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ROSATI | SCHULTZ
JOPPICH | AMTSBUECHLER

January 4, 2024

Rebecca Runkel, Project Engineer
City of Novi
Field Services Complex
26300 Lee BeGole Drive
Novi, MI 48375

RE: Stormwater Design Standards – Ordinance Amendments

Dear Ms. Runkel:

The City's Municipal Separate Storm Sewer System Permit (MS4 Permit) issued by the Michigan Department of Environment, Great Lakes & Energy (EGLE), which is the permit that applies to the drainage system that connects throughout the City to collect, retain or detain, move, and treat stormwater, includes the requirement that the City update its Stormwater Design & Construction Standards to meet the minimum requirements of the MS4 Permit. The City, like many other Oakland County Communities, has chosen to adopt the Stormwater Design & Construction Standards developed by the Oakland County Water Resource Commissioner's Office (WRC Standards). The WRC Standards have been approved by EGLE. In order to adopt the WRC Standards, we have worked with the City's Engineering Division to prepare the enclosed Ordinance Amendments. A copy of WRC's Standards is enclosed. The Amendments include changes to the following Chapters of the City Code:

- Chapter 11 – Design & Construction Standards
- Chapter 12 – Flood Damage Prevention Ordinance

The amendments adopt the WRC Standards by reference. A copy of the current WRC Standards will be attached to the City Code as an "Appendix" for ease of reference. Any future changes to the WRC Standards will require the City to re-adopt the modified version of the WRC Standards if the MS4 Permit requires it and/or if the City chooses to adopt the future modifications. WRC's updates will not automatically apply to the City without further review and action by City Council. We note that corresponding changes will be made to the City's Engineering Design Manual. We see no legal impediment to the adoption and implementation of WRC's Standards.

Please feel free to contact me with any questions or concerns in regard to this matter.

Rebecca Runkel, Project Engineer
City of Novi
January 4, 2024
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Very truly yours,

ROSATI SCHULTZ JOPPICH
& AMTSBUECHLER PC



Elizabeth Kudla Saarela

EKS

Enclosures

C: Cortney Hanson, Clerk (w/ Enclosure)
Ben Croy, City Engineer (w/Enclosure)
Thomas R. Schultz, Esquire (w/Enclosure)

STATE OF MICHIGAN
COUNTY OF OAKLAND
CITY OF NOVI

ORDINANCE NO. _____

**ORDINANCE AMENDING DESIGN AND CONSTRUCTION STANDARDS ORDINANCE TO ADOPT
OAKLAND COUNTY'S STORMWATER ENGINEERING DESIGN STANDARDS**

An Ordinance to amend City of Novi City Code, Chapter 11, Design and Construction Standards, Article IV, Storm Sewers to adopt and enact Stormwater Engineering Design Standards developed by the Oakland County Water Resource Commissioners Office for compliance with the City's Part 31, MS4 General Permit, Water Resources Protection in accordance with the requirements of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended and the City's Michigan Department of Environment, Great Lakes & Energy (MDEGLE), Wastewater Discharge Permit, Rule 323.2161a, Post-Construction Requirements.

THE CITY OF NOVI ORDAINS AS FOLLOWS:

Part I. That Chapter 11, Design and Construction Standards, Article IV, Storm Sewers, Section 11-93, "General Design," is hereby amended as follows:

Sec. 11-93. – General Design

(a) The City of Novi hereby adopts the Stormwater Engineering Design Standards as set forth in Section I of the Oakland County Stormwater Engineering Design Standards Manual, as amended, as set forth in Appendix B to this Code. References to "Non-County Stormwater Systems" in Part H of the Oakland County Stormwater Engineering Design Standards shall mean and refer to "Privately-Owned Stormwater Systems within the City." All references throughout the Stormwater Engineering Design Standards to "OCWRC" or "County" shall mean and refer to "the City of Novi." The master plan describes the city stormwater system. Underground drainage facilities will generally be required for the minor stormwater disposal system (ten-year storm event). Continuous overland flood routing will generally be required for the major stormwater disposal system (one-hundred-year storm event).

(b) Hydraulic design calculations for both the minor and major storm design shall be included with the final site plan or subdivision engineering drawings.

(c) Variances from the Channel Protection Performance standards may not be considered by the City in accordance with Section 1-12 of the City of Novi Code of Ordinances and instead must comply with the alternative standard provided by the Michigan Department of Environment, Great Lakes, and Energy Stormwater Permit dated _____, as set forth in Part I, Section A.3.f.1.b).

Part II Severability

Should any section, subsection, paragraph, sentence, clause, or word of this ordinance be held invalid for any reason, such decisions shall not affect the validity of the remaining portions of the ordinance.

Part III Savings

This amendatory ordinance shall not affect violations of the zoning ordinance or any other ordinance existing prior to the effective date of this ordinance and such violation shall be governed and shall continue to be separately punishable to the full extent of the law under the provisions of such ordinance at the time the violation was committed.

Part IV. Repealer.

All ordinances or parts of ordinances in conflict with this ordinance are repealed only to the extent necessary to give this ordinance full force and effect.

Part V Effective Date: Publication.

This amendatory ordinance shall be effective 10 days after adoption by the City Council and after publication as provided by the Charter of the City of Novi.

Ayes:

Nayes:

Abstentions:

Absent:

STATE OF MICHIGAN)
)ss.
COUNTY OF OAKLAND)

I, the undersigned, the qualified and acting City Clerk of the City of Novi, Oakland County, Michigan, do certify that the foregoing is a true and complete copy of the Ordinance adopted by the City Council of the City of Novi at a meeting held on the ____ day of _____, 2021, the original of which is on file in my office.

Cortney Hanson, City Clerk
City of Novi

Adopted:

Published:

Effective:

STATE OF MICHIGAN
COUNTY OF OAKLAND
CITY OF NOVI

ORDINANCE NO. _____

**ORDINANCE AMENDING DRAINAGE AND FLOOD DAMAGE PREVENTION ORDINANCE TO
ADOPT OAKLAND COUNTY'S STORMWATER ENGINEERING DESIGN STANDARDS**

An Ordinance to amend City of Novi City Code, Chapter 12, Flood Damage Prevention Ordinance, Article III, Stormwater Detention to adopt and enact Stormwater Engineering Design Standards developed by the Oakland County Water Resource Commissioners Office for compliance with the City's Part 31, MS4 General Permit, Water Resources Protection in accordance with the requirements of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended and the City's Michigan Department of Environment, Great Lakes & Energy (MDEGLE), Wastewater Discharge Permit, Rule 323.2161a, Post-Construction Requirements.

THE CITY OF NOVI ORDAINS AS FOLLOWS:

Part I. That Chapter 12, Flood Damage Prevention Ordinance, Article III, "Stormwater Detention," Section 12-70, "Determination of need for on-site detention or retention facilities," is hereby amended as follows:

Sec. 12-70. – Determination of need for on-site detention or retention facilities

- (a) For all new developments within the city, the city engineer shall examine all site plans, preliminary plats and building permit applications and determine whether the receiving drainage course possesses sufficient flow capacities to protect downstream properties from damage resulting from developed stormwater flows.
- (b) All new developments and redevelopments shall provide an on-site stormwater detention or retention facility or facilities in accordance with the Engineering Design Manual and the Stormwater Engineering Design Standards as set forth in Section I of the Oakland County Stormwater Engineering Design Standards, as amended, as set forth in Appendix B to this Code. References to "Non-County Stormwater Systems" in Part H of the Oakland County Stormwater Engineering Design Standards shall mean and refer to "Privately-Owned Stormwater Systems within the City." All references throughout the Stormwater Engineering Design Standards to "OCWRC" or "County" shall mean and refer to "the City of Novi."
- (c) Where a receiving drainage course possesses sufficient flow capacities to protect downstream properties from damage resulting from developed stormwater flows, the new development shall:
 - (1) Pay a stormwater detention fee, as provided in section 12-71, if utilizing a regional stormwater detention facility, and provide facilities for stormwater quality enhancements or
 - (2) Elect to provide an on-site stormwater management facility or facilities in accordance with the Engineering Design Manual.
- (d) Upon its adoption by the council, the city stormwater management master plan shall be determinative of whether a new development is served by a drainage course with sufficient flow capacities to protect downstream properties from developed stormwater flows.
- (e) Any owner or developer aggrieved by a determination of the city engineer made pursuant to subsection (a) of this section shall have the right to a hearing before the council, provided a written request therefor is filed with the city clerk within ten (10) days following the personal delivery or the

date of mailing of the determination of the city engineer. Further review may be had in a court of competent jurisdiction.

Part II Severability

Should any section, subsection, paragraph, sentence, clause, or word of this ordinance be held invalid for any reason, such decisions shall not affect the validity of the remaining portions of the ordinance.

Part III Savings

This amendatory ordinance shall not affect violations of the zoning ordinance or any other ordinance existing prior to the effective date of this ordinance and such violation shall be governed and shall continue to be separately punishable to the full extent of the law under the provisions of such ordinance at the time the violation was committed.

Part IV. Repealer.

All ordinances or parts of ordinances in conflict with this ordinance are repealed only to the extent necessary to give this ordinance full force and effect.

Part V Effective Date: Publication.

This amendatory ordinance shall be effective 10 days after adoption by the City Council and after publication as provided by the Charter of the City of Novi.

Ayes:

Nayes:

Abstentions:

Absent:

STATE OF MICHIGAN)
)ss.
COUNTY OF OAKLAND)

I, the undersigned, the qualified and acting City Clerk of the City of Novi, Oakland County, Michigan, do certify that the foregoing is a true and complete copy of the Ordinance adopted by the City Council of the City of Novi at a meeting held on the ____ day of _____, 2021, the original of which is on file in my office.

Cortney Hanson, City Clerk
City of Novi

Adopted:

Published:

Effective:

STATE OF MICHIGAN
COUNTY OF OAKLAND
CITY OF NOVI

ORDINANCE NO. _____

**ORDINANCE AMENDING DRAINAGE AND FLOOD DAMAGE PREVENTION ORDINANCE TO
ADOPT OAKLAND COUNTY'S STORMWATER ENGINEERING DESIGN STANDARDS**

An Ordinance to amend City of Novi City Code, Chapter 12, Flood Damage Prevention Ordinance, Article VI, "Stormwater Management," to adopt and enact Stormwater Engineering Design Standards developed by the Oakland County Water Resource Commissioners Office for compliance with the City's Part 31, MS4 General Permit, Water Resources Protection in accordance with the requirements of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended and the City's Michigan Department of Environment, Great Lakes & Energy (MDEGLE), Wastewater Discharge Permit, Rule 323.2161a, Post-Construction Requirements.

THE CITY OF NOVI ORDAINS AS FOLLOWS:

Part I. That Chapter 12, Flood Damage Prevention Ordinance, Article VI, "Stormwater Management," Section 12-217, "Standards for Stormwater Management and Plan Approval," is hereby amended as follows:

Sec. 12-217. – Standards for Stormwater Management and Plan Approval

All developments requiring a stormwater management plan shall be designed, constructed, and maintained to prevent flooding and protect water quality. The particular facilities and measures required on-site shall take into consideration the natural features, wetlands, and watercourses on the site; the potential for on-site and off-site adverse stormwater impacts, water pollution, and erosion; and the size of the site. The city strongly encourages the use of low impact development techniques for reducing and managing stormwater runoff.

(1) General standards for on-site and off-site stormwater management.

- a. Stormwater management conveyance, storage and infiltration measures and facilities shall be designed to prevent flood hazards and water pollution related to stormwater runoff, to prevent accelerated soil erosion from the proposed development, and shall conform with the requirements specified in the Stormwater Engineering Design Standards as set forth in Section I of the Oakland County Stormwater Engineering Design Standards Manual, as amended, as set forth in Appendix B to this Code and the Engineering Design Manual.
- b. Natural topography and site drainage shall be preserved, and site grading shall be minimized to the maximum extent reasonably achievable considering the nature of the development.
- c. Unless otherwise approved, stormwater runoff shall be conveyed through swales and vegetated buffer strips so as to decrease runoff velocity, allow for natural infiltration, allow suspended sediment particles to settle, and to remove pollutants. To the fullest extent possible, impervious surfaces should be disconnected from other impervious surfaces.
- d. Runoff rates from detention basins shall conform to the requirements specified in the the Stormwater Engineering Design Standards as set forth in Section I of the Oakland County Stormwater Engineering Design Standards Manual, as amended, as set forth in Appendix B to this Code. and the Engineering Design Manual for the first flush, bankfull, and one-hundred-year storm.

- e. Watercourses shall not be deepened, widened, dredged, cleared of vegetation, straightened, stabilized or otherwise altered without applicable permits or approvals from the city, relevant county agencies and the Michigan Department of Environmental Quality.
- f. Drainage systems shall be designed to protect public health and safety and to facilitate efficient and effective maintenance.
- g. The stormwater management plan shall demonstrate a zero percent increase over the discharge or runoff permitted by applicable law and ordinances in relation to the predevelopment and post-development stormwater runoff.

(2) *Soil erosion control.*

- a. Cutting, filling and grading shall conform with the requirements specified in the Engineering Design Manual.
- b. All development and other earth changes shall be designed, constructed and completed in such a manner that the exposed area of any disturbed land is limited to the shortest practical period of time. Proposed erosion control measures shall be submitted to the city building department for determination that such measures comply with the city's soil erosion control ordinance [chapter 29 of this Code].
- c. Approved soil erosion control measures shall be installed and maintained between the disturbed area and any down gradient watercourses (including rivers, streams, creeks, lakes, ponds and other watercourses), wetlands, roadways and property lines.
- d. Sediment resulting from accelerated soil erosion shall be removed from runoff water before it leaves the site of the development.
- e. Temporary and permanent soil measures designed and constructed for the conveyance of water around, through or away from the development or earth change area shall be designed to limit the water flow to a non-erosive velocity.
- f. Temporary soil measures shall be removed after permanent soil measures have been implemented and stabilized. All developments and earth change areas shall be stabilized with permanent soil measures.
- g. If inland lakes, ponds, rivers, creeks, streams or other watercourses and wetlands are located on or near the site, measures which trap sediment shall be provided. Straw bale berms may be used as temporary stormwater diversion structures but will not be considered sufficient by themselves for trapping sediment on-site. The use of temporary sediment basins, sediment traps, filter fabric, and rock filters in lieu of straw bale berms shall be employed as required as part of a permit. Other measures may be required if reasonably determined to be necessary to protect a watercourse or wetland.
- h. When it is not possible to permanently stabilize a disturbed area after an earth change has been completed or where significant earth change activity ceases, temporary soil erosion control measures shall be implemented within two (2) calendar days.
- i. Permanent soil measures for all slopes, channels, ditches, or any disturbed land area shall be completed within fifteen (15) calendar days after final grading or the final earth change has been completed. All temporary soil measures shall be maintained until permanent soil measures are implemented and stabilized.
- j. Vegetated filter strips, twenty-five (25) feet in width, shall be created or retained along the edges of all lakes, creeks, streams, and other watercourses. As part of permit approval, the width of a particular filter strip may be reduced to the extent it is demonstrated that a portion of the width will serve no useful function, e.g., to the extent the grade is such that water flow will be away from the watercourse and the filter strip does not serve to protect wildlife habitat or other useful function.

- k. The city shall have the authority to issue stop-work orders for failure to comply with the requirements of this section, provided a proprietor shall be entitled to a hearing before the chief building official or his designee within three (3) business days to determine whether the stop-work order shall continue.

(3) *Stormwater storage, infiltration and treatment facilities.* Stormwater storage, infiltration and treatment facilities required pursuant to this article shall comply with the requirements specified in the Stormwater Engineering Design Standards as set forth in Section I of the Oakland County Stormwater Engineering Design Standards Manual, as amended, as set forth in Appendix B to this Code and the Engineering Design Manual.

(4) *Discharge of stormwater runoff to wetlands.*

- a. Wetlands will be protected from damaging modification and adverse changes in runoff quality and quantity associated with land developments. Before approval of a final plat or site plan, all necessary wetland permits from the Michigan Department of Environmental Quality (MDEQ) will be in place.
- b. Direct discharge of untreated stormwater to a natural wetland is prohibited. All runoff from the development will be pretreated to remove sediment and other pollutants prior to discharge to a wetland. Such treatment facilities shall be constructed and operational before property grading begins.
- c. Site drainage patterns will not be altered in any way that will modify existing water levels in protected wetlands without proof that all applicable permits from the MDEQ and/or the city have been obtained. Proof that existing trees and vegetation will not "die off" as a result of any increase in wetlands stormwater discharge will be provided by the applicant's engineer.
- d. Wetland construction, reconstruction, or modification will be overseen by the applicant's qualified professional with specific wetland expertise.
- e. A mandatory period of two (2) years and a performance bond equal to the cost of the total wetland construction project is required as assurance that the constructed wetland will function and thrive.
- f. A permanent filter strip twenty-five (25) feet in width, preferably vegetated with native plant species, shall be maintained or restored around the periphery of wetlands.
- g. Wetlands will be protected during development by appropriate soil erosion and sediment control measures that are continuously maintained throughout the construction phase.

Part II. That Chapter 12, Flood Damage Prevention Ordinance, Article VI, Stormwater Management, Section 12-218, "Off-site stormwater management," is hereby amended as follows:

Sec. 12-218. - Off-site stormwater management.

(a) *Requirements.*

- (1) In lieu of on-site stormwater detention, the use of off-site stormwater conveyance, infiltration, and/or detention areas may be proposed. Off-site stormwater management facilities shall be designed to comply with the requirements specified the Stormwater Engineering Design Standards as set forth in Section I of the Oakland County Stormwater Engineering Design Standards Manual, as amended, as set forth in Appendix B to this Code and the Engineering Design Manual and all other standards provided by this article that are applicable to on-site facilities.
- (2) Off-site stormwater management areas may be shared with other landowners, provided that the terms of the proposal are approved by the city council and city attorney.

- (3) Adequate provision and agreements providing for maintenance and inspection of stormwater management facilities shall be made by recorded instrument, including an access easement, approved by the city.
- (4) Accelerated soil erosion shall be managed off-site as well as on-site.
- (b) *Performance guarantees, inspections, maintenance, and enforcement.* All provisions of divisions 7 and 9 of this article, and of chapter 26.5 shall apply to off-site stormwater conveyance and detention. Additional requirements for maintenance of stormwater management facilities provided in the Stormwater Engineering Design Standards as set forth in Section I of the Oakland County Stormwater Engineering Design Standards Manual, as amended, as set forth in Appendix B to this Code and the Engineering Design Manual shall also apply.

Part III Severability

Should any section, subsection, paragraph, sentence, clause, or word of this ordinance be held invalid for any reason, such decisions shall not affect the validity of the remaining portions of the ordinance.

Part IV Savings

This amendatory ordinance shall not affect violations of the zoning ordinance or any other ordinance existing prior to the effective date of this ordinance and such violation shall be governed and shall continue to be separately punishable to the full extent of the law under the provisions of such ordinance at the time the violation was committed.

Part V. Repealer.

All ordinances or parts of ordinances in conflict with this ordinance are repealed only to the extent necessary to give this ordinance full force and effect.

Part VI Effective Date: Publication.

This amendatory ordinance shall be effective 10 days after adoption by the City Council and after publication as provided by the Charter of the City of Novi.

Ayes:

Nayes:

Abstentions:

Absent:

STATE OF MICHIGAN)
)ss.
COUNTY OF OAKLAND)

I, the undersigned, the qualified and acting City Clerk of the City of Novi, Oakland County, Michigan, do certify that the foregoing is a true and complete copy of the Ordinance adopted by the City Council of the City of Novi at a meeting held on the ____ day of _____, 2021, the original of which is on file in my office.

Cortney Hanson, City Clerk
City of Novi

Adopted:
Published:
Effective:



OAKLAND COUNTY WATER RESOURCES COMMISSIONER

Stormwater Engineering Design Standards

Requirements, Rules, and Design Criteria for Stormwater Management

8/24/2021

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Section I - Oakland County Stormwater Standards

Part A: Standards

The Environmental Protection Agency (EPA) through the Michigan Department of Environment, Great Lakes, and Energy (EGLE) requires the County of Oakland and other regulated entities to comply with the National Pollutant Discharge Elimination System (NPDES) Phase II Municipal Separate Storm Sewer System (MS4) permit requirements. The purpose of these standards is to address Post-Construction Stormwater Runoff Controls required under this permit.

These standards are a result of ongoing regional collaboration between Oakland, Wayne, Macomb and Livingston Counties with the following overall objectives:

1. Provide a comprehensive framework for managing stormwater that addresses surface water quality, channel and infrastructure protection, localized flood control and long-term operations and maintenance.
2. Incorporate design standards that control both the quantity and quality of stormwater runoff.
3. Require volume reducing Low Impact Development (LID) design measures, or Best Management Practices (BMPs), such as infiltration, preservation of natural areas, enhanced vegetation and reduced imperviousness to control runoff volume to the Maximum Extent Practicable (MEP).
4. Strengthen the protection of natural features.
5. Protect public health, safety and welfare.
6. Promote economic development using straightforward and uniform drainage standards for site development throughout Oakland County, as well as across Southeast Michigan.
7. Provide guidelines and additional resources for the selection of effective structural and vegetative stormwater BMPs for development sites.
8. Enhance the sustainability of stormwater management practices in Oakland County including performance, longevity, safety, maintenance, community acceptance, and environmental benefits.
9. Establish a framework to increase the likelihood of long-term operation and maintenance of the stormwater management practices.
10. Use the most currently published, relevant rainfall statistics.
11. Promote a consistent design process by using a set of simple equations to determine runoff rates, detention volumes, water quality treatment and infiltration requirements.

WRC's Stormwater Rules address water quality, volume, and flood control. Section I includes an overview of the rules, including key equations used to demonstrate compliance with the standards.

Part B: Authority

The Oakland County Water Resources Commissioner's (WRC) office will apply these standards within its legal authority and jurisdiction as outlined in the following regulations:

1. The Subdivision Control Act, Act 288 of the Public Acts of Michigan of 1967, as amended.
2. The Michigan Drain Code, Public Act 40 of 1956, as amended.
3. The Mobile Home Commission Act, Act 96 of the Public Acts of Michigan of 1987, as amended.
4. Part 31, MS4 General Permit, Water Resources Protection, Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. Oakland County's MS4 permit covers regulated county stormwater systems under the jurisdiction of the OCWRC office (direct discharges to County Drains), the Oakland County Parks and Recreation Commission and the County of Oakland. The Road Commission for Oakland County should be contacted for applicable standards within their stormwater jurisdiction.
5. EGLE Wastewater Discharge Permit, Rule 323.2161a, Post-Construction Requirements.

To promote consistent regional site development stormwater practices, communities and other entities responsible for the management of stormwater systems and MS4 permit compliance are encouraged to adopt these standards. Additionally, communities that operate combined sewer systems and are party to CSO permit compliance are also encouraged to adopt these standards. Local municipalities may elect more restrictive standards and when conflicting standards arise, the more stringent requirements shall govern. These standards establish minimum requirements for the design, construction and maintenance of stormwater systems for subdivisions, site condominiums, commercial, industrial and other development and redevelopment projects.

All construction activity within the WRC's stormwater permitting authority will be reviewed by the WRC's Permitting Department to determine if the activity is regulated. The WRC's office will use the following applicability criteria to assist in making this determination and to clarify which stormwater standards apply to the proposed construction activity.

These rules were developed in close coordination with Wayne, Macomb, and Livingston Counties, as well as the City of Detroit. This provides a generally consistent set of standards across Metro Detroit.

Part C: Applicability

These standards shall apply to development and redevelopment projects with construction activity greater than or equal to 1 acre, or part of a common plan of development resulting in a development or redevelopment activity greater than or equal to 1 acre in size, including without limitation, clearing, grading, excavating, construction and paving, that results in an earth change or disturbance in the existing cover or topography of land, including any external demolition, modification, or alteration of a site or the footprint of a building.

Common exemptions to these stormwater standards include the following:

1. Resurfacing of an asphalt, concrete, or similar surface (i.e., 'mill and fill') that does not expose the aggregate or subgrade or result in replacement of the onsite drainage system.
2. The practices of clearing, plowing, and tilling soil and harvesting for the purpose of crop production.
3. The project does not meet the development or redevelopment criteria in this standard.
4. The development or redevelopment project construction activity is less than 1.0 acre.
5. The development or redevelopment project is for one single family detached dwelling that is not part of a common plan of development.
6. The development or redevelopment project is for emergency maintenance and work performed to protect public health and safety.
7. The development or redevelopment project discharges solely to a RCOC stormwater system or right-of-way. Contact the RCOC permit staff at the Road Commission for Oakland County Official Website (rcocweb.org) for RCOC-specific stormwater requirements.
8. Other exemptions listed herein or approved by the OCWRC office.

These rules apply to development within WRC's stormwater jurisdiction & MS4 permit jurisdiction.

At the community's discretion, they can also adopt these rules to meet their stormwater & MS4 permit needs.

To protect all water resources under WRC stormwater jurisdiction, WRC requires applicable standards to be implemented for development and redevelopment projects located both inside and outside the Regulated MS4 Area. Similarly, to protect all water resources under WRC stormwater jurisdiction, WRC requires applicable standards to be implemented for development and redevelopment projects regardless of whether they discharge stormwater to a MS4 or not.

The WRC office continues to collaborate with the George W. Kuhn Combined Sewer District communities in adopting Post-Construction stormwater standards to meet its Combined Sewer System NPDES permit requirements. Many of these communities have both separate and combined systems and the goal is to adopt similar Post-Construction standards that meet local and regional needs for both types of systems. Currently, the standards outlined herein are encouraged to be used in the GWK combined district; collaboration continues with a goal of adoption of these standards in both MS4 and combined sewer communities.

These standards supersede all previous versions and revisions, and updates will be available on the WRC's website (www.oakgov.com/water) including registration information to receive revisions and updates to these standards as they become available. These standards are intended to be a living document and updated as necessary to reflect ongoing changes in climate and regulatory conditions. Before submitting a site plan for stormwater permitting, please refer to the WRC website above for the most recent version of the standards.

Part D: Channel Protection Volume Control

Channel Protection Volume Control (CPVC) is necessary to protect natural watercourses from increased erosion and sedimentation as a result of increased imperviousness and runoff volume as development occurs. CPVC also promotes groundwater recharge, stabilizes flow rates and baseflow in our natural watercourses, and addresses water quality control criteria (Total Suspended Solids).

CPVC shall be implemented to the Maximum Extent Practicable (MEP). The required Channel Protection Volume (V_{CP-R}) is the post-development site runoff volume from a 1.3-inch rainfall event.

The following CPVC implementation process is summarized in Appendix A (Channel Protection Flowchart).

1. Implement land use practices that limit the increase in runoff volume, such as LID practices including (but not limited to) a design emphasis on naturalized areas (i.e., meadow or wooded areas vs. turf grass), reduced impervious coverage, etc.
2. Calculate the required Channel Protection Volume using the following equation:

The Channel Protection Volume Control (CPVC) volume is intended to control runoff volume under post-development conditions for a 1.3-inch rainfall event

Eq. I-1	$V_{CP-R} = 4,719 \times C \times A$
C =	Post-development runoff coefficient
A =	Contributing area in acres
V_{CP-R} =	Required CPVC volume in cubic feet

3. Provide adequate infiltration and/or storage/reuse BMPs, to the MEP, to provide the calculated CPVC volume. This may include (but is not limited to) bioretention, rain gardens, bio-swales, pervious pavement, cisterns, green roofs, and infiltration trenches. For water reuse BMPs (i.e., cisterns), water demand (such as gray water or irrigation water) must be established and documented to show adequate drawdown times.
 - a. When the measured in-situ infiltration rate is above 0.5 in/hr., supplemental measures, such as subsoil amendments and/or a perforated underdrain system, are not required.
 - b. When the measured in-situ infiltration rate is between 0.24 in/hr. and 0.5 in/hr., soils are marginally suitable for infiltration BMPs, and supplemental measures are required. Supplemental measures may include subsoil amendment, or an underdrain located at the top of the storage bed layer to maximize infiltration.

- c. When the measured in-situ infiltration rate is less than 0.24 in/hr., infiltration is deemed impractical, and the use of this BMP is therefore waived. When infiltration is waived, other volume-reducing LID practices must be implemented to the MEP.
 - d. Infiltration BMPs shall completely dewater in less than 72 hours, consisting of 24-hour dewatering for the surface volume, and 48-hour dewatering of the void space (soil storage) volume. Water storage/reuse BMPs shall also be designed to fully dewater within 72 hours.
4. Pretreatment is required for all BMPs to remove fine sediment, trash, and debris to preserve the longevity and function of the BMPs.
- a. Common methods of BMP pretreatment include mechanical separators, sediment forebays, vegetated filter strips, vegetated swales, constructed filters, and curb cuts with sediment traps.
5. To incentivize and encourage stormwater infiltration on all sites, the provided Channel Protection Volume, (V_{CP-P}) can be subtracted from the required 100-year detention volume, V_{100D} (see equations in Part G below). Upon subtracting the provided Channel Protection Volume from the required 100-year detention volume, the resulting volume cannot be less than the Extended Detention Volume (V_{ED} , see Part E below).

For underground infiltration BMPs that are not easily accessible for inspection and maintenance, such as underground detention system infiltration, this Channel Protection Volume is generally not credited and will be evaluated on a case-by-case basis by the OCWRC's office.

Infiltration BMPs are prohibited in areas containing contaminated soils/groundwater, wellhead protection areas, high seasonal groundwater (less than 2 feet from the bottom of the stone storage layer of the infiltration BMP to the seasonally high groundwater table) and in areas with hotspot activities and setback restrictions (foundations, property lines, drinking wells, septic fields, pavement, etc.) as defined in the standards. When any of the above adverse conditions are demonstrated, other volume-reducing LID practices must be implemented to the MEP.

Channel Protection Volume Control (infiltration) is required when the measured in-situ infiltration rate is ≥ 0.24 inches/hour and groundwater is at least 2 feet below the bottom layer of the proposed BMP

Part E: Channel Protection Rate Control: Extended Detention

Channel Protection Rate Control (CPRC) is necessary to protect natural watercourses from increased erosion and sedimentation as a result of increased imperviousness and runoff rates as development occurs. Channel protection rate control is based on a 2-year / 24-hour storm event. The CPRC shall be implemented to the MEP as outlined below.

1. Extended Detention is required for the site's post-development runoff volume from a 1.9-inch rainfall event. This Extended Detention Volume (V_{ED}) shall be dewatered in not less than 48 hours.
2. Calculate the required Extended Detention Volume using the following equation:

Eq. I-2	$V_{ED} = 6,897 \times C \times A$
C =	Post-development runoff coefficient
A =	Contributing area in acres
V_{ED} =	Required Extended Detention Volume in cubic feet

3. The Extended Detention requirement effectively maintains the 2-year pre-settlement peak flow rates, to the MEP, for new developments and reduces the existing 2-year peak flow rates for redevelopments.

Part F: Water Quality Control

Water Quality Control (WQC) focuses on limiting the concentration of Total Suspended Solids (TSS) in post-development runoff to either of the following water quality standards: 80 mg/L, or 80% TSS reduction. WQC shall be implemented to the MEP as outlined below.

WQC can be achieved one of several ways:

1. Infiltration (i.e., runoff volume-reducing) or water reuse BMPs that achieve the required Channel Protection Volume (V_{CP-R} , see Part D) meet the TSS requirements for only areas tributary to an infiltration BMP. If any areas on a site plan bypass infiltration BMPs, those areas must receive alternative TSS treatment (see below for other options).
2. Mechanical separators designed for the required TSS removal at a peak flow rate (Q_{WQ}) generated by a 1-year peak flow as calculated below:

Eq. I-3	$Q_{WQ} = C \times I_1 \times A$
Q_{WQ} =	Peak flow rate for mechanical separator design in cfs
C =	Post-development runoff coefficient
I_1 =	Rainfall intensity in inches/hour
A =	Contributing area in acres

Eq. I-4	$I_1 = \frac{35.44}{(T_C + 9.17)^{0.81}}$
I_1 =	Rainfall intensity in in/hr
T_C =	Time of Concentration (minutes)

3. Sediment forebay(s), when combined with downstream Extended Detention. Forebays shall be designed with a volume equal to 15% of the Water Quality Volume ($0.15 \times V_{WQ}$) and capture heavy sediment at inlet pipe locations. Access shall be provided to accommodate sediment removal equipment. The required sediment forebay volume, V_F , is calculated below:

Eq. I-5	$V_F = 0.15V_{WQ} = 545 \times C \times A$
C =	Post-development runoff coefficient
A =	Contributing area in acres
V_{WQ} =	Required Water Quality Volume in cubic feet

4. The following treatment methods are effective at meeting the OCWRC water quality requirements:
 - a. Bioretention BMPs (infiltration), discharging to a conventional detention basin* (wet or dry)
 - b. Mechanical separator(s), discharging to a conventional detention basin* (wet or dry)
 - c. Sediment forebay(s), discharging to a conventional detention basin* (wet or dry)

** Conventional detention basins include hydraulic controls for both V_{ED} and V_{100D}*

Part G: Detention & Flood Control

Detention and flood control is a critical component in stormwater design as it helps to prevent excess peak flows and reduces the likelihood of flooding downstream of a development site. The regional collaboration has resulted in the following Detention and Flood Control standards.

Detention and Flood Control shall be implemented to manage the **100-year peak runoff rate** for developed sites as outlined below. The allowable 100-year post-development peak flow rate (Q_{100P}) shall be approved by the WRC office on a case-by-case basis and will be calculated one of two ways:

1. Using the Variable Release Rate (see equations below)
2. County-determined peak flow rate based on a documented County Drain flow capacity or other known downstream capacity limitations (flow rate provided in cfs/acre)

Prior to commencing with site plan design, please contact the WRC Permitting Department to confirm which of the above methods are more restrictive and will apply to your site. The chosen method to determine the 100-year post-development peak flow rate can have a significant impact on required detention pond volume.

WRC (or any local review authority) reserves the right to set a specific discharge rate that is below the Variable Release Rate where outlet capacity is restricted

The Variable Release Rate and corresponding post-development peak flow rate are calculated as follows:

Eq. I-6	$Q_{VRR} = 1.1055 - 0.206 \ln(A)$
$Q_{VRR} =$	Allowable release rate in cfs/acre
$A =$	Contributing area in acres
	The variable release rate (cfs/acre) is capped at 1.0 cfs/acre for developments 2 acres or less. For all developments equal to or greater than 100 acres, the variable release rate is 0.15 cfs/acre.

Eq. I-7	$Q_{100P} = Q_{VRR} \times A$
$Q_{100P} =$	Allowable 100-year post-development peak flow rate in cfs
$A =$	Contributing area in acres

If downstream capacity is insufficient for the proposed development, the developer can make improvements that may include construction of additional off-site conveyance capacity, improvements to the existing drain, acquisition of easements from downstream property owners, etc. The developer is responsible for securing all necessary easement(s) from downstream property owners and is responsible for all improvement costs.

All stormwater discharges from the proposed development site shall outlet within the watershed where the flows originated, unless approval is obtained from the WRC's office. Offsite runoff shall bypass the proposed site's stormwater system. If this cannot be achieved, detailed hydrologic and hydraulic calculations shall be provided to the WRC office to demonstrate that no adverse impacts will occur downstream from the 10-year and 100-year storm events.

When calculating the required detention volume, all on-site contributing drainage areas shall be used in the calculation. Volume stored within the forebay and extended detention area may be applied towards the required detention volume. Please refer to Appendix C for typical detention basin profiles and stormwater design calculations.

The required 100-year detention volume (V_{100D}) is calculated as follows:

1. Calculate the total 100-year runoff volume (V_{100R}) under post-development conditions:

Eq. I-8	$V_{100R} = 18,985 \times C \times A$
C =	Post-development runoff coefficient
A =	Contributing area in acres
V_{100R} =	Post-development 100-year runoff volume in cubic feet

2. Calculate the 100-year peak inflow rate, Q_{100IN} , into the detention basin; this is the post-development peak instantaneous flow prior to (upstream of) the detention basin:

Eq. I-9	$Q_{100IN} = C \times I_{100} \times A$
Q_{100IN} =	100-year post-development peak inflow rate in cfs
C =	Post-development runoff coefficient
I_{100} =	100-year peak rainfall intensity in inches/hour
A =	Contributing area in acres

3. Calculate the Storage Curve Factor for the 100-year detention volume (R):

Eq. I-10	$R = \left[0.206 - 0.15 \ln \left(\frac{Q_{100P}}{Q_{100IN}} \right) \right]$
R =	Storage Curve Factor (dimensionless)
Q_{100P} =	100-year post-development peak flow rate in cfs
Q_{100IN} =	100-year post-development peak inflow rate in cfs

4. Finally, calculate the 100-year detention basin size, identifying any credits to the detention basin volume to reflect the provided Channel Protection Volume (V_{CP-P})

Eq. I-11	$V_{100D} = (V_{100R} \times R) - V_{CP-P}$
$V_{100D} =$	Required 100-yr detention volume in cubic feet
$V_{100R} =$	100-year runoff volume in cubic feet
$R =$	Storage Curve Factor (dimensionless)
$V_{CP-P} =$	Provided CVPC volume in cubic feet
	KEY RULE: $V_{100D} \geq V_{ED}$

Check to verify the adjusted 100-year detention basin volume is equal to or greater than the Extended Detention Volume (V_{ED}). Under no circumstances shall the adjusted detention basin volume be less than V_{ED} .

Part H: Operations and Maintenance

Long-term Operations and Maintenance (O&M) Plans are required for County Stormwater Systems and Non-County Stormwater Systems and are summarized below. To facilitate routine inspections, all O&M requirements and documents listed below shall be incorporated into the plan set on dedicated O&M-specific plan sheets. When O&M responsibilities or requirements are modified or updated, the respective O&M Plan sheet(s) shall be updated accordingly.

County Stormwater Systems

The following MS4 Permit O&M requirements apply to all regulated County Stormwater Systems owned, operated and maintained by the WRC's office, the Oakland County Parks and Recreation Commission and the County of Oakland, hereafter referred to as County Departments:

1. Prior to the start of any development or redevelopment activity meeting the criteria defined in Part C: Applicability, the County Department shall obtain a Drain Permit from the WRC's Permitting Department. Coordination with the WRC's Permitting Department is recommended at the conceptual stage of development projects to ensure that permit requirements are clearly identified early in the planning process.
2. To ensure consistent perpetual O&M of the site's stormwater system and to enhance water quality protection, prior to Drain Permit issuance, the WRC's Permitting Department shall review and approve the County Department's site-specific Stormwater Management O&M Plan with the following requirements:
 - a. Purpose of the plan.
 - b. Drainage area description and details.
 - c. Description of the stormwater system and its individual components.
 - d. Specific short-term, intermediate and long-term maintenance tasks.
 - e. Inspection and maintenance tasks, frequencies and responsibilities.
 - f. Employee and contractor training requirements and responsibilities.
 - g. Approved construction drawings including stormwater calculations, details, elevations and a location map, etc.
 - h. Approved O&M Plan sheet(s) to facilitate routine O&M inspections.
 - i. County Departments shall submit an Annual Stormwater System O&M Summary, for their stormwater systems, to the WRC's Environmental Department for County MS4 permit

Maintaining stormwater systems is critical for ensuring they meet ongoing water quality and flood control needs. Individual County Departments are responsible for completing all (perpetual) O&M tasks and for maintaining detailed O&M tracking records for their stormwater systems.

reporting. Individual County Departments are responsible for completing all O&M tasks and for maintaining detailed O&M tracking records for their stormwater systems.

Non-County Stormwater Systems

The following MS4 Permit O&M requirements apply to all regulated Non-County Stormwater Systems owned, operated and maintained by others, which directly connect to a County Stormwater System:

1. Prior to the start of any development activity meeting the site applicability criteria defined in Part C: Applicability, a Drain Permit shall be obtained from the WRC's Permitting Department. Coordination with the WRC's Permitting Department is recommended at the conceptual stage of development projects to ensure that permit requirements are clearly identified early in the planning process.
2. To ensure consistent perpetual O&M of the site's stormwater system and to enhance water quality protection, prior to Drain Permit issuance, the WRC's Permitting Department shall review and approve the site-specific Stormwater Management O&M Agreement between the community and property owner. A fully executed Stormwater Management O&M Agreement is required prior to issuance of the Drain Permit. This agreement shall consist of the following requirements which will be incorporated into the O&M Plan sheet(s):

- a. Legal Description: A legal description and reduced copy map to identify the land parcel(s) affected by this Agreement. This map shall be prepared for each site and must include a reference to a Subdivision Plat, parcel survey, or Condominium Master Deed, and a map to illustrate the affected parcel(s).

The community is responsible for enforcement of the O&M requirements as outlined in the Stormwater Management O&M Agreement and their MS4 permit.

- b. Stormwater System Description and Map: A location map of the entire stormwater system. This map must be prepared for each site and the scale of the map shall show necessary detail.
- c. Stormwater O&M Plan Sheet(s): The site-specific Stormwater O&M Plan shall include the following requirements:
 - Description of the stormwater system, drainage area, and its individual components.
 - Specific short-term, intermediate and long-term maintenance tasks.
 - Inspection and maintenance tasks, frequencies and responsibilities (matrix/table).
 - Employee and contractor O&M training requirements, certifications, and responsibilities.
 - BMP Details
 - Property owners are responsible for completing all O&M tasks and maintaining O&M records for their stormwater systems. Upon request, property owners shall submit an Annual Stormwater System O&M Summary to OCWRC's Permitting Department for

tracking only. The community is responsible for enforcement of the O&M requirements as outlined in the Stormwater Management O&M Agreement and their MS4 permit.

- d. Memorandum of Stormwater Management Operations and Maintenance Agreement: This O&M Memorandum acknowledges a perpetual requirement of stormwater system operations and maintenance, which is recorded with the Register of Deeds to put any future property owners, or interest holders, on notice of the Stormwater System and the Stormwater O&M Plan. This O&M Memorandum references the required Stormwater Management O&M Agreement, which resides with the local community to ensure consistency and periodic updates as necessary. A copy of the recorded document shall be submitted to OCWRC prior to closure of the Drain Permit.

Appendix G-Stormwater Management O & M Agreement is an approved “example” agreement. However, the WRC office recognizes that community-specific O & M agreements, ordinances and programs may also be proposed and submitted to the WRC for approval. When developing alternative O & M programs for consideration, the community should reference EGLE’S Post-Construction Stormwater Runoff Controls Program Compliance Assistance Document (available on EGLE’s website) and their MS\$ permit.

Part I: Stormwater Tracking & Mapping

Collecting data on site runoff characteristics is critical for WRC and the local review jurisdiction (if applicable) to meet ongoing EGLE permit requirements. This will be accomplished with a **Land Use Summary Table**, which must be included on the O&M Plan Sheet of each submitted site plan (see table below). Additionally, GIS-based site data (in the form of a shapefile) will be required as a condition of site plan approval. GIS data will be limited to key stormwater components that will require future inspection and maintenance.

Land Use Summary

must be included on the O&M Plan Sheet for all site plans

Characteristic		Existing Conditions	Proposed Conditions
Land Use Data	Total Development Area (ac)		
	Impervious Area (ac)		
	Total Pervious Area (ac)		
	Pervious Area Breakdown by Cover Type		
	<i>Meadow/fallow/natural areas (non-cultivated)</i>	x.xx acres	x.xx acres
	<i>Predominant NRCS Soil Type (A, B, C, or D)</i>		
	<i>Improved areas (turf grass, landscape, row crops)</i>	x.xx acres	x.xx acres
	<i>Predominant NRCS Soil Type (A, B, C, or D)</i>		
Pervious Area			
	<i>Wooded Areas</i>	x.xx acres	x.xx acres
	<i>Predominant NRCS Soil Type (A, B, C, or D)</i>		
	CPVC Volume Calculated (cubic feet)		
	CPVC Volume Provided (cubic feet)		
	CPVC Volume Provided (cubic feet)		
	The Professional Engineer who signs and seals this site plan certifies that the values in this table reflect the WRC stormwater calculations required for this development and that geotechnical investigations were performed that provide conclusive documentation that demonstrates whether infiltration (i.e., CPVC Volume Control) is practicable.		

Notes:

- The Professional Engineer Certification Statement (see above) must be included with the Land Use Summary Table.
- Areas to be shown to the nearest 0.01 acre
- 'Predominant' soil type shall be the soil type with the largest percentage coverage over the designated land use (e.g., 70% Soil Type B and 30% Soil Type C shall be listed in the table as "Soil Type B")
- USDA soil types cannot be used to determine site suitability for infiltration and meeting the CPVC volume standard; direct infiltration testing will be required to determine site suitability for infiltration

- *If CPVC requirement is waived, enter ZERO for the 'CPVC Volume Provided'*
- *When more than one soil type exists in one area, assign the predominant soil type for that area*
- *Use NRCS/USDA Online Soil Survey Map to determine soil type (A, B, C, or D):*

<https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>

In addition to the Land Use Summary table, the applicant must include the following stormwater system information in the submittal:

1. Project name
2. Project location
3. City / Township / Village name
4. Applicant name and contact information
5. Engineer and owner names, including contact information
6. Description of work and other relevant information
7. **Stormwater Design Narrative** (separate document), consisting of the following minimum components:
 - a. Summary of the proposed stormwater management system
 - b. Geotechnical investigations (e.g., soil borings, infiltration tests, and/or an Environmental Site Assessment)
 - i. *NOTE: the stormwater review cannot be approved without the submittal of in-situ soil characteristics and/or evidence of existing soil contamination; this information is necessary to determine whether the Channel Protection Volume Control standard will be required.*
 - c. All stormwater calculations, including a list of all assumptions, site characteristics, and other information to support the calculations.
 - d. If mechanical separators are to be used, include all vendor certifications for unit sizing and TSS removal efficiencies.
 - e. Figures/schematics of the stormwater management system, including clear references to existing wetlands, floodplains, woodlands or other protected natural features.
 - f. Outlet hydraulic calculations, including (if requested by the WRC) calculations and certifications for the hydraulic capacity of the receiving system.
 - g. Operations & Maintenance (O&M) Plan for all proposed stormwater components (collection system, water quality treatment, infiltration, extended detention, and flood control) shall be included on the O&M Plan sheet(s).
8. Construction plans developed in accordance with WRC requirements
9. Executed Stormwater Management O&M Agreement
10. Recorded Memorandum of Stormwater Management O&M Agreement

A stormwater report (narrative) is a required component of each site plan submittal; a concise and well-organized report will help to expedite the site plan review process

A final component of the site plan review process is the submittal of a GIS shapefile containing, at a minimum, the layers listed below, which consist of points and polygons that reflect the key components of the stormwater system. This information will be provided only after the technical review is completed. The GIS shapefile must reflect the final approved design and include the following layers (use the layer naming conventions listed below for ease of storing and tracking the GIS data):

1. Development Site – Area (ac), GIS area **polygon** (DSA-1, DSA-X)
 - a. This area should reflect the entire area for which the stormwater system is designed
2. Site Discharge Point(s), GIS **points** (D-1, D-2, etc.)
 - a. These points should reflect the location of each site discharge point; this is typically the point of connection to a County Drain, city storm sewer, or other drainage feature downstream of the detention basin discharge structure
3. Dry Detention Basins, GIS area (ac) **polygons** (DBASIN-1, etc.)
 - a. The polygon should reflect the detention basin footprint up to and including the berm and any associated maintenance buffer
4. Wet Detention Basins, GIS area (ac) **polygons** (WBASIN-1, etc.)
 - a. The polygon should reflect the detention basin footprint up to and including the berm and any associated maintenance buffer
5. Retention Basins (no outlet), GIS area (ac) **polygons** (RBASIN-1, etc.)
 - a. The polygon should reflect the detention basin footprint up to and including the berm and any associated maintenance buffer
6. Sediment Forebays, GIS area (ac) **polygons** (Forebay-1, etc.)
 - a. The polygon should reflect the detention basin footprint up to and including the berm and any associated maintenance buffer
7. Mechanical Separators, GIS **points** (MS-1, etc.)
 - a. The points can be placed at a maintenance access point for each structure. If multiple mechanical separator units are proposed, create a point for each unit.
8. Bioretention/Bioswales – GIS area (ac), GIS **polygons** (BR-1, etc.)
 - a. The polygon should reflect the bioretention/bioswale footprint including any maintenance or safety buffers
9. Porous Pavement – GIS area (ac), GIS **polygons** (PP-1, etc.)
10. Cisterns/Rain Barrels, GIS **points** (RB-1, etc.)