
1427	Steel	Sound	12	325723.2	1115581
1434	Concrete	Partial Collapse		320136.6	1111264
1436	Concrete	Sound		319931.8	1111153
1443	Concrete	Sound		319836	1110329
1451	Cor. Plastic	Sound	24	320062.7	1110000
1480	Steel	Sound	24	320302	1108725

City of Madison

Water Quality Characterization Report

MS4 Permit #: INR040061

March 2023

MADISON Indiana

OHM Advancing Communities

Table of Contents

OHM Advisors
400 Missouri Avenue, Suite 100
Jeffersonville, IN 47130
www.OHM-Advisors.com

Table of Revisions

The following table summarizes revisions, additions, deletions, etcetera to the contents of this report:

Date	Revised Pages/Appendices	Summary of Change

Primary MS4 Contact

Brian Jackson
Utility Manager
101 W. Main St.
Madison, IN 47250
Phone: 812-265-8326

WQCR Certification

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 the 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.

Qualified Professional:

Name: Allison Padron, PE

Title: Project Manager, OHM Advisors

Signature: [signature]

Date: 3/17/2023

MS4 Operator or Designee:

Name: Bob Courtney

Title: Mayor

Signature: [signature]

Date: 3/27/23

1.0 Purpose

This water quality assessment report is intended to accompany the Southern Indiana Stormwater Advisory Committee (SWAC) Regional Water Quality Characterization Report (WQCR). This component of the WQCR contains information specific to the City of Madison as a method for further analyzing water quality within the MS4 boundaries, and using that information to guide their MS4 Program as they begin implementing the Indiana MS4 General Permit (INR040000) and Indiana Construction Stormwater General Permit (INRA00000).

2.0 Assessment of Land Use

The City of Madison is located in Jefferson County in southeastern Indiana along the north shore of the Ohio River. The City of Madison's municipal boundary consists of approximately 8.89 square miles (5,689.6 acres) of land. The entire downtown with over 2,000 structures is on the National Historic Register, making the City of Madison quite unique. In 2006, the Secretary of the Interior presented the City with the designation of National Historic Landmark District. The downtown area is predominantly located in the combined sewer overflow (CSO) area. The City has a significant elevation change between the Hilltop and the downtown riverside area. The Hilltop area includes a variety of residential, commercial and agricultural land uses. Figure 1 highlights recent land use conditions in the City of Madison. Over 40% of the City consists of developed area at the top and bottom of the hill, while around 35% of the City consists of forested/ agriculture areas, especially on the hillside. Below in Table 1, is a breakdown of land use within the City of Madison.

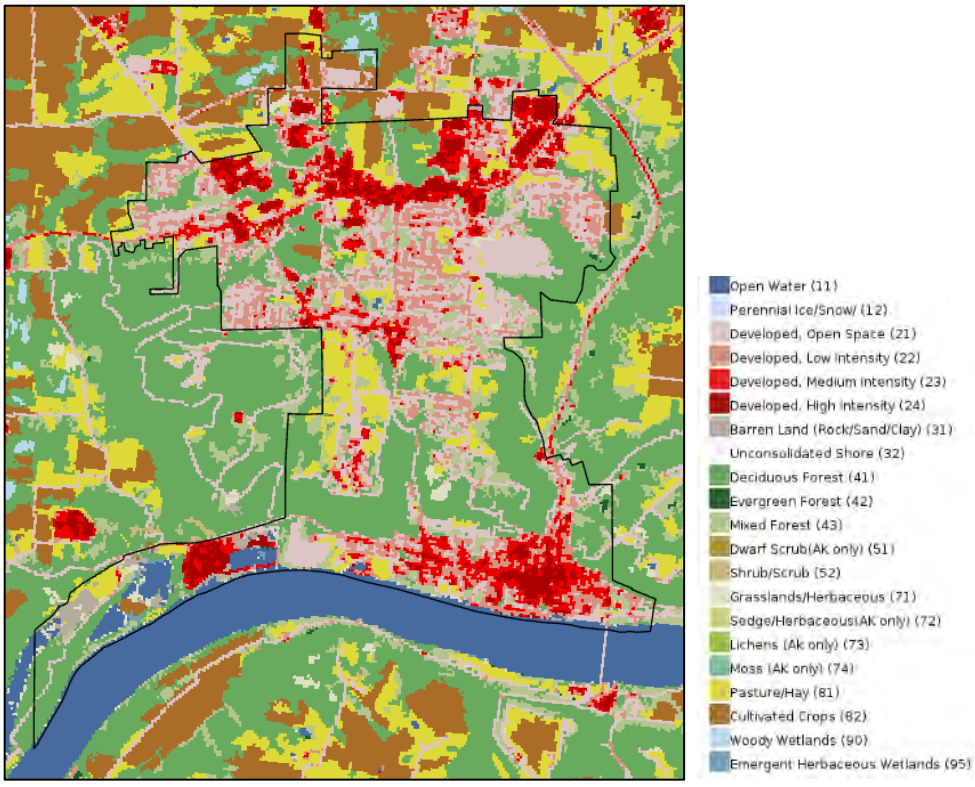


Figure 1. Land Use Map (NLCD, 2019)

Table 1: Land Use for Madison MS4 Area

Category	Acres	Percentage
Deciduous Forest	1,445.4	25.4%
Developed, Open Space	1,136.7	20.0%
Developed, Low Intensity	894.5	15.7%
Developed, Medium Intensity	511.2	9.0%
Hay/Pasture	493.2	8.7%
Mixed Forest	423.6	7.4%
Developed, High Intensity	343.9	6.0%
Open Water	167.4	2.9%
Cultivated Crops	125.9	2.2%
Barren Land	71.7	1.3%
Herbaceuous	54.5	1.0%
Emergent Herbaceuous Wetlands	8.3	0.15%
Woody Wetlands	5.9	0.10%
Evergreen Forest	4.1	0.07%
Shrub/Scrub	3.4	0.06%
TOTAL:	**5,689.6**	**100.0%**

Source: National Land Cover Database (NLCD, 2019)

Land use beyond the boundaries of the City of Madison consists of the City of Hanover to the southwest. The north and east of the City are primarily unincorporated, rural areas of Jefferson County. Clifty Falls State Park borders the City to the west.

3.0 Best Management Practices (BMPs)

The following section describes the City of Madison's efforts to improve stormwater quality through the MS4 program by implementing the six (6) Minimum Control Measures (MCMs), including structural and non-structural BMPs.

3.1 Structural BMPs

Within Madison's storm sewer system, there are 140 outfalls; 64 manholes; 1,079 catch basins/inlets; and 406 outlets. The drainage system also includes 12.5 miles (65,802.4 feet) of pipe; 176 culverts measuring 8,136 feet in length total; 49.6 miles (261,728 feet) of earthen/riprap channels/roadside ditches; 36.8 miles (194,254 feet) of curb and gutter; and 30.25 miles (159,695.8 ft) of natural channels. Figure 2 shows the locations of outfalls and manholes and pipes, culverts, ditches, curb and gutter, and channels that have been mapped in Madison (Madison, GIS).

Within the City of Madison, there are at least four (4) detention/retention ponds (City of Madison, GIS). Two (2) of these structural BMPs are detention basins associated with new developments, and two (2) are retention ponds located on City property. The sunrise Golf Course features vegetated buffers between 10-feet and 80-feet wide that reduce erosion and runoff from this facility. Sod and turf are used as natural erosion control on the riverfront and along roadway medians. The City conducts regular inspections and requires necessary

maintenance to ensure that owners are in compliance with the Post-Construction Stormwater Management Ordinance.

An inventory of the City's stormwater outfalls and stormwater manholes can be seen in Tables 7 and 8 at the end of the report. The tables include material, shape, diameter, structural assessment, and geographical location.

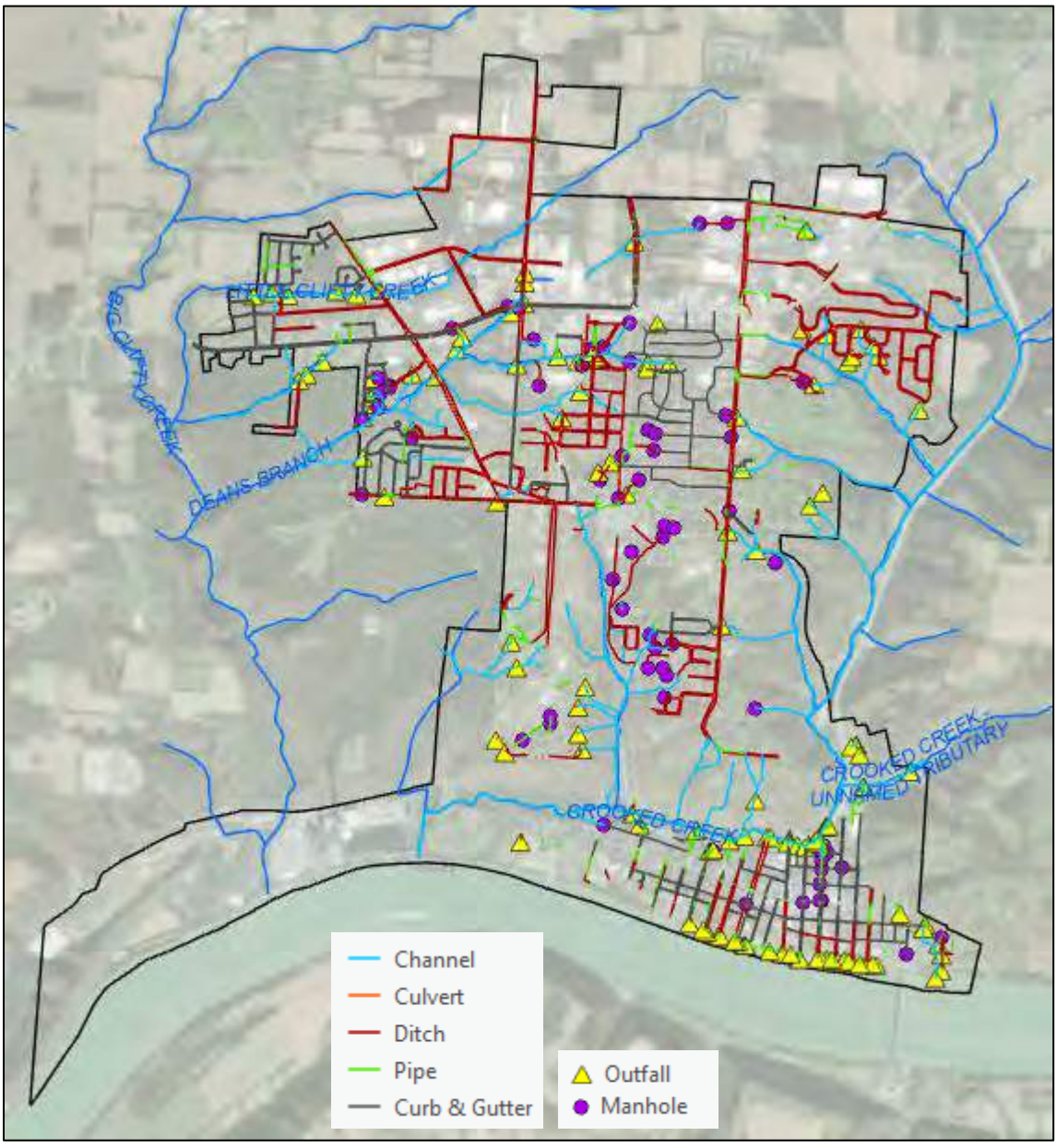


Figure 2. Mapped Outfalls, Manholes, Pipes, and Channels (Madison, GIS)

3.2 Non-Structural BMPs

3.1.1 Ordinances

The City of Madison maintains legal authority to administer the MS4 program and ensure compliance through adopted ordinances. The City of Madison utilizes the following ordinances:

- IDDE, EPSC: City of Madison Stormwater Regulations, Ord. 2006-20, adopted November 21, 2006.
- Post-Construction: Post-Construction Stormwater Regulations, Ord. 2007-1, adopted February 20, 2007.

The City utilizes the Best Management Practices Stormwater Management Manual for Southern Indiana, developed in 2008, which contains methodologies for determining runoff rates, storage volumes, and BMP sizing. It also contains design standards and specifications for open channels, construction site stormwater pollution prevention standards, and controlling peak flows.

3.1.2 Partnerships

The City of Madison is a part of the Southern Indiana Stormwater Advisory Committee (SWAC). The SWAC has provided a forum for public education, outreach, participation and involvement as well as coordinated implementation of the MS4 program in participating communities. Participating communities to date include: the City of Madison, the City of Jeffersonville, the City of New Albany, the Town of Sellersburg, the Town of Clarksville, Floyd County, the Town of Georgetown, and the Oak Park Conservancy District.

3.1.3 MCM 1 & 2 – Public Education and Outreach; Participation and Involvement

The City has produced and distributed newsletters, flyers, brochures, posters and educational displays concerning stormwater related topics to citizens in an effort to increase public awareness and education concerning stormwater related issues. The City of Madison maintains stormwater information on the City webpage, which provides information on stormwater activities and dates, as well as a summary of the City's MS4 Program. The City discusses stormwater quality issues and concerns at regularly held city council meetings.

3.1.4 MCM 3 – Illicit Discharge Detection and Elimination

The City of Madison adopted an Illicit Discharge Detection and Elimination Ordinance on November 21, 2006, which defines and prohibits illicit discharges and establishes an escalating enforcement policy. The City has mapped 100% of the stormwater drainage system, including outfalls and conveyances. The City has continuously implemented a field assessment program to detect and eliminate discharges and connections to the MS4 system.

The City has educated citizens and trained public employees from the Street, Water, Sewer and Parks Departments, as well as the Wastewater Treatment Plant, about the hazards associated with illicit discharges and improper waste disposal.

3.1.5 MCM 4– Construction Site Stormwater Runoff

The City adopted the Construction Site Runoff Ordinance on November 21, 2006, which governs stormwater run-off associated with construction activity. The City continues to implement this ordinance, which specifies

requirements for review of construction site BMP plans, installation of erosion prevention and sediment control BMPs, inspection, and escalating enforcement procedures.

The City of Madison adopted a Stormwater BMP Design Manual which includes design specifications and selection guidance for both construction and post-construction BMPs approved for installation by the City. This manual is available on the City's website. The City's Post-Construction Ordinance also references the use of the Indiana Storm Water Quality Manual.

The City of Madison reviews construction plans and associated stormwater pollution prevention plans (SWPPP) and issues a Site Development Permit. The permit application may be approved, approved with conditions, or disapproved. The City provides BMP information to permit applicants and conducts periodic inspections of construction sites to ensure compliance with the Construction Site Runoff Ordinance.

3.1.6 MCM 5 –Post-Construction Stormwater Runoff

The City of Madison adopted the Post-Construction Stormwater Management Ordinance (2007-1) on February 20, 2007. This Ordinance includes the minimum post-construction requirements of Rule 5, now known as General Permit INRA0000, for all projects disturbing one (1) or more acres of land within the City.

The City of Madison adopted a Stormwater BMP Design Manual which includes design specifications and selection guidance for both construction and post-construction BMPs approved for installation by the City. As part of the Post-Construction Stormwater Management Ordinance, the owners of approved BMPs maintain the facilities in accordance with the approved Stormwater Pollution Prevention (SWPPP).

3.1.7 MCM 6 - Municipal Operations Pollution Prevention and Good Housekeeping

The City of Madison has implemented many good housekeeping practices to prevent or reduce polluted runoff from municipal operations, such as regular stormwater drainage system maintenance and cleaning, street sweeping cleaning sidewalks, plazas and parking lots, medians, parks, and other municipal areas. The City collects garbage, recycling and compost (i.e., leaf and woody debris). Controls for reducing discharges from municipal facilities and operations include use of a covered salt storage facility, containment and spill control measures at the Street Department's maintenance garage, and use of underground storage tanks with leak detection for fuel storage. City staff are also regularly trained in pollution prevention measures.

4.0 Receiving Waters

The City of Madison has four (4) receiving waters. Table 2 lists the name, length, and total percentage of the receiving waters. All of Madison is located in a single watershed, the Crooked Creek-Ohio River (HUC 051401010302) watershed which drains directly to the Ohio River, as seen in Figure 3. The City of Madison is influenced by activities outside the MS4 area which drain into the City limits, primarily in the downtown area with Crooked Creek.

Table 2: City of Madison Receiving Waters

Receiving Water	Total Length	Percentage
Big Clifty Creek	0.44	7.0%
Crooked Creek	2.87	45.5%
Deans Branch	1.62	25.7%
Little Clifty Creek	1.38	21.8%
TOTAL	**6.31**	**100%**

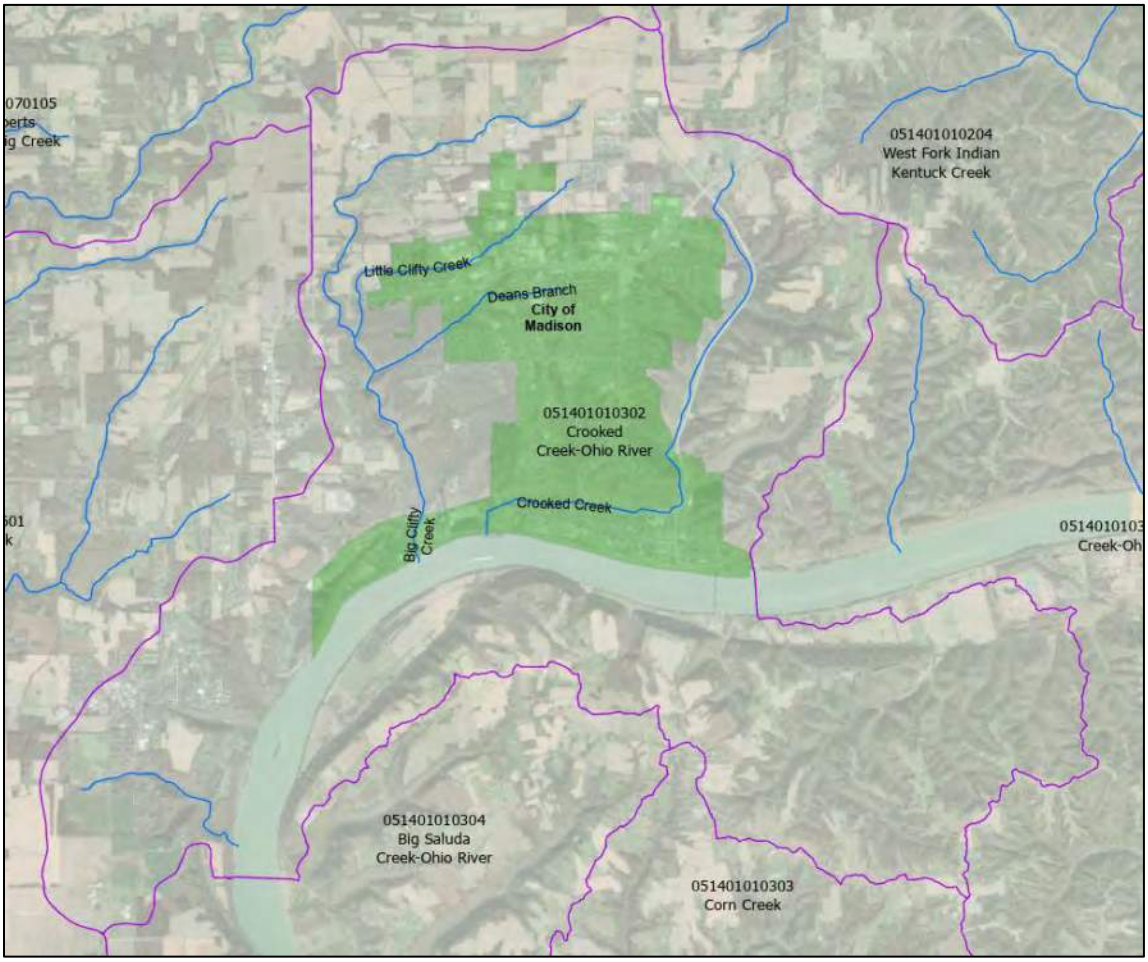


Figure 3. Receiving Waters and Watersheds for the City of Madison

5.0 303(d) Impaired Waters

The 2022 Integrated Water Monitoring and Assessment Report published by IDEM includes the 303(d) List of Impaired Streams for Indiana. One (1) stream segment in the City of Madison was listed on the 2022 303(d) list, listed in Table 3 and shown in Figure 4. The impaired stream was Deans Branch with 2.09 miles of the stream classified as impaired due to elevated levels of E. coli and an impaired biotic community (IBC). Land use around the impaired water is a mixture of residential commercial, and industrial. It is located at the top of the hill before draining into the Clifty Falls State Park.

Table 3: City of Madison Impaired 303(d) Waters

Stream Name	Assessment ID	Impairment	TMDL
Deans Branch	INN0132_T1010	E. coli, Impaired Biotic Community (IBC)	None

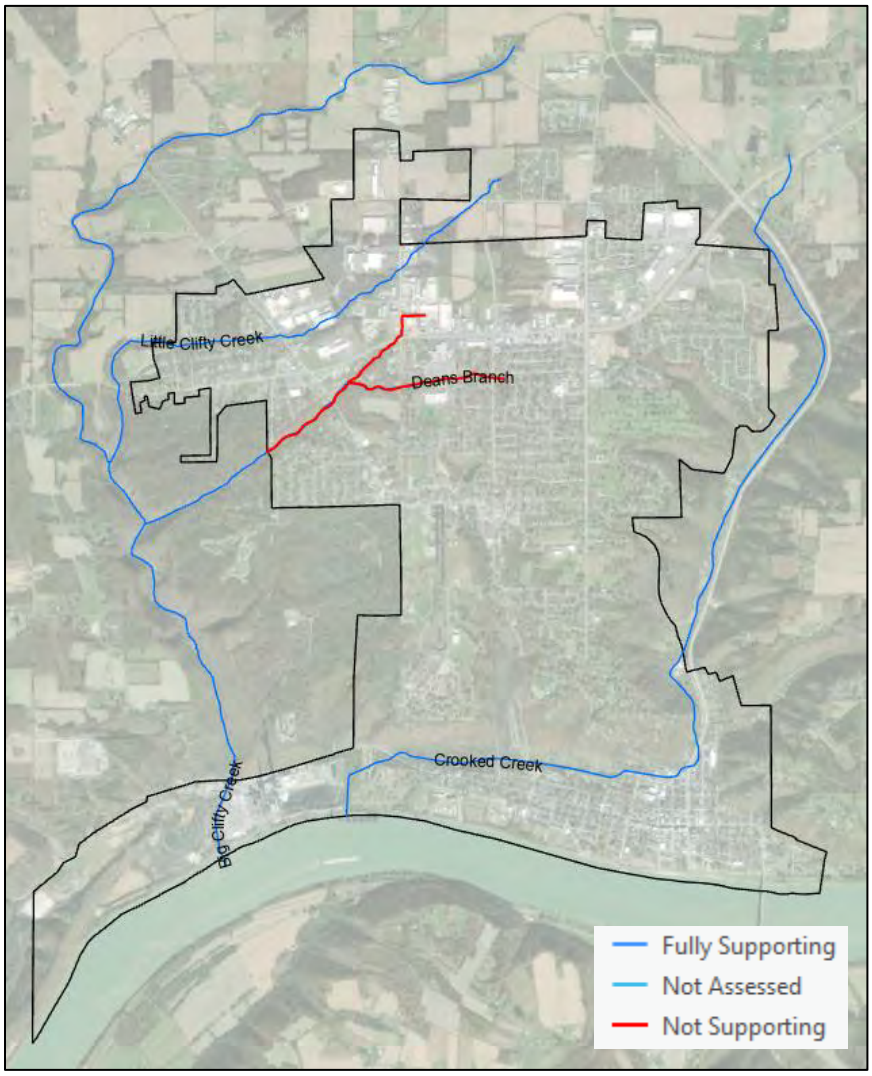


Figure 4. 303(d) Impaired Waters of the City of Madison

6.0 Known Sensitive Areas

Public Beaches/ Full Body Contact Recreation: There are no beaches or lakes with public swimming or recreational facilities other than enclosed public swimming pools. The City is currently not aware of any locations within the MS4 area where full body contact recreation occurs.

Surface Drinking Water Intakes: Drinking water sources within the City are derived primarily from local groundwater resources.

Wetlands: Wetland areas are considered to be environmentally sensitive features and are protected by the Clean Water Act. National Wetland Inventory (NWI) data was used to estimate the extent and locations of wetlands and deep waters in Madison. Based on these data, there are 87.3 acres of wetlands and deep water habitats within the City. Table 4 shows the different types of wetlands within, as classified by the NWI.

Table 4: Types of Wetlands in Madison

Type	Acres
Freshwater Emergent Wetland	0.24
Freshwater Forested/Shrub Wetland	10.9
Freshwater Pond	5.6
Lake	35.0
Riverine	35.5
Total	**87.3**

Source: NWI.

Wellhead Protection Areas: There are two (2) wellhead protection areas (WHPAs) in the City of Madison, which include the Madison Water Department WHPA West and East. The wellfields are located along the Ohio River and the associated WHPAs intersect the MS4 boundary. To date, seventeen (17) stormwater outfalls have been mapped in WHPA West One (1) Year Time of Travel (TOT1) area, and ten (10) stormwater outfalls have been mapped in WHPA East TOT1 area. Outfalls in both WHPAs drain residential areas into Crooked Creek and the Ohio River. The Madison Water Department has developed and is implementing a Wellhead Protection Plan (WHPP). The City also utilizes a BMP Design Manual that encourages the use of non-infiltrative BMPs within the WHPAs. In 2019, the USGS Indiana Water Science Center collected samples from a Production well in the City of Madison, Site # IN002-384400085240015. There were 3 samples taken, and over 500 parameters tested.

Sinkhole Areas: Within the City of Madison, no sinkhole areas were identified through a review of Indiana Geological Survey (IGS) data. IGS data show sinkhole areas to the east of the City near the Ohio River.

Boat Launches: There is one (1) boat launch within the City of Madison in Riverfront Park, near the intersection of West Street and Vaughn Drive. Eighteen (18) MS4 outfalls are located within 0.5 miles upstream of the launch, and eleven (11) MS4 outfalls are located within 0.5 miles downstream of the launch.

7.0 Existing and Available Monitoring Data

Indiana STORET: Monitoring Report was completed by Indiana STORET from data collected on Dean's Branch, Site # OSK-040-0002 in the City of Madison. Eleven (11) samples were collected throughout 2005. Data are summarized in Table 5 below.

Table 5: Results from Indiana STORET (2005) for Site # OSK-040-0002

Parameter	Average of Values
E. Coli	724.73 MPN / 100 ml
Total Phosphorus	0.07 mg/L
Dissolved Oxygen	6.07 mg/L
pH	7.83
Total Suspended Solids	4.5 mg/L
Turbidity	3.78 NTU

IDEM Data and Reports (2022): Indiana's 2022 Integrated Water Monitoring and Assessment Report provided an assessment of subwatersheds and listed impaired waterbodies (IDEM, 2022). Dean's Branch, that discharges into Big Clifty Creek, then to the Ohio River, has been listed on the 303(d) List of Impaired Streams, as seen in Section 4. A 2.88 mile segment of Dean's Creek in the Crooked Creek-Ohio River sub watershed was impaired for E. coli.

Stream Visual Assessment Protocol: The City of Madison began implementing the Stream Visual Assessment Protocol (SVAP) in 2009 as a component of the Municipal Separate Storm Sewer System (MS4) program. The intent of the program is to visually inspect and document conditions at strategic sites on streams throughout the City. Over time, this visual inspection is used to determine changes, whether positive or negative, taking place in watersheds throughout the City. Data is collected twice per year, in the Spring and Fall.

The current program consists of ten (10) sites throughout the City, seen below in Figure 5. There are four regional watersheds impacting the City, all of which are tributaries that ultimately drain to the Ohio River. The SVAP sites are in the Big Clifty Creek watershed and the Crooked Creek watershed.

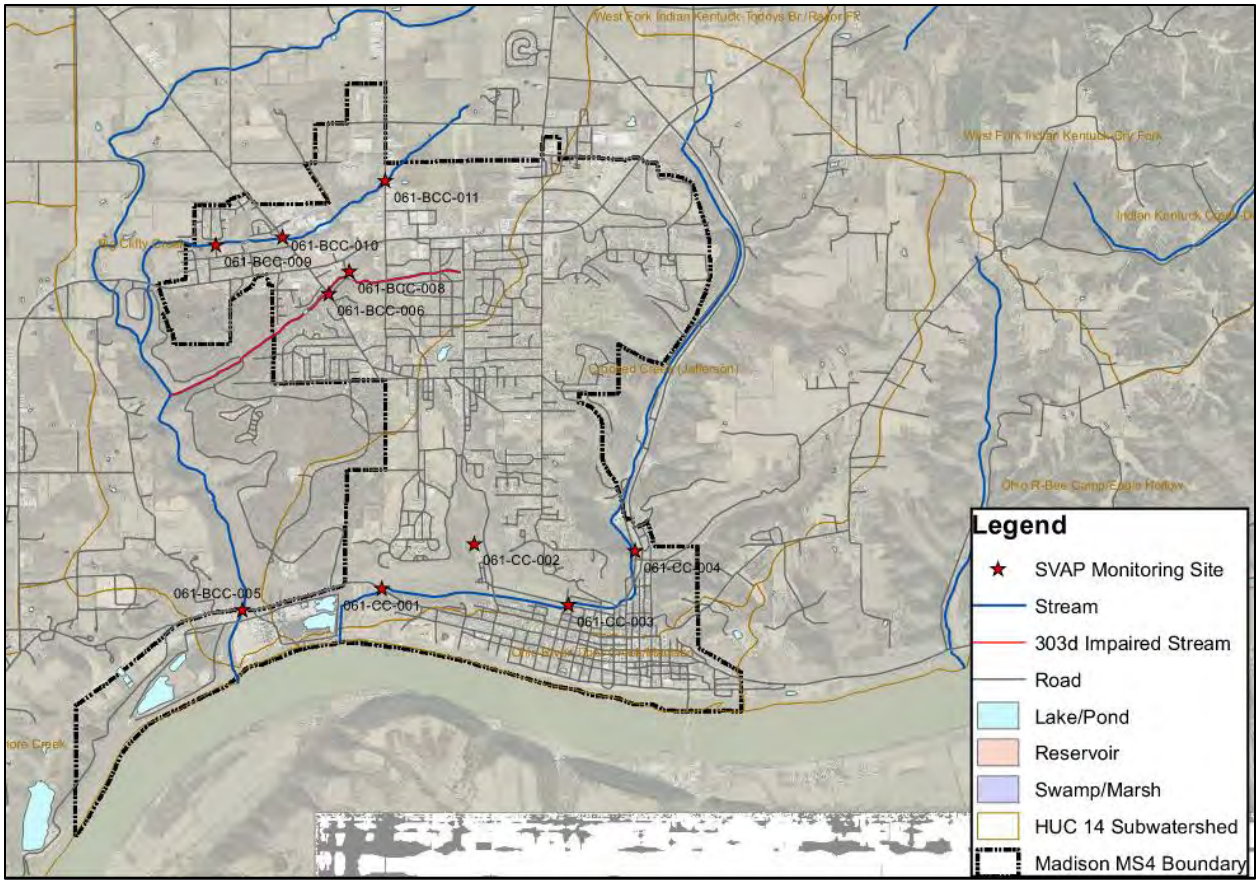


Figure 5. City of Madison SVAP Sites

Data collected for the sites between 2009-2022 has shown water color and clarity have been primarily clear with a few instances of cloudiness in the northwest sites. Rare instances of floatables, such as oil sheen, have been observed and there were no recorded instances of odor. Algae growth was observed in 2 of the sites. Outfalls are present at 6 sites, there have been no concerns with these outfalls or illicit discharges. Erosion, scour, and sedimentation were observed at many of the SVAP sites with a few instances of rapid bank erosion. Erosion and sediment transport were commonly observed at sites within the Big Clifty Creek watershed, which attributed to the extreme topography with a secondary cause likely from urbanization in the watershed. Litter and debris were observed at 4 of the sites and along roadway sites.

The City plans to maintain the program and a record of stream conditions and to help meet on-going water quality characteristic requirements. Additional monitoring and assessments may be considered in targeted areas to gain a more representative sample of receiving water conditions.

Wet Weather Impact Study: The Ohio River Sanitation Commission (ORSANCO) performed a Wet Weather Impact Study of the Ohio River in the Louisville/Southern Indiana area, which focused on the sources of bacteria in the Ohio. The results of the study indicate that tributaries contribute significant bacterial loads to the Ohio River. These findings were primarily based on testing performed in the mixing zone, at the mouth or just downstream of the study tributary. The study did not identify the portion of the bacterial loads to the Ohio River that could be attributed to stormwater discharges from the City of Madison.

City of Madison Data (2004): The City of Madison conducted a biological study of three sites in 2004. Sites were located on Crooked Creek, Clifty Creek and Eagle Hollow Creek. Results are summarized below.

Crooked Creek: This site was located west of the downtown area. Habitat was classified as "fair" and benthic macroinvertebrate communities were classified as "slightly impacted".

Clifty Creek: This site was located north of the downtown area, near Highway 421. Habitat was classified as "excellent" and benthic macroinvertebrate communities were classified as "excellent".

Eagle Hollow Creek: This site was located west of the downtown area near Clifty Falls State Park. Habitat was classified as "fair" and benthic macroinvertebrate communities were classified as "slightly impacted.

There are no Watershed Management Plan developed for the Madison watershed.

A search for more recent (last 5 years) water quality and related data beyond the watershed study and Impaired 303(d) List from IDEM was performed using publicly accessible reports and databases published by the Indiana Department of Natural Resources (IDNR), United States Environmental Protection Agency (USEPA), and the United States Geological Survey (USGS). These agencies had not published more recent water quality data for streams in the City of Madison.

8.0 Areas with Potential to Contribute to Water Quality Issues

In order to gain a better understanding of how the City of Madison's MS4 impacts the overall quality of nearby surface waters, the City will continue to implement and enhance the Stream Visual Assessment Protocol (SVAP). Data gathered from the SVAP will continue to allow the City to identify remediation and improvement projects under the purview and jurisdiction of the MS4 program. The residential areas of the City will continue to be monitored to address water quality concerns.

Madison has seven (7) active facilities that discharge stormwater from industrial activities under Rule 6 (IDEM, 2023). These facilities are shown on Table 6.

Table 6. NPDES Active Industrial Stormwater Permits in the City of Madison

NPDES ID	Permit Name	Effective Date	Expiration Date	Location Address	SIC	Permit SIC Description
INRM00868	Arvin Sango Incorporated	7/21/2019	7/20/2024	2905 Wilson Ave	3714	Motor Vehicle Parts And Accessories
INRM01053	Madison Precision Products Incorporated	8/17/2019	8/16/2024	94 E Cr 400 N	3363	Aluminum Die-Castings
INRM01178	Madison Chemical Company Incorporated	9/17/2019	9/16/2024	3141 Clifty Dr	2841	Soap And Other Detergents

INRM01508	Vehicle Service Group - A Dover Company	6/10/2019	6/9/2024	2700 Lanier Dr	3534	Elevators And Moving Stairways
INRM01678	Madison Municipal Airport	4/2/2018	4/1/2023	3919 W Ims Ln	4581	Airports, Flying Fields, & Services
INRM02528	Nucor Tubular Products	2/12/2019	2/11/2024	4004 N Us Hwy 421	3317	Steel Pipe And Tubes
INRM02792	Madison Bin	9/3/2021	9/2/2026	930 Ja Berry Ln	4214	Local Trucking With Storage

9.0 Recommendations

Based on the findings discussed, the City of Madison plans to continue to implement and enhance the MS4 program. The following additional BMPs are recommended for consideration.

- Update ordinances to conform to new MS4 General Permit INR040000 and Construction Stormwater Runoff General Permit INRA00000.
- Finalize the development of the 2023 Qualified Professional program and implement the plan the new permit term.
- Continue to implement the SVAP monitoring protocol to collect additional data in potentially impacted streams to help distinguish between stormwater, point, and non-point pollution sources.
- Consideration should be given for town-wide and/or watershed-based stormwater master planning to assist with identification, prioritization, scheduling, and implementation of capital improvement projects.
- Continue inspecting and monitoring stormwater management activities occurring and BMPs being implemented at municipal facilities and during municipal operations.
- Further enhance the outreach and public participation program to educate residents and visitors about stormwater quality.

Table 7: City of Madison Stormwater Manhole Inventory

ID #	Owner	Structural Assessment	Obstruction	Easting	Northing	Maintenance Required
4	City	Sound	Clear	413615.8	1269873	No
697	City	Sound	Clear	407929.8	1271613	No
1701	City	Unknown	Clear	402354	1284372	No
1702	City	Unknown	Clear	402079.8	1284427	No
1754	City	Unknown	Clear	400758	1283801	No
1760	City	Unknown	Clear	402730.1	1283656	No
1765	City	Unknown	Clear	403935.6	1283093	No
1772	City	Unknown	Clear	404208.9	1283530	No
1774	City	Unknown	Clear	404435.7	1283589	No
1798	City	Unknown	Clear	398749.8	1281433	No
1799	City	Unknown	Clear	399132	1281732	No
1800	City	Unknown	Clear	399127.7	1282112	No
1801	City	Unknown	Clear	399055.7	1282460	No
1806	City	Unknown	Clear	399362	1282286	No
1807	City	Unknown	Clear	399371.3	1282257	No
1832	City	Unknown	Clear	402970.4	1282533	No
1859	City	Unknown	Clear	399966.7	1281076	No
1899	City	Unknown	Clear	404582.5	1280376	No
1964	City	Unknown	Clear	405344.7	1277295	No
1978	City	Unknown	Clear	406068.3	1276721	No
1986	City	Unknown	Clear	406530	1275775	No
1991	City	Unknown	Clear	406535.5	1275228	No
1998	City	Unknown	Clear	406602.4	1276524	No
1999	City	Unknown	Clear	406231.6	1276410	No
2032	City	Unknown	Clear	403155.6	1273963	No
2296	City	Unknown	Clear	409310.8	1283087	No
2306	City	Unknown	Clear	407536.3	1282155	No
2310	City	Unknown	Clear	407706.2	1281604	No
2311	City	Unknown	Clear	405687	1281666	No
2327	City	Unknown	Clear	407759.3	1279847	No
2370	City	Unknown	Clear	398873.9	1279631	No
2379	City	Unknown	Clear	405074	1277978	No
2385	City	Unknown	Clear	408981.4	1278671	No
2432	City	Unknown	Clear	405093.5	1283289	No
2445	City	Unknown	Clear	406086.4	1275915	No
2446	City	Unknown	Clear	406406.8	1275915	No

2453	City	Unknown	Clear	407249.2	1286791	No
2454	City	Unknown	Clear	406585.1	1286741	No
2368	City	Unknown	Clear	405841.1	1281561	No
2458	City	Unknown	Clear	405837.4	1281156	No
2459	City	Unknown	Clear	405545.5	1280439	No
2475	City	Unknown	Clear	408743	1275127	No
2495	City	Unknown	Clear	412806	1269454	No
2452	City	Unknown	Clear	405270.2	1272051	No
2455	City	Unknown	Clear	405487.9	1278705	No
2500	City	Unknown	Clear	406198.3	1279117	No
2501	City	Unknown	Clear	406229.2	1279375	No
2502	City	Unknown	Clear	406472.4	1279356	No
78	City	Sound	Clear	411090.1	1271397	No
207	City	Sound	Clear	410227.9	1270499	No
553	City	Sound	Clear	408818.4	1270378	No
648	City	Sound	Clear	410670.8	1270567	No
649	City	Sound	Clear	410608.3	1270564	No
652	City	Sound	Clear	410590.1	1270990	No
657	City	Sound	Clear	410710.2	1271739	No
661	City	Sound	Clear	410590.8	1271348	No
664	City	Sound	Clear	410585.3	1271580	No
666	City	Sound	Clear	410585.8	1271805	No
667	City	Sound	Clear	410593	1271936	No
872	City	Sound	Clear	405029.6	1284221	No
952	City	Sound	Clear	405088	1281013	No
971	City	Sound	Clear	405070.8	1279943	No
1619	City	Sound	Clear	403810.4	1274385	No
1620	City	Sound	Clear	403805.8	1274572	No

Table 8: City of Madison Stormwater Outfall Inventory

ID #	Structural Assessment	Erosion	Diam.	Shape	Material	Face Type	Illicit Discharge Detected	Easting	Northing	Maintenance Required
3	Sound	None	46	Circular	CMP	Headwall	no	413544	1269750	no
8	Sound	None		Rectangular	Stone - Block	N/A	no	413634	1269498	no
13	Sound	None	18	Circular	CMP	Headwall	no	413663	1269106	no
19	Sound	None	36	Circular	CMP	Headwall	no	413190	1270208	no
22	Sound	None		Rectangular	Concrete	Headwall	no	413160	1270106	no
30	Sound	None	24	Circular	Concrete	Headwall	no	411875	1269139	no
31	Sound	None	18	Circular	Concrete	Headwall	no	411846	1269137	no
58	Sound	None	24	Circular	Concrete	Headwall	no	411490	1269171	no
59	Sound	None	24	Circular	Concrete	Headwall	no	411507	1269170	no
121	Sound	None	18	Circular	CMP	Headwall	no	411072	1269124	no
122	Sound	None	24	Circular	CMP	N/A	no	411109	1269118	no
123	Sound	None	24	Circular	CMP	N/A	no	410883	1269148	no
126	Sound	None	4	Circular	Grass/Earthen	N/A	no	410875	1269215	no
128	Sound	None	8	Circular	Grass/Earthen	N/A	no	410728	1269205	no
129	Sound	None	48	Circular	CMP	N/A	yes	410640	1269180	no
167	Sound	None	8	Circular	Grass/Earthen	N/A	no	412085	1269140	no
169	Sound	None	10	Circular	Grass/Earthen	Headwall	no	411990	1269156	no
174	Sound	None	4	Circular	PVC	Headwall	no	411137	1269207	no
176	Sound	None	8	Circular	Grass/Earthen	N/A	no	411294	1269197	no
178	Sound	None	4	Circular	Grass/Earthen	N/A	no	411406	1269183	no
180	Sound	None	8	Circular	Grass/Earthen	N/A	no	411007	1269208	no
181	Sound	None	24	Circular	Concrete	N/A	no	410215	1269155	no
182	Cracking	Moderate	24	Circular	Concrete	N/A	no	410230	1269156	yes
226	Sound	None	36	Circular	CMP	N/A	no	410243	1271940	no
229	Sound	None		Rectangular	Concrete	N/A	no	410219	1271896	no
232	Sound	None	24	Circular	Concrete	N/A	no	409797	1271977	no
234	Sound	None	24	Circular	Concrete	N/A	no	409755	1271991	no
239	Sound	None		Unknown	Unknown	N/A	no	409738	1271941	no
241	Sound	None	36	Circular	Concrete	Headwall	no	409978	1271908	no
242	Sound	None	42	Circular	CMP	N/A	no	410157	1271869	no
272	Sound	None	36	Circular	CMP	N/A	no	409793	1269257	no
299	Sound	None	36	Circular	CMP	N/A	no	409479	1269294	no
333	Sound	None	18	Circular	Concrete	N/A	no	411226	1274433	no
335	Sound	None	18	Circular	Concrete	N/A	no	411215	1274417	no

338	Sound	None		Rectangular	Concrete	N/A	no	411109	1274373	no
341	Sound	None	12	Circular	Stone - Block	N/A	no	411324	1274194	no
378	Sound	None	18	Circular	Grass/Earthen	N/A	no	406135	1272131	no
384	Sound	None	18	Circular	Concrete	N/A	no	405929	1272391	no
399	Sound	None	4	Circular	PVC	N/A	no	408866	1269410	no
400	Sound	None	24	Circular	CMP	N/A	no	408888	1269398	no
441	Sound	None	24	Circular	CMP	N/A	no	403282	1271520	no
460	Sound	None	120	Circular	Concrete	N/A	no	412570	1270422	no
462	Sound	None		Unknown	Unknown	N/A	no	412576	1273866	no
467	Sound	None	18	Circular	Rip rap	N/A	no	411473	1273429	no
469	Sound	None	36	Circular	Rip rap	N/A	yes	411468	1273429	no
486	Sound	None	18	Circular	Concrete	N/A	no	410637	1272438	no
501	Unknown	None	24	Circular	CMP	N/A	no	408338	1271898	yes
502	Full Collapse	Extreme		Rectangular	Concrete	N/A	no	407498	1269825	yes
509	Sound	None		Rectangular	Concrete	N/A	no	408698	1269464	no
514	Sound	None		Rectangular	Concrete	N/A	no	408218	1269578	no
515	Sound	None		Rectangular	Concrete	N/A	no	408267	1269570	no
530	Sound	None	18	Circular	Rip rap	N/A	no	409222	1272040	no
531	Sound	None	36	Circular	Rip rap	N/A	no	409307	1272048	no
574	Sound	None		Rectangular	Concrete	N/A	no	408621	1269477	no
579	Sound	None	12	Circular	Concrete	N/A	no	410380	1271995	no
582	Sound	None	36	Circular	Cor. Plastic	N/A	no	410635	1272387	no
583	Sound	None	36	Circular	Cor. Plastic	N/A	no	410689	1272418	no
637	Sound	None	18	Circular	Concrete	N/A	no	408691	1272024	no
646	Sound	None		Rectangular	Stone - Block	Headwall	no	407878	1269662	no
647	Sound	None		Rectangular	Concrete	Headwall	no	407939	1269646	no
673	Sound	None		Rectangular	Concrete	N/A	no	410467	1272070	no
675	Sound	None	18	Circular	Concrete	Headwall	no	410369	1271990	no
677	Sound	None	18	Circular	Concrete	N/A	no	410408	1272047	no
696	Sound	None	18	Circular	CMP	N/A	no	407869	1271624	no
698	Sound	None	24	Circular	Grass/Earthen	N/A	no	407948	1271649	no
701	Sound	None	36	Circular	Concrete	Grate	no	407515	1272096	no
878	Sound	None	30	Circular	Grass/Earthen	N/A	no	405548	1283310	no
902	Sound	None	18	Circular	PVC	N/A	no	405710	1284264	no
911	Sound	None	36	Circular	Concrete	Headwall	no	406060	1283311	no
916	Sound	None	12	Circular	Concrete	N/A	no	405541	1283166	no
959	Sound	None	32	Circular	Grass/Earthen	N/A	no	404808	1280843	no
963	Sound	None		Rectangular	Concrete	N/A	no	405254	1280101	no
1002	Sound	None		Rectangular	Concrete	N/A	no	407762	1279366	no

1047	Sound	Extreme	12	Circular	Concrete	Headwall	no	396362	1284361	yes
1054	Sound	None	36	Circular	Grass/Earthen	N/A	no	409832	1284280	no
1057	Sound	None	18	Circular	CMP	Headwall	no	396747	1284321	no
1071	Sound	None	12	Circular	Cor. Plastic	Headwall	no	395908	1284246	no
1076	Sound	None	24	Circular	CMP	Headwall	no	399873	1282635	yes
1080	Sound	None	15	Circular	CMP	Headwall	no	398900	1281999	no
1082	Sound	None		Unknown	Unknown	N/A	no	400446	1282621	no
1092	Sound	None	10	Circular	Cor. Plastic	Headwall	no	400906	1283306	no
1106	Sound	None	12	Circular	CMP	Headwall	no	399981	1281296	yes
1120	Sound	None	15	Circular	Cor. Plastic	Headwall	no	398821	1280539	yes
1162	Sound	None	15	Circular	CMP	Headwall	no	399409	1279627	no
1180	Sound	None	24	Circular	Grass/Earthen	N/A	no	411108	1283855	no
1203	Sound	None	24	Circular	Grass/Earthen	N/A	no	409592	1283054	no
1225	Sound	None	36	Circular	Grass/Earthen	N/A	no	412170	1282626	no
1233	Sound	None	12	Circular	Grass/Earthen	N/A	no	410371	1283652	no
1235	Sound	None	24	Circular	Grass/Earthen	N/A	no	409215	1284369	no
1253	Sound	None	12	Circular	Concrete	Headwall	no	409986	1280467	no
1257	Sound	None	24	Circular	Concrete	N/A	no	409704	1280135	no
1263	Sound	None	24	Circular	Concrete	N/A	no	409147	1286785	no
1264	Sound	None	24	Circular	Concrete	N/A	no	409147	1286779	no
1313	Sound	None	30	Circular	CMP	Headwall	no	402139	1279689	no
1324	Sound	None	15	Circular	Cor. Plastic	N/A	no	402436	1285032	no
1327	Sound	None	12	Circular	Cor. Plastic	N/A	no	402426	1285262	no
1347	Sound	None	15	Circular	Cor. Plastic	N/A	no	404275	1283392	yes
1350	Sound	None	12	Circular	CMP	N/A	no	404212	1283352	no
1360	Sound	None	12	Circular	PVC	Headwall	no	403367	1283306	no
1362	Sound	None	24	Circular	CMP	N/A	no	402466	1284532	no
1363	Sound	None	15	Circular	CMP	Headwall	no	403851	1283223	no
1366	Sound	None	15	Circular	Concrete	Headwall	no	403959	1282492	no
1373	Sound	None	15	Circular	Cor. Plastic	N/A	no	404335	1283363	no
1384	Partial Collapse	None	24	Circular	CMP	N/A	no	403561	1281827	yes
1424	Sound	None	36	Circular	Cor. Plastic	Headwall	no	398395	1284463	no

1431	Sound	None	36	Circular	Cor. Plastic	Headwall	no	397899	1284511	no
1442	Sound	None		Oval	Concrete	Headwall	no	398956	1284604	no
1445	Sound	None	12	Circular	CMP	Headwall	no	397691	1282780	no
1448	Sound	None	10	Circular	Cor. Plastic	Headwall	no	397327	1282447	yes
1449	Sound	None		Rectangular	Concrete	Headwall	no	397145	1282284	no
1459	Sound	None		Square	Concrete	N/A	no	402381	1283040	no
1530	Sound	None	12	Circular	PVC	Headwall	no	402717	1276328	no
1552	Sound	None	36	Circular	CMP	Headwall	no	407773	1277081	no
1626	Sound	None	12	Circular	CMP	N/A	no	402895	1275718	no
1628	Partial Collapse	None	24	Circular	CMP	N/A	no	402512	1273942	yes
1630	Sound	None	12	Circular	Concrete	N/A	no	402746	1273656	yes
1638	Sound	None	10	Circular	Cast Iron	N/A	no	404618	1273844	no
1640	Sound	None	18	Circular	Cast Iron	N/A	no	404497	1274220	no
1642	Sound	Moder ate	12	Circular	Cast Iron	N/A	no	404447	1274867	yes
1644	Sound	None	12	Circular	Cast Iron	N/A	no	404583	1275373	no
1651	Sound	None		Square	Concrete	N/A	no	402157	1284286	no
1773	Unknown	None		Unknown	Unknown	N/A	no	404208	1283459	no
1791	Unknown	None		Unknown	Unknown	N/A	no	399009	1282157	no
1792	Unknown	None		Unknown	Unknown	N/A	no	398933	1282462	no
1796	Unknown	None		Unknown	Unknown	N/A	no	399053	1281835	no
1797	Unknown	None		Unknown	Unknown	N/A	no	398755	1281510	no
1901	Unknown	None		Parabolic	Unknown	N/A	no	404534	1280580	no
2047	Sound	None	30	Circular	Cor. Plastic	N/A	no	401019	1283602	no
2060	Sound	None	18	Circular	CMP	Headwall	no	410457	1283792	no
2062	Sound	None	18	Circular	CMP	Open Channel	no	410638	1284489	no
2065	Sound	None	36	Circular	CMP	Open Channel	no	410974	1284092	no
2091	Sound	None	48	Circular	CMP	Open Channel	no	405023	1286214	no
2168	Sound	None	36	Circular	Concrete	Headwall	no	407786	1282147	no
2179	Sound	None	12	Circular	Cor. Plastic	N/A	no	407998	1280886	no
2183	Sound	None	60	U-Shaped	Brick	Headwall	no	408889	1272919	no
2332	Unknown	None		Unknown	Unknown	N/A	no	408484	1278953	no
2390	Unknown	None		Unknown	Unknown	N/A	no	413533	1268927	no
2509	Unknown	None	15	Circular	ADS	N/A	no	411681	1269138	no
2510	Unknown	None	15	Circular	Concrete	Headwall	no	409997	1269263	no
2511	Unknown	None	8	Circular	ADS	N/A	no	407837	1269711	no