

CITY OF MANSFIELD

STORM WATER MANAGEMENT PROGRAM

Updated: November, 2016



Updated by:



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LIST OF EXHIBITS

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- Exhibit 3 – Stormwater Management Ordinance

LIST OF ACRONYMS/ABBREVIATIONS

BMP	Best Management Practice
EPA	Environmental Protection Agency
ESC	Erosion & Sediment Control
HSTS	Home Sewage Treatment Systems
IDDE	Illicit Discharge Detection and Elimination
MCM	Minimum Control Measure
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
ORC	Ohio Revised Code
O & M	Operation and Maintenance
PPGHP	Pollution Prevention and Good Housekeeping Program
SWCD	Soil & Water Conservation District
SWMP	Storm Water Management Program
SWP3	Storm Water Pollution Prevention Plan

1. Introduction

On December 27, 2002 Ohio EPA issued an NPDES General Permit (Permit No.: OHQ000001) to authorize small Municipal Separate Storm Sewer Systems (MS4s) to discharge storm water under the National Pollutant Discharge Elimination System (NPDES). This permit was developed as a result of U.S. EPA's Phase II storm water program. The Phase II regulations required that MS4s which serve populations of less than 100,000 and which are located partially or fully within urbanized areas, as based on US census data, apply for coverage under this permit and submit a Storm Water Management Program (SWMP) to Ohio EPA by March 10, 2003. The City of Mansfield was defined by Ohio EPA to be a Phase II Small MS4. The City of Mansfield submitted a SWMP to OEPA on March 7, 2003.

The OEPA has issued two renewals to the permit (2009 & 2014), with the latest being OHQ00003 (2014). Each renewal of the permit has had additional requirements. This updated SWMP outlines the plan by the City of Mansfield to develop, implement and enforce a storm water management program that meets the new permit requirements. It also establishes the permit coverage area, organizational structure and addresses the following six minimum control measures (MCM) as required by the permit:

1. MCM #1 - Public Education and Outreach on Storm Water Impacts
2. MCM #2 - Public Involvement/Participation
3. MCM #3 - Illicit Discharge Detection and Elimination
4. MCM #4 - Construction Site Storm Water Runoff Control
5. MCM #5 - Post-Construction Storm Water Management in New Development and Redevelopment
6. MCM #6 - Pollution Prevention/Good Housekeeping for Municipal Operations

1.1. Legal authority

The legal authority for the City of Mansfield to control the quality of separate storm water is derived from 40 C.F.R. Parts 9, 122, 123 and 124 as well as the Ohio Administrative Code (OAC) 3745-39. Article XVIII, Section 3 of the Ohio Constitution grants municipalities the legal authority to exercise all powers of self-government and to adopt and enforce within their limits such local police, sanitary, and other similar regulations, as are not in conflict with general laws. The City of Mansfield Ordinance Chapter 1361, Storm Water Management, and Chapter 1362, Storm Water Erosion and Sediment Control currently provide the legal authority for the City of Mansfield to control water quality. This authority addresses both industrial and municipal discharges. The City of Mansfield has both the fiscal authority and legal resources to fully implement its storm water management plan.

1.2. Permit Coverage Area

The SWMP covers all the incorporated urbanized areas of the City of Mansfield as outlined on Figure 1 - 2010 Decennial Census Urbanized Areas, Mansfield, Ohio. Based on the 2010 U.S. Census the City of Mansfield has just under 48,000 residents and encompasses approximately twenty nine square miles.

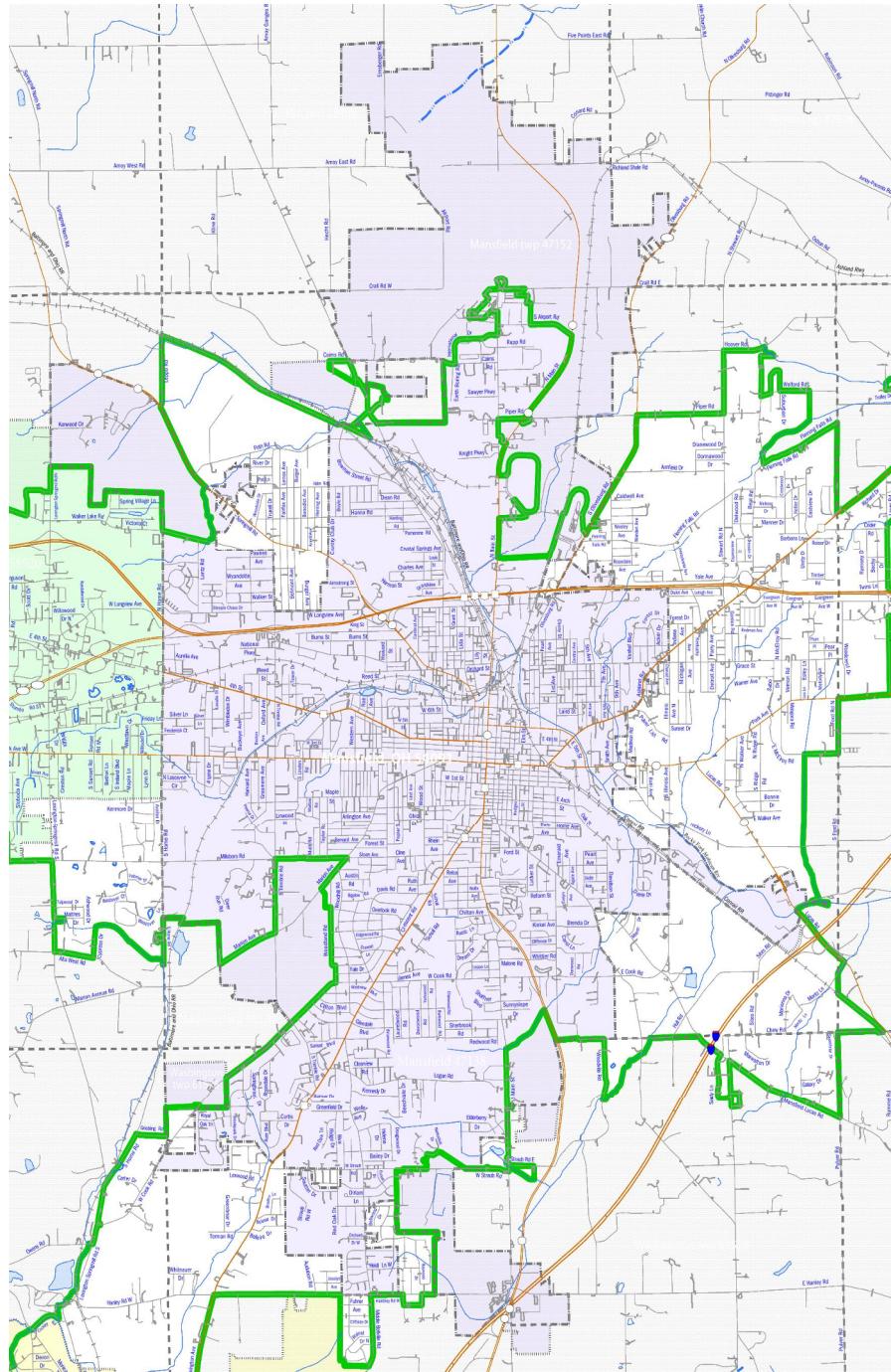
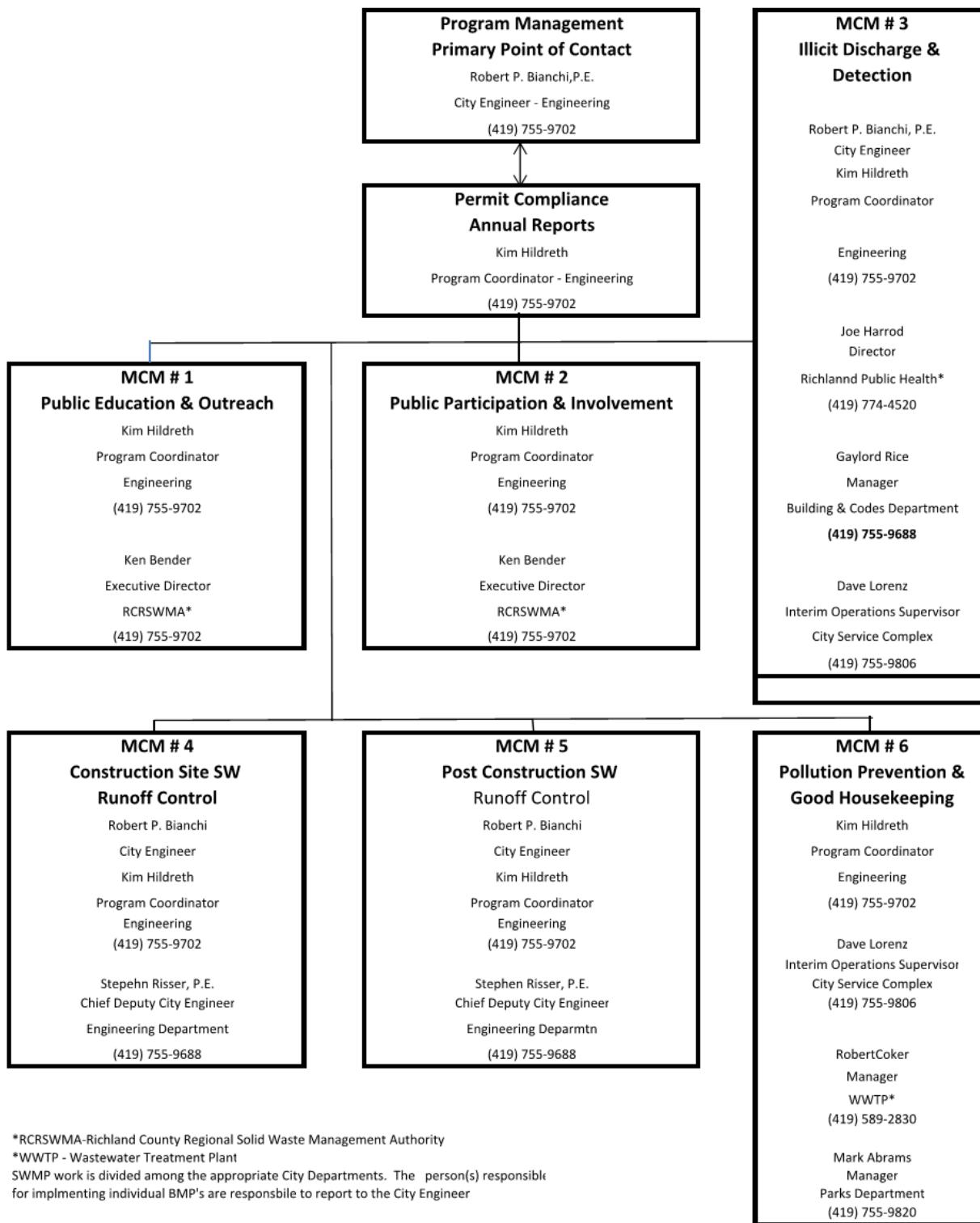


Figure 1 – 2010 Decennial Census Urbanized Areas, Mansfield, Ohio

2. Management of the Storm Water Program

2.1. Organizational Structure

The Storm Water Program is overseen by the City Engineering Department. The Program Coordinator within the Engineering Department will be the point of contact and will be responsible for ensuring that the SWMP is in compliance with the permit. The City Engineer will be responsible for the overall management of the program. The responsibilities for individual BMPs have been delegated to various departments to report to the City Engineer.

CITY OF MANSFIELD, OHIO - STORMWATER MANAGEMENT PROGRAM ORGANIZATIONAL CHART

Attachment A

Organizational Chart

Updated: 11-01-16

Figure 2 – Organizational Chart

3. TOTAL DAILY MAXIMUM LOAD'S (TMDL'S)

The renewal to the NPDES permit issued on September 11, 2014 (OHQ000003) states that “BMP’s shall be selected to address U.S. EPA approved TMDL recommendations for identified water quality problems associated with MS4 discharges within” the MS4 watershed. This SWMP will provide rationale for how and why each of the BMP’s and measurable goals were elected for each of the Minimum Control Measures discussed in Section 4, and how this relates to applicable TMDL recommendations. Table 1-1 of the Total Maximum Daily Loads for the Mohican River Watershed draft report from the Ohio EPA shows what TMDL’s have been approved in the draft report throughout the watershed which is broken down in assessment units. The City of Mansfield falls within the following 4 assessment units: 01-03, 02-03, 02-04, and 03-03 as shown in Figure 3-1 of the same report. Figure 3-1 and relevant sections of Table 1-1 and from the Total Maximum Daily Loads for the Mohican River Watershed draft report from the Ohio EPA are shown below as Figures 3 & 4 respectively. Even though this is a draft report, the City of Mansfield plans on implementing the findings so they do not need to revisit the SWMP once the report is official.

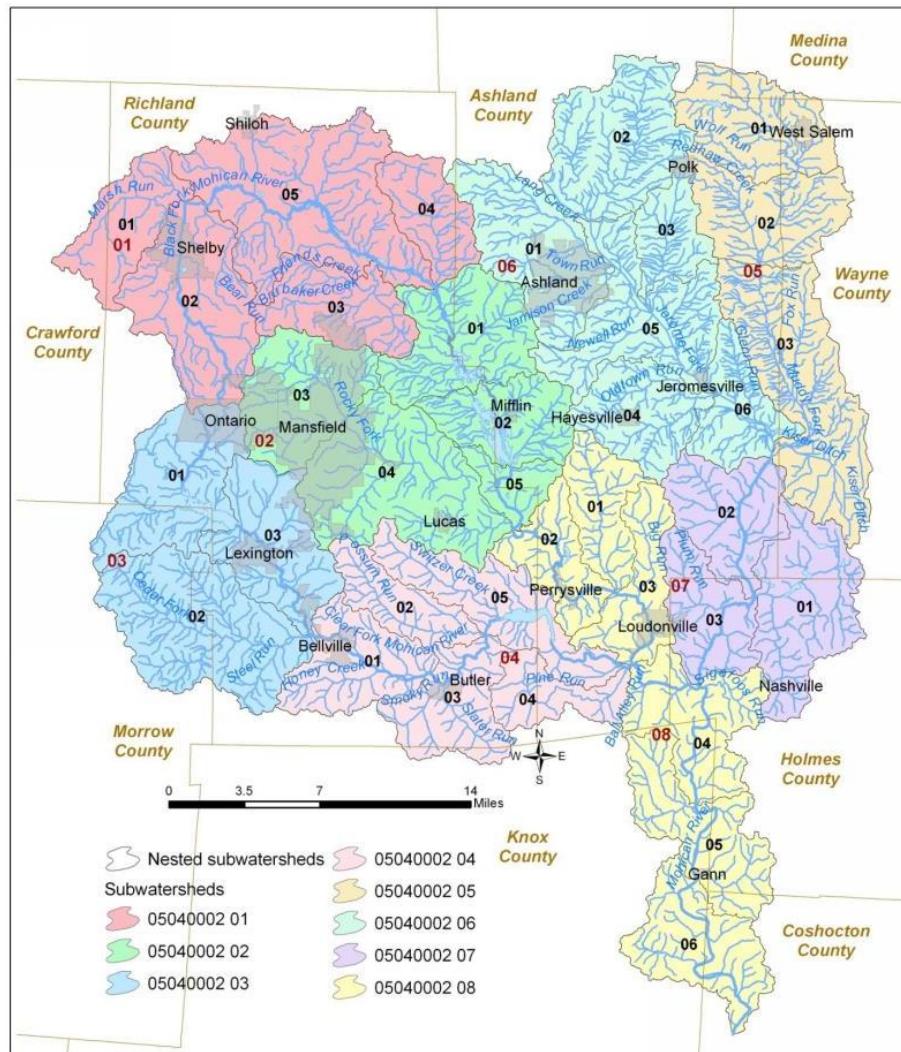


Figure 3 – Map of the Mohican Watershed

Figure 3-1 – “Total Maximum Daily Loads for the Mohican River Watershed” draft report (Ohio EPA)

Assessment Unit	Narrative Description	Causes of Impairment	Method to Address
01 03 <i>Priority points: 1</i>	Brubaker Creek	Nutrient/eutrophication biological indicators (ALU) Bacteria (RU)	Nitrate-nitrite TMDL <i>E. coli</i> TMDL
02 03 <i>Priority points: 4</i>	Headwaters Rocky Fork	Natural conditions (flow or habitat) (ALU)	No action necessary
		Nutrient/eutrophication biological indicators (ALU)	Total phosphorus TMDL
		Metals (ALU)	Not addressed
		High flow regime (ALU)	Not addressed
		Unknown toxicity (ALU)	Not addressed
		Bacteria (RU)	<i>E. coli</i> TMDL
02 04 <i>Priority points: 10</i>	Outlet Rocky Fork	Nutrient/eutrophication biological indicators (ALU)	Total phosphorus TMDL
		Organic enrichment (sewage) biological indicators (ALU)	Total phosphorus and <i>E. coli</i> TMDLs
		Bacteria (RU)	<i>E. coli</i> TMDL
03 03 <i>Priority points: 8</i>	Town of Lexington-Clear Fork Mohican River	Sedimentation/siltation (ALU) Direct habitat alterations (ALU) Bacteria (RU)	Sediment TMDL Habitat TMDL <i>E. coli</i> TMDL

Figure 4 – Approved TMDL's

Table 1-1 – “Total Maximum Daily Loads for the Mohican River Watershed” draft report (Ohio EPA)

4. NPDES MS4 GENERAL PERMIT COMPLIANCE

Each of the MCM's are described by first explaining the Permit Requirement/Performance Standards. Followed by the Decision Process and the BMP's selected. The Permit Requirement/Performance Standards describe the requirements of the permit. *Italicized text* indicates text that comes directly from the permit. The Decision Process contains the information specifically required by the permit. The ***bold/italicized text*** indicates required items that must be specifically addressed in the SWMP and are directly from the permit. The BMP's section will explain which BMP's are to be used to comply with the permit, whether the City has legal authority to implement the BMP, the measurable goal(s) for the BMP, rationale for the BMP, and the responsible party.

4.1. MCM#1 - Public Education and Outreach on Storm Water Impacts

4.1.1. Permit Requirement/Performance Standards

Permit Requirement: *You shall implement a public education program to distribute educational materials to the community or conduct equivalent outreach activities about the impacts of storm water discharges on water bodies and the steps that the public can take to reduce pollutants in storm water runoff.*

Performance Standards: *Your storm water public education and outreach program shall include more than one mechanism and target at least five different storm water themes or messages over the permit term. At a minimum, at least one theme or message shall be targeted to the development community. Your storm water public education and outreach program shall reach at least 50 percent of your population over the permit term.*

4.1.2. Decision Process

1. ***How you plan to inform individuals and households about the steps they can take to reduce storm water pollution.***

Information will be disseminated to individuals and households through a variety of measures. During this permit term, the City will publish information on the City website and social network sites explaining sediment reduction techniques, proper separation of sanitary and storm sewer discharges, litter prevention measures, and other timely topics relating to storm water management. Information regarding local stream cleanup efforts and citizen participation opportunities in these activities will be included on the website. This same information will also be included at least once per year with the City's water and sewer bills, reaching every household within the City. The City will develop an MOU with the Solid Waste District to work with the Mansfield School District to make presentations to fourth or fifth grade students on storm water pollution and its impacts. Additionally, there will be a display at Richland County fair where specific information on storm water point/non-point pollution will be displayed for attendees and visitors to the booth.

2. How you plan to inform individuals and groups on how to become involved in the storm water program (with activities such as local stream and beach restoration activities).

Information regarding local stream cleanup efforts and citizen participation opportunities will be available on the City website and the social media page. Public notices will be posted at the public library. Whenever possible, the program coordinator will be on local radio stations to educate public on the importance of cleanup/restoration activities and available opportunities to participate. The same information will be included with the City's water and sewer bills at least once per year.

3. Who are the target audiences for your education program who are likely to have significant storm water impacts (including commercial, industrial and institutional entities) and why those target audiences were selected.

Some of the target audiences that are likely to have significant storm water impacts include homeowners, developers, contractors, small businesses, industries, and educational institutions. The listed audiences were targeted because they incorporate a large cross section of the community and can provide significant positive water quality impacts when properly educated. BMP's have been and will continue to be tailored in large part to reach and teach these target audiences.

4. What are the target pollutant sources your public education program is designed to address.

- Sediment
- Lawn Fertilizers
- Pesticides
- Pet Waste
- Oils
- Metals
- Grease
- Sewage
- Paint
- Hazardous Waste
- Organic Material
- Nutrients

5. What is your outreach strategy, including the mechanisms (e.g., printed brochures, newspapers, media, workshops, etc.) you will use to reach your target audiences, and how many people do you expect to reach by your outreach strategy over the permit term.

Under the current permit, the City is required to develop a public education program that uses more than one mechanism and at least five different themes. The City will develop a public education program at the beginning of each year that will determine a theme and the mechanisms that will be utilized to implement it and reach the target audience. At least one theme will be targeted to the development community. The public educational program will be developed to reach at least 50% of the target audience.

Mechanisms will include storm water management website, flyers, brochures, water/sewer bill stuffers, display boards, radio interviews and (when requested) public presentations. Previous themes have included:

- Litter Prevention
- Construction Erosion Control
- Leaf Disposal
- Recycling Information
- Point/Non Point Pollution
- Storm Water Quantity Reduction
- Clean Water is Everyone's Business
- Proper Disposal of Household Prescriptions

6. Who (person or department) is responsible for overall management and implementation of your storm water public education and outreach program and, if different, who is responsible for each of the BMPs identified for this program.

The Program Coordinator within the City of Mansfield Engineering Department is responsible for the overall management and implementation of the storm water public education and outreach program.

7. How will you evaluate the success of this minimum measure, including how you selected the measurable goals for each of the BMPs.

The public education and outreach program has goals set by the permit that require at least 50% of the population within the permit area be reached by the program annually. Measurable goals for each of the BMP's have been outlined which provide a framework to ensure that permit requirements are met. The program including each BMP will be evaluated annually to determine if the program is on track to meet the requirements of the permit.

4.1.1. MCM #1 - Public Education and Outreach BMP's

BMP Description:	Annual Public Education Plan	BMP #	MCM1-01
Responsible Party:	Program Coordinator	Legal Authority:	Y
Measurable Goals:	Develop an annual public education plan that includes the development of at least one theme for each year and more than one mechanism to reach the target audience. Goal is the reach at least 50% of the population annually.		
Yearly Themes:	2015: Only Rain Down the Drain 2016: Trees – Reduce and Clean Stormwater 2017: Reduce your Stormwater Footprint 2018: Pollution Prevention 2019: Keep Dirt where it Belongs		
Rationale:	The permit requires that the storm water public education and outreach program shall include more than one mechanism and at least five different storm water themes or messages over the permit term.		
Method:	The public education plan is developed to target a yearly theme and suitable mechanisms to convey the message.		
Target Audience:	General Public, Commercial, Developers, Contractors, Institutional and Designers		
Target Pollutants:	All pollutants targeted by the permit are expected to be addressed by the City.		
TMDL's Targeted:	All TMDL's approved within the City of Mansfield are to be address within the permit term. However, each theme will address the following TMDL's potentially more than others: 2015: E. Coli, Phosphorus, Nitrate-Nitrite, Sediment 2016: Nitrate-Nitrite, Sediment, Phosphorus 2017: Phosphorus 2018: E. Coli, Phosphorus, Nitrate-Nitrite, Sediment 2019: Sediment		

BMP Description:	Storm Water Management Website	BMP #	MCM1-02
Responsible Party:	Program Coordinator	Legal Authority:	Y
Measurable Goals:	Update the storm water management website at a minimum four times a year. Record number of visits to the site.		
Rationale:	A website provides a quick and efficient way to disseminate information to the general public, developers, designers, contractors and City staff.		
Method:	Currently the Engineering website has a link setup for storm water management. The website will be frequently updated with useful information regarding storm water BMPs and point and non-point source pollution.		
Target Audience:	General Public, Commercial, Developers, Contractors, Institutional and Designers.		
Target Pollutants:	All pollutants targeted by the permit are expected to be targeted with the website in some form.		
TMDL's Targeted:	All approved TMDL's are expected to be targeted by the website in some form.		

BMP Description:	Social Network Site	BMP #	MCM1-03
Responsible Party:	Program Coordinator	Legal Authority:	Y
Measurable Goals:	Post monthly to social network sites at a minimum.		
Rationale:	Social media is now one of the quickest avenues to access and spread information.		
Method:	The program coordinator will administer the social network sites and post monthly tips, information, volunteer opportunities and track the number of favorable responses.		
Target Audience:	General Public.		
Target Pollutants:	All pollutants targeted by the permit are expected to be targeted by social networking in some form.		
TMDL's Targeted:	All approved TMDL's are expected to be targeted in some form.		

BMP Description:	Mansfield City School Presentations	BMP #	MCM1-04
Responsible Party:	Richland County Regional Solid Waste Management (RCRSWMA)	Legal Authority:	Y
Measurable Goals:	Develop an MOU with the RCRSWMA to conduct presentations at the city school district to include at least 5 presentations per year to fourth and/or fifth grade classes.		
Rationale:	Students are future stewards of the environment and are the best candidates to be involved in practicing sound storm water management practices.		
Method:	Presentations to fourth and/or fifth grade students about point/non-point source pollution and storm water impact, litter prevention, recycling and how it impacts storm water quantity and quality.		
Target Audience:	Fourth or fifth grade students within the Mansfield City School District.		
Target Pollutants:	Point/non-point pollution, litter prevention, stream pollutants.		
TMDL's Targeted:	Nutrients (Nitrate-Nitrite and Phosphorus), Bacteria, Organic Enrichment		

BMP Description:	Richland County Fair Booth	BMP #	MCM1-05
Responsible Party:	Program Coordinator	Legal Authority:	Y
Measurable Goals:	Have a booth annually at the Richland County Fair and track number of visitors to booth.		
Rationale:	The county fair is a fun activity that is well attended. A booth at the event enables outreach to the general public attending the fair providing education about storm water quality issues.		
Method:	Have a booth at the County fair with information on BMP's, including point/nonpoint source pollution, stream cleanups, and recycling and program involvement opportunities.		
Target Audience:	General public		
Target Pollutants:	General storm water quality		
TMDL's Targeted:	No specific TMDL will be targeted		

BMP Description:	Informational Utility Bill Stuffers	BMP #	MCM1-06
Responsible Party:	Program Coordinator	Legal Authority:	Y
Measurable Goals:	Minimum of one informational bill stuffer every year.		
Rationale:	Utility bills are sent out to 100% of the residents in the City. Including informational flyers in the utility bill ensures that 100% of the households within the City are reached.		
Method:	Educational tips and information about pollution prevention, litter pickup, paint and other hazardous waste disposal, and recycling will be included at least once per year.		
Target Audience:	Residents within the City		
Target Pollutants:	Lawn fertilizers, pet waste, disposal of paint and other hazardous waste		
TMDL's Targeted:	Nutrients, Bacteria, Organic Enrichment		

BMP Description:	Educational Training for City Employees	BMP #	MCM1-07
Responsible Party:	Program Coordinator	Legal Authority:	Y
Measurable Goals:	Conduct an annual training for municipal employees		
Rationale:	Municipal employee training is necessary to train staff about potential sources of stormwater contamination and ways to minimize the water quality impact of municipal activities.		
Method:	A training will be held annually for City Employees involved in municipal activities.		
Target Audience:	Employees of street department, engineering department, parks department		
Target Pollutants:	Paint, oil, grease, hazardous waste and other pollutants generated by municipal activities.		
TMDL's Targeted:	All approved TMDL's will be addressed within the permit term at trainings.		

4.1. MCM #2 - Public Participation and Involvement

4.1.1. Permit Requirement/Performance Standards

Permit Requirement: *You shall comply with State and local public notice requirements and satisfy this minimum control measure's minimum performance standards when implementing a public involvement/participation program.*

Performance Standards: *Your storm water public involvement/participation program shall include, at a minimum, five public involvement activities over the permit term.*

4.1.2. Decision Process

- 1. Have you involved the public in the development and submittal of your NOI and SWMP description.**

The SWMP was updated by a team of consultants in consultation with City Staff. A copy of the draft updated SWMP will be posted to the storm water management website. All comments and recommendations will be reviewed and considered. A copy of the draft SWMP will also be available for review at the City Engineer's office.

- 2. What is your plan to actively involve the public in the development and implementation of your program.**

Since its development in 2003, aspects of the program have been presented through the City's website, publication, announcements and other means of communication. In addition, the general public has the ability to obtain information, report concerns and provide comments on various issues pertaining to stormwater quality to the City in person, by phone, mail and email. The Program Coordinator will work to develop public involvement opportunities each year in conjunction with the yearly public education plan. Also the public will have an opportunity to provide input on the plan and ordinances developed to support the program.

- 3. Who are the target audiences for your public involvement program, including a description of the types of ethnic and economic groups engaged. You are encouraged to actively involve all potentially affected stakeholder groups, including commercial and industrial businesses, trade associations, environmental groups, homeowners associations, and educational organizations, among others.**

Target audiences for the public involvement program include the general public, business owners, developers, contractors, environmentalists, designers and government employees. All ethnic and economic groups can be engaged by the program as a number of free public meetings and events are held and announced throughout each year.

- 4. What are the types of public involvement activities included in your program. Where appropriate, consider the following types of public involvement activities: citizen representatives on a storm water management panel, public hearings, working with citizen volunteers willing to educate others about the program, volunteer monitoring or stream/beach clean-up activities.**

Public Involvement activities include:

- Operation Clean Sweep
- Earth Stewardship Project
- Save our Streams
- Special Litter Collection Projects

5. Who (person or department) is responsible for the overall management and implementation of your storm water public involvement/participation program and, if different, who is responsible for each of the BMPs identified for this program.

The Program Coordinator is responsible for the overall management and implementation of the Public Involvement/Participation Program. Responsible party for each of the BMP's is listed in Section 4.2.3.

6. How you will evaluate the success of this minimum measure, including how you selected the measurable goals for each of the BMPs.

The Public Involvement/Participation program has goals set by the permit that require at least 5 public involvement activities over the permit term. Measurable goals for each of the BMP's have been outlined which provide a framework to ensure that permit requirements are met. The program including each BMP will be evaluated annually to determine if the program is on track to meet the requirements of the permit.

4.1.3. MCM #2 - Public Participation and Involvement BMP's

BMP Description:	Operation Clean Sweep	BMP #	MCM2-01
Responsible Party:	Program Coordinator	Legal Authority:	Y
Measurable Goals:	Hold at least one event annually and track the number of volunteers and bags of trash collected.		
Rationale:	Businesses looking to relocate choose clean well-kept communities not littered and neglected ones. Statistics have also proven less crime takes place in clean, well-kept communities as opposed to neglected ones.		
Method:	Host a litter cleanup in the downtown area. The City will provide trash bags, gloves and disposal of litter collected.		
Target Audience:	General public, downtown businesses, stakeholders.		
TMDL's Targeted:	Habitat, Nutrients, Organic Enrichment, Sediment		

BMP Description:	Annual Earth Stewardship Celebration	BMP #	MCM2-02
Responsible Party:	Program Coordinator	Legal Authority:	Y
Measurable Goals:	Hold 1 Celebration/Cleanup event each year.		
Rationale:	The Earth Stewardship Day Celebration held annually for the past 19 years brings businesses, volunteers, nonprofits, and community members together to celebrate the environmental stewardship and sustainability efforts across the City. Groups are encouraged to conduct a litter cleanup and beautification project of their own choice. When litter is picked up and areas are cleaned, storm water quality also benefits.		
Method:	Litter cleanups, tree planting and beautification projects are encouraged.		
Target Audience:	General public, county employees, city employees, downtown businesses.		
TMDL's Targeted:	Habitat, Nutrients, Organic Enrichment, Sediment		

BMP Description:	Solid and Hazardous Waste Disposal	BMP #	MCM2-03
Responsible Party:	Richland County Regional Solid Waste Management (RCRSWMA)	Legal Authority:	Y
Measurable Goals:	Develop a MOU with the RCRSWMA, which has a collection center that is currently open 5 days a week.		
Rationale:	There is an extensive amount of solid and hazardous waste generated by the general public. The collection center provides a way to dispose of this waste in a legal and conscientious manner.		
Method:	A collection center has been set up to receive waste throughout the year. It is open to the public 5 days a week. RCRSWMA partners with local schools to provide a S.C.R.A.P trailer to collect recyclables.		
Target Audience:	General Public, Businesses and Organizations.		
TMDL's Targeted:	Bacteria		

BMP Description:	Save our Streams	BMP #	MCM2-04
Responsible Party:	Program Coordinator	Legal Authority:	Y
Measurable Goals:	Conduct one stream cleanup every year and track number of volunteers.		
Rationale:	Hosting a stream cleanup is an effective way to promote stormwater awareness. Many people are unaware that most storm drains discharge untreated runoff directly into local water bodies. A stream cleanup allows concerned citizens to become directly involved in water pollution prevention. Stream cleanups also educate members of the community about the importance of stream water quality through media coverage and publicity efforts.		
Method:	Participants volunteer to walk the length of the stream or river bank, collecting trash and recording information about the quantity and types of garbage that has been removed.		
Target Audience:	General Public		
TMDL's Targeted:	All TMDL's are targeted at this event		

4.2. MCM #3 - Illicit Discharge Detection and Elimination (IDDE)

4.2.1. Permit Requirement/Performance Standards

Permit Requirement: *You shall develop, implement and enforce a program to detect and eliminate illicit discharges, as defined in Part VI of this permit, into your small MS4 (for illicit discharges to your MS4 via an adjacent, outside of your jurisdiction, interconnected MS4, you are only required to inform the neighboring MS4 and Ohio EPA in your annual report submission, of their existence);*

You shall develop, if not already completed, a comprehensive storm sewer system map, showing the location of all outfalls and the names and location of all surface waters of the state that receive discharges from those outfalls. Your comprehensive storm sewer system map shall also include your MS4 system (owned and/or operated by you), including catch basins, pipes, ditches, flood control facilities (retention/detention ponds), post-construction water quality BMPs and

private post-construction water quality BMPs which have been installed to satisfy Ohio EPA's NPDES Construction Storm Water general permit and/or your local post-construction water quality BMP requirements.

Within five years of when your initial Small MS4 general permit coverage was granted, you shall submit the following to Ohio EPA:

A list of all on-site sewage disposal systems connected to discharge to your MS4 (a.k.a., home sewage treatment systems (HSTSs)) including the addresses; and

A storm sewer map showing the location of all HSTSs connected to your MS4. This map shall include details on the type and size of conduits/ditches in your MS4 that receive discharges from HSTSs, as well as the water bodies receiving the discharges from your MS4.

You shall to the extent allowable under State or local law, effectively prohibit, through ordinance, or other regulatory mechanism, illicit discharges into your storm sewer system and implement appropriate enforcement procedures and actions;

You shall develop and implement a plan to detect and eliminate non-storm water discharges, including illegal dumping, to your system. At a minimum, for household sewage treatment systems (HSTSs), your plan shall address or include provisions for:

Working with the appropriate Board(s) of County Commissioners, other public officials, local waste water authorities, any other appropriate entity and local board(s) of health to proactively identify residences with existing individual discharging HSTSs that can be legally, feasibly and economically connected to central sewers. At a minimum, the plan shall evaluate applying provisions identified by ORC 6117.51 and other applicable State and local laws and/or regulations. At a minimum, this activity should require connection to central sewers for any discharging HSTS that is not operating as designed and intended if feasible, but it does not preclude connection to central sewers of any HSTS if local planning and coordination recommends such;

Working with local board(s) of health to develop a proactive operation and maintenance program or implement/enhance an existing operation and maintenance program which determines if existing discharging HSTSs are operating as designed and intended and, for those not meeting this criteria, requires elimination, upgrade or replacement of the systems as appropriate. For HSTS discharges that cannot be eliminated through connection to central sewers or installation of soil absorption systems, the property owner must be notified of the requirement to pursue coverage under an appropriate Ohio EPA general NPDES permit;

Actively investigating the source(s) of contamination in outfalls identified during dry weather screening process. When the contamination source has been identified as discharging HSTS that is not operating as designed and intended, work with the local board(s) of health to determine proper course of action in resolving the non-functioning HSTS with connection to central sewers being preferred alternative, followed by replacing system with a soil absorption system that does not discharge and only allowing a replacement discharging HSTS when no other option is available. For HSTS discharges that cannot be eliminated through connection to central sewers

or installation of soil absorption systems, the property owner must be notified of the requirement to pursue coverage under an appropriate Ohio EPA general NPDES permit; and

Working with local waste water authorities, planning agencies or other appropriate agencies involved to evaluate the planned or possible future installation of sewers for areas which contain high densities of discharging HSTSS.

You shall inform public employees, businesses, and the general public of hazards associated with illegal discharges and improper disposal of waste; and

You shall address the following categories of non-storm water discharges or flows (i.e., illicit discharges) only if you or Ohio EPA has identified them as significant contributors of pollutants to your small MS4: water line flushing, landscape irrigation, diverted stream flows, rising ground waters, uncontaminated ground water infiltration (as defined at 40 CFR §35.2005(20)), uncontaminated pumped ground water, discharges from potable water sources, foundation drains, air conditioning condensation, irrigation water, springs, water from crawl space pumps, footing drains, lawn watering, individual residential car washing, flows from riparian habitats and wetlands, dechlorinated swimming pool discharges, street wash water, and discharges or flows from fire-fighting activities (by definition, not an illicit discharge).

You may also develop a list of other similar occasional incidental non-storm water discharges (e.g., non-commercial or charity car washes, etc.) that will not be addressed as illicit discharges. These non-storm water discharges must not be reasonably expected (based on information available to the permittees) to be significant sources of pollutants to the MS4, because of either the nature of the discharges or conditions you have established for allowing these discharges to your MS4 (e.g., a charity car wash with appropriate controls on frequency, proximity to sensitive water bodies, BMPs on the wash water, etc.). You must document in your SWMP any local controls or conditions placed on the discharges. You must include a provision prohibiting any individual non-storm water discharge that is determined to be contributing significant amounts of pollutants to your MS4.

Performance Standard: Your storm water illicit discharge detection and elimination program shall include or have included an initial dry-weather screening of all your storm water outfalls over the permit term. Your program shall establish priorities and specific goals for long-term system- wide surveillance of your MS4, as well as for specific investigations of outfalls and their tributary area where previous surveillance demonstrates a high likelihood of illicit discharges. Data collected each year shall be evaluated and priorities and goals shall be revised annually based on this evaluation. Your comprehensive storm sewer system map shall be updated annually as needed.

4.2.2. Decision Process

- 1. How you will develop a comprehensive storm sewer map showing the location of all outfalls and the names and location of all receiving waters. Describe the sources of information you used for the maps, and how you plan to verify the outfall locations with field surveys. If already completed, describe how you developed this map. Also, describe how your map will be regularly updated.**
-

Generic mapping of the City storm sewer exists as 1" = 400 " hand drawn maps. However the City of Mansfield recognizes the requirement for up to date mapping of the entire MS4 including public and private water quality BMPs. The City has contracted with a consultant to develop a pilot GIS mapping project. When completed and approved, the methodology will be extended to the entire City. The City's goal is to complete this comprehensive GIS based mapping of the City's storm infrastructure by July 2017. All 233 outfalls and their receiving surface waters have been mapped. The City will evaluate the storm system map annually to determine if any changes have been made to the MS4, if so the storm system map will be updated based on improvement plans and field locates.

- 2. *The mechanism (ordinance or other regulatory mechanism) you will use to effectively prohibit illicit discharges into the MS4 and why you chose that mechanism. If you need to develop this mechanism, describe your plan and a schedule to do so. If your ordinance or regulatory mechanism is already developed, include a copy of the relevant sections with your program.***

The City of Mansfield chose an ordinance as the mechanism by which to prohibit illicit discharges into the MS4 because the ordinance is a method of legislation approved by the State. The City has an existing illicit discharge ordinance, Chapter 1365 – Illicit Discharge and Illegal Connection Control which is attached as Exhibit 1 - Illicit Discharge Ordinance. The City has created a new ordinance in place of the existing ordinance which will allow the City to the extent allowed by law, to prohibit illicit discharges and illegal connections, establish legal authority to carry out inspections, develop monitoring procedures and create enforcement actions as necessary.

- 3. *Your plan to ensure through appropriate enforcement procedures and actions that your illicit discharge ordinance (or other regulatory mechanism) is implemented.***

City Ordinance 1365 provides enforcement per Section 1365.09 (See Exhibit 1 for ordinance language).

- 4. *Your plan to detect and address illicit discharges to your system, including discharges from illegal dumping and spills. Your plan shall include dry weather field screening for non-storm water flows and Ohio EPA recommends field tests of selected chemical parameters as indicators of discharge sources. You shall describe the mechanisms and strategies you will implement to ensure outfalls which have previously been dry-weather screened will not have future illicit connections. Your plan shall also address on-site sewage disposal systems (including failing on-lot HSTSS and off-lot discharging HSTSS) that flow into your storm drainage system. Your description shall address the following, at a minimum:***

The City has developed an IDDE program to ensure that permit requirements are being met. The program includes procedures for dry weather screenings, tracing, IDDE investigation procedures

and HSTSs that flow into the storm drainage system. 10% of the outfalls will be dry weather screened each year to ensure that future illicit connections are addressed.

- a. Procedures for locating priority areas which include areas with higher likelihood of illicit connections (e.g., areas with older sanitary sewer lines, for example) or ambient sampling to locate impacted reaches;*

The IDDE program provides a procedure for review of potential "hot spots". Potential hot spots include areas with dated sanitary sewer lines, locations where complaints are common, locations with previously documented illicit discharges and locations where dry weather screenings indicate problem areas. The review will be conducted to determine which areas to target with further sampling and inspections.

- b. Procedures for tracing the source of an illicit discharge, including the specific techniques you will use to detect the location of the source;*

The engineering department works with the sewer repair department to investigate apparent illicit discharges through televising, dye testing and smoke testing as required. The IDDE program includes procedures and techniques for tracing the source of an illicit discharge. Techniques may include water quality sampling and testing, visual inspections of streams, sanitary sewers and manholes, smoke testing, dye testing and TV inspection.

- c. Procedures for removing the source of the illicit discharge; and*

Currently the Engineering Department works with the Mansfield/Ontario/Richland County Health Department and Sewer Repair Department to determine the best solution for elimination of an illicit discharge. The City also has an Illicit Discharge Ordinance, which includes enforcement procedures that provides the City with the ability to eliminate illicit discharge sources.

- d. Procedures for program evaluation and assessment.*

Procedures for program evaluation and assessment include an annual review of the program to determine effectiveness. A series of questions will be answered in the annual review as follows (Questions come from the IDDE guidance manual prepared by the Cuyahoga County Board of Health):

To effectively evaluate your program, a number of questions need to be asked and analyzed.

1. Evaluate priority areas within your community:
 - a. Were these areas identified initially?
 - b. Are these areas still appropriate to be a priority area?
 - c. Have illicit discharges been located in these areas?
2. Detection Program
 - a. Is the program effective? Need to reassess the program by determining what has been achieved. Look at number of outfalls inventoried, the number visually inspected, the number that had dry weather flows and look at the overall

- percentages of these flows as part of your overall storm sewer system for your community.
- b. Cost effectiveness: What aspects of the program had the highest quality of effectiveness in relationship to cost?
 - c. Number of illicit discharges detected utilizing each detection method (will assist to see what method is more effective).
- 3. Tracing Program
 - a. What techniques were used?
 - b. Were these methods successful?
 - c. What techniques that were not used would be beneficial for next year?
 - d. How many illicit sources were identified and eliminated?
 - 4. Other
 - a. If using water quality sampling, resample areas within community to determine effectiveness of the removal of illicit discharges.
 - b. Determine how much time was spent by employees and expenses to determine overall cost for achieving a given result.
- 5. *How you plan to inform public employees, businesses, and the general public of hazards associated with illegal discharges and improper disposal of waste. Include in your description how this plan will coordinate with your public education minimum measure and your pollution prevention/good housekeeping minimum measure programs.***

The Illicit Discharge Public Education Program will be developed in conjunction with MCM #1 Public Education and Outreach as well as MCM #6 Pollution Prevention and Good Housekeeping. As part of the Public Education and Outreach program; storm water quality bill stuffers will be distributed at least once per year with utility bills, the storm water website will be updated to provide information on hazards associated with illicit discharges and improper disposal of waste. Public service announcements will be made on local radio stations to bring awareness to illicit discharge and how to prevent it.

- 6. *Who is responsible for overall management and implementation of your storm water illicit discharge detection and elimination program and, if different, who is responsible for each of the BMPs identified for this program.***

The Program Coordinator as outlined in the organization chart is responsible for the overall management and implementation of the IDDE program. Responsible party for each of the BMP's is listed in Section 4.3.3.

- 7. *How you will evaluate the success of this minimum measure, including how you selected the measurable goals for each of the BMPs.***

Success of this MCM will be evaluated by analyzing the number of Illicit Discharges detected and eliminated on an annual basis. Measurable goals for each of the BMP's were selected based on the City's ability physically and financially to implement these BMP's.

4.2.3. MCM #3 - Illicit Discharge Detection and Elimination BMP's

BMP Description:	Storm Sewer System Map	BMP #	MCM3-01
Responsible Party:	Program Coordinator	Legal Authority:	Y
Measurable Goals:	Complete the city wide GIS comprehensive map by July, 2017.		
Rationale:	The MS4 map is required by Ohio EPA and provides an inventory of existing storm entities in the City of Mansfield		
Method:	Generic mapping of the City storm sewer exists as 1" = 400 " hand drawn maps. All 233 outfalls and their receiving surface waters have been mapped. The City has contracted with a consultant to develop a pilot GIS mapping project. When completed and approved the methodology will be extended to the entire City. This map will then be updated as new installations, replacements, and realignments occur.		
TMDL's Targeted:	The comprehensive map will allow the storm sewer system to be managed more efficiently and allow for tracking of IDDE's which may contain TMDL's		

BMP Description:	HSTS Map and List	BMP #	MCM3-02
Responsible Party:	Program Coordinator	Legal Authority:	Y
Measurable Goals:	Develop an MOU with the Richland County Health Department. Complete a quality and completion review on the HSTS map and list. An updated HSTS map and list will be provided to Ohio EPA following completion of the QAR. The map and list will be updated annually if needed.		
Rationale:	The HSTS map and list provides the City with a list of all HSTSs that discharge to the MS4. This allows for effective investigations of potential contamination sources.		
Method:	The HSTS map was developed using the information from the Health Department		
TMDL's Targeted:	A map of the HSTS's will be beneficial for all approved TMDL's		

BMP Description:	IDDE Ordinance	BMP #	MCM3-03
Responsible Party:	Program Coordinator	Legal Authority:	Y
Measurable Goals:	Maintain compliance with the IDDE Ordinance as approved by City Council		
Rationale:	The ordinance outlines ability and responsibility of the City to the extent allowed by law to prohibit illicit discharges and illegal connections, establish legal authority to carry out inspections, develop monitoring procedures and create enforcement actions as necessary.		
Method:	The ordinance was passed by City Council in accordance with the Ohio Revised Code.		
TMDL's Targeted:	Tracing of IDDE's will allow for removal of all illicit discharges and should have a positive effect on reducing the approved TMDL's		

BMP Description:	IDDE Program	BMP #	MCM3-04
Responsible Party:	Program Coordinator	Legal Authority:	Y
Measurable Goals:	Continue Implementation of the IDDE Program		
Rationale:	The IDDE program has been created to provide a guidance manual for City personnel in the detection and elimination of illicit discharges.		
Method:	The IDDE program is based on guidance provided by the Cuyahoga County Board of Health entitled "Illicit Discharge Detection and Elimination Manual" dated July 2006.		
TMDL's Targeted:	Tracing of IDDE's will allow for removal of all illicit discharges and should have a positive effect on reducing the approved TMDL's		

BMP Description:	Outfall Dry Weather Screening	BMP #	MCM3-05
Responsible Party:	Program Coordinator	Legal Authority:	Y
Measurable Goals:	100% of 233 known outfalls were screened by the end of 2014. Since then another 148 outfalls were located. 10% of total known outfalls are to be screened each year.		
Rationale:	Dry weather screening helps with the detection and elimination of illicit discharges.		
Method:	Personnel will conduct dry weather screening by visual inspection of all MS4 outfalls when in the field within the City in accordance with the IDDE Program.		
TMDL's Targeted:	Continual Screening will allow for removal of all illicit discharges and should have a positive effect on reducing the approved TMDL's		

BMP Description:	Illicit Connection Tracing/Elimination	BMP #	MCM3-06
Responsible Party:	Program Coordinator/ Engineering Department	Legal Authority:	Y
Measurable Goals:	Perform tracing of 10% of outfalls with dry weather flow each year. Eliminate 10% of the illicit discharges discovered each year.		
Rationale:	Tracing the source of an illicit discharge helps with its detection and elimination. If the source of an illicit discharge into the MS4 is confirmed, it requires removal. The updated IDDE Ordinance will provide provisions for enforcement and elimination of the sources		
Method:	The engineering department will work with the sewer repair department to investigate the apparent illicit discharge as per the IDDE program.		
TMDL's Targeted:	Tracing of IDDE's will allow for removal of all illicit discharges and should have a positive effect on reducing the approved TMDL's		

BMP Description:	Illicit Discharge Public Education Program	BMP #	MCM3-07
Responsible Party:	Program Coordinator	Legal Authority:	Y
Measurable Goals:	The City currently provides Illicit Discharge Public Education through MCM #1 Public Education and Outreach. The City will provide at least one IDDE public education message each year.		
Rationale:	Public Education brings awareness and provides guidance to the General Public, as well as city staff on how to detect and eliminate illicit discharges thereby improving the water quality of our streams and lakes		
Method:	The Illicit Discharge Public Education Program will be performed in conjunction with MCM #1 Public Education and Outreach.		
TMDL's Targeted:	This program will address all approved TMDL's		

4.3. MCM #4 - Construction Site Storm Water Runoff Control

4.3.1. Permit Requirement/Performance Standards

Permit Requirement: *You shall develop, implement, and enforce a program to reduce pollutants in any storm water runoff to your small MS4 from construction activities that result in a land disturbance of greater than or equal to one acre. Reduction of pollutants in storm water discharges from construction activity disturbing less than one acre shall be included in your program if that construction activity is part of a larger common plan of development or sale that would disturb one acre or more. If Ohio EPA waives requirements for storm water discharges associated with small construction from a specific site(s), you are not required to enforce your program to reduce pollutant discharges from such site(s). Your program shall include the development and implementation of, at a minimum:*

An ordinance or other regulatory mechanism to require erosion and sediment controls, as well as sanctions to ensure compliance, to the extent allowable under State or local law. Your ordinance or other regulatory mechanism shall, at a minimum, be equivalent with the technical requirements set forth in the Ohio EPA NPDES General Storm Water Permit(s) for Construction Activities applicable for your permit area which have been issued at the time of issuance of this permit. This would include the following Ohio EPA NPDES General Storm Water Permits for Construction Activities: OHCO00004, OHCD00002 and OHCO00002. If you had coverage under the previous version of this permit you shall revise your ordinance or other regulatory mechanism, if needed, within two years of when your coverage under this general permit was granted;

Requirements for construction site operators to implement appropriate erosion and sediment control BMPs;

Requirements for construction site operators to control waste such as, but not limited to, discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste at the construction site that may cause adverse impacts to water quality;

Procedures for storm water pollution prevention plan review which incorporate consideration of potential water quality impacts;

Procedures for receipt and consideration of information submitted by the public; and

Procedures for site inspection and enforcement of control measures.

Performance Standard: Your construction site storm water control program shall include preconstruction storm water pollution prevention plan review of all projects from construction activities that result in a land disturbance of greater than or equal to one acre. To ensure compliance, these applicable sites shall be initially inspected. The frequency of follow-up inspections shall be on a monthly basis unless you document your procedures for prioritizing inspections such as location to a waterway, amount of disturbed area, compliance of site, etc.

4.3.2. Decision Process

- 1. The mechanism (ordinance or other regulatory mechanism) you will use to require erosion and sediment controls at construction sites and why you chose that mechanism. If you need to develop this mechanism, describe your plan and a schedule to do so. If your ordinance or regulatory mechanism is already developed, include a copy of the relevant sections with your SWMP description;**

The City of Mansfield chose an ordinance as the mechanism by which to require erosion and sediment controls at construction sites because the ordinance is a method of legislation approved by the State. City Ordinance Chapter 1362-Stormwater Erosion and Sediment Control provides for the control of erosion and sediment associated with land development that involves more than 1 acre of earth-disturbing activity or less than 1 acre of earth disturbing activity but part of a larger common plan of development which will ultimately disturb 1 or more acres. A copy of the existing ordinance is attached as Exhibit 2 – Stormwater Erosion and Sediment Control Ordinance.

The City has updated the existing ordinance so that it will be equivalent with the technical requirements set forth in the Ohio EPA NPDES General Storm Water Permit for Construction Activities (CGP). The approved ordinance was passed by City Council on April 7, 2015. A copy of the approved ordinance will be provided to Ohio EPA and Exhibit 2 will be updated following City Council approval.

- 2. Your plan to ensure compliance with your erosion and sediment control regulatory mechanism, including the sanctions and enforcement mechanisms you will use to ensure compliance. Describe your procedures for when you will use certain sanctions. Possible sanctions include non-monetary penalties (such as a stop work orders), fines, bonding requirements, and/or permit denials for non-compliance;**

City Ordinance 1362 provides enforcement per Section 1362.99 (See Exhibit 2 for ordinance language).

3. Your requirements for construction site operators to implement appropriate erosion and sediment control BMPs and control waste at construction sites that may cause adverse impacts to water quality. Such waste includes, but is not limited to, discarded building materials, concrete truck washouts, chemicals, litter, and sanitary waste;

The City has updated the existing Stormwater Erosion and Sediment Control Ordinance which has procedures for construction site operators to implement appropriate sediment control BMPs and control waste at construction sites.

4. Your procedures for pre-construction storm water pollution prevention plan review which incorporate consideration of potential water quality impacts. Describe the estimated number and percentage of sites that will have pre-construction site plans reviewed;

The City of Mansfield performs plan review of site plans, storm water management plans and storm water pollution prevention plans (SWP3) for any earth disturbing activity in excess of 20,000 SF. Site plans, storm water management plans and SWP3s must be prepared by an engineer licensed in the State of Ohio. 100% of applicable proposed land disturbance activities that meet the above threshold are subject to pre-construction plan review. The number of overall annual site plan reviews is difficult to estimate due to fluctuating development economy; however the City provides this number for each year in the annual report.

At present The Bureau of Buildings Codes and Permits in conjunction with the City Engineer reviews the stormwater management plan or drainage plan within thirty days of receipt and indicates its approval or disapproval to the person who filed the plan. Indication of disapproval shall include plan deficiencies and the procedure for filing a revised plan. Pending preparation and approval of a revised plan, earth-disturbing activities shall not be allowed until the deficiencies have been properly addressed and an acceptable plan has been filed and approved. During plan review, the Bureau may request recommendations pertaining to the proposed plan from the Richland County Soil and Water Conservation District, the City Engineer and the City Planning Commission. The City Engineer shall be responsible for review and approval of all hydrological and runoff calculations as well as design and construction inspection for all stormwater management facilities.

The City has developed a standard plan review procedure and checklist that provides the basis for plan reviews.

5. Your procedures for receipt and consideration of information submitted by the public. Consider coordinating this requirement with your public education program;

The City Engineer's office or the office of Building Codes and Permits can be contacted in person, phone, mail or email about storm water related inquiries, complaints or violation reporting. The public education program will include mechanisms to solicit public feedback. Contact information will be provided on the City stormwater website and other public education material. All information will be recorded and reviewed and a response initiated within 48

hours. A site visit will be conducted if warranted and the owner and contractor instructed to initiate remedial measures.

6. Your procedures for site inspection and enforcement of control measures, including how you will prioritize sites for inspection;

The City Engineer's office and Building Codes and Permits department currently divide responsibilities on plan review as well as inspection of control measures. A non-compliance letter is sent if deemed necessary followed by discussion with the contractor or owner about remedial measures. The City plans to provide inspections of applicable construction sites once per month with priority given to those sites that have had previous violations. The City has developed standard procedures for construction site inspections along with a standard inspection checklist to streamline inspections and ensure compliance.

7. Who is responsible for overall management and implementation of your construction site storm water control program and, if different, who is responsible for each of the BMPs identified for this program;

The City Engineer as outlined in the organization chart is responsible for the overall management and implementation of the construction site runoff control program. Responsible party for each of the BMPs is listed in Section 4.4.3.

8. Describe how you will evaluate the success of this minimum measure, including how you selected the measurable goals for each of the BMPs.

The City has provided a mechanism to control erosion and sediment on construction sites with the Stormwater Erosion and Sediment Control Ordinance. The updated ordinance, site plan review standards and checklist, and site inspection procedures and checklist will provide mechanisms for the continued success of this measure. The program will be evaluated annually to determine the number of plans reviewed and inspections performed. Public submittals of information regarding sites not in compliance with the rules will also be reviewed annually to determine how compliance issues were resolved. Measurable goals were selected based on the expected ability of the City to meet said goals.

4.3.3. MCM #4 - Construction Site Storm Water Runoff Control BMPs

BMP Description:	Stormwater Erosion & Sediment Control Ordinance	BMP #	MCM4-01
Responsible Party:	Program Coordinator	Legal Authority:	Y
Measurable Goals:	Updated ordinance has been passed by the city council that is equivalent with the technical requirements set forth in the Ohio EPA NPDES General Storm Water Permits for Construction Activities.		
Rationale:	The ordinance updated the existing Stormwater Erosion and Sediment Control Chapter 1362 to provide the City with a means to control sediment and erosion from construction sites.		
Method:	City council passed the ordinance on April 7 th , 2015 and declared it an emergency so that it became effective immediately.		
TMDL's Targeted:	All approved TMDL's will be targeted with the passing of the ordinance		

BMP Description:	Stormwater Erosion and Sediment Control Requirements	BMP #	MCM4-02
Responsible Party:	Program Coordinator	Legal Authority:	Y
Measurable Goals:	In conjunction with the Stormwater Erosion and Sediment Control Ordinance, the City has developed Stormwater Erosion and Sediment Control Requirements.		
Rationale:	The Stormwater Erosion and Sediment Control Requirements provide guidance to engineers, contractors and developers on design and construction practices required by the City of Mansfield. They also provide guidance to City personnel as they review and inspect erosion and sediment control plans and construction.		
Method:	The requirements are administered by the City Engineer's office. Plan review is required for any land disturbance greater than or equal to 20,000 SF.		
TMDL's Targeted:	The requirements developed in conjunction with the ordinance will assist in reducing all approved TMDL's		

BMP Description:	Plan Review Procedures and Checklist	BMP #	MCM4-03
Responsible Party:	Program Coordinator	Legal Authority:	Y
Measurable Goals:	The City has developed Plan Review Procedures and Checklist. The City will track the number of applicable sites requiring plans and plan review.		
Rationale:	The city performs plan review of sediment and erosion controls, non-sediment pollutant controls and post construction storm water management controls for sites with over 20,000 SF of earth disturbing activity. To ensure that each of the required elements is met, a standard plan review procedure and checklist is used.		
Method:	Develop a standard plan review procedure guide and checklist as a reference for both reviewers and designers.		
TMDL's Targeted:	These will assist in managing active sites and reducing all approved TMDL's at those sites.		

BMP Description:	Site Inspection Procedures and Checklist	BMP #	MCM4-04
Responsible Party:	Program Coordinator	Legal Authority:	Y
Measurable Goals:	The city has developed Site Inspection Procedures and Checklist and the goal is to perform inspections of all applicable construction sites once a month.		
Rationale:	The city regularly inspects all applicable sites for implementation of appropriate construction site storm water quality BMPs. A standard procedure for these inspections along with a checklist will ensure all terms are met and proper documentation of the inspection is maintained		
Method:	Develop a standard procedure and checklist for site inspections as a guide for reviewers.		
TMDL's Targeted:	These will assist in managing active sites and reducing all approved TMDL's at those sites.		

4.4. MCM #5 - Post Construction Storm Water Management in New Development and Redevelopment

4.4.1. Permit Requirement/Performance Standards

Permit Requirement: *You shall develop, implement, and enforce a program to address storm water runoff from new development and redevelopment projects that disturb greater than or equal to one acre, including projects less than one acre that are part of a larger common plan of development or sale, that discharge into your small MS4. Your program shall ensure that controls are in place that will prevent or minimize water quality impacts;*

You shall develop and implement strategies which include a combination of structural and/or non-structural BMPs appropriate for your community;

You shall use an ordinance or other regulatory mechanism to address post-construction runoff from new development and redevelopment projects to the extent allowable under State or local law. Your ordinance or other regulatory mechanism shall, at a minimum, be equivalent with the technical requirements set forth in the Ohio EPA NPDES General Storm Water Permit(s) for Construction Activities applicable for your permit area which have been issued at the time of issuance of this permit. This would include the following Ohio EPA NPDES General Storm Water Permits for Construction Activities: OHC000004, OHCD00002 and OHCO00002. If had coverage under a previous version of this permit, you shall revise your ordinance or other regulatory mechanism, if needed, within two years of when your coverage under this general permit was granted; and

You shall ensure adequate long-term operation and maintenance of BMPs.

Performance Standard: *Your post-construction SWMP shall include pre-construction storm water pollution prevention plan review of all projects from construction activities that result in a land disturbance of greater than or equal to one acre to ensure that required controls are designed per requirements. These applicable sites shall be inspected to ensure that controls are installed per requirements. Your program shall also ensure that long-term operation and maintenance (O&M) plans are developed and agreements in place for all applicable sites.*

4.4.2. Decision Process

- 1. Your program to address storm water runoff from new development and redevelopment projects. Include in this description any specific priority areas for this program.**

The City of Mansfield has been enforcing a storm water management policy since 1986. City Ordinance 1361 - Storm Water Management (Exhibit 3) addresses storm water runoff from new development and redevelopment. The City has updated the existing ordinance to be equivalent with the technical requirements set forth in the Ohio EPA NPDES General Storm Water Permits for Construction Activities.

Priority areas for the program are those areas with existing detention basins. The Engineering and the Building Codes and Permits departments inspect existing detention basins for continued operation and for compliance with plans and specifications. The goal of this program will be to inspect each significant detention basin at least once every 10 years. The City has undertaken and will continue to undertake stormwater management programs on its own where the magnitude or complexity of the problem exceeds the capabilities of the property owners. The efforts will range from stream maintenance and establishment of riparian corridors to major stormwater construction projects.

- 2. How your program will be specifically tailored for your local community, minimize water quality impacts, and attempt to maintain pre-development runoff conditions.**

The city of Mansfield updated the Ordinance for storm water management which was passed by city council on April 7th, 2015. In conjunction with the ordinance update a Stormwater Design Manual was also developed. The ordinance and Manual provide guidelines for minimizing water quality impacts and maintaining pre-development runoff conditions.

- 3. Any non-structural BMPs in your program, including, as appropriate: policies and ordinances that provide requirements and standards to direct growth to identified areas, protect sensitive areas such as wetlands and riparian areas, maintain and/or increase open space (including a dedicated funding source for open space acquisition), provide buffers along sensitive water bodies, minimize impervious surfaces, and minimize disturbance of soils and vegetation; policies or ordinances that encourage infill development in higher density urban areas, and areas with existing storm sewer infrastructure; education programs for developers and the public about project designs that minimize water quality impacts; and other measures such as minimization of the percentage of impervious area after development, use of measures to minimize directly connected impervious areas, and source control measures often thought of as good housekeeping, preventive maintenance and spill prevention.**

The City's planning and zoning code regulates development within all areas of the City in accordance with respective zone classifications. The City will continue to encourage development in the industrial park and several Brownfield sites where existing infrastructure is configured to handle stormwater. Additional non-structural BMPs have been incorporated into

the updated Stormwater Management Ordinance and accompanying Stormwater Design Manual.

- 4. Any structural BMPs in your program, including, as appropriate: storage practices such as wet ponds and extended-detention outlet structures; filtration practices such as grassed swales, bioretention cells, sand filters and filter strips; and infiltration practices such as infiltration basins and infiltration trenches.**

Currently the City of Mansfield allows all structural BMPs that are approved for use in Ohio EPA's NPDES General Storm Water Permit for Construction Activities.

- 5. The mechanisms (ordinance or other regulatory mechanisms) you will use to address post construction runoff from new developments and redevelopments and why you chose the mechanism(s). If you need to develop a mechanism, describe your plan and a schedule to do so. If your ordinance or regulatory mechanism is already developed, include a copy of the relevant sections with your program.**

The City of Mansfield chose an ordinance as the mechanism by which to address post construction runoff from new development and redevelopments because the ordinance is a method of legislation approved by the State. City Ordinance Chapter 1361-Stormwater Management addresses post construction runoff from new development and redevelopment which involves more than 20,000 square feet of earth-disturbing activities. A copy of the existing ordinance is attached as Exhibit 3 – Stormwater Management Ordinance. A copy of the approved ordinance has been provided to Ohio EPA and included as Exhibit 3.

- 6. How you will ensure the long-term operation and maintenance (O&M) of your selected BMPs. Options to help ensure that future O&M responsibilities are clearly identified include an agreement between you and another party such as the post-development landowners or regional authorities.**

The City of Mansfield has developed a standard O& M agreement which is required as part of the plan submittal process. Additionally, the City of Mansfield will perform a post construction inspection to ensure that post construction BMPs are in place and that the O & M agreement has been signed.

- 7. Who is responsible for overall management and implementation of your post-construction SWMP and, if different, who is responsible for each of the BMPs identified for this program.**

The Program Coordinator outlined in the organization chart is responsible for the overall management and implementation of the Post Construction Storm Water Runoff Control program. Responsible party for each of the BMP's is listed in Section 4.5.3.

8. How you will evaluate the success of this minimum measure, including how you selected the measurable goals for each of the BMPs.

The City has provided a mechanism to control Post Construction Storm Water Runoff via ordinance, inspections and the O & M Agreement. The success of this MCM will be evaluated annually to determine the number of plans reviewed and inspections performed. Periodic inspections of Post Construction BMPs will be performed to insure compliance with the Operations and Maintenance Agreement that is required for new and redevelopment projects. Measurable goals were selected based on the expected ability of the City to meet said goals.

4.4.3. MCM #5 - Post Construction Storm Water Runoff Control BMP's

BMP Description:	Stormwater Management Ordinance	BMP #	MCM5-01
Responsible Party:	Program Coordinator	Legal Authority:	Y
Measurable Goals:	An updated ordinance was passed by the city council on April 7 th , 2015 that is equivalent with the technical requirements set forth in the Ohio EPA NPDES General Storm Water Permits for Construction Activities.		
Rationale:	The ordinance updated the existing Stormwater Management Ordinance, Chapter 1361 to provide the City with a means to control the quality of storm water discharged from the site after construction is complete.		
Method:	City council passed the ordinance on April 7 th , 2015 and declared it an emergency so that it became effective immediately.		
TMDL's Targeted:	The ordinance will target and allow for reduction of all approved TMDL's		

BMP Description:	Stormwater Design Manual	BMP #	MCM5-02
Responsible Party:	Program Coordinator	Legal Authority:	Y
Measurable Goals:	In conjunction with the Stormwater Management Ordinance, the City developed a Stormwater Design Manual.		
Rationale:	The Stormwater Design Manual provides guidance to engineers, contractors and developers on design and construction practices required by the City of Mansfield. They also provide guidance to City personnel as they review and inspect post construction BMP plans and construction.		
Method:	The requirements are administered by the City Engineer's office. Plan review is required for any land disturbance greater than or equal to 20,000 SF.		
TMDL's Targeted:	The manual will target and allow for reduction of all approved TMDL's		

BMP Description:	Plan Review Procedures and Checklist	BMP #	MCM4-03
Responsible Party:	Program Coordinator	Legal Authority:	Y
Measurable Goals:	The City has developed Plan Review Procedures and Checklist and will track number of applicable sites requiring plans and plan review.		
Rationale:	The city performs plan review of sediment and erosion controls, non-sediment pollutant controls and post construction storm water management controls for sites with over 20,000 SF of earth disturbing activity. To ensure that each of the required elements are met, a standard plan review procedure and checklist is used.		
Method:	Develop a standard plan review procedure guide and checklist as a reference for both reviewers and designers.		
TMDL's Targeted:	These will target and allow for reduction of all approved TMDL's		

BMP Description:	Site Inspection Procedures and Checklist	BMP #	MCM4-04
Responsible Party:	Program Coordinator	Legal Authority:	Y
Measurable Goals:	Implement Site Inspection Procedures and Checklists.		
Rationale:	Perform inspections of all applicable Post Construction BMP sites following completion of construction activities and final stabilization.		
Method:	The city regularly inspects all applicable sites for implementation of appropriate construction site storm water quality BMPs. A standard procedure for these inspections along with a checklist will ensure all terms are met and proper documentation of the inspection is maintained.		
TMDL's Targeted:	Develop a Standard procedures and checklists for site inspections as a guide for reviewers have been developed.		
TMDL's Targeted:	These will target and allow for reduction of all approved TMDL's		

BMP Description:	Post Construction Long Term O & M Plan/Agreement	BMP #	MCM5-05
Responsible Party:	Codes and Permits and City Engineer	Legal Authority:	Y
Measurable Goals:	A Standard O&M Plan/Agreement is required for all sites that have Post Construction BMPs.		
Rationale:	The Post Construction Long Term O & M plan/Agreement provides the City with a way to ensure that Post Construction BMP's are being maintained and are functioning correctly.		
Method:	A Post Construction Long Term O & M Plan/Agreement is required as part of the plan submittal process. The City will perform an inspection to ensure that the post construction BMPs are in place as per plan.		
TMDL's Targeted:	An O&M program will allow for continued reduction of all approved TMDL's		

4.5. MCM #6 - Pollution Prevention and Good Housekeeping

4.5.1. Permit Requirement/Performance Standards

Permit Requirement: You shall develop and implement an operation and maintenance program that includes a training component and has the ultimate goal of preventing or reducing pollutant runoff from municipal operations; and

Using training materials that are available from Ohio EPA or other organizations, your program shall include employee training to prevent and reduce storm water pollution from activities such as park and open space maintenance, fleet and building maintenance, new construction and land disturbances, and storm water system maintenance; and

You shall include a list of industrial facilities you own or operate that are subject to Ohio EPA's Industrial Storm Water General Permit or individual NPDES permits for discharges of storm water associated with industrial activity that ultimately discharge to your MS4. Include the Ohio EPA permit number or a copy of the Industrial NOI form for each facility. For your municipal facilities that conduct activities described in 40 CFR 122.26(b)(14) that are not required to obtain Industrial Storm Water General Permit coverage, including vehicle maintenance facilities, bus terminals, composting facilities, impoundment lots and waste transfer stations, a Storm Water Pollution Prevention Plan (SWP3) shall be developed and implemented in accordance with the SWP3 requirements of Ohio EPA's Industrial Storm Water General Permit (OHR000005).

Performance Standard: Your pollution prevention/good housekeeping program shall include, at a minimum, an annual employee training. Your operation and maintenance program shall include appropriate procedures, controls, maintenance schedules and recordkeeping to address Part III.B.6.d.iii of this permit.

4.5.2. Decision Process

- 1. Your operation and maintenance program to prevent or reduce pollutant runoff from your municipal operations. Your program shall specifically list the municipal operations that are impacted by this operation and maintenance program.**

The City has developed SWP3s for its Municipal operations. The municipal operations that are impacted include:

- Mansfield Service Building
480 Park Avenue East
Mansfield, OH

Activities at complex include:

- Vehicle maintenance
 - Vehicle washing
 - Equipment storage
 - Salt storage
 - Compost site
 - Street and sewer repair spoil area
- Wastewater Treatment Plant
385 S Illinois Ave
Mansfield, OH

Activities at complex include:

- Waste water treatment
- Temporary storage of street sweepings/grit

2. ***Any government employee training program you will use to prevent and reduce storm water pollution from activities such as park and open space maintenance, fleet and building maintenance, new construction and land disturbances, and storm water system maintenance. Describe any existing, available materials you plan to use. Describe how this training program will be coordinated with the outreach programs developed for the public information minimum measure and the illicit discharge minimum measure.***

The City of Mansfield will incorporate an employee training program utilizing either in-house resources or other available government training resources. The trainings will be held at least once per year and will be held in conjunction with MCM1 - Public Education and Outreach.

3. ***Your program description shall specifically address the following areas:***

- a. ***Maintenance activities, maintenance schedules, and long-term inspection procedures for controls to reduce floatables and other pollutants to your MS4.***
- b. ***Controls for reducing or eliminating the discharge of pollutants from streets, roads, highways, municipal parking lots, maintenance and storage yards, waste transfer stations, fleet or maintenance shops with outdoor storage areas, and salt/sand storage locations and snow disposal areas you operate. A description of the materials used for roadway and municipal parking lot winterization (use of salt, sand, bottom ash, etc. or combination thereof), associated application rates, and the rationale for the selected application rates shall be included. Also identify controls or practices to be used for reducing or eliminating discharges of pollutants resulting from roadway and municipal parking lot winterization activities.***

- c. Procedures for the proper disposal of waste removed from your MS4 and your municipal operations, including dredge spoil, accumulated sediments, floatables, and other debris.*

Though the City performs maintenance activities and has controls in place to reduce pollutants and properly disposes of waste, there is not currently a written program delineating how these areas are to be handled. The City is in the process of compiling an Operation and Maintenance (O & M) program to provide written procedures for all municipal activities provided by the City per the MS4 permit requirements. This updated O & M program is anticipated to be completed by the end of the permit term.

- d. Procedures to ensure that new flood management projects are assessed for impacts on water quality and existing projects are assessed for incorporation of additional water quality protection devices or practices.*

The Codes and Permits office and City Engineer's office are responsible for reviewing all new flood management projects. New developments are required to provide flood management with incorporated water quality design. For public flood control projects, the City Engineer's office hires design teams using qualifications based selection to ensure that a design team is engaged that is qualified to provide flood management as well as water quality design. Public flood management projects will also be reviewed by City Engineer staff for water quality impacts.

- e. Who is responsible for overall management and implementation of your pollution prevention/good housekeeping program and, if different, who is responsible for each of the BMPs identified for this program.*

The Program Coordinator as outlined in the organization chart is responsible for the overall management and implementation of the Pollution Prevention and Good Housekeeping program. Responsible party for each of the BMPs is in Section 4.6.3.

- 4. How you will evaluate the success of this minimum measure, including how you selected the measurable goals for each of the BMPs.**

Measurable goals for each of the BMP's have been outlined which provide a framework to ensure that permit requirements are met. The PPGHP provides reporting requirements for spills, storm water discharge visual inspections and annual inspections. These reports will be analyzed annually in conjunction with each BMP to determine if the program is helping to improve Pollution Prevention and Good Housekeeping at City Facilities.

4.5.3. MCM #6 - Pollution Prevention and Good Housekeeping BMP's

BMP Description:	Municipal Facilities Storm Water Pollution Prevention Plans (SWP3)	BMP #	MCM6-01
Responsible Party:	The Program Coordinator will be responsible to oversee development of the SWP3s. The SWP3 will designate a responsible party for each facility.	Legal Authority:	Y
Measurable Goals:	SWP3s for each of the facilities have been developed and the City will perform quarterly inspections as required.		
Rationale:	The SWP3 provides facility operators a guide for pollution prevention and good housekeeping practices that should be implemented to keep the facility in compliance with Ohio EPA.		
Method:	SWP3's will be developed by a consultant formatted in accordance with Ohio EPA guidelines		
Target Audience:	Facility Operators		
TMDL's Targeted:	SWP3's will target all TMDL's present at municipal facilities		

BMP Description:	Employee Training Program	BMP #	MCM6-02
Responsible Party:	Program Coordinator	Legal Authority:	Y
Measurable Goals:	Hold employee training at least once per year. Track number of employee participants.		
Rationale:	Providing training to employees in good housekeeping measures will help them recognize pollutants and potential areas where pollutants could be released as well as provide information on how to avoid allowing those pollutants to be released.		
Method:	The City will provide announcements of employee training opportunities.		
Target Audience:	City Employees/General Public.		
TMDL's Targeted:	Employee training will assist in the prevention of all approved TMDL's		

5. Reporting Requirements

Ohio EPA requires that an annual report be submitted by April 1st of each year. These reports must be filled out on the form provided by Ohio EPA which is found on their website at HTTP://WWW.EPA.STATE.OH.US/DSW/PERMITS/GP_MS4STORMWATER.ASPX.

6. Funding

The City currently funds the storm water management program through the general and/or sewer fund.

7. 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."

Lori A. Cope
Safety Service Director

8. References

Clermont County. 2010. "Storm Water Management Plan", August, 2009

NOACA Storm Water Task Force. 2003. "NOACA Model Approach to Phase II Storm Water

State of Ohio. "Ohio Revised Code"

State of Ohio Environmental Protection Agency. 2009. "Authorization for Small Municipal Separate Storm Sewer Systems to Discharge Storm Water Under the National Pollutant Discharge Elimination System", January, 2009

Trumbull County. 2003. "Ohio Storm Water Management Program", March, 2003

U.S. EPA. "Stormwater discharges From Municipal Separate Storm Sewer Systems (MS4s)".

<http://cfpub.epa.gov/npdes/stormwater/munic.cfm>

City of Canton. 2011 " Storm Water management Program (SWMP)", February 2011

9. Exhibits

EXHIBIT 1 – ILLICIT DISCHARGE ORDINANCE

EXHIBIT 2 – STORMWATER EROSION AND SEDIMENT CONTROL ORDINANCE

EXHIBIT 3 – STORMWATER MANAGEMENT ORDINANCE

Exhibit 1 – Illicit Discharge Ordinance



BILL #15-067*

ORDINANCE# _____

BY: MR. VAN HARLINGEN

Enacting Chapter 1365 – Illicit Discharge and Illegal Connection Control of the Mansfield Codified Ordinances of 1997.

WHEREAS, illicit discharges to the City of Mansfield separate storm sewer system create water quality risks to public health, safety, and general welfare; and,

WHEREAS, illicit discharges may necessitate repair of storm sewers and ditches; damage to public and private property; and may damage water resources by reducing water quality; and,

WHEREAS, 40 C.F.R. Parts 9, 122, 123, and 124, and Ohio Administrative Code 3745-39 require designated communities, including the City of Mansfield, to develop a Storm Water Management Program that, among other components, requires the City of Mansfield to prohibit illicit discharges to their storm water system and to implement appropriate enforcement procedures and actions to detect and eliminate such illicit discharges; and,

WHEREAS, Article XVIII, Section 3 of the Ohio Constitution grants municipalities the legal authority to exercise all powers of local self-government and to adopt and enforce within their limits such local police, sanitary, and other similar regulations, as are not in conflict with general laws.

**NOW, THEREFORE, BE IT ORDAINED BY THE COUNCIL OF THE
CITY OF MANSFIELD, STATE OF OHIO:**

SECTION 1: That Chapter 1365 of the Mansfield Codified Ordinances of 1997, be, and the same is hereby, enacted to read as follows:

"CHAPTER 1365 Illicit Discharge and Illegal Connection Control"

1365.01 PURPOSE AND SCOPE.

The purpose of this regulation is to provide for the health, safety, and general welfare of the citizens of the City of Mansfield through the regulation of illicit discharges to the municipal separate storm sewer system (MS4). This regulation establishes methods for controlling the introduction of pollutants into the MS4 in order to comply with requirements of the National Pollutant Discharge Elimination System (NPDES) permit process as required by the Ohio Environmental Protection Agency (Ohio EPA). The objectives of this regulation are:

- A. To prohibit illicit discharges and illegal connections to the MS4;
- B. To establish legal authority to carry out inspections, monitoring procedures, and enforcement actions necessary to ensure compliance with this regulation.

1365.02 APPLICABILITY.

This regulation shall apply to all residential, commercial, industrial, or institutional facilities responsible for discharges to the MS4 and on any lands in the City of Mansfield, except for those discharges generated by the activities detailed in Section 1365.07 (A)(1) to (A)(3) of this regulation,

1365.03 DEFINITIONS.

The words and terms used in this regulation, unless otherwise expressly stated, shall have the following meanings:

- A. **Best Management Practices (BMPs)**: means schedules of activities, prohibitions of practices, general good housekeeping practices, pollution prevention and educational practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants to

storm water. BMPs also include treatment practices, operating procedures, and practices to control site runoff, spillage or leaks, sludge or water disposal, or drainage from raw materials storage.

B. Community: means the City of Mansfield, its designated representatives, boards, or commissions.

C. Environmental Protection Agency or United States Environmental Protection Agency (USEPA): means the United States Environmental Protection Agency, including but not limited to the Ohio Environmental Protection Agency (Ohio EPA), or any duly authorized official of said agency;

D. Floatable Material: in general this term means any foreign matter that may float or remain suspended in the water column, and includes but is not limited to, plastic, aluminum cans, wood products, bottles, and paper products;

E. Hazardous Material: means any material including any substance, waste, or combination thereof, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause, or significantly contribute to, a substantial present or potential hazard to human health, safety, property, or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

F. Illicit Discharge: as defined at 40 C.F.R. 122.26 (b)(2) means any discharge to an MS4 that is not composed entirely of storm water, except for those discharges to an MS4 pursuant to an NPDES permit or noted in Section 1365.07 of this regulation;

G. Illegal Connection: means any drain or conveyance, whether on the surface or subsurface, that allows an illicit discharge to enter the MS4.

H. Municipal Separate Storm Sewer System (MS4): as defined at 40 C.F.R. 122.26 (b)(8), municipal separate storm sewer system means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):

1. Owned or operated by a state, city, town, borough, county, parish, district, municipality, township, county, district, association, or other public body (created by or pursuant to State law) having jurisdiction over sewage, industrial wastes, including special districts under State law such as a sewer district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the Clean Water Act that discharges to waters of the United States;

2. Designed or used for collecting or conveying storm water;

3. Which is not a combined sewer; and

4. Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 C.F.R. 122.2.

I. National Pollutant Discharge Elimination System (NPDES) Storm Water Discharge Permit: means a permit issued by EPA (or by a State under authority delegated pursuant to 33 USC § 1342(b)) that authorizes the discharge of pollutants to waters of the United States; whether the permit is applicable on an individual, group, or general area wide basis;

J. Off-Lot Discharging Household Sewage Treatment System: means a system designed to treat household sewage on-site and discharges treated wastewater effluent off the property into a storm water or surface water conveyance or system.

K. Owner/Operator: means any individual, association, organization, partnership, firm, corporation or other entity recognized by law and acting as either the owner or on the owner's behalf.

L. Pollutant: means anything that causes or contributes to pollution. Pollutants may include, but are not limited to, paints, varnishes, solvents, oil and other automotive fluids, non-hazardous

liquid and solid wastes, yard wastes, refuse, rubbish, garbage, litter or other discarded or abandoned objects, floatable materials, pesticides, herbicides, fertilizers, hazardous materials, wastes, sewage, dissolved and particulate metals, animal wastes, residues that result from constructing a structure, and noxious or offensive matter of any kind.

M. Storm Water: any surface flow, runoff, and drainage consisting entirely of water from any form of natural precipitation, and resulting from such precipitation;

N. Wastewater: The spent water of a community. From the standpoint of a source, it may be a combination of the liquid and water-carried wastes from residences, commercial buildings, industrial plants, and institutions.

1365.04 DISCLAIMER OF LIABILITY.

Compliance with the provisions of this regulation shall not relieve any person from responsibility for damage to any person otherwise imposed by law. The provisions of this regulation are promulgated to promote the health, safety, and welfare of the public and are not designed for the benefit of any individual or for the benefit of any particular parcel of property.

1365.05 CONFLICTS, SEVERABILITY, NUISANCES & RESPONSIBILITY.

- A. Where this regulation is in conflict with other provisions of law or ordinance, the most restrictive provisions, as determined by the City of Mansfield, shall prevail.
- B. If any clause, section, or provision of this regulation is declared invalid or unconstitutional by a court of competent jurisdiction, the validity of the remainder shall not be affected thereby.
- C. This regulation shall not be construed as authorizing any person to maintain a nuisance on their property, and compliance with the provisions of this regulation shall not be a defense in any action to abate such a nuisance.
- D. Failure of the City of Mansfield to observe or recognize hazardous or unsightly conditions or to recommend corrective measures shall not relieve the site owner from the responsibility for the condition or damage resulting there from, and shall not result in the City of Mansfield, its officers, employees, or agents being responsible for any condition or damage resulting therefrom.

1365.06 RESPONSIBILITY FOR ADMINISTRATION.

The City of Mansfield shall administer, implement, and enforce the provisions of this regulation. The City of Mansfield may contract with the Richland Public Health to conduct inspections and monitoring and to assist with enforcement actions.

1365.07 DISCHARGE AND CONNECTION PROHIBITIONS.

A. Prohibition of Illicit Discharges: No person shall discharge, or cause to be discharged, an illicit discharge into the MS4. The commencement, conduct, or continuance of any illicit discharge to the MS4 is prohibited except as described below:

1. Water line flushing; landscape irrigation; diverted stream flows; rising ground waters; uncontaminated ground water infiltration; uncontaminated pumped ground water; discharges from potable water sources; foundation drains; air conditioning condensate; irrigation water; springs; water from crawl space pumps; footing drains; lawn watering; individual residential car washing; flows from riparian habitats and wetlands; dechlorinated swimming pool discharges; street wash water; and discharges or flows from firefighting activities. These discharges are exempt until such time as they are determined by the City of Mansfield to be significant contributors of pollutants to the MS4.
2. Discharges specified in writing by the City of Mansfield as being necessary to protect public health and safety.
3. Discharges from off-lot discharging household sewage treatment systems existing prior to January 1, 2007 and permitted by the Richland Public Health for the purpose of discharging treated sewage effluent in accordance with Ohio Administrative

Code 3701-29, or other applicable Richland Public Health regulations, until such time as the Ohio Environmental Protection Agency issues an NPDES permitting mechanism for household sewage treatment systems existing prior to January 1, 2007. These discharges are exempt unless such discharges are deemed to be creating a public health nuisance by the Richland Public Health. Discharges from new or replacement off-lot household sewage treatment systems installed after January 1, 2007 are not exempt from the requirements of this regulation.

In compliance with the City of Mansfield Storm Water Management Program, discharges from all off-lot discharging household sewage treatment systems must either be eliminated or have coverage under an appropriate NPDES permit issued and approved by the Ohio Environmental Protection Agency. When such permit coverage is available for systems existing prior to January 1, 2007, discharges from off-lot discharging household sewage treatment systems existing prior to January 1, 2007 will no longer be exempt from the requirements of this regulation.

B. Prohibition of Illegal Connections: The construction, use, maintenance, or continued existence of illegal connections to the MS4 is prohibited:

1. This prohibition expressly includes, without limitation, illegal connections made in the past, regardless of whether the connection was permissible under law or practices applicable or prevailing at the time of connection.
2. A person is considered to be in violation of this regulation if the person connects a line conveying illicit discharges to the MS4, or allows such a connection to continue.

1365.08 MONITORING OF ILLICIT DISCHARGES AND ILLEGAL CONNECTIONS.

A. Establishment of an Illicit Discharge and Illegal Connection Monitoring Program: The City of Mansfield shall establish a program to detect and eliminate illicit discharges and illegal connections to the MS4. This program shall include the mapping of the MS4, including MS4 outfalls and household sewage treatment systems; the routine inspection of storm water outfalls to the MS4, and the systematic investigation of potential residential, commercial, industrial, and institutional facilities for the sources of any dry weather flows found as the result of these inspections.

B. Inspection of Residential, Commercial, Industrial, or Institutional Facilities:

1. The City of Mansfield shall be permitted to enter and inspect facilities subject to this regulation as often as may be necessary to determine compliance with this regulation.
2. The City of Mansfield shall have the right to set up at facilities subject to this regulation such devices as are necessary to conduct monitoring and/or sampling of the facility's storm water discharge, as determined by the City of Mansfield.
3. The City of Mansfield shall have the right to require the facility owner/operator to install monitoring equipment as necessary. This sampling and monitoring equipment shall be maintained at all times in safe and proper operating condition by the facility owner/operator at the owner/operator's expense. All devices used to measure storm water flow and quality shall be calibrated by the City of Mansfield to ensure their accuracy.
4. Any temporary or permanent obstruction to safe and reasonable access to the facility to be inspected and/or sampled shall be promptly removed by the facility's owner/operator at the written or oral request of the City of Mansfield and shall not be replaced. The costs of clearing such access shall be borne by the facility owner/operator.
5. Unreasonable delays in allowing the City of Mansfield access to a facility subject to this regulation for the purposes of illicit discharge inspection is a violation of this regulation.
6. If the City of Mansfield is refused access to any part of the facility from which storm water is discharged, and the City of Mansfield demonstrates probable cause to believe that there may be a violation of this regulation, or that there is a need to inspect and/or

sample as part of an inspection and sampling program designed to verify compliance with this regulation or any order issued hereunder, or to protect the public health, safety, and welfare, the City of Mansfield may seek issuance of a search warrant, civil remedies, including but not limited to injunctive relief, and/or criminal remedies from any court of appropriate jurisdiction.

7. Any costs associated with these inspections shall be assessed to the facility owner/operator.

1365.09 ENFORCEMENT

A. Notice of Violation: When the City of Mansfield finds that a person has violated a prohibition or failed to meet a requirement of this regulation, the City of Mansfield may order compliance by written Notice of Violation. Such notice must specify the violation and shall be hand delivered, and/or sent by registered mail, to the owner/operator of the facility. Such notice may require the following actions:

1. The performance of monitoring, analyses, and reporting;
2. The elimination of illicit discharges or illegal connections;
3. That violating discharges, practices, or operations cease and desist;
4. The abatement or remediation of storm water pollution or contamination hazards and the restoration of any affected property; or
5. The implementation of source control or treatment BMPs.

B. If abatement of a violation and/or restoration of affected property is required, the Notice of Violation shall set forth a deadline within which such remediation or restoration must be completed. Said Notice shall further advise that, should the facility owner/operator fail to remediate or restore within the established deadline, a legal action for enforcement may be initiated.

C. Any person receiving a Notice of Violation must meet compliance standards within the time established in the Notice of Violation.

D. Administrative Hearing: If the violation has not been corrected pursuant to the requirements set forth in the Notice of Violation, the City of Mansfield shall schedule an administrative hearing to determine reasons for non-compliance and to determine the next enforcement activity. Notice of the administrative hearing shall be hand delivered and/or sent registered mail.

E. Injunctive Relief: It shall be unlawful for any owner/operator to violate any provision or fail to comply with any of the requirements of this regulation pursuant to O.R.C. 3709.211. If an owner/operator has violated or continues to violate the provisions of this regulation, the City of Mansfield may petition for a preliminary or permanent injunction restraining the owner/operator from activities that would create further violations or compelling the owner/operator to perform abatement or remediation of the violation.

1365.10 REMEDIES NOT EXCLUSIVE

The remedies listed in this regulation are not exclusive of any other remedies available under any applicable federal, state or local law and it is in the discretion of the City of Mansfield to seek cumulative remedies."

SECTION 2: In order to provide for the proper and effective management of illicit discharge and illegal connection control, this measure is determined to be an emergency Ordinance for the immediate preservation of the public peace, health, safety and welfare of the City of Mansfield and its inhabitants and providing it receives the affirmative vote of two-thirds of all members elected to Council, it shall take effect and be in force immediately upon its adoption, otherwise from and after the earliest time allowed by law, after its passage and approval by the Mayor.

Caucus 7 April 2015
1st Reading 7 April 2015
2nd Reading _____
PASSED 7 April 2015

SIGNED

ATTEST

Amy Yockey

/s/ Amy L. Yockey
Clerk of Council

APPROVED

P.E. Scott

/s/ Phillip E. Scott
President
Tim Healer

/s/ Timothy L. Healer
Mayor

APPROVED AS TO FORM:

John R. Spon
Law Director
City of Mansfield, Ohio

*Publication Required.

Clerk of Council of the City of Mansfield,
hereby certify that this is a true copy of the original of this doc-
ument, which is presently on file in the office of Mansfield City
Council.
Amy Yockey

Exhibit 2 – Stormwater Erosion and Sediment Control Ordinance



BILL #15-066*

ORDINANCE# _____

BY: MR. VAN HARLINGEN

Repealing Chapter 1362 – Stormwater Erosion and Sediment Control of the Mansfield Codified Ordinances of 1997 and enacting Chapter 1362 – Stormwater Erosion and Sediment Control.

WHEREAS, currently, the Mansfield Codified Ordinances provide for the establishment of certain rules and regulations relating to stormwater erosion and sediment control, and

WHEREAS, the City finds it beneficial to the needs of the community to update and revise said Section:

**NOW, THEREFORE, BE IT ORDAINED BY THE COUNCIL OF THE
CITY OF MANSFIELD, STATE OF OHIO:**

SECTION 1: That Chapter 1362 of the Mansfield Codified Ordinances of 1997, authorizing the establishment of certain rules and regulations relating to stormwater erosion and sediment control, be and the same is hereby, repealed.

SECTION 2: That Chapter 1362 of the Mansfield Codified Ordinances of 1997, be, and the same is hereby, enacted to read as follows:

"CHAPTER 1362 Stormwater Erosion and Sediment Control

1362.01 AUTHORITY AND TITLE.

This chapter has been developed under authority of Article XVIII, Section 3 of the Ohio Constitution.

The official title of these rules shall be known as the "City of Mansfield, Ohio Stormwater Erosion and Sediment Control Rules and Regulations." However, simply "Stormwater Erosion and Sediment Control Rules and Regulations" may be used as a short title.

1362.02 PURPOSE.

City Council has adopted this chapter for the purpose of establishing feasible and economical standards to achieve a level of conservation practices which will abate erosion of the soil and abate the degradation of the waters of the State by soil sediment in conjunction with non-farm, earth-disturbing activities.

1362.03 DIRECTION.

No person shall cause or allow earth-disturbing activities on a development area except in compliance with the criteria established by the regulations contained in this chapter.

1362.04 EROSION AND SEDIMENT CONTROL DURING CONSTRUCTION.

(a) When a proposed development involves 1 acre or more of earth-disturbing activities and performed on land used or land being developed for commercial industrial, residential, recreational, public service or other nonfarm purposes which are within the jurisdiction of the City, the owner of record shall develop and submit to the Bureau of Buildings Inspections, Licenses and Permits a Storm Water Pollution Prevention Plan;

For development involving less than one acre of earth-disturbing activities, but is part of a larger common plan of developing or sale that will ultimately disturb one or more acres of land, the owner of record shall develop and submit to the Bureau of Buildings, Inspections, Licenses and Permits a Storm Water Pollution Prevention Plan;

The erosion and sediment controls and the Stormwater Pollution Prevention Plan including all construction activities shall at a minimum meet the technical requirements set forth in the Ohio

Environmental Protection Agency NPDES General Stormwater Permit(s) for construction activities and any subsequent Ohio Environmental Protection Agency issued permits.

No earth-disturbing activities shall commence prior to the Storm Water Pollution Prevention Plan being filed, reviewed by the Office of the City Engineer and approved by the City Planning Commission.

(b) When a proposed development involves earth-disturbing activities less than 1 acre, a Storm Water Pollution Prevention Plan is not required. However, the owner of record shall comply with all other General Requirements and provisions to prevent sediment pollution from occurring.

1362.05 NOTIFICATION.

The Bureau of Buildings, Inspections, Licenses and Permits shall be notified two (2) working days prior to commencement of earth-disturbing activities. The Bureau of Buildings, Inspections, Licenses and Permits shall also be notified upon project completion.

1362.99 PENALTY.

Violation of the provisions of this chapter or failure to comply with any of its requirements shall constitute a minor misdemeanor. Any person who violates this chapter or fails to comply with any of its requirements shall upon conviction thereof be fined not more than one hundred dollars for each offense. Each day such violation continues shall be considered a separate offense. Nothing herein contained shall prevent the City of Mansfield from taking such other lawful action as is necessary to prevent or remedy any violation."

SECTION 3: In order to provide for the proper and effective management of stormwater erosion and sediment control, this measure is determined to be an emergency Ordinance for the immediate preservation of the public peace, health, safety and welfare of the City of Mansfield and its inhabitants and providing it receives the affirmative vote of two-thirds of all members elected to Council, it shall take effect and be in force immediately upon its adoption, otherwise from and after the earliest time allowed by law, after its passage and approval by the Mayor.

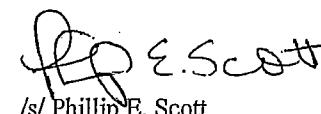
Caucus	7 April 2015
1 st Reading	7 April 2015
2 nd Reading	
PASSED	7 April 2015

ATTEST

/s/ Amy L Yockey
Clerk of Council

SIGNED

APPROVED


/s/ Phillip E. Scott
President

/s/ Timothy L. Theaker
Mayor

APPROVED AS TO FORM:

John R. Spon
Law Director
City of Mansfield, Ohio

*Publication Required.

Clerk of Council of the City of Mansfield
hereby certify that this is a true copy of the original of one
document which is presently on file in the office of Mansfield City
Council.

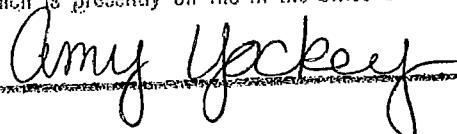

Amy L. Yockey

Exhibit 3 – Stormwater Management Ordinance

BILL #15-065*

ORDINANCE# _____

BY: MR. VAN HARLINGEN

Repealing Chapter 1361 – Stormwater Management of the Mansfield Codified Ordinances of 1997 and enacting Chapter 1361 – Stormwater Management.

WHEREAS, currently, the Mansfield Codified Ordinances provide for the establishment of certain rules and regulations relating to stormwater management, and

WHEREAS, the City finds it beneficial to the needs of the community to update and revise said Section.

**NOW, THEREFORE, BE IT ORDAINED BY THE COUNCIL OF THE
CITY OF MANSFIELD, STATE OF OHIO:**

SECTION 1: That Chapter 1361 of the Mansfield Codified Ordinances of 1997, authorizing the establishment of certain rules and regulations relating to stormwater management, be and the same is hereby, repealed.

SECTION 2: That Chapter 1361 of the Mansfield Codified Ordinances of 1997, be, and the same is hereby, enacted to read as follows:

“CHAPTER 1361 Stormwater Management

1361.01 AUTHORITY AND TITLE.

This Chapter has been developed under authority of Article XVIII, Section 3 of the Ohio Constitution.

The official title of these rules shall be known as the “City of Mansfield, Ohio Stormwater Management Rules and Regulations.” However, simply “Stormwater Rules and Regulations” may be used as a short title.

1361.02 PURPOSE.

Council has adopted this chapter for the purpose of establishing feasible and economically reasonable standards to achieve a level of management and conservation practices which will abate erosion of the soil and abate the degradation of the waters of the State by soil sediment in conjunction with nonfarm, earth-disturbing activities.

It is the further intent of this chapter to:

- (a) Permit development without increasing downstream flooding, erosion or sedimentation.
- (b) Reduce damage to receiving streams and impairment of their capacity which may be caused by increases in the quantity and/or rate of water discharged.
- (c) Establish a basis for the design of all storm drainage systems which will preserve the rights and options of both the dominant and servient property owners and help assure the long-term adequacy of storm drainage systems;

1361.03 ADOPTION OF “CITY OF MANSFIELD STORMWATER DESIGN MANUAL”.

(a) Subject to the provisions set forth in this chapter, the City of Mansfield hereby adopts the “City of Mansfield Stormwater Design Manual” which provides policy, standards, applicability, criteria, requirements, recommendations and guidance for general stormwater drainage, stormwater quantity, and stormwater quality management in the City of Mansfield that are not provided explicitly in this chapter.

A copy of the “City of Mansfield Stormwater Design Manual” is hereby referenced and adopted as part of this chapter.

(b) The City Engineer is authorized to amend, supplement, or revise the "City of Mansfield Stormwater Design Manual." The City of Mansfield Stormwater Design Manual, shall be made available in the Office of the City Engineer, and may be updated and expanded from time to time, at the discretion of the City Engineering Department, based on improvements in engineering, science, monitoring, local maintenance experience, and federal or state regulations.

(c) At a minimum, the "City of Mansfield Stormwater Design Manual" shall meet the technical requirements set forth in the Ohio Environmental Protection Agency NPDES general stormwater permit(s) for construction activities and any subsequent Ohio Environmental Protection Agency issued permits.

1361.04 SCOPE.

This chapter shall apply to all earth-disturbing activities as indicated within the Stormwater Design Manual.

1361.05 WAIVERS.

Certain earth-disturbing activities may exist such that the submission of a stormwater management plan serves no real purpose. Such activity shall be eligible for a waiver from the requirement of submitting a plan and/or other requirements of this chapter.

To obtain a waiver, a person shall submit a written request to the Bureau of Buildings, Inspections, Licenses and Permits. This request shall include sufficient data to determine that granting a waiver will not result in excessive stormwater runoff or rate of runoff.

1361.06 PLAN REVIEW.

All stormwater management plans and runoff calculations shall be submitted to the Bureau of Buildings Inspections, Licenses and Permits. The Office of the City Engineer shall review the stormwater management plan and runoff calculations within thirty days of receipt and indicate its approval or disapproval to the person who filed the plan. Indication of disapproval shall include the plan deficiencies and the procedure for filing a revised plan. Pending preparation and approval of a revised plan, earth-disturbing activities shall not be allowed until the deficiencies have been properly addressed and an acceptable plan has been filed and approved by the City Planning Commission.

The Office of the City Engineer shall be responsible for the construction inspection of all stormwater management facilities.

1361.07 PERMITS.

Any person performing any nonfarm, earth-disturbing activities that disturbs 20,000 square feet or more as indicated within the Stormwater Design Manual shall be required to file a stormwater management plan and obtain a stormwater management permit.

Permit application forms shall be made available in the Bureau of Buildings Inspections, Licenses and Permits. Information required shall be sufficient for the Bureau to determine if a stormwater management plan is necessary and that the person intends to comply with this chapter. At a minimum, the application shall include the following:

- (a) Name, address and phone number of property owner and/or other person responsible for the activity.
- (b) Location of the activity.
- (c) Description of the activity.
 - (1) Type of activity.
 - (2) Area to be disturbed.
 - (3) Area to be rendered permanently impervious.
 - (4) Size of parcel or lot on which activity will occur.

The Bureau shall review the permit application and if no stormwater management plan is required, an application shall be made to the Zoning Administrator for a zoning certificate in accordance with Section 1155.03.

In the event that a plan is required, the permit shall be issued upon approval by the City Planning Commission.

1361.08 FEES.

(a) Permit Fee: A permit fee in the amount of fifty-five dollars (\$55.00) shall be paid to the Bureau of Buildings, Inspections, Licenses and Permits upon the submission of an application.

No permit fee shall be required for the following: Nonfarm, earth-disturbing activities which have been provided for in an already approved stormwater management plan. (Example: home construction on a lot in an approved subdivision with an approved stormwater management plan.)

(b) Plan Review and Field Inspection Fees: A fee in the amount of two-hundred dollars (\$200.00) shall be paid to the Bureau of Buildings, Inspections, Licenses and Permits before issuance of the stormwater management permit to offset the costs of plan review and field inspection of such construction to assure its conformance with the plans.

1361.09 ASSURANCE OF COMPLETION.

The Bureau of Buildings, Inspections, Licenses and Permits shall not issue a Certificate of Occupancy until the stormwater management facilities have been constructed in accordance with the approved stormwater management plan and have been approved by the Office of the City Engineer.

Stormwater management facilities that are being constructed as part of a subdivision subject to the Subdivision Regulations of the City shall be considered an improvement. As such they shall be subject to the bonding requirement therein. The value of the stormwater management facilities shall be included in the amount of the performance bond for the subdivision improvements.

If it can be shown that assurance of completion is being provided through another regulation of this City or other governmental subdivisions, this section of the Stormwater Management Regulations shall be waived.

1361.10 DISCLAIMER OF LIABILITY.

Neither submission of a plan under provisions of this chapter nor compliance with provisions of this chapter shall relieve any person from responsibility for damage to any person or property otherwise imposed by law, nor impose any liability upon the City for damage to any person or property.

1361.11 SURVEILLANCE AND COMPLIANCE.

The Office of the City Engineer shall inspect land disturbance areas during construction to determine compliance with this chapter. If it is determined that a violation of this chapter exists, the responsible person shall be notified of the deficiencies or noncompliance by the Office of the City Engineer in writing and by certified mail. If after fourteen (14) days after receipt of the letter for compliance, the deficiency or noncompliance has not been corrected or substantial steps taken to correct same, such deficiency or noncompliance shall be reported to the City Law Director for legal action.

1361.12 MAINTENANCE OF STORMWATER DRAINAGE FACILITIES AND CONTROL STRUCTURES:

When stormwater management facilities and control structures are located on private property, it is the private post-construction operator's/developer's responsibility to inspect and properly maintain the facilities. In addition, an Operation and Maintenance Plan shall be developed and implemented in accordance with the Stormwater Design Manual. The maintenance of minor detention areas such as swales, etc. on individual parcels or lots in new subdivisions shall be the responsibility of the individual parcel or lot owners. Special provisions shall be written into the deeds for the individual parcels, or lots in new subdivisions, so the owners are aware that the parcels or lots are used for temporary stormwater storage. The City shall require all of these stormwater drainage facilities and control structures to be designed to minimize maintenance costs.

1361.13 RIGHTS OF ACCESS

The City of Mansfield shall be permitted to enter and inspect facilities subject to this regulation as often as may be necessary to determine compliance with this regulation.

1361.99 PENALTY.

Violation of the provisions of this chapter or failure to comply with any of its requirements shall constitute a minor misdemeanor. Whoever violates any provision of this chapter or fails to comply with any of its requirements shall be fined not more than One Hundred Dollars (\$100.00) for each offense.

Each day such violation continues shall be considered a separate offense. Nothing herein contained shall prevent the City from taking such other lawful action as is necessary to prevent or remedy any violation."

SECTION 3: In order to provide for the proper and effective management of stormwater, this measure is determined to be an emergency Ordinance for the immediate preservation of the public peace, health, safety and welfare of the City of Mansfield and its inhabitants and providing it receives the affirmative vote of two-thirds of all members elected to Council, it shall take effect and be in force immediately upon its adoption, otherwise from and after the earliest time allowed by law, after its passage and approval by the Mayor.

Caucus	7 April 2015
1 st Reading	7 April 2015
2 nd Reading	
PASSED	7 April 2015

SIGNED

Amy Yockey
/s/ Amy L. Yockey
Clerk of Council

ATTEST

APPROVED

P.E. Scott
/s/ Phillip E. Scott
President

Tim Theaker
/s/ Timothy L. Theaker
Mayor

APPROVED AS TO FORM:

John R. Spon
Law Director
City of Mansfield, Ohio

*Publication Required.

Clerk of Council of the City of Mansfield
hereby certify that this is a true copy of the original of this document, which is presently on file in the office of Mansfield City Council.

Amy Yockey

STORMWATER DESIGN MANUAL

Effective Date: April 7, 2015

City of Mansfield



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STORMWATER DESIGN MANUAL

1.0 INTRODUCTION

This Manual establishes design criteria required for stormwater facilities within the City of Mansfield in conjunction with City Code, Part 13, Chapters 1361 and 1362 and the Ohio Environmental Protection Agency's (OEPA) NPDES Phase II Stormwater Program. While adherence to this Manual will not stop flooding or prevent all damage caused by flooding, it does establish a basis for design which will:

- a. Minimize the damage and inconvenience of flooding.
- b. Provide drainage systems which continue to provide benefit over the long term.
- c. Minimize the expense of maintaining the drainage facilities within the City.
- d. Reduce non-point-source pollution.
- e. Minimize new impacts on engineered and natural drainage system.
- f. Prevent or reduce impacts to stream and river ecosystems.

1.1 Administration

The City Engineer is authorized to administer, implement and enforce the provisions of this Manual. The Engineer shall serve as the principle executive officer for stormwater management for the purposes of fulfilling the requirements of the OEPA's NPDES Phase II Stormwater Program. Compliance with this Manual will be determined by the Engineer and his/her office.

Stormwater Management Plans shall be designed to meet the requirements of this Manual and submitted to the Bureau of Buildings, Inspections, Licenses and Permits. The Office of the City Engineer shall review the stormwater management plans and indicate the plans approval or disapproval. Earth-disturbing activities shall not commence until an acceptable plan has been filed and approved by the City Planning Commission. Stormwater Management Plans shall be prepared, signed, and sealed by an Ohio Professional Civil Engineer (ORC 4733.01).

1.2 Drainage Policy

This drainage policy, control guidelines and criteria do not provide solutions to all drainage problems, nor is the Engineer restricted to these design criteria or procedures exclusively. Although the policies as stated will hold true for most development work, the City realizes that there may be individual projects involving special or unusual drainage design problems that should be reviewed prior to completing the requisite Development Plan. Exceptions may be granted to the policies and criteria in such cases when engineering study(s) justify modification.

Experience has shown that most of the more serious flooding situations are "created." Development can lead to ever increasing flooding problems unless well-conceived, cooperative stormwater drainage and flood control programs are undertaken throughout the entire watershed. For this reason, the general policy of the City shall be as follows:

- a. Land uses and developments which increase runoff rate or volume shall control the discharge rate of runoff prior to its release to off-site land or the Municipal Separate Storm Sewer System (MS4).
- b. It is the responsibility of the property owner to not change or alter any drainage course, ditch, flood routing path or drainage system on his/her property that will cause increased runoff, or will damage or cause flooding to adjacent, upstream or downstream property owners.
- c. All stormwater drainage systems, including conveyances, within a development shall be designed to have capacity and depth, including sufficient invert elevations to permit future

- connections, to serve that total tributary area up to the 100-year storm frequency. The system for the upstream tributary area shall be extended through the development.
- d. All proposed developments with a runoff rate greater than that which the downstream system has capacity for, or will be designed for, will be required to control the rate of stormwater discharge.
 - e. The Stormwater Management Plan shall be submitted to the City for review and approval prior to the commencement of work at any proposed development site.
 - f. All information necessary shall be submitted to the City to determine how stormwater runoff should be controlled within the development prior to its release to downstream properties. The tributary area and the upstream watersheds should be determined using natural land divides unless man-made alterations are approved by the City's Engineer as the basis for watershed delineations.
 - g. This Stormwater Design Manual applies to all land developments that disturb more than 20,000 square feet and performed on land used or land being developed for commercial, industrial, residential, recreational, public service or other nonfarm purposes which are within the jurisdiction of the City.

For developments with earth disturbing activities less than 20,000 square feet, the City Engineer reserves the right to require previous development, constructed after March 4th, 1986 without stormwater controls, to be included into the stormwater management calculations as "new" impervious area. If the sum total of the developments earth disturbing activities and the previously constructed impervious area is greater than 20,000 square feet, a stormwater management plan may be required and the appropriate stormwater controls shall be incorporated into the development.

Table 1-1: Stormwater Management Requirements

Earth Disturbing Area	Stormwater Management Requirements		
	Erosion & Sediment Control	Peak Flow Rate Control	Post-Construction Water Quality
≥ 20,000 SF		✓	
≥ 1 AC	✓	✓	✓

The following exceptions from the Peak Flow Rate Controls are as follows:

1. Single-family residential lot not part of a larger common development or sale.
2. Two, three, or four unit multi-family structure not part of a larger common development or sale.
3. Managed open space associated with parks, golf courses, cemeteries, and other similar land uses including associated paved trails needed for the function of the land use.
4. Existing public right-of-way improvements including minor road widening increase in impervious area, and bridge crossings.
5. Linear utility line installations.
6. Land preparation for agricultural crops, orchards, woodlots, sod farms, and nursery operations.
7. Land grading or leveling for erosion control under direction of the local soil conservation district.
8. Developments with less than 20,000 square feet of earth disturbing activities as long as the requirements of 1.2(a) through (f) have been complied with.
9. Properly permitted environmental restoration projects including wetlands, stream restoration, and other related activities.
10. Developments within previously approved Stormwater Management Plan.

2.0 STORMWATER SYSTEM DESIGN CRITERIA

2.1 Design Storm Criteria

The following table provides guidance on the full flow design frequency for storm sewers, culverts, and pavement spread. In addition to the design criteria indicated below, the designer shall provide a major flood route for larger rainfall events up to and including the 100-year design storm.

Table 2-1: Design Storm Criteria

	Collector	Local Streets	Commercial, Industrial, Institutional and other Developments
Storm Sewer Open Channel	10-year	10-year	10-year
Storm Sewer Hydraulic Grade Line	10-year	10-year	10-year
Pavement Spread	10-year	10-year	n/a
Roadway Ditch Design	10-year	10-year	10-year
Roadway Culverts (non-FEMA streams)	25-year	10-year	10-year
Roadway Culverts (FEMA streams)	100-year	100-year	100-year

2.2 Peak Discharge Calculation Methodology

The rational method ($Q = CIA$) shall be used to determine peak discharge rates for storm sewers, culverts, pavement spread, and roadway ditch designs with individual tributary areas less than 10 acres using the following formula to determine rainfall intensity.

$$\text{Intensity} = X / (Y + T)^Z \quad (\text{see Table 2-2 for coefficients})$$

Where T is equal to the time of concentration in minutes

Alternative methods for determining peak flow rates include the National Resources Conservation Service (NRCS) TR-55 methodology and the Green-Ampt Method¹.

¹ Use of the Green-Ampt method shall require prior approval of the City Engineer.

For larger watershed and floodplain studies, the United States Geological Survey (USGS) rural regression equation may be used, specifically Water Resources Investigation Report 03-4164² according to the following formulas:

$$Q_2 = (58.9)(\text{CONTDA})^{0.785}(\text{SLOPE})^{0.174}(\text{STORAGE}+1)^{-0.178}$$

$$Q_5 = (96.2)(\text{CONTDA})^{0.766}(\text{SLOPE})^{0.202}(\text{STORAGE}+1)^{-0.221}$$

$$Q_{10} = (121.2)(\text{CONTDA})^{0.759}(\text{SLOPE})^{0.217}(\text{STORAGE}+1)^{-0.241}$$

$$Q_{25} = (152.4)(\text{CONTDA})^{0.754}(\text{SLOPE})^{0.232}(\text{STORAGE}+1)^{-0.260}$$

$$Q_{50} = (175.3)(\text{CONTDA})^{0.751}(\text{SLOPE})^{0.240}(\text{STORAGE}+1)^{-0.272}$$

$$Q_{100} = (197.7)(\text{CONTDA})^{0.747}(\text{SLOPE})^{0.248}(\text{STORAGE}+1)^{-0.281}$$

Where CONTDA is the contributing drainage area in square miles, SLOPE in the main channel slope in feet/mile; and STORAGE is the drainage area as open water and wetlands in percent. Main channel slope (SLOPE), in feet per mile; is computed as the difference in elevation at points 10 and 85 percent of the distance along the main channel from a specified location on the channel to the topographic divide, divided by the channel distance between the two points.

Table 2-2: Rational Method Intensity Formula Coefficients

Storm Frequency (years)	X	Y	Z
2	140.596	25.099	1.015
5	81.276	18.800	0.855
10	275.649	29.499	1.070
25	294.909	28.099	1.044
100	293.888	26.699	1.000

2.3 Pavement Spread

Table 2-3 Pavement Spread Standards for the Design Storm

Street Classification	Maximum Encroachment from Face of Curb	Maximum Inlet Spacing
Local	14 feet	300 Feet
Collector	10 feet	200 Feet

- a. Detailed calculations for spread are not required if the area to the inlet does not exceed 0.50 acres of area for local and 0.20 acres of area for collector per inlet.

² US Geological Survey. (2003). *Techniques for Estimating Flood-Peak Discharges of Rural, Unregulated Streams in Ohio, Second Edition: Water-Resources Investigations Report 03-4164* by G.F. Koltun.

2.4 Roadway Culverts

- a. Design Procedure: The culvert design procedure recommended for use is Hydraulic Design Series No. 5, U.S. Department of Transportation.
- b. Preferred Construction: Single span culverts, including concrete box and slab top are preferred. Multiple cell pipe culverts are discouraged, except when they are the only structures that will meet the physical requirements introduced by rigid headwater controls, will they be acceptable.
- c. Culvert/Storm Sewer Pipe Material
 1. High Density Polyethylene (HDPE) pipe between 12 inch and 36 inch diameter shall conform to ODOT CMS 707.33 with maximum 15 feet coverage and minimum 2 feet coverage. Concrete encasement shall be provided when the coverage between the top of pipe and the pavement subgrade is less than 30 inches.
 2. Reinforced Concrete Pipe ODOT CMS 706.02 with sealed joints.
 3. Concrete Box ODOT CMS 706.05.
 4. Underdrains: 6 inch diameter pipe underdrains per ODOT CMS 605 installed a minimum of three feet below subgrade shall be required under all pavement in order to provide satisfactory subgrade drainage.
- d. Inlet Elevation: The flowline elevation at the culvert inlet should be set deep enough to provide an adequate outlet for future storm sewer improvements upstream.
- e. Allowable Headwater shall not exceed any of the following controls for the design storm:
 1. 24 inches below the near, low edge of pavement for drainage areas of 1000 acres or more.
 2. 12 inches below the near, low edge of pavement for drainage areas of 1000 acres or less.
 3. 4 feet above inlet crown in deep ravine.
 4. 1 foot below near edge of pavement for bicycle pathways.
 5. Property Damage –
 - a. 100-year frequency headwater plus 1 foot, shall not exceed any proposed building first floor elevation.
 - b. 100-year frequency headwater shall not be increased at any existing building first flood elevation.
- f. Maximum Allowable Outlet Velocity shall be:
 1. Turf Channel: 5 feet per second.
 2. Rock Protection: 18 feet per second.

Notes:

 - a. When the outlet velocity exceeds 18 feet per second, a stilling basin or other such energy dissipation structure shall be used.
 - b. The downstream channel shall have the ability to handle the flow satisfactorily.
- g. Structural Design Criteria for culverts shall be the same as that required by the Ohio Department of Transportation (ODOT).
- h. Emergency Flood Routing shall be capable of routing the 100-year storm over or around the culvert without creating a hazard or causing potential for erosion or personal property damage. Adequate scour protection shall be included in the design.
- i. End Protection should be as follows:
 1. 12-inch through 36-inch culverts – full-height headwall.
 2. 42-inch through 84-inch culverts – full height headwall with flared wings.
 3. Other special type headwalls shall be approved before use.

2.5 Storm Sewers

The criteria for designing storm sewer systems are listed below:

- a. All Storm Sewer Systems shall be designed using Manning's Equation or an EPA SWMM³ based modeling platform where the design storm flow does not exceed the flowing full capacity of the pipe. For the Manning's Equation use the following formula:

$$Q = \underline{1.49} R^{2/3} S^{1/2} A$$

n

and

$$Q = VA$$

Where:

Q = Rate of discharge (cfs)

A = Area of cross-section of flow (sq.ft.)

V = Mean velocity of flow (fps)

n = Manning's roughness coefficient

R = A/wp = Hydraulic radius (ft)

S = Slope of pipe or hydraulic grade line if surcharged (ft/ft)

wp = Wetted perimeter (ft)

- b. Hydraulic Gradient Requirement shall be:

1. For design storm, shall not exceed window or grate elevation for an inlet or catch basin.
2. Grade line is based on tailwater or 0.8 D at outlet (whichever is greater) or other critical points within the system.

- c. Design Flow Determination:

1. Areas under 10 acres use Rational Method $Q = CiA$.
2. Areas over 10 acres use Technical Release 55.
3. For appropriate larger areas, use the Rural Regression Equation (USGS 89-4126).

- d. Minimum Time of Concentration: 5 minutes.

- e. Runoff Coefficient: based on Table 2-4.

- f. Manning's "n" Value: based on Ohio Department of Transportation Location and Design Manual, Volume 2.

- g. Off-site Area: The sewer shall be deep enough and sized accordingly to receive the flow from all its sources within the watershed.

- h. Solids: The gradient of the sewer shall be sufficient to avoid deposition of solids by having a minimum full flow open channel velocity of 3.0 feet/second.

- i. Material: See Section 2.4(C).

- j. Manholes: The main conduit, if over 24 inches in diameter, will be required to be separated from all curb and gutter inlets unless a special design is approved by the City Engineer. Furthermore, the main conduit will be required to be separated from all deep curb and gutter inlets, which have a depth greater than 6.5 feet from invert to the top-of-casting elevation.

³ Designer shall obtain approval from City Engineer regarding use of EPA SWMM prior to commencing the stormwater plan.

- k. Flow Line: Unless otherwise approved by the City Engineer, the flow line of pipes should be set such that the crown of pipes, at junctions, are at the same elevation; if the outlet elevation permits, the crown of the outlet pipe may be lower. The flowline elevations of sewers should be set to avoid using concrete encasement.
- l. Specifications: The current Ohio Department of Transportation (ODOT) "Construction and Material Specifications" (CMS) together with the requirements of the City of Mansfield, Ohio, including all supplements thereto shall govern all materials and workmanship involved in the improvements.
- m. Submerged Pipe Outlets:
The submergence of a permanent pool of water above the flowline invert elevation of a storm sewer at the outlet is discouraged and shall not be permitted to a depth greater than the ½ the pipe diameter or a depth of two-feet at the outlet, whichever is less. When submergence is allowed upon approval by the City Engineer, special requirements shall include, but may not be limited to:
 1. Submergence "zone" shall not extend beneath pavement.
 2. Submergence "zone" shall not extend beyond the first manhole.
 3. "O-ring" sealed gasketed pipe joints shall be installed along the storm sewer for the full length of the submergence zone.
 4. Anti- seepage collars shall be installed in the submergence "zone".
- n. End protection should be as follows:
 1. 12-inch through 36-inch culverts – full-height headwall. If the outlet is not located within a channel bank or within the direct flow path of crossing floodwaters, half-headwalls at the outlet may be used.
 2. 42-inch through 84-inch culverts – full height headwall with flared wings.
 3. Other special type headwalls shall be approved before use.
- o. Minimum Cover to subgrade and Maximum Cover over pipe:
See Section 2.4(C).
- p. Encasement: See Section 2.4(C).
- q. Maximum Length between access structures:
 1. Pipes under 60 inch – 350 feet.
 2. Pipes 60 inch and over 500 feet.

Table 2-4: Rational Method Runoff Coefficients⁴

Hydrologic Soil Group	A			B			C			D		
Storm Recurrence Interval (YR)	2-5	10	100	2-5	10	100	2-5	10	100	2-5	10	100
Land Use Or Surface Characteristics												
Business												
A. Commercial Area	.75	.80	.95	.80	.85	.95	.80	.85	.95	.85	.90	.95
B. Neighborhood Area	.50	.55	.65	.55	.60	.70	.60	.65	.75	.65	.70	.80
Residential												
A. Single Family	.25	.25	.30	.30	.35	.40	.40	.45	.50	.45	.50	.55
B. Multi-Unit (Detached)	.35	.40	.45	.40	.45	.50	.45	.50	.55	.50	.55	.65
C. Multi-Unit (Attached)	.45	.50	.55	.50	.55	.65	.55	.60	.70	.60	.65	.75
D. ½ Acre Lot Or Larger	.20	.20	.25	.25	.25	.30	.35	.40	.45	.40	.45	.50
E. Apartments	.50	.55	.60	.55	.60	.70	.60	.65	.75	.65	.70	.80
Industrial												
A. Light Areas	.55	.60	.70	.60	.65	.75	.65	.70	.80	.70	.75	.90
B. Heavy Areas	.75	.80	.95	.80	.85	.90	.80	.85	.95	.80	.85	.95
Parks, Cemeteries Playgrounds	.10	.10	.15	.20	.20	.25	.30	.35	.40	.35	.40	.45
Schools	.30	.35	.40	.40	.45	.50	.45	.50	.55	.50	.55	.65
Railroad Yard Areas	.20	.20	.25	.30	.35	.40	.40	.45	.45	.45	.50	.55
Streets												
A. Paved	.85	.90	.95	.85	.90	.95	.85	.90	.95	.85	.90	.95
B. Gravel	.25	.25	.30	.35	.40	.45	.40	.45	.50	.40	.45	.50
Drives, Walks, & Roofs	.85	.90	.95	.85	.90	.95	.85	.90	.95	.85	.90	.95
Lawns												
A. 50% - 75% Grass (Fair Condition)	.10	.10	.15	.20	.20	.25	.30	.35	.40	.30	.35	.40
B. 75% Or More Grass (Good Condition)	.05	.05	.10	.15	.15	.20	.25	.25	.30	.30	.35	.40
Undeveloped Surface (By Slope)												
A. Flat (0-1%)	0.04-0.09			0.07-0.12			0.11-0.16			0.15-0.20		
B. Average (2-6%)	0.09-0.14			0.12-0.17			0.16-0.21			0.20-0.28		
C. Steep	0.13-0.18			0.18-0.24			0.23-0.31			0.28-0.38		

⁴ Iowa Stormwater Management Manual, Iowa State University, 2009. Available from <http://www.intrans.iastate.edu/pubs/stormwater/index.cfm>

3.0 PEAK FLOW RATE CONTROL FACILITIES CALCULATION REQUIREMENTS

This section provides guidance on the implementation of the peak flow control requirements consistent with the critical storm method. The NRCS runoff curve number (RCN) method shall be used to determine runoff volumes and peak flow rates to stormwater control facilities. **Calculations shall be performed using the HydroCAD computation software unless otherwise approved by the City Engineer.**

The peak rate of runoff from an area after development shall not exceed the peak rate of runoff from the same area before development for the 1, 2, 5, 10, 25, 50, and 100-year return frequency storms. For sites that increase the volume of runoff, determine the percent increase in runoff for the 1-year, 24-hour storm using a rainfall depth of 2.16 inches and determine the critical storm from the following table. The critical storm shall be detained to the 1-year predeveloped rate.

Table 3:1 Critical Storm Determination

Percent Increase in Runoff Volume	Critical Storm
0-10	1-year
10-20	2-year
20-50	5-year
50-100	10-year
100-250	25-year
250-500	50-year
500+	100-year

As an example, if the total volume is shown to be increased by thirty-five percent (35%), the critical storm is a five-year storm. The peak rate of runoff for all storms up to this intensity shall be controlled so as not to exceed the peak rate of runoff from a one-year frequency storm under predevelopment conditions in the area. The runoff from a more intense storm need only be controlled so as not to exceed the predevelopment peak rate from the same frequency of storm.

3.1 Runoff Curve Number

- a. For the purpose of determining site pre-development conditions for previously undeveloped land, runoff curve numbers identified within table 3-2 are to be used based upon the sites current conditions. For redevelopment sites, the current land use conditions at the time of the proposed improvements shall be used in determining the existing conditions runoff curve number.
- b. Hydrologic Soil Group (HSG). Hydrologic soil group classifications are based on undisturbed, naturally occurring soils. During construction, soils are dramatically changed by the removal of topsoil, compaction of the underlying soil profile, and removal of vegetation. The runoff potential of these soils increase; therefore, for post-developed conditions the hydrologic soil group may require adjustment. The Ohio Department of Natural Resources has created a chart, Appendix 9 of the Rainwater and Land Development Manual, for adjusting the hydrologic soil group following construction. For the disturbance area of a project, the hydrologic soil group shall follow the guidelines set forth by the Rainwater Manual. Please see link below:

http://soilandwater.ohiodnr.gov/portals/soilwater/pdf/stormwater/Appendix9_5_7_12_Final.pdf

Table 3-2: NRCS Runoff Curve Numbers⁵

Description of Land Use	Hydrologic Soil Group			
	A	B	C	D
Paved parking lots, roofs, driveways	98	98	98	98
Streets and Roads:				
Paved with curbs and storm sewers	98	98	98	98
Gravel	76	85	89	91
Dirt	72	82	87	89
Cultivated (Agricultural Crop) Land:				
With or without conservation treatment (terraces, contours)	62	71	78	81
Pasture or Range Land:				
Poor (<50% ground cover or heavily grazed)	68	79	86	89
Good (50-75% ground cover; not heavily grazed)	39	61	74	80
Meadow (grass, no grazing, mowed for hay)	30	58	71	78
Brush (good, >75% ground cover)	30	48	65	73
Woods and Forests:				
Poor (small trees/brush destroyed by over-grazing or burning)	45	66	77	83
Fair (grazing but not burned; some brush)	36	60	73	79
Good (no grazing; brush covers ground)	30	55	70	77
Open Spaces (lawns, parks, golf courses, cemeteries, etc.):				
Fair (grass covers 50-75% of area)	49	69	79	84
Good (grass covers >75% of area)	39	61	74	80
Commercial and Business Districts (85% impervious)	89	92	94	95
Industrial Districts (72% impervious)	81	88	91	93
Residential Areas:				
1/8 Acre lots, about 65% impervious	77	85	90	92
1/4 Acre lots, about 38% impervious	61	75	83	87
1/2 Acre lots, about 25% impervious	54	70	80	85
1 Acre lots, about 20% impervious	51	68	79	84

3.2 Directly Connected Impervious Area

The runoff volume and peak flow rates for all directly connected impervious areas should be calculated independently of other land uses and disconnected impervious area. Sites with disconnected impervious areas may be permitted to use a composite runoff curve number to determine runoff volumes and peak flow rates. Directly connected impervious areas are those impervious areas that are hydraulically connected to the conveyance system (i.e. streets with curbs, catch basins, storm drains, etc.) and thence to the basin outlet point (i.e. a retention/detention pond, existing storm sewer/ditch system, natural water body, etc.) without flowing over pervious areas. For example, roof drains that are piped to the back of curb, which then flows to a curb and gutter inlet, which conveys the runoff to a storm sewer system that conveys the runoff to a wet detention basin is considered a directly connected impervious area.

⁵ Chow, Ven Te (1988). *Open Channel Hydraulics*, McGraw Hill, Inc.

3.3 Rainfall Depths and Rainfall Distributions

For peak flow rate analysis, the 24-hour rainfall depths, shown on Table 3-3 from National Oceanic and Atmospheric Administration Atlas 14, Mansfield Station 33-4874, shall be used with a Type II rainfall distribution pattern.

Table 3-3: 24-hour Rainfall Depths

Storm Event (yr)	Rainfall Depth (in)
1	2.16
2	2.59
5	3.21
10	3.71
25	4.42
50	5.01
100	5.62

3.4 Time of Concentration Calculation

Use the following formulas to determine predeveloped and post-developed time of concentration with no more than 100' permissible for the overland sheet flow calculation for both existing and proposed conditions unless it is a paved surface. Time of concentration calculations should be calculated independently for directly connected impervious areas where applicable with a minimum time of concentration of 5 minutes. The time of concentration may include up to three components, overland sheet flow, shallow concentrated flow, and channel flow.

3.4.1 Overland Sheet Flow ($T_{c\ sheet}$)

Overland sheet flow is the shallow mass of runoff over plane surfaces (e.g. parking lots, lawns). Overland sheet flow usually occurs over a short distance at the hind end of a drainage area. NRCS recommends limiting overland sheet flow to 100 feet for unpaved areas. For paved surfaces, the maximum is 300 feet. Use the following equation to estimate $T_{c\ sheet}$:

$$T_{c\ sheet} = 0.014 \left(\frac{nL}{\sqrt{s}} \right)^{0.75}$$

Where:

n = Manning's roughness coefficient for overland flow (see Table 4-3), based on very shallow flow depth of up to 0.10 feet

L = Overland flow path length, ft

s = Slope of overland flow path, ft/ft

⁶ Zomorodi, Kaveh, *Revising the NRCS Sheet Flow Travel Time Equation for Flatlands*, AWRA 2005 Annual Water Resources conference, Seattle Washington.

Table 3-4: Manning's Roughness Coefficient (n) for Overland or Sheet Flow

Surface description	N
Asphalt and concrete: New Existing	0.016
Cement rubble surface	0.024
Fallow (no residue)	0.05
Cultivated Soils: Residue cover \leq 20% Residue cover > 20% Range (natural)	0.06 0.17 0.13
Grass: Short grass prairie (fields) Dense grasses (lawns)	0.15 0.24
Woods: Light underbrush Dense underbrush	0.40 0.80

3.4.2 Shallow Concentrated Flow (T_c shallow)

After a short distance (depending on ground cover, but always less than 100 feet), overland sheet flow starts to concentrate in rills, and then in gullies. This flow is referred to as shallow concentrated flow. The velocity of this flow is estimated using a relationship between velocity and slope. To calculate the shallow concentrated flow time of concentration or T_c shallow, first estimate the velocity of flow using the following equation:

$$V = K_u k \sqrt{S}$$

Where:

V = Velocity of flow, ft/s

S = Slope, ft/ft

k = intercept coefficient (see Table 4-4)

K_u = Units conversion factor, 33

Table 3-5: Intercept Coefficient for Shallow Concentrated Flow⁷

Land cover/flow regime	k
Forest with heavy ground litter; hay meadow	0.076
Trash fallow or minimum tillage cultivation; contour or strip cropped, woodland	0.152
Short Grass Pasture	0.213
Cultivated straight row	0.274
Nearly bare and untilled	0.305
Grassed waterway	0.457
Unpaved	0.491
Paved Area; small upland gullies	0.619

Once velocity has been determined, use the equation below to calculate $T_{c\text{ shallow}}$.

$$T_{c\text{ shallow}} = \frac{L}{60V}$$

Where:

$T_{c\text{ shallow}}$ = Shallow concentrated flow travel time, minutes

L = Flow length, ft

V = Velocity of flow, ft/s

3.4.3 Open Channel Flow ($T_{c\text{ channel}}$)

Open channel flow may consist of gutter flow, pipe flow, or flow through a drainage swale. Various forms of the Manning's equation may be used to estimate the velocity in the channel. Use Table 3-6 for Manning's 'n' value for open channel flow through vegetation and used to determine a travel time using the following equation:

$$T_{c\text{ channel}} = \frac{L}{60V}$$

Where:

$T_{c\text{ shallow}}$ = Shallow concentrated flow travel time, minutes

L = Flow length, ft

V = Velocity of flow, ft/s

⁷ Iowa Department of Transportation Office of Design, Design Manual, Chapter 4, November 2010. Available from <http://www.iowadot.gov/design/dmanual/04a-05.pdf>

Table 3-6: Values of Manning's Coefficient (n) for Open Channel Flow⁸

Channel material	Manning's 'n'
Concrete Trowel finish Float finish	0.013 0.015
Concrete bottom with rubble or riprap sides	0.030
Vegetation Depth of flow up to 0.7 feet Lawns cut 4 to 8 inches Good stand cut to 12 inches Good stand cut to 24 inches Fair stand cut to 12 inches Fair stand cut to 24 inches Depth of flow from 0.7 to 1.5 feet Lawns cut 4 to 8 inches Good stand cut to 12 inches Good stand cut to 24 inches Fair stand cut to 12 inches Fair stand cut to 24 inches	0.070 0.140 0.250 0.120 0.200 0.050 0.100 0.150 0.080 0.140
Bare Soil Recently completed Clean after weathering	0.035 0.040

⁸ Iowa Department of Transportation Office of Design, Design Manual, Chapter 4, November 2010. Available from <http://www.iowadot.gov/design/dmanual/04a-05.pdf>

4.0 WATER QUALITY CONTROL CRITERIA

Stormwater qualitative control shall be implemented into sites in accordance with general and specific requirements outlined in the current OEPA's general permit for stormwater discharges associated with construction activity. Water quality BMPs shall be designed according to the latest design standards as set forth by the Ohio Department of Natural Resources Rainwater and Land Development Manual. Supplemental information for specific BMPs is contained in this Manual. In addition to the minimum standards set forth by the Ohio EPA, the following BMPs are not permitted to be used in providing water quality control within the City:

- a. Constructed wetlands, bioretention, sand and other media filtration, and pocket wetlands as defined by the ODNR Rainwater and Land Development Manual and Ohio EPA are not permitted as a water quality BMP's within the City for development projects unless otherwise approved by the City Engineer.

The Ohio EPA General Construction permit can be found at the following link:

http://www.epa.state.oh.us/dsw/permits/GP_ConstructionSiteStormWater.aspx

Clarifications regarding specific sections of the Construction General Permit are found in a Q&A document at the following link:

<http://www.epa.state.oh.us/dsw/storm/CGPPCQA.aspx>

The Ohio EPA refers to the Ohio Department of Natural Resources (ODNR) Rainwater and Land Development Manual for technical design standards for individual Best Management Practices (BMPs) to meet General Construction Permit requirements. The manual is available at the following link:

<http://soilandwater.ohiodnr.gov/water-conservation/stormwater-management>

4.1 Ohio EPA Water Quality Permit Supplemental Information

The following sections provide guidance pertinent to the design of water quality BMPs within the City of Mansfield.

4.1.1 Water Quality Volume (WQv):

The selected BMP(s) shall be sized to treat the water quality volume and ensure compliance with Ohio EPA General Construction Permit. The WQv shall be equivalent to the volume of runoff from a 0.75-inch rainfall using the following formula.

- a. Standard Equation:

$$WQv = C * P * A / 12$$

Where:

WQv = water quality volume in acre-feet

C = runoff coefficient appropriate for storms less than 1 inch (see Table 4-1)

P = 0.75 inch precipitation depth

A = area draining into the BMP in acres

- b. Alternate runoff coefficient (C) calculation

$$C = 0.858i^3 - 0.778i^2 + 0.774i + 0.04$$

I = percent imperviousness of tributary area

Table 4-1: Water Quality Volume Runoff Coefficients Based on Land Use

Land Use	Runoff Coefficient
Industrial & Commercial	0.8
High Density Residential (>8 Dwellings/Acre)	0.5
Medium Density Residential (4 To 8 Dwellings/Acre)	0.4
Low Density Residential (<4 Dwellings/Acre)	0.3
Open Space And Recreational Areas	0.2

Where the land use will be mixed, the runoff coefficient should be calculated using a weighted average. For example, if 60% of the contributing drainage area to the stormwater treatment structure is low density residential, 30% is high density residential, and 10% is open space, the runoff coefficient is calculated as follows $(0.6)(0.3) + (0.3)(0.5) + (0.1)(0.2) = 0.35$.

Drawdown times are intended to provide both stream channel erosion protection and 80% annual total suspended solids (TSS) removal.

Table 4-2: Target Drawdown (Drain) Times for Water Quality BMPs

Best Management Practice	Drain Time of WQv
Infiltration Basin ^A	24 – 48 Hours
Enhanced Water Quality Swale	24 Hours
Wet Extended Detention Basin*	24 Hours
Bioretention Cell ^A	24 Hours
Vegetated Swale and Filter Strip	24 Hours
Pervious Pavement (extended detention)	24 Hours
Pervious Pavement (infiltration)	48 Hours

*Provide both a permanent pool and an EDv above the permanent pool, each sized at 75% of the WQv.

^AThe WQv shall completely infiltrate within 24 hours so there is no standing or residual water in the BMP.

4.1.2 Approval For Use of Proprietary BMPs

Approval of alternative BMPs by the Ohio EPA is required prior to approval from the City Engineer except for the following:

- a. For sites less than 5 acres and not part of a larger common development, alternative BMPs can be approved by the City Engineer with sufficient evidence from the manufacturer that the BMP is able to achieve 80% TSS removal on an average annual basis or current state standard.

For a list of possible proprietary BMPs approved by the Ohio Department of Transportation, please view the following link:

<http://www.odotonline.org/materialsmanagement/qpl.asp?specref=SS-995>

An alternative list for proprietary BMPs in the Washington Department of Ecology TAPE program, specifically technologies classified as BASIC with Conditional or General Use Level classifications is found at the following link:

<http://www.ecy.wa.gov/programs/wq/stormwater/newtech/technologies.html>

5.0 WATER QUALITY AND DETENTION SYSTEM DESIGN CRITERIA

Although every water quality and peak flow rate control BMP is unique and designed based on specific site conditions, the standards set forth within this section are intended to establish the guidelines for the layout and design of public or residential BMPs within the City of Mansfield.

The design of all stormwater BMPs shall conform to the standards set forth within this section and those in Section 4 of this manual. The site and/or construction plans, engineering documents and specifications shall include all pertinent details for any permanent BMP feature.

Table 5-1 provides guidance on the recommended BMPs to use to meet water quality requirements and peak flow rate control requirements. Conditional uses shall seek approval of that particular water quality BMP or peak flow rate control BMP during the Development Plan approval process. Notwithstanding Table 5-1, Section 4.0(a) lists BMP exclusions.

Table 5-1: Water Quality and Peak Flow Rate Control Best Management Practices Applicability

	Wet basin	Dry Basin	Wetland Basin	Bioretention	Permeable Pavement Privately Maintained	Permeable Pavement Publicly Maintained	Parking Lot Storage	Infiltration Trench	Sand Filter	Underground Storage	Proprietary Device				
P = Permitted C = Conditional X = Not Permitted															
Water Quality															
Area of Disturbance < 1 Acre					Not Applicable										
Area of Disturbance 1 to 5 Acres	C	P	X	P	P	C	X	X	X	X	C				
Area of Disturbance > 5 Acres	P	P	X	P	P	C	X	X	X	X	X				
Peak Flow Rate Control															
Multi-Family Residential Privately Maintained	P	P	X	P	P		P	X	X	P					
Single Family Residential Publicly Maintained	P	P	X	P		C		X	X	X					
Commercial & Industrial	P	P	X	P	P	C	P	X	X	P					

5.1 Parking Lot Storage

Parking lot storage is surface storage where shallow wet ponding is designed to flood specific graded areas of the parking lot. Controlled release features are incorporated into the surface drainage system of the parking lot. Parking lot storage is a convenient multi-use structural control method where impervious parking lots are planned. Design features include small wet ponding areas with controlled release by pipe-size and slope, and increased curb heights.

The major disadvantage is the inconvenience to users during the wet ponding function. This inconvenience can be minimized with proper design consideration. Clogging of the flow control device and icy conditions during cold weather are maintenance problems. Parking lot design and construction grades are critical factors. This method is intended to control the runoff directly from the parking area, and is usually not appropriate for storing large runoff volumes.

Wet ponding areas in parking or traffic areas shall be designed for a maximum potential depth of twelve (12) inches. Flood routing or overflow shall occur after the maximum depth is reached.

The preferred minimum orifice size is 4" in diameter. Smaller sizes shall provide adequate protection to protect it from clogging.

5.2 Water Quality Basins (Wet or Dry)

Please refer to the latest version of the Ohio Department of Natural Resources Rainwater and Land Development Manual at the following link:

<http://soilandwater.ohiodnr.gov/water-conservation/stormwater-management>

5.3 Bioretention Basins

For sizing and construction of bioretention basins, please refer to the latest version of the Ohio Department of Natural Resources Rainwater and Land Development Manual at the following link:

<http://soilandwater.ohiodnr.gov/water-conservation/stormwater-management>

For the materials to be used in a bioretention basin, supplemental information has been provided for the mulch and bioretention soil. The bioretention soil specification is the most important aspect of the design. An improperly designed soil that lacks sufficient infiltration capacity can have long periods of standing water rendering the basin ineffective and adding stress to the vegetation. Improper organics can also have detrimental consequences on the health of selected vegetation.

5.3.1 Mulch

ORGANIC MULCH: Mechanically chipped, shredded, hammered or ground raw wood material from either hard or soft timber. Mulch shall be free of mold, dirt, sawdust, and foreign and deleterious material and shall not be in an advanced state of decomposition. Mulch shall not contain chipped or shredded manufactured boards or chemically treated wood, including but not limited to wafer board, particleboard, chromated copper arsenate (CCA) or penta treated wood.

- a. Color: Natural, undyed.
- b. Size Range: 3 inches (76 mm) maximum, ½ inch (13 mm) minimum.
- c. pH: 6.0 to 7.5.
- d. Salinity: less than 3.0 millimhos per cm (mS / cm).
- e. Carbon: Nitrogen Ratio: less than 36:1.

5.3.2 Bioretention Soil

SAND: Clean, natural sand meeting the requirements of ASTM C 33 for fine aggregate.

Other Graduation Characteristics shall fall within the limits specified below:

- a. Fineness Modulus (FM) – 2.5 to 3.1.
- b. Coefficient of Uniformity – 2.5 to 3.5 preferred (<4.1 acceptable).

ORGANIC AMENDMENT: Mature/stable aerobically composted yard debris (green waste) compost, animal manure compost, biosolids compost or compost derived from a combination three of these feedstocks:

- a. pH: 6.0 to 7.5.
- b. Salinity: less than 6.0 millimhos per cm (mS / cm).
- c. Organic Matter: not less than 35% by weight.
- d. Carbon: Nitrogen Ratio: less than 36:1.
- e. Solvita® Maturity Index: between 6 and 7.

The compost shall meet all applicable state regulations based on the feedstock type or U.S. EPA 503 Regulations for bio solids compost.

TOPSOIL (optional): A loamy, friable soil essentially free from heavy or stiff clay lumps, stones, cinders, concrete, brick, roots, sticks brush, litter, plastics, metals, refuse or other deleterious materials in accordance with ASTM D 5268. The soil shall be free of herbicides, petroleum-based materials or other substances of a hazardous or toxic nature which may inhibit plant growth. The soil shall be free of noxious weeds, seeds or vegetative parts of weedy plants that cannot be selectively controlled in the planting.

- a. pH: 6.0 to 8.0.
- b. Salinity: less than 1.5 millimhos per cm (mS / cm).
- c. Organic Matter: 3 to 8% by weight.

The soil shall be taken from a well-drained site and have a USDA soil texture classification of a Clay Loam or Loam.

- a. Existing topsoil at the site may be used provided it meets the requirements of this section for topsoils.
- b. Off-site (borrow) topsoils may be used provided they meet the requirements of this section and their source or location is submitted to and approved by the Engineer or Landscape Architect.

ENGINEERED SOIL MIX: Mix Sand, Organic Amendment and Topsoil components by volume, to obtain Engineered Soil Mix meeting the specified requirements:

- a. pH: 5.5 – 7.5 (ASTM D4972).
- b. Salinity: less than 0.8 millimhos per cm (mS / cm).
- c. Organic Matter: 2 - 10% by weight (ASTM F1647).
- d. Phosphorus: Not to exceed 69 mg / kg.
- e. Cation Exchange Capacity (CEC): Minimum of 10.
- f. Infiltration Rate: 4 to 12 inches per hour (with soil compacted sample to 85% standard proctor), as determined by ASTM F1815 or ASTM D5856.

Mix Design Submittal: Contractor shall submit proposed mix to the City Engineer for approval prior to final mixing and shipment to project site. Report percentage by volume of Sand, Organic Amendment and Topsoil. Furnish laboratory analysis and a written report, less than six months old, by a qualified testing laboratory stating compliance with the above parameters.

5.4 Infiltration Trenches

Please refer to the latest version of the Ohio Department of Natural Resources Rainwater and Land Development Manual at the following link:

<http://soilandwater.ohiodnr.gov/water-conservation/stormwater-management>

5.5 Permeable Pavement

For general requirements of pervious pavement systems, please refer to the latest version of the Ohio Department of Natural Resources Rainwater and Land Development Manual at the following link:

<http://soilandwater.ohiodnr.gov/water-conservation/stormwater-management>

To meet Ohio Department of Natural Resources Rainwater Manual guidance, maximum ratio of impervious area draining onto the surface area of the pervious paver system shall be no greater than 2:1 especially in areas with high potential for organic contaminants such as leaves and tree nuts for example. Higher ratios up to 5:1 may be permissible on a case by case basis for areas with minimal contamination potential.

For all pervious pavement systems, do not use sand or cinders for deicing. Moreover, when this green infrastructure practice is used in areas with potential for organic matter to accumulate such as nuts and leaves, monthly maintenance using a vacuum/regenerative air sweeper may be required during growing season.

For frost depth considerations, the pavement thickness from surface to subgrade is recommended to be ½ of the frost depth; however research has shown that as long as there is sufficient void space for water to expand (9%), it can freeze without movement (Smith, p. 23).⁹ For the Mansfield area, the frost depth is approximately 34"; therefore a minimum section thickness of 17" should be used.

⁹ Smith, David R., *Permeable Interlocking Concrete Pavements*, Interlocking Concrete Pavement Institute, Herndon, VA, Fourth Edition, 2011.

It is recommended that impervious areas sheet flow onto pervious pavement surfaces and not be point loaded onto a small area. The maximum surface slope for pervious pavement surface is 5% (Smith, p. 14).¹⁰

The following information is in addition to the ODNR guidelines providing additional detail on the use of various types of pavement systems.

5.5.1 Pervious Pavement Stone Aggregate

- a. Aggregates should be crushed with minimum 90% fractured faces and a minimum Los Angeles (LA) abrasion <40 per ASTM C131 and C535 (Smith, p. 28).¹¹
- b. All shall be clean, washed and free of fines with <2% passing the No. 200 sieve per ASTM C 136 (Smith, p. 28).¹²
- c. A porosity of at least 30% for the No. 8, 89, or 9 jointing material using ASTM C 29 (Smith, p. 28).¹³
- d. A porosity of at least 32% for the No. 57 bedding and No. 2, 3, or 4 subbase and base layers approximately using ASTM C 29 (Smith, p. 28).¹⁴
- e. No. 8 Setting Bed Material: Narrowly graded mixture of washed, crushed stone, or crushed gravel; in accordance with CMSC Section 703.01; coarse-aggregate grading Size 8; with 100 percent passing a ½-inch (12.5-mm) sieve and 0 to 5 percent passing a No. 16 (1.18-mm) sieve. Setting bed material shall be installed with a screed to the maximum extent possible to achieve a level surface for placement of pervious paver clay or concrete bricks.
- f. No. 8, 89, or 9 jointing material: Narrowly graded mixture of washed, crushed stone, or crushed gravel; in accordance with CMSC Section 703.01; coarse-aggregate grading Size 8; with 100 percent passing a ½-inch (12.5-mm) sieve and 0 to 5 percent passing a No. 16 (1.18-mm) sieve; grading Size 89; with 100 percent passing a ½-inch (12.5-mm) sieve and 0 to 10 percent passing a No. 16 (1.18-mm) sieve; grading Size 9; with 100 percent passing a 3/8-inch (9.5-mm) sieve and 0 to 10 percent passing a No. 16 (1.18-mm) sieve.
- g. No. 57 Bedding Layer: Narrowly graded mixture of washed, crushed stone, or crushed gravel; in accordance with CMSC Section 703.01; coarse-aggregate grading Size 57; with 100 percent passing a 1½-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36 mm) sieve.
- h. No. 2, 3 or 4 Subbase and Base Layer: Narrowly graded mixture of washed, crushed stone, or crushed gravel; in accordance with CMSC Section 703.01; coarse-aggregate grading Size 2 with 100 percent passing a 3-inch (100-mm) sieve, 0 to 5 percent passing a ¾-inch (19-mm) sieve, and less than 2 percent passing the No. 200 sieve. Grading size 3 with 100 percent passing the 2 ½-inch (63 mm) sieve, 0 to 5 percent passing a ½ inch (12.5 mm) sieve, and less than 2 percent passing the No. 200 (75 um) sieve. Grading size 4 with 100 percent pass the 2-inch (50 mm) sieve, 0 to 15 percent passing the ¾-inch (19 mm) sieve, and less than 2 percent passing the No. 200 (75 um) sieve.

¹⁰ Ibid

¹¹ Ibid

¹² Ibid

¹³ Ibid

¹⁴ Ibid

- i. Compaction of the bedding, subbase, and base layers of material shall be done with a 10-12 ton vibratory roller with aggregate lifts of no more than 6 inches. Compaction of the setting bed material is not required except after placement of pavers and jointing material using walk behind compaction equipment.

5.5.2 Pervious Interlocking Concrete Pavers

Pervious pavers can be used on any surface ranging from pedestrian plazas, low speed roadways to heavy industrial and shipping yards. Pervious pavers are not recommended for high speed roadways with posted speed limits above 25 MPH or high volume roadways.

- a. Pervious concrete pavers are referred to as Permeable Interlocking Concrete Pavements (PICP) in the paver industry. PICP shall conform to ASTM C936 which limits length-to-thickness ratio to no more than 4:1 to provide interlocking effect. It also limits face area to no more than 101 sq. in.
- b. A minimum average compressive strength of 8,000 psi is required per ASTM C936; however an average strength of 8,500 psi is preferred.
- c. At a minimum be resistant to freezing and thawing when tested according to ASTM C1645. It is preferred that the paver meet the higher Canadian standard, CSA A231.2, which is a similar test but at a lower temperature with more testing cycles.
- d. For vehicular applications, the majority of the pavers shall have a minimum joint width of 12 mm or larger as joint widths less than 12 mm are harder to maintain, require a smaller stone chip that is more susceptible to washing out or migrating into the underlying No. 57 aggregate. Smaller joints associated with soldier courses or other embedded pavers are acceptable.
- e. "L" shape pavers shall be used in all public roadway driving lanes and high traffic areas on private sites. Other geometries may be used for soldier courses, replacement for striping, parking lanes, parking lots, alleys, sidewalks, and other non-vehicular use applications.
- f. All paver areas shall have concrete edge restraints.
- g. Pavers that can be machine installed are preferred for larger projects.
- h. PICP structural design for vehicular applications assumes a minimum soil CBR (96-hour soaked per ASTM D 1883 or AASHTO T 193) of 4%, or a minimum R-value = 9 per ASTM D 2844 or AASHTO T-190, or a minimum Mr of 6,500 psi per AASHTO T-307 to qualify for use under vehicular traffic. Compaction or treatment of the subgrade with cement, lime, or lime/flyash may be required to achieve at least 4% soaked CBR. Expansive soils will need to be treated and will significantly reduce the infiltration capabilities of the native soil. (Ref: Smith Chapter 3)
- i. The pavement system from surface to subgrade should be designed using the 1993 AASHTO Method for flexible pavements. The paver and setting bed have a structure layer coefficient of between 0.20 and 0.40, with 0.30 a commonly used value. The No. 57, No. 2, 3 or 4 aggregates have a structural layer coefficient of 0.14. Care should be taken to obtain a subgrade CBR value and an estimation of traffic load. When a CBR value is not available use a value of 3 (Smith, Chapter 3).¹⁵

¹⁵ Smith, David R., *Permeable Interlocking Concrete Pavements*, Interlocking Concrete Pavement Institute, Herndon, VA, Fourth Edition, 2011

- j. The soldier course paver shall be a full-length rectangular pervious paver brick of the same thickness as the main system capable of accepting a No 8, 89, or 9 chip material.
- k. Color and finish are important decisions that need to be considered during the design process. Specialized face mixes can provide enhanced color durability to prevent fading and alternative textures for specialized applications.

5.5.3 Pervious Clay Brick Pavers

Pervious clay brick pavers are $2\frac{3}{4}$ inch thick solid interlocking paving units made of fired clay that allows water to flow through joints between the individual paving units. The joints are filled with open graded, small aggregate to allow for the units to interlock and still provide void space for the water to flow through.

Pervious clay brick pavers may be used in all areas where traditional pavement would be considered for pedestrian use. In addition, pervious clay brick pavers may be used in low volume and low speed (less than 25 MPH) vehicular use areas such as public roads, parking lots and roadside parallel parking.

- a. Clay brick pavers are categorized as ASTM C902 for Pedestrian and Light Traffic Paving Brick or ASTM C1272 for Heavy Vehicular Paving Brick. For both ASTM C902 and ASTM C1272 application PX shall be specified for pavers with close dimensional tolerance.
- b. Provide joint widths of at least 12 mm to allow for adequate infiltration capacity. It is difficult to find clay pavers with joints width of 12 mm or larger as joint widths less than 12 mm are harder to maintain, require a smaller stone chip that is more susceptible to washing out or migrating into the underlying No. 57 aggregate. Smaller joints associated with soldier courses or other embedded pavers are acceptable. If clay pavers are to be used in roadway applications, the setting bed shall be No. 8 stone and the joints filled to the maximum extent practical with the larger of No. 8, No. 89, or No. 9 stone.
- c. At a minimum be resistant to 50 freeze and thaw cycles when tested according to ASTM C67. It is preferred that the paver meet the higher Canadian standard, CSA A231.2, which is a similar test but at a lower temperature with more cycles.
- d. All paver areas shall have concrete edge restraint.
- e. Structural design for vehicular applications assumes a minimum soil CBR (96-hour soaked per ASTM D 1883 or AASHTO T 193) of 4%, or a minimum R-value = 9 per ASTM D 2844 or AASHTO T-190, or a minimum Mr of 6,500 psi per AASHTO T-307 to qualify for use under vehicular traffic. Compaction or treatment of the subgrade with cement, lime, or lime/flyash may be required to achieve at least 4% soaked CBR. Expansive soils will need to be treated and will significantly reduce the infiltration capabilities of the native soil (Smith, Chapter 3).¹⁶
- f. The pavement system from surface to subgrade should be designed using the 1993 AASHTO Method for flexible pavements. The paver and setting bed have a structure layer coefficient of between 0.20 and 0.40, with 0.30 a commonly used value. The No. 57 and No. 2 aggregates have a structural layer coefficient of 0.14. Care should

¹⁶ Smith, David R., *Permeable Interlocking Concrete Pavements*, Interlocking Concrete Pavement Institute, Herndon, VA, Fourth Edition, 2011

be taken to obtain a subgrade CBR value and an estimation of traffic load. When a CBR value is not available use a value of 3 (Smith, Chapter 3).¹⁷

- g. Pavers shall be laid in a herringbone pattern to increase interlocking stability.
- h. The soldier course paver shall be a full-length rectangular pervious paver brick of the same thickness as the main system capable of accepting a No 8, 89, or 9 chip material.
- i. Color and finish are important decisions that need to be considered during the design process.

5.5.4 Pervious Concrete

Pervious concrete is a type of pervious pavement that when cast has between 15-25% void space within the concrete. These void spaces are interconnected so that water and air are able to pass through from the top surface of the concrete down into aggregate storage layers below. Pervious concrete does not contain fine aggregates and is sometimes referred to as 'no-fines' concrete. Coarse aggregate, Portland cement, water and admixtures are the component materials of pervious concrete.

Pervious concrete may be used in all areas where traditional concrete would be considered for pedestrian use. In addition, pervious concrete may be used in vehicular use areas such as parking lots and roadside parallel parking. It is not recommended for travel lanes on public roadways, but has been successful in low volume residential streets and alleys. Pervious concrete shall comply with current editions of ACI 522.1 and ASTM C94.

- a. A model specification and structural design guidance is available from the Ohio Ready Mixed Concrete Association with the following exceptions:
 - 1. Wet cure with UltraCure by McTech Group or equivalent;
 - 2. Placement of concrete should be done with a hydraulically actuated pipe roller and;
 - 3. Joints shall be saw-cut; rolled joints are not to be permitted.¹⁸
- b. Slump tests and traditional strength tests cannot be used with pervious concrete. Testing shall be for density (unit weight), void content and thickness. These tests include ASTM C 172, ASTM C 29, ASTM C 42 and ASTM C 1688.
- c. All pervious concrete areas shall have concrete edge restraints.
- d. Structural design for vehicular applications assumes a minimum soil CBR (96-hour soaked per ASTM D 1883 or AASHTO T 193) of 4%, or a minimum R-value = 9 per ASTM D 2844 or AASHTO T-190, or a minimum Mr of 6,500 psi per AASHTO T-307 to qualify for use under vehicular traffic. Compaction or treatment of the subgrade with cement, lime, or lime/flyash may be required to achieve at least 4% soaked CBR. Expansive soils will need to be treated and will significantly reduce the infiltration capabilities of the native soil (Smith, Chapter 3).¹⁹

¹⁷ Ibid

¹⁸ Maloney, M. (2013). Pervious pavement as public infrastructure [Powerpoint slides].

¹⁹ Smith, David R., *Permeable Interlocking Concrete Pavements*, Interlocking Concrete Pavement Institute, Herndon, VA, Fourth Edition, 2011

- e. Pervious concrete can be colored with pigment during the mixing process and should be considered during the design process.

5.5.5 Pervious Asphalt

Pervious asphalt is a type of asphalt with approximately 16-20% air void space within the asphalt after installation. These void spaces are interconnected so that water and air are able to pass through from the top surface of the asphalt down into aggregate storage layers below. Pervious asphalt does not contain fine aggregates smaller than a No. 8 aggregate. A polymer modified asphalt binder (6%) is the main component that differentiates standard asphalt from pervious asphalt. Pervious asphalt has been around since the early 1970s and was previously referred to as open graded friction course and used on highways to reduce road spray.

Pervious asphalt may be used in all areas where traditional asphalt would be considered for pedestrian use. In addition, pervious asphalt may be used in low volume and low speed (less than 25 MPH) vehicular use areas such as parking lots and roadside parallel parking. It also has been successful in low volume residential streets and alleys.

- a. The ODNR considers The University of New Hampshire Stormwater Center (UNHSC) Design Specification for Porous Asphalt Pavement a reliable specification for pervious asphalt mix design.²⁰
- b. Asphalt pavement surface course may follow the Flexible Pavement of Ohio Asphalt Pavement Surface Course requirements, October 2007, revised September 2012. However, Flexible Pavements of Ohio should be contacted before the use of this specification as recent projects in Ohio have experienced raveling of the surface course in low impact parking lot applications. Updates to the specification to address these issues are ongoing.
- c. Pervious asphalt structural design for vehicular applications assumes a minimum soil CBR (96-hour soaked per ASTM D 1883 or AASHTO T 193) of 4%, or a minimum R-value = 9 per ASTM D 2844 or AASHTO T-190, or a minimum Mr of 6,500 psi per AASHTO T-307 to qualify for use under vehicular traffic. Compaction or treatment of the subgrade with cement, lime, or lime/flyash may be required to achieve at least 4% soaked CBR. Expansive soils will need to be treated and will significantly reduce the infiltration capabilities of the native soil. (Smith, Chapter 3).²¹
- d. The pavement system from surface to subgrade should be designed using the 1993 AASHTO Method for flexible pavements. The No. 57, No. 2, 3, or 4 aggregates have a structural layer coefficient of 0.14. Care should be taken to obtain a subgrade CBR value and an estimation of traffic load. When a CBR value is not available use a value of 3 (Smith, Chapter 3).²²

²⁰ University of New Hampshire Stormwater Center (2009). *Design specifications for Porous Asphalt Pavement and infiltration Beds*.

²¹ Smith, David R., *Permeable Interlocking Concrete Pavements*, Interlocking Concrete Pavement Institute, Herndon, VA, Fourth Edition, 2011

²² Ibid

5.6 Underground Storage

Underground storage may be used to provide storage volume to meet the peak control rate requirements, but shall not be used to provide water quality on its own unless coupled with an approved water quality BMP per section 4.1.

- a. Adequate flood routing shall be provided if the system becomes clogged or surcharges onto the surface.
- b. The preferred minimum orifice size is 4" in diameter. Smaller sizes shall provide adequate protection to protect it from clogging.
- c. The maximum ponding depth at any point in the parking lot is 12" for the 100-year storm.
- d. The use of perforated pipe to maximize storage volume in the surrounding stone backfill is not permitted without an approved pretreatment device listed in Section 4.1 or the use of a proprietary BMP in the Washington Department of Ecology TAPE program, specifically technologies classified as PRETREATMENT with Conditional or General Use Level classifications at the following link:

<http://www.ecy.wa.gov/programs/wq/stormwater/newtech/technologies.html>

6.0 PUBLIC AND PRIVATE WET BASIN DESIGN STANDARDS

Although every wet basin is unique and designed based on specific site conditions, the standards set forth within this section are intended to establish the guidelines for the layout and design of public or private wet basins within the City.

Some problems encountered with wet basins are: site reservation (land requirements), permanent easements, complexity of design and construction, safety hazards and maintenance problems. However, the recreational, aesthetic, and water quality benefits of permanent wet basins justify their use in many applications.

All wet basins with a permanent pool depth greater than twenty-four inches (24") shall be enclosed by a fence unless each of the following criteria is met:

- Interior side slopes are no steeper than 3H:1V
- A minimum eight foot (8') wide dry bench and a eight foot (8') wide wet bench are provided adjacent to the full perimeter of the permanent pool, and
- Graded benches are to be no steeper than 8H:1V.

Fencing shall be a minimum forty-eight inches (48") in height and at a minimum be equipped with a double eight foot (8') swing gates (sixteen feet (16') total) to allow for access.

Reference the standard basin grading figure provided on page 6-7.

6.1 Existing Wet Basin Investigation Requirements

When existing wet basins are proposed to become part of a stormwater management system to meet peak flow rate and water quality requirements and to be incorporated into a development the following information is recommended:

- a. Photos of the existing basin.
- b. Bathymetry Survey.
- c. Discussion of the current conditions, including the presence of trees, inlet/outlet structures, etc.
- d. A proposed usage description outlining any changes, including increased embankment height, inlet/outlet structures, etc.

6.2 Dam Safety Classifications

All dams shall adhere to the State of Ohio's Dam Safety Regulations (Title XV, Chap. 1521 of the Ohio Revised Code, Rule 1501:21-13-01).

The following dam types do not require construction permits per Ohio Dam Safety Laws, Section 1521.06:

- a. A dam that is or will be less than 10 feet in height and greater than 6 feet and that has or will have a storage capacity of not more than 50 acre-feet at the elevation of the top of the dam, as determined by the ODNR Chief. For the purposes of this section, the height of a dam shall be measured from the natural stream bed or lowest ground elevation at the downstream or outside limit of the dam to the elevation of the top of the dam.
- b. A dam, regardless of height, that has or will have a storage capacity of not more than 15 acre-feet at the elevation of the top of the dam.
- c. A dam, regardless of storage capacity, that is or will be 6 feet or less in height.
- d. A dam, dike or levee that belongs to a class exempted by the ODNR Chief.

6.3 Outlet/Inlet Treatment

a. Submerged Outlet/Inlet Structures

The City encourages the use of submerged storm pipes in lieu of exposed outlet/inlet structures. Submerged Outlets may consist of a siphon pipe where such pipe is no smaller than 6 inches in diameter. Inlet pipes that are equal to or larger in diameter than 36 inches should be submerged to at least the "springline" of the pipe (i.e., normal pool at a depth equal to the elevation at one-half the diameter of the pipe). When an inlet pipe is at least partially submerged at the wet basin, the conditions listed below shall also be met.

1. Submergence of inlet pipes is limited to the next upstream manhole or catch basin along the storm sewer system.
2. All lengths of submerged storm pipe shall include "O-ring" sealed gasket pipe joints.
3. All lengths of the submerged storm pipe shall have bedding and backfill material consistent with the compacted embankment material.

b. Structure Requirements

All headwall and structures shall be in accordance with Ohio Department of Transportation standard drawings (modified as necessary).

c. Bedding/Backfill Material

The bedding and backfill material for all storm pipe outlets shall consist of 100 percent cohesive embankment material or controlled-density fill. Where inlet storm pipes are submerged, bedding and backfill material for those pipes shall consist of 100 percent cohesive embankment material to the next structure upstream along the storm sewer system.

d. Anti-Seep Collars

Anti-seep collars shall be used at all outlet storm pipe locations and shall be located (spaced) and sized in accordance with the criteria provided below. All anti-seep collars shall be constructed with material that provides a watertight connection to the pipe and is of a material that is compatible to the pipe. Anti-seep collars shall also be used along the submerged portion of any storm inlet pipes.

The anti-seep collars shall be located along the length of the outlet pipe within the saturation zone of the embankment at approximately equal spacing and at intervals not exceeding 25 feet. The saturation zone is considered to extend through the embankment from the elevation of the riser (normal pool) to the downstream embankment toe.

The anti-seep collars shall be designed to increase the length along the line of seepage (along the outlet pipe) by at least 15 percent. The proper design of the anti-seep collars may be achieved by either:

1. Selecting the number of collars and determining the minimum projection of the collar away from the outlet pipe: $V = 0.075 \times (L/N)$; or
2. Selecting the projection of the collar away from the outlet pipe and
3. Determining the minimum number of collars: $N = 0.075 \times (L/V)$.

e. Emergency Spillways

Emergency Spillways should meet all of the following criteria unless they are located in areas where a basin is not located adjacent to a stream or roadway, in which case, an emergency spillway is then not required. However, an adequate flood routing path is required from the basin.

1. They shall not operate (convey flow) for any routed design storm less than the 50-year event.
2. They shall be reinforced with concrete or designed erosion control materials (geotextiles) consisting of 100 percent synthetic, non-biodegradable materials (the plans should include a specification for the intended geotextile, referencing the required physical properties or the specific material).
3. They shall be designed to pass the 50-year peak inflow to the basin on its own without attenuation (the plans shall include a detail demonstrating the necessary dimensions of the control section, both width and breadth).

f. Miscellaneous

The following general criteria are preferred:

1. Roof drain (downspout) outlets directly to a wet basin are not permitted.
2. The minimum allowable installed orifice size is 4 inches in diameter unless protected by a means acceptable to the City.
3. All inlet structures (e.g., pipe headwalls) shall be recessed into the adjoining wet basin grading to diminish the amount the structure is visible.

6.4 Geotechnical Considerations

Design of wet basin liners and embankments may require a qualified geotechnical engineer or geologist to design the liner. Acceptable soils used in wet basin liners or embankments shall meet the following minimum criteria:

- a. Free of large rocks, roots, limbs and other deleterious materials which would adversely affect the design integrity of the liner.
- b. Classified under the Unified Soil Classification System as CL, CH or SC.
- c. Minimum 15% passing the No. 200 sieve.
- d. Have a plasticity index (PI) ≥ 15 .
- e. Have a laboratory permeability of 1×10^{-6} cm/sec or less based on a minimum of two undisturbed core (tube) samples taken from the liner.

1. Wet Basin Liner

Wet basin liners consisting of acceptable soils as described above shall be a minimum of 2 feet in thickness. Localized granular, organic, or other deposits (which would be sources for wet basin leakage) shall be removed and replaced with suitable soils. Disking of up to 6 inches of surface material for re-compaction is acceptable, if necessary. The material shall be compacted at optimum moisture content to (but not exceeding) 3 percent above optimum moisture content in loose lifts not to exceed 8 inches in thickness. The installation of wet basin liners shall be under the supervision of a geotechnical engineer, geologist or other City of Mansfield approved entity who shall certify that the liner was installed in accordance with this policy. Alternative wet basin liners accompanied by a geotechnical report may be used upon review and approval by the City of Mansfield. These include, but are not limited to poly-liners (minimum 30 mil) and bentonite (typically 1 to 3 lb/ft²).

2. Embankment Materials

All outlet embankment materials shall consist of cohesive soils compacted to a minimum of 98 percent of the maximum density obtainable with the Standard Proctor Test method (ASTM Standard D-698). Certified test results shall be submitted to the City prior to installation or the test is to be performed at the time of installation, in the presence of the City or its assigned representative. The

compacted outlet embankment shall be free of vegetative material and other construction debris. The engineering plan shall include notes and other references regarding the conditions and requirements for construction of the outlet embankment, including design information for a key trench, if necessary.

6.5 Public and Residential Wet Basin Amenities

When developing wet basins in residential areas, it is the intent of the City to incorporate features within the basin as amenities to the development. The following amenities may be required to be included with the basin design.

6.5.1 Observation/Fishing Platform

Any wet basin that includes an incoming stormwater pipe of 30 inches or greater may be required to include at least one platform made of wood or other material. The size of the platform shall be a minimum of 10' x 10'.

6.5.2 Walkway

Installation of a 6-foot minimum bituminous walkway around the circumference of the wet basin edge for wet basins within residential subdivisions. The walk may be at generally the same elevation around the wet basin but shall vary in distance from the normal water surface. The construction of the path will be in conformance with City Specifications.

6.5.3 Fountains and Aerators

For wet basins within residential subdivisions provide one (1) fountain for every 3/4 of an acre of surface area.

6.5.4 Depth of Water Surface Elevation

The water surface elevation is a critical aspect of the general aesthetics of a wet basin. For this reason, the proposed water surface elevation for wet basins within residential subdivisions and publicly viewed private developments shall not be any lower than 5-feet below any adjoining roadway or viewing area, so long as adequate freeboard is available for stormwater detention. The viewing area is defined as the level area above the freeboard of the wet basin. This area may be comprised of the finished floor elevation of the homes nearest to the wet basin or the finished grade between the nearest homes.

6.5.5 Wet Basin Vegetation

The City permits the planting of wetland species vegetation within designated areas of a wet basin for purposes of general water quality considerations or as mitigation in conformance with the requirement for State of Ohio 401 Water Quality Certification. Refer to Table 6-1 for a listing of acceptable wetland species vegetation.

6.6 Wet Basin Maintenance

6.6.1 Treatment of Algae

The use of herbicides/pesticides to control the growth of aquatic vegetation is regulated by the State of Ohio. Private or public wet or wetland basins that are within the regulatory jurisdiction of the State of Ohio are subject to the criteria of the Ohio Surface Water

Regulations (Ohio Administrative Code 3745-1 Water Quality Standards), pertaining to the application of chemicals. Refer to the following website for information regarding notification to the EPA prior to applying aquatic herbicides: <http://ohioline.osu.edu/a-fact/0013.html>

6.6.2 Goose Control

Stormwater basins are often constructed with mowed turf grass around the perimeter making it an ideal habitat for geese as they can walk into and out of wet basins easily to forage on grass and escape back to the water when threatened. Tall vegetation at the edge of the pond can discourage geese as they are not able to see through the taller grass and are less likely to venture out of pond to forage. Another potential solution is to plant turf type grasses that do not taste well to geese, which discourages their use of the pond and they will seek other areas. Such grasses include Titan Limited, Turf-type Tall Fescue or Jacklin Pixie.

Table 6-1: Species of Plants and Shrubs Recommended for Stabilizing Flood Prone Areas

Riparian Corridor—Trees

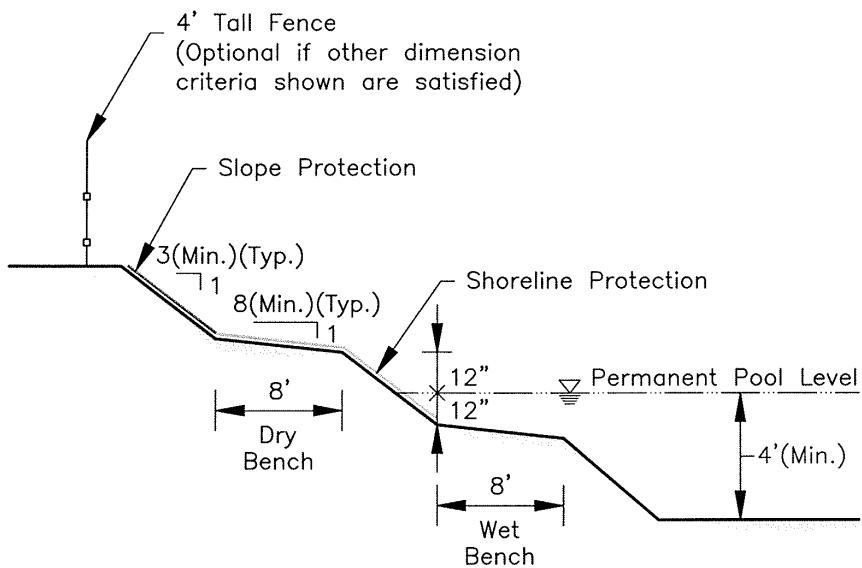
Botanical Name	Common Name
<i>Acer spp.</i>	Maple(s)
<i>Betula nigra</i>	River Birch
<i>Carya spp.</i>	Hickory(s)
<i>Celtis occidentalis</i>	Common Hackberry
<i>Cercis Canadensis</i>	Eastern Redbud
<i>Crataegus phaenopyrum</i>	Washington Hawthorne
<i>Crataegus crusgalli</i>	Cockspur Hawthorne
<i>Fagus grandiflora</i>	Beech
<i>Fraxinus Americana</i>	White Ash
<i>Gleditsia triacanthos</i>	Honeylocust
<i>Hamamelis virginiana</i>	Common Witchhazel
<i>Liriodendron tulipifera</i>	Tulip Poplar
<i>Liquidambar styraciflua</i>	Sweetgum
<i>Platanus occidentalis</i>	Sycamore
<i>Populus deltoids</i>	Eastern Cottonwood
<i>Prunus serotina</i>	Black Cherry
<i>Quercus alba</i>	White Oak
<i>Quercus palustris</i>	Pin Oak
<i>Quercus rubra</i>	Red Oak
<i>Ulmus rubra</i>	Slippery Elm

Riparian Corridor--Shrubs

Botanical Name	Common Name
<i>Aronia melanocarpa</i>	Black Chokeberry
<i>Cornus racemosa</i>	Gray Dogwood
<i>Cornus stolonifera*</i>	Red-osier Dogwood
<i>Lindera benzoin</i>	Spicebush
<i>Salix spp.*</i>	Willow(s)
<i>Sambucus canadensis</i>	Elderberry
<i>Viburnum dentatum</i>	Southern Arrowwood
<i>Viburnum prunifolium</i>	Blackhaw Viburnum
<i>Viburnum lentago</i>	Nannyberry Viburnum
<i>Viburnum trilobum</i>	American Cranberrybush

*In stream plantings for rapid shade cover and bank stabilization

Figure 6-1: Standard Wet Basin Grading Section



STANDARD WET BASIN GRADING SECTION

SCALE: NONE

Notes:

1. Shoreline Protection shall consist of Seeding with Turf Reinforcing Mat, Type 1 (ODOT CMS Item 836).
2. Slope Protection shall consist of Seeding and Erosion Control Matting (ODOT CMS Item 671 and Erosion Control Material 712.11 Type B) installed on a 6" minimum depth of topsoil.

7.0 DRAINAGE EASEMENTS

When it is necessary to convey stormwater outside the property lines of a proposed improved area in order to discharge into an adequate outlet, the Owner or Developer:

- a. Is required to obtain easements and/or maintenance agreements, in a form and substance satisfactory to the City, from abutting property owners; and
- b. Is responsible for maintenance agreements of such drainage course unless the easements and/or maintenance agreements require the abutting property owners to repair and maintain the drainage course satisfactorily.

Any required drainage easement, preservation areas, reserves and other similar areas shall be shown on the required plans and reflected on the final plat or a separate recorded document approved by the City. The Owner and/or Developer shall comply with the procurement, execution, and maintenance of the Easement, and their responsibilities to the adjacent and downstream property owners. The easement shall be of sufficient width, minimum of 20-foot, to allow cleaning, widening, deepening, replacing or other general maintenance of such drainage course or piped system. Such declaration of restrictions shall include the operation and maintenance requirements as specified in the City approved plans.

8.0 OPERATION AND MAINTENANCE PLANS

The owner/developer of a site that includes the implementation of structural and nonstructural BMPs to manage stormwater from the site and provide qualitative treatment shall prepare an Operation and Maintenance (O&M) Plan. The O&M plan shall be submitted to the City for review and shall be approved prior to the commencement of construction activities. The O&M Plan shall meet the minimum requirements of the latest version of the Ohio EPA General Construction Permit and include an O&M Agreement signed by the owner/developer and a requirement for annual inspection reports filed on forms provided by the City and conducted by a licensed Ohio Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), or Certified Professional in Storm Water Quality (CPSWQ).

The Ohio EPA General Construction permit can be found at the following link:

http://www.epa.state.oh.us/dsw/permits/GP_ConstructionSiteStormWater.aspx

The O&M plan shall be a stand-alone document which contains the following minimum requirements:

- a. A designated entity for stormwater inspection and maintenance responsibilities.
- b. The routine and non-routine maintenance tasks to be undertaken.
- c. A schedule for inspection and maintenance tasks.
- d. Any necessary legally binding maintenance easements and agreements.
- e. A map showing the location of the BMPs and access and maintenance easements.
- f. BMP details.
- g. Procedures for properly disposing of collected pollutants within the BMPs in accordance with local, state, and federal regulations.

An O&M plan template and the Inspection and Maintenance Agreement are provided within Appendix A. The post-construction operator of the site that is responsible for maintaining the BMP's per the plan is required to inspect the BMP's and forward a copy of the inspection report to the City Engineer on an annual basis. Post-construction BMP inspection reports are provided within Appendix B.

9.0 STORMWATER MANAGEMENT PLAN SUBMITTAL REQUIREMENTS

The developer shall submit the stormwater management calculations to the City for review in the following format. Sections that are not applicable to a specific project shall be omitted.

Section 1 – Project Information

- Engineer's certification
- Project narrative (description of project, existing conditions, and proposed stormwater management design)
- Location map
- Flood Insurance Rate Map
- Copies of other permit applications (401/404, NPDES, Dam Safety, etc.)

Section 2 – Stormwater Conveyance System Calculations

- Narrative description of procedures and assumptions used to calculate hydrologic and hydraulic conditions (including management of off-site runoff)
- Storm sewer design calculations
 - Conveyance calculations
 - Tailwater analysis
 - Outfall scour protection
- Pavement spread calculations
- Open channel design calculations
 - Conveyance calculations
 - Tailwater analysis
 - Shear stress and slope protection design
- Culvert design calculations
 - Conveyance calculations
 - Tailwater analysis
 - Outfall scour protection

Section 3 – Stormwater Control Facility Calculations

- Narrative description of procedures and assumptions used to calculate hydrologic and hydraulic conditions (including management of off-site runoff)
- Stormwater quantity control calculations
 - Existing condition hydrology
 - Allowable release rate calculations
 - Narrative description of proposed facility type and function
 - Proposed condition hydrology
 - Facility tailwater analysis
- Stormwater Quality Control Calculations
 - Required water quality calculations
 - Narrative description of proposed BMP type and function
 - BMP design calculations

Section 4 – Exhibits and Mapping

- Site topographic map
 - Scale 1"=100' or less
 - Existing and proposed contours onsite and within 100 feet of site
 - Delineation of pre-development regulatory floodplain and floodway limits
 - Delineation of post-development regulatory floodplain and floodway limits
 - Location of all wetlands, lakes, and ponds with normal water elevation shown
 - Location of all buildings near the site
 - Identification of lowest floor and lowest point of entry for each building within 100 feet of the development

- Site plan – showing existing and proposed conditions
 - Scale 1"=100' or less
 - Existing major and minor stormwater systems
 - Proposed major and minor stormwater systems
 - Existing wetlands and streams
 - Proposed wetland and stream mitigation
 - Existing roadways, structures, parking lots, driveways, sidewalks, and other impervious surfaces.
 - Proposed roadways, structures, parking lots, driveways, sidewalks, and other impervious surfaces.
 - Nearest base flood elevations
 - Design details for stormwater management facilities
- Tributary drainage area mapping
 - Watershed boundaries for areas draining through the development
 - Soil types, vegetation, and land cover affecting runoff upstream of the property for any area drainage through the site
 - Existing and proposed time of concentration
- Miscellaneous exhibits

Section 5 – Erosion and Sediment Control

- Erosion and sediment control plan
- Storm water pollution prevention plan

Section 6 – Operation and Maintenance

- Long term operation and maintenance plan
 - Scheduled maintenance program for stormwater facilities
 - Planned maintenance tasks and schedule
 - Indication of persons responsible for maintenance
 - Permanent access and maintenance easements
 - Inspection and Maintenance Agreement

ITEM	TO BE COMPLETED BY APPLICANT'S ENGINEER		TO BE COMPLETED BY CITY'S REVIEWER
	APPLICABLE (Y/N)	PROVIDED (Y/N)	REVIEWED (Y/N)
Section 1 – Project Information			
Engineer's Certification			
Project Narrative			
Location Map			
Flood Insurance Rate Map			
Wetland Delineation			
Copies of Other Permit Applications (401 /404, NPDES, etc.)			
Section 2 – Stormwater Conveyance System Calculations			
Narrative description of procedures and assumptions used to calculate hydrologic and hydraulic conditions (including management of off-site runoff)			
Storm sewer design calculations			
Conveyance calculations			
Tailwater analysis			
Outfall scour protection			
Pavement spread calculations			
Open channel design calculations			
Conveyance calculations			
Tailwater analysis			
Shear stress and slope protection design			
Culvert design calculations			
Conveyance calculations			
Tailwater analysis			
Outfall scour protection			
Section 3 – Stormwater Control Facility Calculations			
Narrative description of procedures and assumptions used to calculate hydrologic and hydraulic conditions (including management of off-site runoff)			
Stormwater quantity control calculations			
Existing condition hydrology			
Allowable release rate calculations			
Narrative description of proposed facility type and function			
Proposed condition hydrology			
Facility tailwater analysis			
Stormwater Quality Control Calculations			
Required water quality calculations			
Narrative description of proposed BMP type and function			
BMP design calculations			
Section 4 – Exhibits and Mapping			
Site topographic map			
Scale 1"=100' or less			
Existing and proposed contours onsite and within 100 feet of site			
Delineation of pre-development regulatory floodplain and floodway limits			
Delineation of post-development regulatory floodplain and floodway limits			

ITEM	TO BE COMPLETED BY APPLICANT'S ENGINEER		TO BE COMPLETED BY CITY'S REVIEWER
	APPLICABLE (Y/N)	PROVIDED (Y/N)	REVIEWED (Y/N)
Location of all wetlands, lakes, and ponds with normal water elevation shown			
Location of all buildings near the site			
Identification of lowest floor and lowest point of entry for each building within 100 feet of the development			
Site plan – showing existing and proposed conditions			
Scale 1"=100' or less			
Existing major and minor stormwater systems			
Proposed major and minor stormwater systems			
Existing wetlands and streams			
Proposed wetland and stream mitigation			
Existing roadways, structures, parking lots, driveways, sidewalks, and other impervious surfaces.			
Proposed roadways, structures, parking lots, driveways, sidewalks, and other impervious surfaces.			
Nearest base flood elevations			
Design details for stormwater management facilities			
Tributary drainage area mapping			
Watershed boundaries for areas draining through the development			
Soil types, vegetation, and land cover affecting runoff upstream of the property			
Existing and proposed condition time of concentration mapping			
Miscellaneous exhibits			
Section 5 – Erosion and Sediment Control			
Erosion and Sediment Control Plan			
Storm Water Pollution Prevention Plan			
Section 6 – Operation and Maintenance			
Long term operation and maintenance plan			
Scheduled maintenance program for stormwater facilities			
Planned maintenance tasks and schedule			
Indication of persons responsible for maintenance			
Permanent access and maintenance easements			
Location of all wetlands, lakes, and ponds with normal water elevation shown			
Inspection and maintenance agreement			

10.0 GLOSSARY

The following definitions shall apply to this Manual:

100-year flood: A flood which has a one (1) percent chance of occurring each year, otherwise known as the base flood.

Attenuation: Is the gradual loss of intensity of flow.

Best Management Practice(s) (BMP): Measures including structural and non-structural BMPs that are determined to be the most effective, practical means of preventing or reducing point source or non-point source pollution inputs to stormwater runoff and water bodies and reduction in peak flow rates.

Conveyance: Any pipe, channel, inlet, drain, or other structure that facilitates the movement or removal of water.

Dam: An artificial barrier usually constructed across a stream channel to impound water. Dams shall have spillway systems to safely convey normal stream and flood flows over, around, or through the dam. Spillways are commonly constructed of non-erosive materials such as concrete. Dams should also have a drain or other water withdrawal facility to control the pool or lake level and to lower or drain the lake for normal maintenance and emergency purposes. A permit from ODNR is not required for impoundments with a total storage volume of less than 15 ac-ft., or less than 50 ac-ft. for impoundments with a height of less than 10 feet, or unlimited storage for heights of less than 6 feet.

Detention Basin: A facility designed for the temporary storage of stormwater runoff for the purpose of delaying and attenuating flow to the downstream receiving system. For the purpose of this design manual, this definition excludes storage in areas of parking lots, rooftops, underground tanks and other water quality based applications, such as bio-retention basins.

Design Storm: A rainfall event of specified size and return frequency which is used to calculate the runoff volume and peak flow rate.

Development: Any action in preparation for construction activity which results in an alteration of either land or vegetation, including but not limited to clearing, grubbing, grading, filling, excavation or any other development operations and the construction of new facilities, buildings, parking areas, recreational areas, etc.

Development Area: Any contiguous (abutting) area owned by one person or operated as one development unit and used or being developed for nonfarm commercial, industrial, residential or other nonfarm purposes upon which earth-disturbing activities are planned or underway.

Dike: An artificial barrier used to divert or restrain flood waters from tidal bodies of water.

Discharge: Any substance introduced to the Waters of the State or to surface runoff which is collected or channeled by the MS4 which does not lead to treatment works and/or the addition of any pollutant to the Waters of the State from a point source.

Disturbance: Earth surface subject to erosion due to the removal of vegetative cover and/or earthmoving activities.

Ditch: An open channel constructed for the purpose of drainage or irrigation with intermittent flow.

Drainage: A general term applied to the removal of surface or subsurface water from a given area, either by gravity or by pumping, commonly applied herein to surface water.

Drainage Area: The contributing area to a single drainage basin, expressed in acres, square miles or other unit or area. Also called, "catchment area", "watershed" and "river basin", or the area served by a drainage system receiving storm and surface water or by a watercourse

Drainage System or Drainageway: The surface and subsurface system for the removal of water from the land, including both the natural elements of streams, marshes, swales and wet basins, whether of an intermittent or continuous nature, and man-made elements which include culverts, ditches, channels, storage facilities and the storm sewer system.

Earth-Disturbing Activity: Any grading, excavating, filling or other alteration of the earth's surface where natural or man-made ground cover is destroyed and which may result in increased rate and/or volume or runoff and/or contribute to erosion and sediment pollution.

Easement: Property titled to the City for the operation and maintenance of stormwater drainage and management systems.

Engineer: A Professional Engineer registered in the State of Ohio as required by Chapter 4733 of the Ohio Revised Code.

Environmental Protection Agency (EPA): The United States Environmental Protection Agency, including but not limited to the Ohio Environmental Protection Agency (Ohio EPA), or any duly authorized official of said agency.

Erosion: The general process whereby soil or surface material is moved by flowing surface or subsurface water or is worn away by the action of wind, water, ice or gravity.

Erosion control: Measures that reduce or prevent erosion.

Extended Detention: A stormwater design feature that provides for the gradual release of a volume of stormwater (0.75 inch per impervious acre) over a 24 to 48-hour interval to increase settling of urban pollutants and protect channels from degradation.

Facility: Any operation, including construction sites, required by the Federal Clean Water Act to have a permit to discharge stormwater associated with activities subject to NPDES Permits as defined in 40 Code of Federal Regulations (CFR), Part 122.

Flood: A temporary rise in the level of rivers, streams, watercourses and lakes which results in inundation of areas not ordinarily covered by water.

Floodplain: The relatively level land to either side of a channel, which is inundated during high flows. It is often used to reference the 100-year flood plain.

Forebay: A distinct area near an inlet of a wet, dry or wetland basin and in some cases bioretention basins, to enhance deposition of incoming sediments.

Geotextile: A woven or nonwoven, water-permeable fabric generally made of synthetics such as polypropylene. It's used to slowly pass runoff or as bedding for rock to keep the rock separate from adjacent soil.

Grading: Changing the ground surface condition, elevation, and/or slope through excavation or fill of material.

Hydrologic Soil Group: One of four classifications of soil based on the minimum infiltration characteristics for bare soil after prolong wetting as used by the United States Department of Agriculture Natural Resources Conservation Service Technical Release No. 55, *Urban Hydrology for Small Watersheds*. The Richland County Soil Survey should be used as the reference source for soils types and hydrologic soil groups within the City of Mansfield.

Impervious: Any constructed surface; including but not limited to, rooftops, sidewalks, roads, and parking lots; covered by impenetrable materials such as asphalt, concrete, brick, and stone. These materials seal surfaces, repel water and prevent precipitation and runoff from infiltrating soils.

Infiltration: The gradual downward flow of water from the surface through soil to groundwater.

Landscape: To mow, seed, sod, plant, and to do other activities which are not earth changes.

Larger Common Development of Sale: A contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules under one plan. A common plan is broadly defined as any announcement or piece of documentation (including a sign, public notice or hearing, sales pitch, advertisement, drawing, permit application, zoning request, computer design, etc.) or physical demarcation (including boundary signs, lot stakes, surveyor, markings, etc.) indicating that construction activities may occur. A larger common plan or sale needs to also consider spoil areas, staging areas and borrow sites. A public body need not consider all their construction projects within their entire jurisdiction to be part of an overall common plan. Discrete construction projects within a larger common plan or development or sale are located at least 1/4 mile apart and the area between the two projects is not being disturbed, each individual project can be treated as a separate plan of development or sale provided any interconnecting road, pipeline, or utility project that is part of the same "common plan" is not concurrently being disturbed.

Levee: An artificial barrier that diverts or restrains flood waters from streams and lakes. Per the Ohio Department of Natural Resources, sufficient freeboard shall be provided to prevent overtopping of the levee due to passage of the design flood or due to severe frost damage, ice damage, stream obstruction or wave action. The design freeboard shall not be reduced without the approval of the ODNR Chief.

- For levees in Class I, the minimum elevations of the top of the levee shall be three feet higher than the maximum adjacent water surface elevation during passage of the design flood.
- For levees in Class II and Class III, the minimum elevations of the top of the levee shall be two feet higher than the maximum adjacent water surface elevations during passage of the design flood.
- Where special condition of severe frost damage, ice damage, stream obstruction, wave action, or impact of other structures may occur, the ODNR Chief may require elevations higher than required item 1 above.

Managed Open Space: Land that is regularly maintained via mowing, fertilizing, landscaping, and other actions that prevent the land from being in a natural state such as single-family residential lawns, golf courses, cemeteries, and other similar types of development.

Material: Soil, sand, gravel, clay, or any other organic or inorganic material.

Municipal Separate Storm Sewer System (MS4): As defined at 40 CFR 122.26(b)(8), "means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):

- Owned or operated by a state, city, town, borough, county, parish, district, municipality, township, county, district, association, or other public body (created by or pursuant to State law) having jurisdiction over sewage, industrial wastes, including special districts under State law such as a sewer district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the Clean Water Act that discharges to waters of the United States;
- Designed or used for collecting or conveying stormwater;
- Which is not a combined sewer; and
- Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2."

National Pollutant Discharge Elimination System (NPDES): A national program under Section 402 of the Clean Water Act for regulation of discharges of pollutants from point sources to Waters of the United States. Discharges are illegal unless authorized by an NPDES permit.

National Pollutant Discharge Elimination System (NPDES) Stormwater Discharge Permit: A permit issued by the EPA (or by a state under authority delegated pursuant to 33 USC § 1342(b)) that authorizes the discharge of pollutants to Waters of the United States, whether the permit is applicable on an individual, group, or general area-wide basis.

Operate: To drive, conduct, work, run, manage, or control a tool, piece of equipment, vehicle, or facility.

Owner: Any person with a legal or equitable interest in a piece of land or parcel.

Permeability: The capacity for transmitting runoff through a material or into soil. The relevant soil property is the saturated hydraulic conductivity, which is the amount of water that would move vertically through a unit of saturated soil per unit time under hydraulic gradient.

Person: Any individual, owner, operator, association, organization, partnership, firm, corporation, municipal corporation, joint venture, agency, County or State agency, unincorporated associate, party, the federal government, any combination thereof or other entity recognized by law.

Pollutant: Anything that causes or contributes to pollution. Pollutants may include, but are not limited to, paints, varnishes, solvents, oil and other automotive fluids, non-hazardous liquid and solid wastes, yard wastes, refuse, rubbish, garbage, litter or other discarded or abandoned objects, floatable materials, pesticides, herbicides, fertilizers, hazardous materials, wastes, sewage, dissolved and particulate metals, animal wastes, residues that result from constructing a structure, and noxious or offensive matter of any kind.

Pollution: The alteration of the physical, thermal, chemical, or biological quality of, or the contamination of, any Water of the State or Water of the United States, that renders the water harmful, detrimental, or injurious to humans, animal life, vegetation, or property, or to the public health, safety, or welfare, or impairs the usefulness or the public enjoyment of the water for any lawful or reasonable purpose.

Post-development: The state of condition of the earth's surface after urbanization occurs. Other terms are "developed", "future", and "after development".

Practices: Schedules of activities, prohibitions of practices, maintenance procedures and other management practices and techniques (both structural and non-structural) used to lessen the environmental impacts of land use and to prevent or reduce the pollution of Waters of the State. BMPs also include treatment requirements, operating procedures and practices to control facility and/or construction site runoff, spillage or leaks, sludge or waste disposal or drainage from raw material storage. Techniques may involve basins, vegetation, altering construction operations, open space development, riparian buffers or other means of limiting environmental impacts.

Pre-development: The state of condition of the earth's surface averaged over the last five years prior to urbanization. Other terms are "developed", "present", and "before development".

Rainwater and Land Development Manual: A manual describing construction and post-construction BMPs and associated specifications prepared by the Ohio Department of Natural Resources Division of Soil and Water Conservation. The compilation of technical standards and design specifications are methods of controlling construction related surface runoff, erosion and sedimentation. A copy of the manual may be obtained by contacting the Ohio Department of Natural Resources, Division of Soil & Water Conservation.

Return frequency: Also known as the *recurrence interval*, it is the average period between precipitation events or flood events of a certain size based on the records and statistics.

Routine Maintenance: Routine maintenance that does not require Ohio EPA General Permit Coverage that disturbs less than 5 acres of land and meets the definition of small construction at 40 CFR 122.26(b)(15)(i) which states: "Small construction activity does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of the facility". The land disturbance shall also not go beyond the original footprint of the facility. Examples of routine maintenance are as follows:

- Berm repair or topsoil placement.
- Berm repair or topsoil placement along shoulders - placing berm material or topsoil on shoulders adjacent to pavement to eliminate drop-offs.
- Bridge abutment repairs.
- Bridge deck overlays.
- Bridge deck replacement.
- Chip sealing - placing asphalt or polymer binder and stone on existing roads.
- Culvert repair/lining - repairing or lining existing culvert maintaining same line, grade, and hydraulic capacity and within USAC Nationwide Permit (NWP) #3 parameters.
- Culvert replacement - replacing a culvert with the same line, grade, and hydraulic capacity and within USAC NWP #3 parameters.
- Curb repairs - repairing existing curbing along a roadway.
- Ditch cleanout - maintaining or restoring original flow line and cross-section only.
- Fence repair/replacement.
- Full depth pavement repairs - isolated repairs of pavement build-up down to sub-grade (soil).
- Guardrail installation/replacement - installing or repairing with minor grading work to create proper grade for end assemblies.
- Lighting maintenance.
- Linear grading - reshaping of graded shoulders to establish proper drainage away from pavement.
- Loop detector repairs - repairing loop detectors in existing pavement.
- Noise wall repair.
- Partial depth pavement repairs - isolated repairs of surface courses of pavement.
- Pothole filling.
- Resurfacing - replacing several inches of asphalt wearing course by milling existing asphalt and replacing with new.
- Sign repair/maintenance - installing or repairing traffic signs and poles/posts.
- Signal installation/maintenance - installing or repairing traffic signals and poles/posts.
- Tree/brush removal.

Runoff: The portion of rainfall, precipitation, melted snow or irrigation water that flows across the ground surface and is eventually returned to streams.

Runoff coefficient: The fraction of total rainfall that will appear as runoff.

Sediment: Soils or other surface materials (including, but not limited to rock, sand, gravel and organic material or residue associated with or attached to the solid) that can be transported or deposited by the action of wind, water, ice or gravity as a product of erosion or sedimentation.

Sediment pollution: Degradation of Waters of the State by sediment as a result of failure to apply management or conservation practices to abate wind or water soil erosion, specifically in conjunction with earth disturbing activities on land used or being developed for commercial, industrial, residential or other non-farm purposes.

Sedimentation: The processes that operate at or near the surface of the ground to deposit soils, debris and other materials either on the ground surfaces or in water channels or the action of deposition of sediment that is determined to have been caused by erosion.

Sheet Flow: Diffuse runoff flowing overland in a thin layer not concentrated and not in a defined channel.

Site: The entire area of land surrounding the discharge activity.

Soil Erosion: The movement of soils that occurs as a result of wind, rain, precipitation, or flowing water.

Stabilization: Vegetative or structural soil-cover controlling erosion (including but not limited to permanent and temporary seed, mulch, sod, pavement, etc.) or the use of vegetative and/or structural practices that prevent exposed soil from eroding.

Storm Drainage System: All facilities, channels, and areas which serve to convey, filter, collect and/or receive stormwater, either on a temporary or permanent basis.

Stormwater: Water runoff resulting from precipitation, snow melt, or irrigation runoff as defined in 40 Code of Federal Regulation 122.26(b)(13).

Stormwater Management Facilities: The drainage system and control facilities necessary to meet the runoff criteria of these regulations.

Stormwater runoff: Surface water runoff which converges and flows primarily through water conveyance features such as swales, gullies, waterways, channels or storm sewers.

Stormwater Treatment: The removal of pollutants from urban runoff and improvement of water quality, accomplished largely by deposition and utilizing the benefits of natural processes.

Stream: A system including permanent or seasonally flowing water, often with a defined channel (bed and bank), flood plain, and riparian ecosystem. To be classified as a stream, the waterway shall meet certain requirements as defined by the Ohio EPA and/or US Army Corps of Engineers and may then be classified as either an ephemeral, intermittent, or perennial stream.

Structure: Anything manufactured, constructed or erected which is normally attached to or positioned on land, including, but not limited to buildings, portable structures, earthen structures, roads, parking lots, and paved storage areas.

Water Quality Volume: A volume captured for the purposes of treating pollutants and protecting stream stability. This volume is prescribed by the Ohio EPA Construction General Permit and is equivalent to the volume generated by a 0.75 inch rainfall.

Watershed: A region draining to a specific river.

Wetland: An area that is inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated or hydric soil conditions as defined by the Ohio EPA and/or US Army Corps of Engineers.