

Michigan Department of Environmental Quality – Water Resources Division
STORM WATER DISCHARGE PERMIT APPLICATION

PLEASE TYPE OR PRINT								
Applicants for either new permit coverage or reissuance of a permit shall include all of the following requested information for Sections I-VIII.								
SECTION I. APPLICANT NAME AND MAILING ADDRESS				Current Permit/COC Number (if applicable)				
Charter Township of Oakland				MIG610222				
Additional Applicant Name Information								
Street Address or P.O. Box				e-mail				
4393 Collins Road								
City or Village		State		ZIP Code				
Rochester		MI		48306				
Telephone (with area code)			FAX Number (with area code)					
248-651-4440			248-651-7340					
SECTION II. CONTACTS	<input checked="" type="checkbox"/> Application Contact <input type="checkbox"/> Storm Water Program Manager <input type="checkbox"/> Storm Water Billing	First Name Lara		Last Name Treemore-Spears				
		Title Senior Scientist		Business ASTI Environmental				
		Address 1 10448 Citation Drive		Address 2 Suite 100				
		City Brighton		State MI	ZIP Code 48116			
		Telephone (with area code) 810-225-2800	FAX (with area code) 810-225-3800		e-mail LSpears@asti-env.com			
		First Name Elaine		Last Name Leven				
	<input type="checkbox"/> Application Contact <input checked="" type="checkbox"/> Storm Water Program Manager <input type="checkbox"/> Storm Water Billing	Title Planning & Zoning Administrator		Business Charter Township of Oakland				
		Address 1 4393 Collins Road		Address 2				
		City Rochester		State MI	ZIP Code 48306			
		Telephone (with area code) 248-218-6958	FAX (with area code) 248-651-7340		e-mail			
		First Name Paul		Last Name Rentschler				
		Title Aquatic Ecologist		Business ASTI Environmental				
	<input checked="" type="checkbox"/> Application Contact <input type="checkbox"/> Storm Water Program Manager <input type="checkbox"/> Storm Water Billing	Address 1 10448 Citation Drive		Address 2 Suite 100				
		City Brighton		State MI	Zip Code 48116			
		Telephone (with area code) 810-923-5278	FAX (with area code) 810-225-3800		e-mail prentschler@asti-env.com			
SECTION III. PERMIT ACTION REQUESTED:								
<input type="checkbox"/> New Authorization <input checked="" type="checkbox"/> Reissuance of Previous Authorization <input type="checkbox"/> Modification of Current Permit								
SECTION IV. REGULATED AREA								
Provide a map identifying the urbanized area within the applicant's jurisdictional boundary as defined by the 2010 Census. The regulated municipal separate storm sewer system (MS4) means an MS4 owned or operated by a city, village, township, county, district, association, or other public body created by or pursuant to state law and the nested MS4 identified in Section VI. that is located in an urbanized area and discharges storm water into surface waters of the state. The 2010 Census maps are located at								

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SECTION V. OUTFALLS AND POINTS OF DISCHARGE

Identify and provide the surface water of the state that receives the discharge from each of the applicant's outfalls and points of discharge in Table 1 or an alternative format. Please note that an MS4 is not a surface water of the state. For example, an open county drain that is a surface water of the state is not an MS4.

SECTION VI. NESTED JURISDICTIONS

Submit the name and general description of each nested MS4 for which a cooperative agreement has been reached to carry out the terms and conditions of the permit for the nested jurisdiction. The applicant shall be responsible for assuring compliance with the permit for those nested jurisdictions with which they have entered into an agreement and listed as part of the Application. If the primary jurisdiction and the nested jurisdiction agree to cooperate so that the terms and conditions of the permit are met for the nested MS4, the nested jurisdiction does not need to apply for a separate permit. A city, village, or township shall not be a nested jurisdiction.

NESTED JURISDICTION NAME AND GENERAL DESCRIPTION:

None

SECTION VII. STORM WATER MANAGEMENT PROGRAM

This Application requires a description of the Best Management Practices (BMPs) the applicant will implement for each minimum control measure and the applicable water quality requirements during this permit cycle. The applicant shall incorporate the BMPs to develop a Storm Water Management Program (SWMP) as part of the Application. The SWMP shall be developed, implemented, and enforced to reduce the discharge of pollutants from the MS4 to the Maximum Extent Practicable and protect water quality in accordance with the appropriate water quality requirements of the NREPA 451, Public Acts of 1994, Part 31, and the Federal Water Pollution Control Act, as amended, (33 U.S.C. 1251 *et seq.*). The Maximum Extent Practicable may be met by implementing the BMPs identified in the SWMP and demonstrating the effectiveness of the BMPs. The applicant shall attach any appropriate and necessary documentation to demonstrate compliance with the six minimum control measures and applicable water quality requirements as part of the Application.

The applicant shall complete this Application to the best of its knowledge and ensure that it is true, accurate, and meets the minimum requirements for a SWMP to the Maximum Extent Practicable.

When answering the questions in this section of the Application, the applicant's MS4 encompasses what the applicant identified in Sections IV, V, and VI, above. The applicant shall include a measurable goal for each BMP. Each measurable goal shall include, as appropriate, a schedule for BMP implementation (months and years), including interim milestones and the frequency of the action. Each measurable goal shall have a measure of assessment to measure progress towards achieving the measurable goal. A United States Environmental Protection Agency (USEPA) guidance document on measurable goals is available at <http://www.epa.gov/npdes/pubs/measurablegoals.pdf>.

Several minimum control measures include a statement requesting the applicant to indicate in the response if you are, or will be, working collaboratively with watershed or regional partners on any or all activities to meet the minimum control measure requirements. If the applicant chooses to work collaboratively with watershed or regional partners to implement parts of the SWMP, each applicant will be responsible for complying with the minimum permit requirements.

For purposes of this Application a procedure means a written process, policy or other mechanism describing how the applicant will implement minimum requirements. It may be helpful to read all questions in each section first.

Enforcement Response Procedure (ERP)

The applicant shall describe the current and proposed enforcement responses to address violations of the applicant's ordinances and regulatory mechanisms identified in the SWMP. The following question represents the minimum requirement for the ERP. Please complete the question below.

1. Provide the ERP. The ERP shall include the applicant's expected response to violations to compel compliance with an ordinance or regulatory mechanism implemented by the applicant in the SWMP (e.g., written notices, citations, and fines). The ERP shall contain a method for tracking instances of non-compliance, including, as appropriate, the name of the person responsible for violating the applicant's ordinance or regulatory mechanism, the date and location of the violation, a description of the violation, a description of the enforcement response used, a schedule for returning to compliance, and the date the violation was resolved. The applicant may keep an electronic file or hard copy file of the enforcement tracking.

ERP Reference (page and paragraph of attachments): *e.g., Attachment A, Page 3, Section b. Attachment A, Page 1, Section V11.1.*

Public Participation/Involvement Program (PPP)

The applicant shall describe the current and proposed BMPs to meet the minimum control measure requirements for the PPP to the maximum extent practicable, which shall be incorporated into the SWMP. Please indicate in your response if you are, or will be, working collaboratively with watershed or regional partners on any or all activities in the PPP during the permit cycle (i.e., identify collaborative efforts in the procedures). The following questions represent the minimum control measure requirements for the PPP. Please complete all the questions below. A measurable goal with a measure of assessment shall be included for each BMP, and, as appropriate, a schedule for implementation (months and years), including interim milestones and the frequency of the BMP.

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2. Provide the procedure for making the SWMP available for public inspection and comment. The procedure shall include a process for notifying the public when and where the SWMP is available and of opportunities to provide comment. The procedure shall also include a process for complying with local public notice requirements, as appropriate.

Procedure Reference (page and paragraph of attachments): *e.g.*, Attachment A, Page 3, Section b. Attachment A, p.2, Section VII.2.

3. Provide the procedure for inviting public involvement and participation in the implementation and periodic review of the SWMP.

Procedure Reference (page and paragraph of attachments): Attachment A, Page 2, Section VII.3.

Public Education Program (PEP)

The applicant shall describe the current and proposed BMPs to meet the minimum control measure requirements for the PEP to the maximum extent practicable, which shall be incorporated into the SWMP. Please indicate in your response if you are, or will be, working collaboratively with watershed or regional partners on any or all activities in the PEP during the permit cycle. The following questions represent the minimum requirements for the PEP. Please complete all the questions below. A measurable goal with a measure of assessment shall be included for each BMP, and, as appropriate, a schedule for implementation (months and years), including interim milestones and the frequency of the BMP. The responses shall reflect the nested MS4s identified in Section VI.

4. Provide the procedure with the assessment of high priority, community-wide issues and targeted issues to reduce pollutants in storm water runoff as part of the PEP. The assessment shall include a list of the priority issues.

Procedure Reference (page and paragraph of attachments): *e.g.*, Attachment A, Page 3, Section b _____

Not applicable – PEP topics will not be prioritized.

5. The applicant shall identify applicable PEP topics below and, if prioritizing topics, prioritize based on the assessment in Question 4. The PEP topics may be prioritized as high, medium, and low or in order from 1-11 based on the assigned priority level (*e.g.*, 1 being the highest priority topic and 11 being the lowest priority topic). For each applicable topic, identify the target audience; key message; delivery mechanism; year and frequency the BMP will be implemented; and the responsible party.

For each topic below, complete one or more of the following

- Fill out Table 2 for each applicable PEP topic.
- Reference the page number in your existing PEP document.
- Explain why the PEP activity is not applicable or a priority issue.

- A. Promote public responsibility and stewardship in the applicant's watershed(s).

Priority Ranking _____

See Table 2

Attach existing approved PEP (page and paragraph of attachments): _____

Not applicable. Provide explanation below.

- B. Inform and educate the public about the connection of the MS4 to area waterbodies and the potential impacts discharges could have on surface waters of the state.

Priority Ranking _____

See Table 2

Attach existing approved PEP (page and paragraph of attachments): _____

Not applicable. Provide explanation below.

- C. Educate the public on illicit discharges and promote public reporting of illicit discharges and improper disposal of materials into the MS4.

Priority Ranking _____

See Table 2

Attach existing approved PEP (page and paragraph of attachments): _____

Not applicable. Provide explanation below.

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D. Promote preferred cleaning materials and procedures for car, pavement, and power washing.

Priority Ranking _____

See Table 2

Attach existing approved PEP (page and paragraph of attachments): _____

Not applicable. Provide explanation below.

E. Inform and educate the public on proper application and disposal of pesticides, herbicides, and fertilizers.

Priority Ranking _____

See Table 2

Attach existing approved PEP (page and paragraph of attachments): _____

Not applicable. Provide explanation below.

F. Promote proper disposal practices for grass clippings, leaf litter, and animal wastes that may enter into the MS4.

Priority Ranking _____

See Table 2

Attach existing approved PEP (page and paragraph of attachments): _____

Not applicable. Provide explanation below.

G. Identify and promote the availability, location, and requirements of facilities for collection or disposal of household hazardous wastes, travel trailer sanitary wastes, chemicals, and motor vehicle fluids.

Priority Ranking _____

See Table 2

Attach existing approved PEP (page and paragraph of attachments): _____

Not applicable. Provide explanation below.

H. Inform and educate the public on proper septic system care and maintenance, and how to recognize system failure.

Priority Ranking _____

See Table 2

Attach existing approved PEP (page and paragraph of attachments): _____

Not applicable. Provide explanation below.

I. Educate the public on, and promote the benefits of, green infrastructure and Low Impact Development.

Priority Ranking _____

See Table 2

Attach existing approved PEP (page and paragraph of attachments): _____

Not applicable. Provide explanation below.

J. Promote methods for managing riparian lands to protect water quality.

Priority Ranking _____

See Table 2

Attach existing approved PEP (page and paragraph of attachments): _____

Not applicable. Provide explanation on the next page.

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K. Identify and educate commercial, industrial, and institutional entities likely to contribute pollutants to storm water runoff.

Priority Ranking _____

See Table 2

Attach existing approved PEP (page and paragraph of attachments): _____

Not applicable. Provide explanation below.

6. Provide the procedure for evaluating and determining the effectiveness of the overall PEP. The procedure shall include a method for assessing changes in public awareness and behavior resulting from the implementation of the PEP and the process for modifying the PEP to address ineffective implementation.

Procedure Reference (page and paragraph of attachments): Attachment A, p. 3, Section VII.6.

Illicit Discharge Elimination Program (IDEP)

The applicant shall describe the current and proposed BMPs to meet the minimum control measure requirements for the IDEP to the Maximum Extent Practicable, which shall be incorporated into the SWMP. Please indicate in your response if you are or will be working collaboratively with watershed or regional partners on any or all BMPs in the IDEP during the permit cycle (e.g., identify collaborative efforts in the procedures). The following questions represent the minimum control measure requirements for the IDEP. Please complete all the questions below. A measurable goal with a measure of assessment shall be included for each BMP, and, as appropriate, a schedule for implementation (months and years), including interim milestones and the frequency of the BMP. The responses shall reflect the nested MS4s identified in Section VI.

The following definitions apply to the terms used below:

- **Illicit Discharge:** Any discharge to, or seepage into, an MS4 that is not composed entirely of storm water or uncontaminated groundwater except discharges pursuant to an NPDES permit. A discharge that originates from the applicant's property and meets the illicit discharge definition is considered an illicit discharge.
- **Illicit Connection:** A physical connection to an MS4 that primarily conveys non-storm water discharges other than uncontaminated groundwater into the MS4; or a physical connection not authorized or permitted by the local authority, where a local authority requires authorization or a permit for physical connections.

The Center for Watershed Protection has a guide on developing and implementing an IDEP available at http://www.epa.gov/npdes/pubs/idde_manualwithappendices.pdf. This guide is a useful tool to assist with completing the Application.

Storm Sewer System Map

7. Provide the location where an up-to-date storm sewer system map(s) is available. The map(s) shall identify the following: the storm sewer system, the location of all outfalls and points of discharge, and the names and location of the surface waters of the state that receive discharges from the permittee's MS4 (for both outfalls and points of discharge). A separate storm sewer system includes: roads, catch basins, curbs, gutters, parking lots, ditches, conduits, pumping devices, and man-made channels. A storm sewer system map(s) may include available diagrams, such as certification maps, road maps showing rights-of-way, as-built drawings, or other hard copy or digital representation of the storm sewer system.

The map (or maps) is available at the following location: *e.g., The Department of Public Works front office Figure 1, Table 1*

Illicit Discharge Identification and Investigation

8. Provide the procedure for prioritizing the applicant's MS4 for detecting non-storm water discharges. The goal of the prioritization process is to target areas with high illicit discharge potential. The procedure shall document the process for selecting each priority area using the list below.

- Areas with older infrastructure
- Industrial, commercial, or mixed use areas
- Areas with a history of past illicit discharges
- Areas with a history of illegal dumping
- Areas with septic systems
- Areas with older sewer lines or with a history of sewer overflows or cross-connections
- Areas with sewer conversions or historic combined sewer systems
- Areas with poor dry-weather water quality
- Areas with water quality impacts, including waterbodies identified in a Total Maximum Daily Load
- Priority areas applicable to the applicant not identified above

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- Procedure Reference (page and paragraph of attachments): *e.g., Attachment A, Page 3, Section b* _____
 Not applicable – The applicant will perform illicit discharge identification and investigation throughout the entire MS4. Skip to Question 10.

9. Provide the geographical location of each prioritized area using either a narrative description or map and identify the prioritized areas that will be targeted during the permit cycle.

IDEP Prioritized Areas (page and paragraph of attachments): Not Applicable

10. Provide the procedure for performing field observations at all outfalls and points of discharge in the priority areas as identified in the procedure above or for the entire MS4 during dry-weather at least once during the permit cycle. The procedure shall include a schedule for completing the field observations during the permit cycle or more expeditiously if the applicant becomes aware of a non-storm water discharge. *As part of the procedure, the applicant may submit an interagency agreement with the owner or operator of the downstream MS4 identifying responsibilities for ensuring an illicit discharge is eliminated if originating from the applicant's point(s) of discharge. The interagency agreement would eliminate the requirement for performing a field observation at that point(s) of discharge.*

The focus of the field observation shall be to observe the following:

- Presence/absence of flow
- Deposits/stains on the discharge structure or bank
- Vegetation condition
- Structural condition
- Biology, such as bacterial sheens, algae, and slimes
- Water clarity
- Color
- Odor
- Floatable materials

Procedure Reference (page and paragraph of attachments): Table 3 - Page 1

11. Provide the procedure for performing field screening if flow is observed at an outfall or point of discharge and the source of an illicit discharge is not identified during the field observation. Field screening shall include analyzing the discharge for indicator parameters (e.g., ammonia, fluoride, detergents, and pH). The procedure shall include a schedule for performing field screening.

Procedure Reference (page and paragraph of attachments): Table 3 - Page 1

12. Provide the procedure for performing a source investigation if the source of an illicit discharge is not identified by field screening. The procedure shall include a schedule for performing a source investigation.

Procedure Reference (page and paragraph of attachments): Table 3 - Page 1

13. Provide the procedure for responding to illegal dumping/spills. The procedure shall include a schedule for responding to complaints, performing field observations, and follow-up field screening and source investigations as appropriate.

Procedure Reference (page and paragraph of attachments): Table 3 - Page 2

14. Provide the procedure for responding to illicit discharges upon becoming aware of such a discharge outside of the priority areas. The procedure shall include a schedule for performing field observations, and follow-up field screening and source investigations as appropriate.

Procedure Reference (page and paragraph of attachments): _____

Not applicable – Field observations will be conducted at all outfalls and points of discharge

15. Provide the procedure that includes a requirement to immediately report any release of any polluting materials from the MS4 to the surface waters or groundwaters of the state, unless a determination is made that the release is not in excess of the threshold reporting quantities in the [Part 5 Rules](#), by calling the appropriate [MDEQ District Office](#), or if the notice is provided after regular working hours call the MDEQ's 24-Hour Pollution Emergency Alerting System telephone number: 800-292-4706.

Procedure Reference (page and paragraph of attachments): Table 3 - Page 2

16. If the procedures requested in Questions 8 through 14 do not accurately reflect the applicant's procedure(s), describe the alternative approach to meet the minimum requirements.

Not applicable

17. Provide the procedure for responding to illicit discharges once the source is identified. The procedure shall include a schedule to eliminate the illicit discharge and pursue enforcement actions. The procedure shall also address illegal spills/dumping.

Procedure Reference (page and paragraph of attachments): Table 3 - Page 2

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IDEP Training and Evaluation

18. Provide the program to train staff employed by the applicant on the following topics. The program shall include a training schedule for this permit cycle. *It is recommended that staff be trained more than once per permit cycle.*
- Techniques for identifying an illicit discharge or connection, including field observation, field screening, and source investigation.
 - Procedures for reporting, responding to, and eliminating an illicit discharge or connection and the proper enforcement response.
 - The schedule and requirement for training at least once during the term of this permit cycle for existing staff and within the first year of hire for new staff.

Program Reference (page and paragraph of attachments): Table 3 - Page 3

19. Provide the procedure for evaluating and determining the overall effectiveness of the IDEP. The procedure shall include a schedule for implementation. *Examples of evaluating overall effectiveness include, but are not limited to, the following: evaluate the prioritization process to determine if efforts are being maximized in areas with high illicit discharge potential; evaluate the effectiveness of using different detection methods; evaluate the number of discharges and/or quantity of discharges eliminated using different enforcement methods; and evaluate program efficiency and staff training frequency.*

Procedure Reference (page and paragraph of attachments): Table 3 - Page 3

Illicit Discharge Ordinance

20. Provide the ordinance or regulatory mechanism in effect that prohibits non-storm water discharges into the applicant's MS4 (except the non-storm water discharges addressed in Questions 21 and 22).

Ordinance number(s) or regulatory mechanism title(s) (attach a copy): Table 3 - Page 3

21. Does the ordinance or other regulatory mechanism exclude prohibiting the discharges or flows from firefighting activities to the applicant's MS4 and require that these discharges or flows only be addressed if they are identified as significant sources of pollutants to waters of the State? The ordinance shall not authorize illicit discharges; however, the applicant may choose to exclude prohibiting the discharges and flows from firefighting activities if they are identified as not being significant sources of pollutants to waters of the state.

- Yes, ordinance or regulatory mechanism reference (page and paragraph of attachments): Table 3 - Page 3
 Not applicable – All non-storm water discharges into the applicant's MS4 will be prohibited.

22. Does the ordinance or other regulatory mechanism prohibit the following categories of non-storm water discharges or flows if identified as significant contributors to violations of Water Quality Standards? The ordinance shall not authorize illicit discharges; however, the applicant may choose to exclude prohibiting the following discharges or flows if they are identified as not being a significant contributor to violations of Water Quality Standards.

- Water line flushing and discharges from potable water sources
- Landscape irrigation runoff, lawn watering runoff, and irrigation waters
- Diverted stream flows and flows from riparian habitats and wetlands
- Rising groundwaters and springs
- Uncontaminated groundwater infiltration and seepage
- Uncontaminated pumped groundwater, except for groundwater cleanups specifically authorized by NPDES permits
- Foundation drains, water from crawl space pumps, footing drains, and basement sump pumps
- Air conditioning condensation
- Waters from noncommercial car washing
- Street wash water
- Dechlorinated swimming pool water from single, two, or three family residences. (A swimming pool operated by the permittee shall not be discharged to a separate storm sewer or to surface waters of the state without NPDES permit authorization from the MDEQ.)

- Yes, ordinance or regulatory mechanism reference (page and paragraph of attachments): Table 3 - Page 3
 Not applicable – All non-storm water discharges into the applicant's MS4 will be prohibited.

23. Provide the ordinance or regulatory mechanism that regulates the contribution of pollutants to the applicant's MS4.

Ordinance or regulatory mechanism reference (page and paragraph of attachments): Table 3 - Page 3

24. Provide the ordinance or regulatory mechanism that prohibits illicit discharges, including illicit connections and the direct dumping or disposal of materials into the applicant's MS4.

Ordinance or regulatory mechanism reference (page and paragraph of attachments): Table 3 - Page 3

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25. Provide the ordinance or regulatory mechanism with the authority established to inspect, investigate, and monitor suspected illicit discharges into the applicant's MS4.

Ordinance or regulatory mechanism reference (page and paragraph of attachments): Table 3 - Page 3

26. Provide the ordinance or regulatory mechanism that requires and enforces elimination of illicit discharges into the applicant's MS4, including providing the applicant the authority to eliminate the illicit discharge.

Ordinance or regulatory mechanism reference (page and paragraph of attachments): Table 3 - Page 3

Construction Storm Water Runoff Control Program

The applicant shall describe the current and proposed BMPs to meet the minimum control measure requirements for the construction storm water runoff control program to the maximum extent practicable, which shall be incorporated into the SWMP. Please indicate in your response if you are or will be working collaboratively with watershed or regional partners on any or all requirements of this program during the permit cycle. The following questions represent the minimum control measure requirements for the construction storm water runoff control program. Please complete all the questions below. A measurable goal with a measure of assessment shall be included for each BMP, and, as appropriate, a schedule for implementation (months and years), including interim milestones and the frequency of the BMP. The responses shall reflect the nested MS4s identified in Section VI.

Qualifying Local Soil Erosion and Sedimentation Control Programs

27. Is the applicant a Part 91 Agency? A list of Part 91 agencies is available at http://www.michigan.gov/deq/0,4561,7-135-3311_4113-8870--00.html.

Yes. Choose type: County Enforcing Agency Municipal Enforcing Agency Authorized Public Agency

No, the applicant relies on the following Qualifying Local Soil Erosion and Sedimentation Control Program (Part 91 Agency)
Oakland County Water Resources Commissioner's Office

Construction Storm Water Runoff Control

28. Provide the procedure with the process for notifying the Part 91 Agency or appropriate staff when soil or sediment is discharged to the applicant's MS4 from a construction activity. The procedure shall allow for the receipt and consideration of complaints or other information submitted by the public or identified internally as it relates to construction storm water runoff control. For non-Part 91 agencies, consideration of complaints may include referring the complaint to the qualifying local Soil Erosion and Sedimentation Control Program as appropriate. Construction activity is defined pursuant to Part 21, Wastewater Discharge Permits, Rule 323.2102 (K). The applicant may consider as part of their procedure when and under what circumstances the Part 91 Agency or appropriate staff will be contacted.

Procedure Reference (page and paragraph of attachments): *e.g., Attachment A, Page 3, Section b Attachment A, p. 3, Section VII.28*

29. Provide the procedure for when to notify the MDEQ when soil, sediment, or other pollutants are discharged to the applicant's MS4 from a construction activity. Other pollutants include pesticides, petroleum derivatives, construction chemicals, and solid wastes that may become mobilized when land surfaces are disturbed. The applicant may consider as part of their procedure when and under what circumstances the MDEQ will be contacted.

Procedure Reference (page and paragraph of attachments): Attachment A, p. 3, Section VII.29

30. Provide the procedure for ensuring that construction activity one acre or greater in total earth disturbance with the potential to discharge to the applicant's MS4 obtains a Part 91 permit, or is conducted by an approved Authorized Public Agency as appropriate. Note: For applicants that conduct site plan review, the procedure must be triggered at the site plan review stage.

Procedure Reference (page and paragraph of attachments): Attachment A, p. 3, Section VII.30-31

31. Provide the procedure to advise the landowner or recorded easement holder of the property where the construction activity will occur of the State of Michigan Permit by Rule (Rule 323.2190).

Procedure Reference (page and paragraph of attachments): Attachment A, p. 3, Section VII.30-31

Post-Construction Storm Water Runoff Program

Post-construction storm water runoff controls are necessary to maintain or restore stable hydrology in receiving waters by limiting surface runoff rates and volumes and reducing pollutant loadings from sites that undergo development or significant redevelopment.

The applicant shall describe the current and proposed BMPs to meet the minimum control measure requirements for the post-construction storm water runoff program to the maximum extent practicable, which shall be incorporated into the SWMP. Please complete the questions below as appropriate. If the "No" response is selected but a date is requested for the minimum requirement to

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be available, please provide a date to meet the minimum requirement. All dates provided by the applicant in this Application should be on or before **October 1, 2015**. Some questions are set up to allow for additional responses to meet the minimum requirements. If space is not available for an additional response, then the minimum requirement must be met in accordance with the question. A measurable goal with a measure of assessment shall be included for each BMP, and, as appropriate, a schedule for implementation (months and years), including interim milestones and the frequency of the BMP. The responses shall reflect the nested MS4s identified in Section VI.

An applicant may reference in its ordinance or regulatory mechanism other technical documents used to implement the post-construction storm water runoff program. For example, an applicant may answer a question with a reference to a performance or technical standards document in the ordinance **and** the reference in the technical document. When referencing the ordinance, regulatory mechanism, or other technical documents, attach the document and provide the page and paragraph reference.

The MDEQ has the following resources available to assist with development of a Post-Construction Storm Water Runoff Program.

- A Post-Construction Storm Water Runoff Program Compliance Assistance Document available at www.michigan.gov/documents/deq/wrd-storm-MS4-ComplianceAssistance_470350_7.pdf
- A manual titled *Low Impact Development Manual for Michigan* available at <http://www.semco.org/LowImpactDevelopment.aspx>. Chapter 9 of the manual provides a methodology for addressing post-construction storm water runoff.

Ordinance or Other Regulatory Mechanism

32. Is an ordinance or other regulatory mechanism in effect to address post-construction storm water runoff from new development and redevelopment projects, including preventing or minimizing water quality impacts? The ordinance or other regulatory mechanism shall apply to private, commercial, and public projects, including projects where the applicant is the developer. This requirement may be met using a single ordinance or regulatory mechanism or a combination of ordinances and regulatory mechanisms.
- Yes, ordinance or regulatory mechanism reference (page and paragraph of attachments): *e.g., Attachment A, Pages 1-15 Appendix A, Township Ordinance 18 pp; Oakland County Standards 55 pp.*
- No, the ordinance or regulatory mechanism will be available on _____
33. Does the ordinance or other regulatory mechanism apply to projects that disturb at least one or more acres, including projects less than an acre that are part of a larger common plan of development or sale and discharge into the applicant's MS4?
- Yes, ordinance or regulatory mechanism reference (page and paragraph of attachments): *Appendix A, Township Ordinance Sec. 6-215; Oakland County Standards pp. 6-10*
- No, the ordinance or regulatory mechanism will be available on _____

Federal Facilities

Federal facilities are subject to the Energy Independence and Security Act of 2007. Section 438 of this legislation establishes post-construction storm water runoff requirements for federal development and redevelopment projects.

34. Is the applicant the owner or operator of a federal facility with a storm water discharge?
- Yes
- No, skip to Question 36
35. Is the applicant implementing the post-construction storm water runoff control requirements in Section 438 of the Energy Independence and Security Act? A guidance document is available at http://www.epa.gov/greeningepa/documents/epa_swm_guidance.pdf
- Yes, regulatory mechanism reference (page and paragraph of attachments): _____
- No, the regulatory mechanism will be available on _____

Water Quality Treatment Performance Standard

36. Does the ordinance or other regulatory mechanism include one or more of the following water quality treatment standards?
- Treat the first one inch of runoff from the entire project site. Ordinance or other regulatory mechanism reference (page and paragraph of attachments) *Attachment A, p. 5, Section VII.36* Skip to Question 38.
- Treat the runoff generated from 90 percent of all runoff-producing storms for the project site. Ordinance or other regulatory mechanism reference (page and paragraph of attachments) _____
- No, the ordinance or other regulatory mechanism will be available on _____
- The ordinance or other regulatory mechanism is/will be available on _____ and includes the following water quality treatment standard. Provide an explanation as to how the water quality treatment standard will prevent or minimize water quality impacts.

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37. What is the source of the rainfall data if the applicant has chosen the water quality treatment standard of requiring the treatment of the runoff generated from 90 percent of all runoff-producing storms?
- The MDEQ's memo dated March 24, 2006 providing the 90 percent annual non-exceedance storm statistics. The memo is available at http://www.michigan.gov/documents/deq/lwm-hsu-nps-ninety-percent_198401_7.pdf.
 - An analysis of at least ten years of local published rain gauge data following the method in the March 25, 2006, MDEQ memo titled *90 Percent Annual Non-Exceedance Storms* cited above.
 - Other rainfall data source (page and paragraph of attachments) _____

38. Does the ordinance or other regulatory mechanism require that BMPs be **designed** on a site-specific basis to reduce post-development total suspended solids loadings by 80 percent or achieve a discharge concentration of total suspended solids not to exceed 80 milligram per liter?

Yes, ordinance or other regulatory mechanism reference (page and paragraph of attachments): Appendix A: Oakland County Engineering Design Standards for Storm Water Facilities

No, the ordinance or other regulatory mechanism will be available on _____

The ordinance or other regulatory mechanism defines treatment as follows:

Please see discussion in Attachment A, p. 5, Section VII.38

Channel Protection Performance Standard

39. Does the ordinance or other regulatory mechanism require that the post-construction runoff rate and volume of discharges not exceed the pre-development rate and volume for all storms up to the two-year, 24-hour storm at the project site? At a minimum, pre-development is the last land use prior to the planned new development or redevelopment. A *spreadsheet to assist with these calculations is available at www.michigan.gov/documents/deq/wb-storm-MS4-RunoffVolume_331235_7.xls*

Yes, ordinance or other regulatory mechanism reference (page and paragraph of attachments): Appendix A: Oakland County Engineering Design Standards for Storm Water Facilities

No, the ordinance or other regulatory mechanism will be available on _____

The ordinance or other regulatory mechanism is/will be available on _____ and includes the following channel protection standard. Provide an explanation as to how the channel protection standard will prevent or minimize water quality impacts.

Please see discussion in Attachment A, p. 5, Section VII.39

40. Does the ordinance or other regulatory mechanism exclude any waterbodies from the channel protection performance standard? The channel protection performance standard is not required for the following waterbodies: the Great Lakes or connecting channels of the Great Lakes; Rouge River downstream of the Turning Basin; Saginaw River; Mona Lake and Muskegon Lake (Muskegon County); and Lake Macatawa and Spring Lake (Ottawa County).

Yes, ordinance or other regulatory mechanism reference (page and paragraph of attachments): _____

No, the ordinance or other regulatory mechanism will be available on _____

Not applicable

Site-Specific Requirements

41. Provide the procedure for reviewing the use of infiltration BMPs to meet the water quality treatment and channel protection standards for new development or redevelopment projects in areas of soil or groundwater contamination in a manner that does not exacerbate existing conditions. The procedure shall include the process for coordinating with MDEQ staff as appropriate.

Procedure Reference (page and paragraph of attachments): Attachment A, p. 5, Section VII.41

42. Does the ordinance or other regulatory mechanism require BMPs to address the associated pollutants in potential hot spots as part of meeting the water quality treatment and channel protection standards for new development or redevelopment projects? Hot spots include areas with the potential for significant pollutant loading such as gas stations, commercial vehicle maintenance and repair, auto recyclers, recycling centers, and scrap yards. Hot spots also include areas with the potential for contaminating public water supply intakes.

Yes, ordinance or other regulatory mechanism reference (page and paragraph of attachments): Attachment A, p. 5, Section VII.42

No, the ordinance or other regulatory mechanism will be available on _____

Off-Site Mitigation and Payment in Lieu Programs

43. Does the ordinance or other regulatory mechanism allow for the approval of off-site mitigation for redevelopment projects that cannot meet 100 percent of the performance standards on-site after maximizing storm water retention? Off-site mitigation refers to BMPs implemented at another location within the same jurisdiction and watershed/sewershed as the original project. A *watershed is the*

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geographic area included in a 10-digit Hydrologic Unit Code and a sewershed is the area where storm water is conveyed by the applicant's MS4 to a common outfall or point of discharge.

- Yes, ordinance or other regulatory mechanism reference (page and paragraph of attachments): Attach. A, p. 5-6, Section VII.43
- No, the ordinance or other regulatory mechanism will be available on _____
- Not pursuing this option

44. Does the ordinance or other regulatory mechanism allow for the approval of payment in lieu for projects that cannot meet 100 percent of the performance standards on-site after maximizing storm water retention? A payment in lieu program refers to a developer paying a fee to the applicant that is applied to a public storm water management project within the same jurisdiction and watershed/sewershed as the original project in lieu of installing the required BMPs onsite. The storm water management project may be either a new BMP or a retrofit to an existing BMP and shall be developed in accordance with the applicant's performance standards. *A watershed is the geographic area included in a 10-digit Hydrologic Unit Code and a sewershed is the area where storm water is conveyed by the applicant's MS4 to a common outfall or point of discharge.*

- Yes, ordinance or other regulatory mechanism reference (page and paragraph of attachments): _____
- No, the ordinance or other regulatory mechanism will be available on _____
- Not pursuing this option. If "not pursuing this option" was selected for both Questions 43 and 44, skip to Question 52.

45. Does the ordinance or other regulatory mechanism establish criteria for determining the conditions under which off-site mitigation and/or payment in lieu are available and require technical justification as to the infeasibility of on-site management? The determination that performance standards cannot be met on-site shall not be based solely on the difficulty or cost of implementing, but shall be based on multiple criteria related to the physical constraints of the project site, such as: too small of a lot outside of the building footprint to create the necessary infiltrative capacity even with amended soils; soil instability as documented by a thorough geotechnical analysis; a site use that is inconsistent with the capture and reuse of storm water; too much shade or other physical conditions that preclude adequate use of plants. The criteria shall also include consideration of the stream order and location within the watershed/sewershed as it relates to the water quality impacts from the original project site (*e.g., the water quality impact from a project site with a discharge to a small-sized stream would be greater than a project site on a large river and an offset downstream of the project site may provide less water quality benefit.*) The highest preference for off-site mitigation and in lieu projects shall be given to locations that yield benefits to the same receiving water that received runoff from the original project site.

- Yes, ordinance or other regulatory mechanism reference (page and paragraph of attachments): _____
- No, the ordinance or other regulatory mechanism will be available on _____

46. Does the ordinance or other regulatory mechanism establish a minimum amount of storm water to be managed on-site as a first tier for off-site mitigation or payment in lieu? A higher offset ratio is required if off-site mitigation or payment in lieu is requested for the amount of storm water identified as the first tier. *For example, a minimum of 0.4 inches of storm water runoff shall be managed on-site as a first tier.*

- Yes, ordinance or other regulatory mechanism reference (page and paragraph of attachments): _____
- No, the ordinance or other regulatory mechanism will be available on _____
- The ordinance or other regulatory mechanism requires the following:

47. Does the ordinance or other regulatory mechanism require an offset ratio of 1:1.5 for the amount of storm water above the first tier (identified in Question 46) not managed on-site to the amount of storm water required to be mitigated at another site or for which in-lieu payments shall be made?

- Yes, ordinance or other regulatory mechanism reference (page and paragraph of attachments): _____
- No, the ordinance or other regulatory mechanism will be available on _____
- The ordinance or other regulatory mechanism requires the following:

48. Does the ordinance or other regulatory mechanism require that if demonstrated by the developer to the applicant that it is completely infeasible to manage the first tier of storm water identified in Question 47 on-site, the offset ratio for the unmanaged portion is 1:2?

- Yes, ordinance or other regulatory mechanism reference (page and paragraph of attachments): _____
- No, the ordinance or other regulatory mechanism will be available on _____
- The ordinance or other regulatory mechanism requires the following:

49. Does the ordinance or other regulatory mechanism require a schedule for completing off-site mitigation and in-lieu projects? *Off-site mitigation and in-lieu projects should be completed within 24 months after the start of the original project site construction.*

- Yes, ordinance or other regulatory mechanism reference (page and paragraph of attachments): _____
- No, the ordinance or other regulatory mechanism will be available on _____
- The ordinance or other regulatory mechanism requires the following:

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50. Does the ordinance or other regulatory mechanism require that offsets and in-lieu projects be preserved and maintained in perpetuity, such as deed restrictions and long-term operation and maintenance?

- Yes, ordinance or other regulatory mechanism reference (page and paragraph of attachments): _____
 No, the ordinance or other regulatory mechanism will be available on _____
 The ordinance or other regulatory mechanism requires the following:

51. Describe the tracking system implemented, or to be implemented, to track off-site mitigation and/or in-lieu projects.

52. Are there any other exceptions to the performance standards, other than off-site mitigation and payment in lieu, being implemented or to be implemented during the permit cycle? The applicant shall demonstrate how the exception provides an equivalent or greater level of protection as the performance standards.

- Yes, demonstration reference (page and paragraph of attachments): _____ No

Site Plan Review

53. Does the ordinance or other regulatory mechanism include a requirement to submit a site plan for review and approval of post-construction storm water runoff BMPs?

- Yes, ordinance or regulatory mechanism reference (page and paragraph of attachments): Attachment A, p. 6, Section VII.53
 No, the ordinance or regulatory mechanism will be available on _____

54. Provide the procedure for site plan review and approval.

Procedure Reference (page and paragraph of attachments): Charter Township of Oakland Stormwater Treatment and Erosion Control Ch. 6-244-246, Attachment A

55. Provide the reference in the site plan review and approval procedure to the process for determining how the developer meets the performance standards and ensures long-term operation and maintenance of BMPs.

Procedure Reference (page and paragraph of attachments): Attachment A, p. 6, Section VII.53

Long-Term Operation and Maintenance of BMPs

56. Does the ordinance or other regulatory mechanism require the long-term operation and maintenance of all structural and vegetative BMPs installed and implemented to meet the performance standards in perpetuity?

- Yes, ordinance or other regulatory mechanism reference (page and paragraph of attachments): Attach. A, p. 6, Section VII.56-59
 No, the ordinance or other regulatory mechanism will be available on _____

57. Does the ordinance or other regulatory mechanism require a maintenance agreement between the applicant and owners or operators responsible for the long-term operation and maintenance of structural and vegetative BMPs installed and implemented to meet the performance standards?

- Yes, ordinance or other regulatory mechanism reference (page and paragraph of attachments): Attach. A, p. 6, Section VII.56-59
 No, the ordinance or other regulatory mechanism will be available on _____
 The ordinance or other regulatory mechanism requires the following:

58. Does the maintenance agreement or other legal mechanism allow the applicant to complete the following? (Check if yes)

- Inspect the structural or vegetative BMP
 Perform the necessary maintenance or corrective actions neglected by the BMP owner or operator
 Track the transfer of operation and maintenance responsibility of the BMP (e.g., deed restrictions)

If any of the boxes above were not checked, provide a response explaining how the maintenance agreement or other legal mechanism allows the applicant to verify and ensure maintenance of the BMP.

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59. Provide the procedure for tracking compliance with a maintenance agreement or other legal mechanism to ensure the performance standards are met in perpetuity.

Procedure Reference (page and paragraph of attachments): Attach. A, p. 6, Section VII.56-59

Pollution Prevention and Good Housekeeping Program

The applicant shall describe the current and proposed BMPs to meet the minimum control measure requirements for the Pollution Prevention and Good Housekeeping Program to the maximum extent practicable, which shall be incorporated into the SWMP. The applicant shall develop and implement a Pollution Prevention and Good Housekeeping Program to prevent or reduce the discharge of pollutants from municipal facilities and operations.

The following definitions apply to the terms used below:

- Fleet: A group of vehicles owned or operated as a unit.
- Maintenance (includes, but not limited to): adding/changing vehicle fluids, fueling, lubrication, painting, mechanical repairs, parts degreasing, and vehicle/equipment washing.
- Storage Yard (includes, but not limited to): areas where vehicles are stored longer than overnight/weekend; areas where road maintenance materials are stored; areas where vehicle maintenance materials are stored; areas where chemicals in bulk are stored; areas where catch basin cleaning wastes are stored; and areas where maintenance equipment such as mowers, tractors, vector trucks, and sweepers is stored.

Please complete the questions below as appropriate. A “Not Applicable” response is appropriate in cases where the applicant does not own or operate a municipal facility or storm water structural control or does not perform the operation in the question. A measurable goal with a measure of assessment shall be included for each BMP, and, as appropriate, a schedule for implementation (months and years), including interim milestones and the frequency of the BMP. The responses shall reflect the nested MS4s identified in Section VI.

Municipal Facility and Structural Storm Water Control Inventory

60. Provide an up-to-date inventory of applicant-owned or operated facilities and storm water structural controls with a discharge of storm water to surface waters of the state. The inventory shall include the location of each facility. **Provide an estimate of the number of structural storm water controls throughout the entire MS4 for each applicable category below (e.g., 100 catch basins and 7 detention basins).**

Inventory Reference (Page and Paragraph of Attachments): *e.g., Attachment A, Page 3, Section b Figure 1 & Table 1*

Check all applicant-owned or operated facilities with a discharge of storm water to surface waters of the state:

- | | |
|---|--|
| <input checked="" type="checkbox"/> Administration buildings | <input type="checkbox"/> Animal Control Building |
| <input type="checkbox"/> Airports | <input type="checkbox"/> Bus Stations and Garages |
| <input type="checkbox"/> Cemeteries | <input type="checkbox"/> Composting facilities |
| <input type="checkbox"/> Equipment storage and maintenance facilities | <input checked="" type="checkbox"/> Fire Stations |
| <input type="checkbox"/> Fuel Farms | <input type="checkbox"/> Hazardous waste disposal facilities |
| <input type="checkbox"/> Hazardous waste handling and transfer facilities | <input type="checkbox"/> Landfills |
| <input type="checkbox"/> Landscape maintenance facilities | <input type="checkbox"/> Libraries |
| <input type="checkbox"/> Materials storage yards | <input type="checkbox"/> Mosquito Control Facility |
| <input checked="" type="checkbox"/> Parks | <input type="checkbox"/> Pesticide storage facilities |
| <input type="checkbox"/> Police stations | <input type="checkbox"/> Public golf courses |
| <input checked="" type="checkbox"/> Public parking lots | <input type="checkbox"/> Public schools |
| <input type="checkbox"/> Public works yards | <input type="checkbox"/> Recycling facilities |
| <input type="checkbox"/> Salt storage facilities | <input type="checkbox"/> Solid waste handling and transfer facilities |
| <input checked="" type="checkbox"/> Vacant land and open space | <input type="checkbox"/> Vehicle storage and maintenance yards |
| <input checked="" type="checkbox"/> Outdoor wash areas | <input type="checkbox"/> Other facilities – Provide a description below: |

Check all applicant-owned or operated structural storm water controls with a discharge of storm water to surface waters of the state:

- | | |
|--|---|
| <input checked="" type="checkbox"/> Catch basins 18 | <input type="checkbox"/> Constructed wetlands |
| <input checked="" type="checkbox"/> Detention basins 1 | <input type="checkbox"/> Infiltration basins and trenches |
| <input checked="" type="checkbox"/> Oil/water separators 2 | <input type="checkbox"/> Porous pavement |

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- | | |
|---|--|
| <input type="checkbox"/> Pump Stations | <input type="checkbox"/> Rain gardens |
| <input type="checkbox"/> Secondary containment | <input type="checkbox"/> Underground storage vaults or tanks |
| <input checked="" type="checkbox"/> Vegetated swales 1 | |
| <input type="checkbox"/> Other structural storm water controls – Provide a description below: | |

61. Provide the location where an up-to-date map (or maps) is available with the location of the facilities and structural storm water controls identified in Question 60. *The location of the facilities and structural storm water controls may be included on the storm sewer system map maintained for the IDEP.*

The map (or maps) is available at the following location: Township Planning Dept., Twp Engineers, ASTI Twp Environ. Consultant

62. Provide the procedure for updating and revising the inventory in Question 60 and map (or maps) identified in Question 61 as facilities and structural storm water controls are added, removed, or no longer owned or operated by the applicant. *A suggested timeframe for updating/revising the inventory and map(s) is 30 days following adding/removing a facility or structural storm water control.*

Procedure Reference (page and paragraph of attachments): Attach. A, p. 6, Section VII.62

Facility-Specific Storm Water Management

63. Provide the procedure for assessing each facility identified in Question 60 for the potential to discharge pollutants to surface waters of the state. The procedure shall include a process for updating and revising the assessment. *A recommended timeframe for updating/revising the assessment is 30 days prior to discharging storm water from a new facility and within 30 days of determining a need to update/revise the facility assessment.*

The applicant should consider the following factors when assessing each facility:

- Amount of urban pollutants stored at the site (e.g., sediment, nutrients, metals, hydrocarbons, pesticides, fertilizers, herbicides, chlorides, trash, bacteria, or other site-specific pollutants)
- Identification of improperly stored materials
- The potential for polluting activities to be conducted outside (e.g., vehicle washing)
- Proximity to waterbodies
- Poor housekeeping practices
- Discharge of pollutants of concern to impaired waters

Procedure Reference (page and paragraph of attachments): Attach. A, p. 6, Section VII.63

Not Applicable – The applicant does not own a facility that discharges storm water to surface waters of the state. Skip to Question 71.

64. Provide the list of prioritized facilities using the assessment in Question 63. Each facility shall be prioritized based on having the high, medium, or low potential to discharge pollutants to surface waters of the state. Facilities with the high potential for pollutant runoff shall include, but are not limited to, the applicant's fleet maintenance and storage yards. The applicant may submit a demonstration with a description of how the applicant's fleet maintenance and storage yard has the low potential to discharge pollutants to surface waters of the state.

Prioritized Facility List (page and paragraph of attachments): Attach. A, p. 7, Section VII.64

Fleet Maintenance and Storage Yard Demonstrations (page and paragraph of attachments): _____

65. Is a site-specific standard operating procedure (SOP) available identifying the structural and non-structural storm water controls implemented and maintained to prevent or reduce pollutant runoff at each facility with the high potential for pollutant runoff? The SOP shall be available at each facility with the high potential for pollutant runoff and upon request from the MDEQ. The SOP shall identify the person responsible for oversight of the facility. *The MDEQ may request the submission of the SOP during the application review process.*

Yes, a site-specific SOP is available at each facility with the high potential for pollutant runoff

Not Applicable – The applicant does not own or operate any facilities with the high potential for pollutant runoff. Skip to Question 70.

66. Provide the reference in the SOP, for each facility with the high potential for pollutant runoff, to the following: the list of significant materials stored on-site that could pollute storm water; the description of the handling and storage requirements for each significant material; and the potential to discharge the significant material.

SOP Reference (page and paragraph of attachments): _____

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This space is available to reference multiple site-specific SOPs

67. Provide the reference in the SOP, for each facility with the high potential for pollutant runoff, identifying the good housekeeping practices implemented at the site. *Good housekeeping practices include keeping the facility neat and orderly, properly storing and covering materials, and minimizing pollutant sources to prevent or reduce pollutant runoff.*

SOP Reference (page and paragraph of attachments): _____

This space is available to reference multiple site-specific SOPs

68. Provide the reference in the SOP, for each facility with the high potential for pollutant runoff, to the description and schedule for conducting routine maintenance and inspections of storm water management and control devices to ensure materials and equipment are clean and orderly and to prevent or reduce pollutant runoff. *A biweekly schedule is recommended for routine inspections.*

SOP Reference (page and paragraph of attachments): _____

This space is available to reference multiple site-specific SOPs

69. Provide the reference in the SOP, for each facility with the high potential for pollutant runoff, to the description and schedule for conducting a comprehensive site inspection at least once every six months. The comprehensive inspection shall include an inspection of all structural storm water controls and a review of non-structural storm water controls to prevent or reduce pollutant runoff.

SOP Reference (page and paragraph of attachments): _____

This space is available to reference multiple site-specific SOPs

70. Provide the procedure identifying the BMPs currently implemented or to be implemented during the permit cycle to prevent or reduce pollutant runoff at each facility with the **medium and lower potential for the discharge of pollutants** to surface waters of the state using the assessment and prioritized list in Questions 63 and 64.

Procedure Reference (page and paragraph of attachments): Attachment A, p. 7, Section VII.70

Structural Storm Water Control Operation and Maintenance Activities

71. Provide the procedure for prioritizing each catch basin for routine inspection, maintenance, and cleaning based on preventing or reducing pollutant runoff. The procedure shall include assigning a priority level for each catch basin and the associated inspection, maintenance and cleaning schedule based on preventing or reducing pollutant runoff. The procedure shall include a process for updating/revising the priority level for a catch basin giving consideration to inspection findings and citizen complaints. *A recommended timeframe for updating/revising the procedure is 30 days following the construction of a catch basin or a change in priority level.*

- Procedure Reference (page and paragraph of attachments): Attach. A, p. 7, Section VII.71
 Not Applicable – The applicant does not own or operate catch basins. Skip to Question 75.

72. Provide the geographic location of the catch basins in each priority level using either a narrative description or map.

Catch Basin Priority Location (page and paragraph of attachments): Attachment A, p. 7, Section VII.72

73. Provide the procedure for inspecting, cleaning, and maintaining catch basins to ensure proper performance. Proper cleaning methods include ensuring accumulated pollutants are not discharged during cleaning and are removed prior to discharging to surface waters of the state. *A compliance assistance document titled Catch Basin Cleaning Activities Guidance Document is available at http://www.michigan.gov/documents/deq/wb-stormwater-CatchBasinGuidance_216198_7.pdf.*

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Procedure Reference (page and paragraph of attachments): Attachment A, p. 7, Section VII.73

74. Provide the procedure for dewatering, storage, and disposal of materials extracted from catch basins. *A compliance assistance document titled Catch Basin Cleaning Activities Guidance Document is available at http://www.michigan.gov/documents/deq/wb-stormwater-CatchBasinGuidance_216198_7.pdf.*

Procedure Reference (page and paragraph of attachments): Attachment A, p. 7, Section VII.74

75. Provide the procedure for inspecting and maintaining the structural storm water controls identified in Question 60, excluding the structural storm water controls included in an SOP as part of Question 65 and catch basins. The procedure shall include a description and schedule for inspecting and maintaining each structural storm water control and the process for disposing of maintenance waste materials. The procedure shall require that controls be maintained to reduce to the maximum extent practicable the contribution of pollutants to storm water. The procedure shall include a process for updating/revising the procedure to ensure a maintenance and inspection program for each structural storm water control. *A recommended timeframe for updating/revising the procedure is 30 days following the implementation of a new structural storm water control.*

- Procedure Reference (page and paragraph of attachments): Attachment A, p. 7, Section VII.75
 Not Applicable – Applicant does not own or operate any structural storm water controls

76. Provide the procedure requiring new applicant-owned or operated facilities or new structural storm water controls for water **quantity** be designed and implemented in accordance with the post-construction storm water runoff control performance standards and long-term operation and maintenance requirements.

Procedure Reference (page and paragraph of attachments): Attachment A, p. 7-8, Section VII.76

Municipal Operations and Maintenance Activities

77. Provide the procedure with the assessment of the applicant's operation and maintenance activities for the potential to discharge pollutants to surface waters of the state. The assessment shall identify all pollutants that could be discharged from each applicable operation and maintenance activity and the BMPs being implemented or to be implemented to prevent or reduce pollutant runoff. The procedure shall include a process for updating and revising the assessment. *A suggested timeframe for updating/revising the assessment is 30 days following adding/removing BMPs to address new and existing operation and maintenance activities.*

At a minimum, the procedure shall include assessing the following municipal operation and maintenance activities if applicable (check all that apply):

- Road, parking lot, and sidewalk maintenance (e.g., pothole, sidewalk, and curb and gutter repair)
 Bridge maintenance
 Right-of-way maintenance
 Unpaved road maintenance
 Cold weather operations (e.g., plowing, sanding, application of deicing agents, and snow pile disposal)
 Vehicle washing and maintenance of applicant-owned vehicles (e.g., police, fire, school bus, public works)

- Procedure Reference (page and paragraph of attachments): Attachment A, p. 8, Section VII.77
 Not Applicable – Provide an explanation below.

78. Provide the procedure for prioritizing applicant-owned or operated streets, parking lots, and other impervious infrastructure for street sweeping based on the potential to discharge pollutants to surface waters of the state. The procedure shall include assigning a priority level for each parking lot and street and the associated cleaning schedule (i.e., sweeping frequency and timing) based on preventing or reducing pollutant runoff. The procedure shall include a process for updating/revising the priority level giving consideration to street sweeping findings and citizen complaints. *A recommended timeframe for updating/revising the prioritization is 30 days following the construction of a new street, parking lot, or other applicant-owned or operated impervious surface or within 30 days of identifying a need to revise a priority level.*

- Procedure Reference (page and paragraph of attachments): Attachment A, p. 8, Section VII.78
 Not Applicable – The applicant does not own or operate any streets, parking lots, or other impervious infrastructure. Skip to Question 82.

79. Provide the geographic location of the streets, parking lots, and other impervious surfaces in each priority level using either a narrative description or map.

Street Sweeping Priority Location (page and paragraph of attachments): Attachment A, p. 8, Section VII.79

80. Provide the procedure identifying the sweeping methods based on the applicant's sweeping equipment and use of additional resources in sweeping seasonal leaves or pick-up of other materials. *Proper sweeping methods include operating sweeping*

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equipment according to the manufacturers' operating instructions and to protect water quality.

Procedure Reference (page and paragraph of attachments): Attachment A, p. 8, Section VII.80-81

81. Provide the procedure for dewatering, storage, and disposal of street sweeper waste material. *A compliance assistance document titled Catch Basin Cleaning Activities Guidance Document is available at http://www.michigan.gov/documents/deq/wb-stormwater-CatchBasinGuidance_216198_7.pdf.*

Procedure Reference (page and paragraph of attachments): Attachment A, p. 8, Section VII.80-81

Managing Vegetated Properties

82. Provide the procedure requiring the applicant's pesticide applicator to be certified by the State of Michigan as an applicator in the applicable category, to prevent or reduce pollutant runoff from vegetated land. A description of the categories is located at http://www.michigan.gov/mdard/0,4610,7-125-1569_16988_35289-11992--,00.html

Procedure Reference (page and paragraph of attachments): Attachment A, p. 8, Section VII.82

Not Applicable – Provide an explanation below (e.g., the applicant's pesticide applicator only uses ready-to-use products from the original container).

Contractor Requirements and Oversight

83. Provide the procedure requiring contractors hired by the applicant to perform municipal operation and maintenance activities comply with all pollution prevention and good housekeeping BMPs as appropriate. The procedure shall include the process implemented for providing oversight of contractor activities to ensure compliance.

Procedure Reference (Page and Paragraph of Attachments): Attachment A, p. 8, Section VII.83

Employee Training

84. Provide the employee training program to train employees involved in implementing or overseeing the pollution prevention and good housekeeping program. The program shall include the training schedule. At a minimum, existing staff shall be trained once during the permit cycle and within the first year of hire for new staff.

Program Reference (Page and Paragraph of Attachments): Attachment A, p. 8, Section VII.84

Total Maximum Daily Load (TMDL) Implementation Plan

The following questions address discharges to impaired waters with a USEPA approved TMDL that includes a pollutant load allocation assigned to the permittee's MS4. BMPs shall be implemented to reduce the discharge of the TMDL pollutant from the MS4 to make progress in meeting Water Quality Standards. Applicable TMDLs are TMDLs approved prior to the applicant being notified of the need to apply for permit reissuance. Applicable TMDLs for the applicant were provided in the application notice letter.

The applicant shall describe the current and proposed BMPs to meet the minimum requirements for the TMDL Implementation Plan, which shall be incorporated into the SWMP. Please indicate in your response, if you are or will be working collaboratively with watershed or regional partners on any or all activities in the TMDL Implementation Plan during the permit cycle. The following questions represent the minimum requirements for a TMDL Implementation Plan. Please complete the following questions as appropriate. A measurable goal with a measure of assessment shall be included for each BMP, and, as appropriate, a schedule for implementation (months and years), including interim milestones and the frequency of the BMP. The responses shall reflect the nested MS4s identified in Section VI.

The USEPA has a document to assist with developing a TMDL Implementation Plan available at http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/upload/region3_factsheet_tmdl.pdf.

85. Was a TMDL included in the applicant's application notice?

Yes, the following approved USEPA TMDL(s) was included in my application notice letter:

No, Skip to Section VIII.

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86. Provide the procedure for identifying and prioritizing BMPs currently being implemented or to be implemented during the permit cycle to make progress toward achieving the pollutant load reduction requirement in each TMDL identified in Question 85. The procedure shall include a process for reviewing, updating, and revising BMPs implemented or to be implemented to ensure progress in achieving the TMDL pollutant load reduction.

Procedure Reference (page and paragraph of attachments): e.g., *Attachment A, Page 3, Section b* _____

87. Provide the list of prioritized BMPs currently being implemented or to be implemented during the permit cycle to make progress toward achieving the pollutant load reduction requirement in each TMDL identified in Question 85. Each BMP shall include a reference to the targeted TMDL pollutant.

TMDL BMP Priority List (page and paragraph of attachments): _____

88. Provide the monitoring plan for assessing the effectiveness of the BMPs currently being implemented, or to be implemented, in making progress toward achieving the TMDL pollutant load reduction requirement, including a schedule for completing the monitoring. Monitoring shall be specifically for the pollutant identified in the TMDL. Monitoring may include, but is not limited to, outfall monitoring, in-stream monitoring, or modeling. At a minimum, monitoring shall be conducted two times during the permit cycle or at a frequency sufficient to determine if the BMPs are adequate in making progress toward achieving the TMDL pollutant load reduction. *Existing monitoring data may be submitted for review as part of the plan to meet part of the monitoring requirement.*

TMDL Monitoring Plan (page and paragraph of attachments): _____

SECTION VIII. CERTIFICATION

Rule 323.2114(1-4), promulgated under the NREPA, requires that this Application be signed by either a principal executive officer or ranking elected official (e.g., mayor, village president, city or village manager, or clerk). Note: If the signatory is not a principal executive officer or ranking elected official, but is authorized to sign the Application, please provide documentation of the authorization.

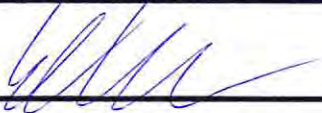
"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage 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 having knowledge of violations."

I understand that my signature constitutes a legal agreement to comply with the requirements of the NPDES Permit. I certify under penalty of law that I possess full authority on behalf of the legal owner/permittee to sign and submit this Application. I certify to the best of my knowledge that it is true, accurate and meets the minimum permit requirements for a SWMP to the MEP.

Print Name: Elaine Leven

Title: Planning & Zoning Coordinator

Representing: Charter Township of Oakland

Signature: 

Date: March 30, 2015

Please submit this completed Application and attachments to:

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
WATER RESOURCES DIVISION
PERMITS SECTION
P.O. BOX 30458
LANSING, MICHIGAN 48909-7958

Attachment A

NPDES MS4 Storm Water Discharge Permit Application Oakland Township, Michigan April 1, 2015

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Section IV. Regulated Area

The Charter Township of Oakland MS4 consists of four outfalls and associated conveyance infrastructure at three public facilities owned by the Township; all other storm water infrastructure within the 36-square mile township is under the jurisdiction of the Oakland County Road Commission, the Oakland County Water Resources Commissioner's Office, the Michigan Department of Transportation, or is privately owned and operated.

The regulated area for this permit includes the land area of three public facilities, as follows:

- Township Offices including Fire Station #1, 4393 Collins Road, 48306
- Fire Station #2, 1888 N. Rochester Rd, 48363
- Paint Creek Cider Mill, 4480 Orion Rd, 48306 (two outfalls)

The locations of these Township-owned properties are shown in Figure 1 along with the urban area boundaries with Oakland Township. Additional detail regarding the locations of the individual outfalls are provided in Figure 2.

Section V. Outfalls and Points of Discharge

Table 1 lists each outfall owned and operated by the Charter Township of Oakland and their receiving waters.

Section VI. Nested Jurisdictions

Not Applicable – no nested jurisdictions

Section VII. Storm Water Management Program (SWMP)

1. Enforcement Response Procedure (ERP)

Enforcement response for violation of Oakland Township ordinances is conducted by the Township Building Director and Building Officer. Examples of chapters of Township Code that relate to storm water and that are enforced by these staff include:

- Chapter 4: Building and Building Regulations (Property Maintenance Code),
- Chapter 6: Environment (Floodplain and Wetlands Protection, Stormwater Management and Erosion Control, Tree Protection), and
- Chapter 20: Parks and Recreation.

All Chapters of Township Code are readily available from the Oakland Township Web Site via <http://www.ecode360.com/OA3183>.

The Township's enforcement response procedures includes (1) notification of the Oakland County Sheriff's Department and the Oakland Township Fire Department for non-administrative code violations (e.g. violations likely to require a law enforcement or physical response), (2) on-site investigation of the complaint or incident, (3) written documentation of the problem and required enforcement/correction action, and (4) follow-up investigation to confirm that the issues has been resolved. Documentation of the complaint and enforcement response is recorded using Township BS&A software. Administrative complaints involving another County agency, such as soil erosion complaints regulated under Part 91 of Michigan Act 451 of 1994, are referred to the appropriate

Oakland County department as soon as possible (e.g. Water Resources Commissioner, Road Commission).

Public Participation/Involvement Program (PPP)

2. The Charter Township of Oakland is divided into two tributary subwatersheds of the Clinton River: Stony and Paint Creeks. The overarching Storm Water Management Plan (SWMP) for these tributary basins is the Stony/Paint Creeks Watershed Plan. From 2000 to 2003, a number of public participation meetings and workshops were held to develop the original plan for Stony Creek, and in 2006 the plan was updated to include Paint Creek. The Township and Township residents participated in the development and implementation of this plan, which was approved by the MDEQ in 2006. From March 30, 2012 to July 9, 2013 watershed residents were surveyed to gather public input for future updates to the various Clinton River subwatershed plans. An online survey was advertised on community websites, social media, postcards and postcards with bar code links. The survey was also conducted via a door-to-door canvass conducted by Clean Water Action. Future revisions and updates to the plan are the responsibility of the Clinton River Watershed Council.

This document (Oakland Township's MS4 Permit Application) serves as the SWMP specific to Oakland Township. It will be made available for public inspection and comment on the Township's website. Availability of the permit application document will be announced at the Township's April 8, 2015 Board of Trustees' meeting. Changes or input suggested by the public received by their May 13th meeting will be incorporated and submitted to the MDEQ.

Additional public participation in the SWMP consists of public inspection of and comment on Oakland Township ordinances, which are readily available from the Township web site; public notice of any ordinance amendments as required by State law and local ordinance; and links to documents, meeting schedules, and other applicable information on the Township web page, www.oaklandtownship.org.

3. Public involvement in implementation of the SWMP is invited primarily through the Township's Public Education Program, described below and through participation in local activities of the Oakland township Stewardship Committee, the Oakland Township Parks and Recreation Department, through the Township's annual Clean Scene trash collection, and through participation in events sponsored by the North Oakland Household Hazardous Waste Consortium. AS the SWMP is revised and updated, Township residents will again be invited to provide comment through meetings and review of the Charter Township of Oakland Board of Trustees.

Public Education Program (PEP)

4. Public Education topics have not been prioritized.
5. Public Education for the Oakland Township MS4 consists of promoting storm water best management practices (BMPs) in displays, presentations, brochures, and the Township web site; articles in the Township newsletter; and promotion of household hazardous waste collection, annual clean-up days and adopt-a-roadway activities. Table 2 contains details for each PEP activity. These activities address Township-wide storm water education that is not specifically targeted toward the Township MS4, which is located exclusively at Township-owned facilities. Specifics topics, media, and schedules for the PEP are presented in Table 2.

Public Education for Township-owned facilities includes promotion of good housekeeping practices for staff and contractors whose activities could affect storm water quality, through training and contractual requirements. Examples include requests for reduction in salt usage by the snow removal contractor, and issuance of a landscape maintenance contract that requires that pesticide applicators be certified. Procedures for evaluating the effectiveness of these measures include documentation of staff and contractor training and compliance with contract conditions, and changes in observable behavior such as clean-up after vehicle and pavement washing, and salt application quantity.

6. By October 1, 2018, the mid-point of the next permit cycle, the Charter Township of Oakland will conduct a survey to determine the efficacy of its public education program. Results of the 2012-2013 survey described under #2 above, and results of a 2004 Regional Water Quality Awareness Survey conducted by the Southeast Michigan Council of Governments (SEMCOG), will serve as baselines for comparison. Should the survey identify areas where existing public education efforts need to be improved, the PEP will be modified to address any deficiencies.

Illicit Discharge Elimination Program (IDEP)

7. Figure 1 shows the location of each of Oakland Township's four MS4 outfalls. Detailed drawings of the infrastructure leading to each of these outfalls are maintained by the Charter Township of Oakland Planning Department, by the Township's engineer, and by ASTI, the Township's stormwater/environmental consultant.

8-9. Not applicable, the Township will not prioritize its outfalls.

- 10-26. The Charter Township of Oakland conducts dry-weather investigations of their four (4) storm water outfalls once per permit cycle (most recent inspection July 7, 2011). Procedures employed in the Township's Illicit Discharge Identification and Elimination Program (IDEP) are summarized in Table 3 and a sample dry-weather field screening data sheet is provided with Table 3.

Construction Storm Water Runoff Program

27. The Charter Township of Oakland is not a Part 91 agency. Construction soil erosion and sedimentation control is administered by the Oakland County Water Resources Commissioner's Office (OCWRC).
28. Because the Township MS4 and associated drainage area contains only Township-owned facilities that are already developed, new construction and associated construction-related discharges to the MS4 during the permit cycle are not anticipated. However, in the event of a complaint that is directed to Township staff or staff observation of a Part 91 violation, the OCWRC is notified. Depending on the nature of the discharge, Township code enforcement staff may meet Police, Fire, and/or County staff at the site of the discharge to investigate. When a construction-related release of sediment to the Township's MS4 or to waters of the state are confirmed, Township staff will immediately notify the OCWRC staff.
29. Notification of the Michigan Department of Environmental Quality will follow guidelines and requirements provided by the MDEQ: http://www.michigan.gov/documents/deq/deq-op2ca-sara-releasenotificationrequirements_273699_7.pdf

30-31. Construction activity disturbing one acre or greater, or construction activities within 500 feet of an inland lake or stream, whether it may discharge to the MS4 or not, is required to first obtain Act 91 permit. Notification of Part 91 permit requirements are contained within the Township’s Stormwater Management and Erosion Control Ordinance (Chapter 6) and are provided on the Township’s and the OCWRC’s websites.

Post-Construction Storm Water Runoff Program

Ordinance or Other Regulatory Mechanism

32-33. The Township MS4 and its associated drainage areas contain only Township-owned facilities that are already developed. New construction and associated construction-related discharges to the MS4 during the permit cycle are not anticipated. However, in the event of construction on one or more of the three properties containing portions of the Township MS4 , the Township Stormwater Management and Erosion Control Ordinance (Chapter 6, Article III, attached) and, by reference, the Oakland County Water Resources Commissioner Engineering Standards for Storm Water Facilities (Appendix A) will apply.

Additionally, outside of the MS4, subdivisions, site condominiums, and plats must conform to the Township’s Ordinance and the OCWRC Engineering Design Standards.

(From Section 6-215 of the Township’s Stormwater Management and Erosion Control Ordinance)

“(a) Generally, every new development or earth change in the Township shall have either a stormwater management plan or an engineered grading plan, depending on the type of development, as listed below.

(b) Stormwater management plan. A stormwater management plan shall be submitted and reviewed in accordance with requirements of division 2 of this article. The following types of developments and earth changes require a stormwater management plan:

- (1) Land development proposals subject to site plan review requirements in the Township zoning ordinance set out in chapter 36.
- (2) Subdivision plat proposals.
- (3) Land divisions which involve public or private road developments regulated under article IV of chapter 12.
- (4) Any proposal to mine, excavate, or clear and grade one acre or more of land for purposes other than agriculture, routine landscaping, and gardening.
- (5) Development projects of federal, state and local agencies.

Approval of final development plans, site plans, and final preliminary subdivision plats shall not be granted prior to approval of the stormwater management plan.

(c) Engineered grading plan. An engineered grading plan shall be submitted and reviewed in accordance with requirements of division 3 of this article. The following types of new construction of single-family housing units require an engineered grading plan:

- (1) Acreage parcels.
- (2) Platted subdivision lots.

The engineered grading plan shall be approved by the Township Engineer and the designated Township Building Official prior to the issuance of any building permit.

Water Quality Treatment Performance Standard

- 36.** Rules of the OCWRC require capture and treatment of the 10-year and 100-year storms, and require sediment forebays sized to hold the 1-year recurrence interval storm for the capture and treatment of suspended solids. The 1-year, 24-hour storm for Oakland Township is 1.87 inches. By requiring a sediment forebay for the 1-year storm, the county regulations exceed the requirement of 1 inch of rainfall across the site.
- 38.** The OCWRC standards require that stormwater storage treatment systems be designed on site-by-site basis based upon site-specific characteristics, land cover, and acreage. The Township and OCWRC standards allow use of wet and dry detention basins constructed wetlands, and other measures that have been determined, when properly designed to capture 80% of the TSS loads <http://www.mde.state.md.us/assets/document/sedimentstormwater/Appnd D5.pdf>.

Channel Protection Performance Standard

- 39.** Rules of the OCWRC establish the pre-development agricultural runoff rate of 0.20 cfs per acre as the maximum allowable outflow rate (I. C. 4. Page 16; II. C. page 21). The OCWRC's Engineering Design Standards further specify that peak discharge shall be calculated using the 2-year, 24-hour storm (2.24") when manufactured treatments systems are used in lieu of a sediment forebay (II. A.4. page 20).

Further, the Charter Township of Oakland Stormwater Ordinance also requires that "every detention basin shall control the release of stormwater for the ten-year and one-hundred-year frequency storm events. For the ten-year frequency storm event, the peak rate of discharge shall not exceed 0.2 cubic feet per second per acre. For the one-hundred-year frequency storm event, the runoff rate shall not exceed the predevelopment rate" (Section 6-246. (1).e.). Additionally, the Township ordinance requires that stormwater runoff discharged to wetlands must be diffused to non-erosive velocities before it reaches the wetland" (Section 6-246. (4).a.).

Site-Specific Requirements

- 41.** The Township ordinance does allow the infiltration of stormwater and even states that, provided the site exhibits suitable soils and groundwater conditions, it is the Township's preferred method (Section 6-246). The ordinance does not directly address groundwater contamination.

The OCWRC Design Standards limit the use of infiltration trenches to prevent groundwater contamination (II. A.6. page 20), but allow for the use of innovative BMPs when sufficient design information is provided for review (II. A.8. page 21).

- 42.** The OCWRC Design Standards do not specifically address pollutants that may be found in stormwater "hot-spots" other than through the design of detention and the use of manufactured pre-treatment systems in lieu of sediment forebays. The Township's Stormwater Ordinance provides the following general language regarding potential pollutants, "Discharge of runoff from any site which may contain oil, grease, toxic chemicals, or other polluting materials is prohibited unless measures to reduce and trap pollutants meet the requirements of the state department of environmental quality and the Township, based upon professionally accepted principles."
- 43.** The Township ordinance (Section 6-247) does allow the applicant to request a waiver for off-site stormwater conveyance, infiltration, and/or detention provided that maintenance agreements with

other landowners are provided for review and approval and recorded. However, the OCWRC Design Standards do not address offsite mitigation.

Site Plan Review

- 53.** Yes, both OCWRC Design Standards (pp. 6-10) and the Township's Stormwater Ordinance (Section 6-243) require site plan review or approval of post-construction stormwater treatment BMPs. The Township's engineer reviews these plans to determine conformance with Township and County standards.
- 55.** It is the Township's practice for all stormwater detention facilities to be made Chapter 18 drains so that long term maintenance is overseen by the OCWRC's Office (OCRWC Design Standards Part IV, pp. 28-31).

Long-Term Operation and Maintenance

- 56-59.** As noted above, it is the Township's practice for all stormwater detention facilities to be made Chapter 18 drains so that long term maintenance is overseen by the OCWRC's Office (OCRWC Design Standards Part IV, pp. 28-31). Long-term maintenance and operation are not addressed in detail within the Township stormwater ordinance.

Pollution Prevention and Good Housekeeping

Municipal Facility and Structural Storm Water Control Inventory

- 62.** Because the Township MS4 contains only four Township-owned outfalls, and no new construction is anticipated during the permit cycle, the existing inventory is complete. Each of these facilities is inspected during the dry-weather screening conducted once per permit cycle. In the event that changes are made increasing or decreasing the number of stormwater structural controls, the inventory will be updated within 30 days of the completion of construction.

Facility-Specific Storm Water Management

- 63.** Procedures for assessing each facility in the MS4 are contained in regular staff duty descriptions, and include:
- Annual inspection of parking lot catch basins by Fire Department staff,
 - Inspection and clean-out of fire station oil-grit separators for floor drains every six months,
 - Large trench drain sediment cleanout every six months (4 drains; Fire Station #2), and
 - Small trench drain sediment cleanout monthly (5 drains; Fire Station #1).

The only hazardous materials used or stored in the Township are pesticides used by the Parks Department for invasive species control within the Township's natural areas. During the warmer months, the Parks and Recreation Department stores herbicides at Watershed Ridge Park in a rated pesticide safety cabinet that locks, has secondary containment, etc. MSDS sheets are kept with herbicides. Any herbicides remaining at the end of the season are brought back to the Paint Creek Cider Mill and stored in a room set up for pesticide storage (locked, labeled, etc.) Parks maintains spill cleanup kits at the storage site and a kit is taken into the field. Parks staff review spill cleanup procedures with herbicide applicators. Herbicides are typically mixed in the field over a temporary containment device (absorbent pad or tray). With secondary containment in place, potential for release to stormwater drainage is very low at both storage sites. The Township is currently updating their Hazard Communication Program, which includes an inventory of hazardous chemicals and their

locations in various parks. The Township Parks and Recreation Commission's herbicide policy is attached in Appendix C.

Other Township housekeeping practices include employment of a conscientious vehicle maintenance company that properly handles and disposes of used vehicle fluids, the use of biodegradable truck wash detergent, pavement sweeping, and proper sediment waste disposal after vehicle washing.

During the permit cycle, the Township will develop a plan for catch basin clean-out. The plan may include a description of catch basin condition that would trigger the need for clean-out, and cooperative arrangements with neighboring municipalities for the employment of vector equipment and proper materials disposal per the MDEQ Catch Basin Cleaning Activities Guidance Document.

64. Based upon vehicle washing activities, Fire Stations #1 and #2 have the greatest potential for discharge of pollutants to waters of the state. However, all of the Township properties provide stormwater detention and treatment prior to outlet to waters of the state and none of the Township facilities exhibit high potential for discharge of pollutants.
70. Each of the existing MS4 outfalls has a structural control currently in place to treat runoff prior to discharge. These include the following:
- Township Hall /Fire Station #1 Vegetated swale and extended detention dry basin
 - Paint Creek Cider Mill Three dry wells capture parking lot runoff
 - Fire Station #2 Wet detention basin
 - Fire Stations #1 and #2 Trench drains and oil/water separators

Additionally, the following non-structural controls are used to minimize pollutant runoff:

- Contract language controlling salt, pesticide, and fertilizer use by contract service providers
- Monthly street/parking lot sweeping to reduce sediment from fire truck washing
- Use of biodegradable soaps
- Scheduled inspections of catch-basin sumps and floor drains
- Dry-weather outfall screening

Structural Storm Water Control Operation and Maintenance Activities

71. As noted above, the fire stations have a somewhat higher potential for pollutant runoff because of the vehicle washing activities that occur there. As such, the structural controls associated with the fire stations receive higher priority for inspection and maintenance. The five trench drains in Fire Station#1 are inspected and cleaned monthly and the four larger trench drains in Fire Station #2 are inspected and cleaned semi-annually. Responsibility for these inspections and cleaning activities are part of the normal duty roster for Fire Department staff on duty at those times.

Each catch basin that is part of the Township will be inspected annually and the facilities supervisor will be notified if cleaning is recommended. Any changes in materials stored on-site, changes in fleet maintenance, or changes in grounds keeping will be reviewed annually and prioritization and maintenance activities will be updated as necessary.

72. Engineer drawings of each of the Oakland Township MS4 sites are attached as Appendix B.

- 73-74.** Fire Department staff currently inspect each catch basin annually, but there has been no system in place to remove accumulated sediment. As noted above, during the upcoming permit cycle, the Township will develop a plan for catch basin clean-out. The plan will include determining a catch basin condition to trigger clean-out, and discussions with neighboring municipalities to develop a cooperative arrangement for the employment of vacuum equipment and proper materials disposal per the MDEQ Catch Basin Cleaning Activities Guidance Document.
- 75.** Structural stormwater controls, besides the floor drains discussed above, will be inspected each permit cycle during dry-weather screening. Any observations requiring sediment removal or repair will be noted and presented to the Township for scheduling of work.
- 76.** Any new flood-control or water quantity control facilities constructed on one or more of the three properties containing portions of the Township MS4 will, like stormwater treatment facilities, need to conform to the requirements of the Township Stormwater Management and Erosion Control Ordinance (Chapter 6, Article III, attached) and, by reference, the Oakland County Water Resources Commissioner Engineering Standards for Storm Water Facilities (Appendix A).

Municipal Operations and Maintenance Activities

- 77.** Once per permit cycle the Township assesses its operations and maintenance activities for clean-out of oil-grit separators and trench drains associated with the fire stations, parking lot catch basin inspection and clean-out, and vehicle washing and maintenance. Contracts for other grounds maintenance activities such as snow removal and landscape maintenance are reviewed annually. These assessments identify the potential for pollutant discharge and BMPs to prevent or reduce pollutant runoff are updated as deemed necessary. Any changes to operations or condition that require a change in maintenance will be addressed within 30-days of the operational change or addition of new structural controls.
- 78.** Prioritization of Township owned and operated streets and parking lots is not required because the Township does not own or operate any streets or roads and the Township MS4 only drains three parking lots. This makes it practical to include all facilities in regular operations and maintenance activities. Each parking lot is swept a minimum of once per year and, as noted previously high traffic areas/aprons of the fire station parking lots are swept monthly to clear accumulated sediment.

As noted above the Township assesses its operations and maintenance activities at a minimum of once per permit cycle. Any changes to operations or condition that require a change in maintenance will be addressed within 30-days of the operational change or addition of new structural controls.

- 79.** The location of the Oakland Township MS4 owned and operated parking lots are provided in the attached engineering drawings (Appendix B).
- 80-81.** Parking lot sweeping, outside of that done by Fire Department personnel by hand, and leaf pickup are conducted on a contractual basis.

Managing Vegetated Properties

- 82.** The procedure for requiring pesticide applicators to be certified by the State of Michigan is written into their contract language. A copy of the 2015 RFP for contractual landscape service providers is attached as Appendix C.

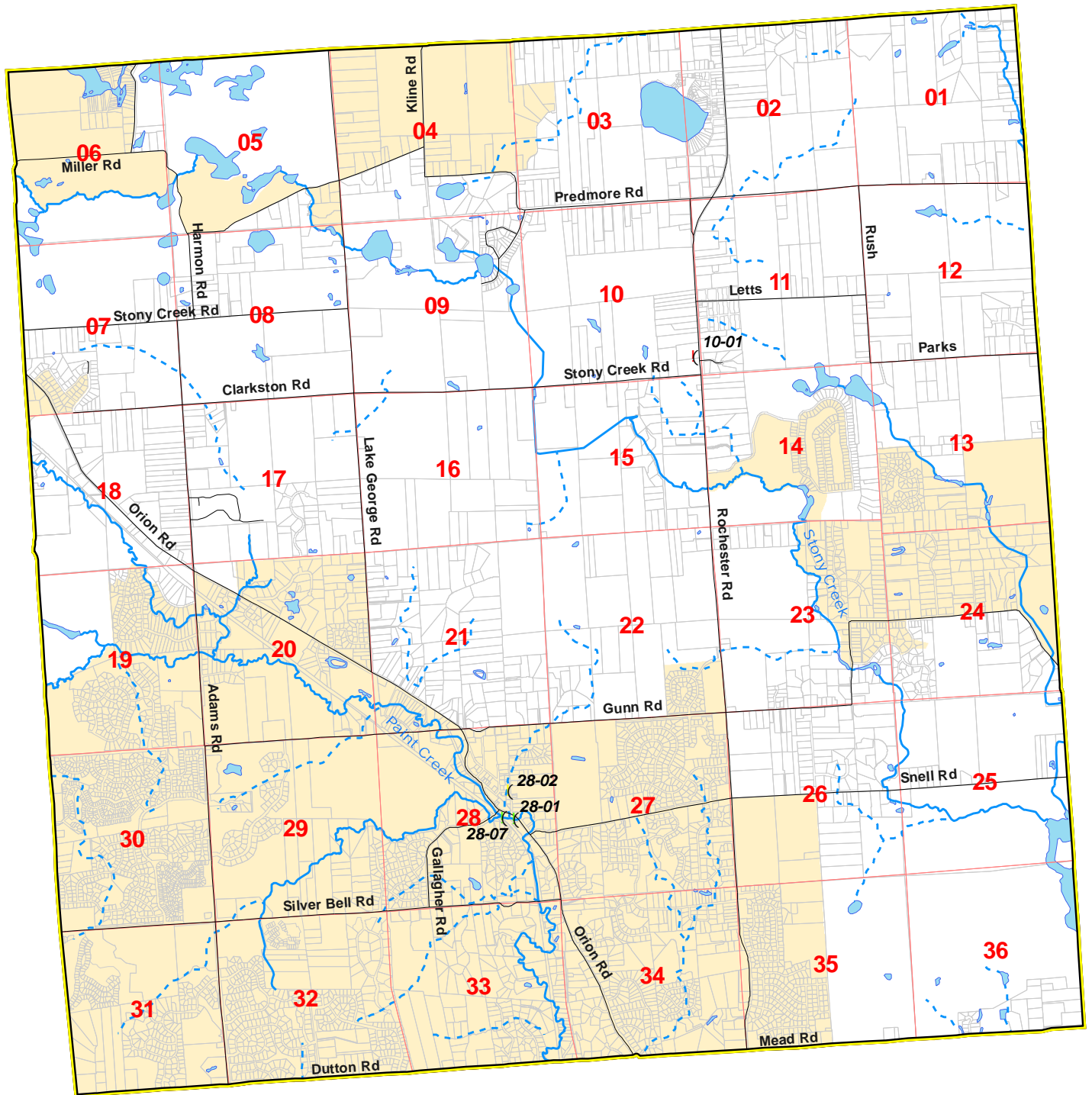
- 83.** Pollution prevention and good housekeeping BMPs are written into landscape service provider contract language. A copy of the 2015 RFP for contractual landscape service providers is attached as Appendix C.

Employee Training

- 84.** Fire and Building Department staff and professional contractors hold the primary responsibility for MS4 housekeeping. Fire Department and Building Department staff must participate in training activities annually to maintain their certification and licensure. Annual training includes storm water awareness training, including IDEP, pollution prevention and good housekeeping practices, and hazardous materials spill response and prevention. Videos of training modules are provided to new hires for as-needed training. Additionally, the Charter Township of Oakland Fire Chief has agreed to incorporate IDEP training into the annual workshop he coordinates for other fire personnel.

Parks personnel are trained in the proper mixing, use, storage, and disposal of pesticides on an annual basis and Parks staff train other contractors hired for herbicide applications on specific Parks and Recreation Department properties or projects.

FIGURES



Legend

<u>Point Source Discharge</u>	⎓ Roads	▭ Parcels
(Fire Station #2 (10-01)*	▭ Township Sections	▭ Detroit Urbanized Area (2010 Census)
(Paint Creek Cider Mill (28-01, 28-07)*	- - - Drains	▭ Oakland Township
(Township Office and Fire Station #1 (28-02)*	~ Rivers & Streams	
<i>*Numbers refer to ECT's 9/19/05 outfall survey</i>	☪ Lakes & Ponds	

Oakland Township

Oakland County, Michigan

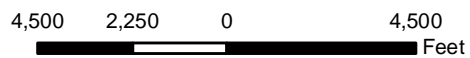
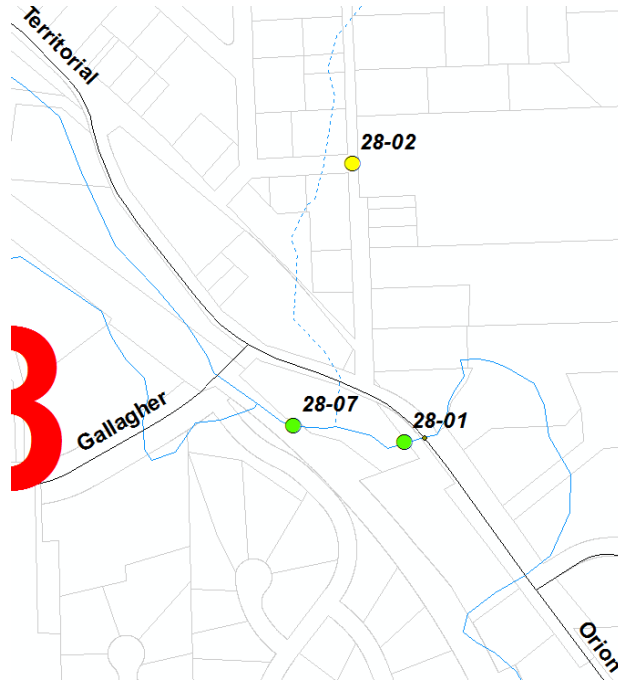


Figure 1 - Point Source Discharge Locations & Urban Area Boundaries

Figure 2. Point Source Discharge Detail.



<u>Facility</u>	<u>Outfall Number(s)</u>
Township Offices including Fire Station #1	28-02
Fire Station #2	10-01
Paint Creek Cider Mill	28-01, 28-07

TABLES

Michigan Department of Environmental Quality – Water Resources Division
STORM WATER DISCHARGE PERMIT APPLICATION

Table 1 – Outfall and Point of Discharge Information

An identification number shall be provided for each outfall and point of discharge. Please note that the latitude and longitude is not required as part of the application. When entering a point of discharge, the receiving water is the point where the storm water enters a surface water of the state. The following definitions apply to these terms:

- **Outfall** means a discharge point from an MS4 directly to surface waters of the state
- **Point of Discharge** means a discharge from an MS4 to an MS4 owned or operated by another public body

A. Outfall/ Point of Discharge No.:	<input checked="" type="checkbox"/> Outfall <input type="checkbox"/> Point of Discharge	Outfall/Point of Discharge Identification No.: 28-02
B. Receiving Water:	Receiving Water : Unnamed Tributary to Paint Creek (Bear Creek?)	
C. Latitude/Longitude (Optional)	Latitude: 42.734609	Longitude: -83.161469
A. Outfall/ Point of Discharge No.:	<input checked="" type="checkbox"/> Outfall <input type="checkbox"/> Point of Discharge	Outfall/Point of Discharge Identification No.: 28-07
B. Receiving Water:	Receiving Water : Paint Creek	
C. Latitude/Longitude (Optional)	Latitude: 42.732276	Longitude: -83.162231
A. Outfall/ Point of Discharge No.:	<input checked="" type="checkbox"/> Outfall <input type="checkbox"/> Point of Discharge	Outfall/Point of Discharge Identification No.: 28-01
B. Receiving Water:	Receiving Water : Paint Creek	
C. Latitude/Longitude (Optional)	Latitude: 42.732116	Longitude: -83.160887
A. Outfall/ Point of Discharge No.:	<input checked="" type="checkbox"/> Outfall <input type="checkbox"/> Point of Discharge	Outfall/Point of Discharge Identification No.: 10-01
B. Receiving Water:	Receiving Water: Un-named drainage	
C. Latitude/Longitude (Optional)	Latitude: 42.771299	Longitude: -83.138159
A. Outfall/ Point of Discharge No.:	<input type="checkbox"/> Outfall <input type="checkbox"/> Point of Discharge	Outfall/Point of Discharge Identification No.:
B. Receiving Water:	Receiving Water :	
C. Latitude/Longitude (Optional)	Latitude:	Longitude:
A. Outfall/ Point of Discharge No.:	<input type="checkbox"/> Outfall <input type="checkbox"/> Point of Discharge	Outfall/Point of Discharge Identification No.:
B. Receiving Water:	Receiving Water :	
C. Latitude/Longitude (Optional)	Latitude:	Longitude:
A. Outfall/ Point of Discharge No.:	<input type="checkbox"/> Outfall <input type="checkbox"/> Point of Discharge	Outfall/Point of Discharge Identification No.:
B. Receiving Water:	Receiving Water :	
C. Latitude/Longitude (Optional)	Latitude:	Longitude:

MDEQ Water Resources Division – Stormwater Discharge Permit Application

Table 2. Public Education Program Best Management Practices (BMPs)

PEP Topic	BMP Identifier	BMP Descriptor	Partner Collaboration	Target Audience	Key Messages	Delivery Mechanism	Year	Frequency	Responsible Party	Measurable Goal & Evaluation Method
A B C D E F G	Presentations and Displays	Provide displays and presentations for water quality-related topics and events Oakland Township continually provides a display of the "Seven Simple Steps to Clean Water" and provides brochures associated with that campaign at the front desk of the Township municipal offices.	N/A	Citizens including the general public and county and municipal employees	Pollution prevention, lawn & vehicle care, hazardous chemicals storage & disposal, pet waste clean-up, water conservation	Displays and presentations	Ongoing	Upon request and availability of staff time; Seven Steps display ongoing; One additional display once in the next 5 years.	Township Administration	Seven Steps display is presented at the Township offices.
A B C D E F G	Regional Public Education Efforts	Continue to participate in the Southeast Michigan Partners for Clean Water group facilitated by SEMCOG and support/share the resources available from this group, including: Seven Simple Steps to Clean Water brochures, tip cards and kids activity sheets.	SEMCOG	Citizens including the general public and county and municipal employees	Pollution prevention, lawn & vehicle care, hazardous chemicals storage & disposal, pet waste clean-up, water conservation, storm drain awareness	Displays, brochures, flyers, activity sheets	Ongoing	Ongoing	Township Administration	Tip cards and a Seven Steps display are presented at the Township offices. Activity sheets are provided upon request.
A B C D E F G H I J K	Public Education Website	Oakland Township's website includes pages for Environmental Information, the "Clean Scene" annual environmental cleanup event, newsletters, meeting schedules, and links to other governmental and environmental web sites. This set of resources encourages environmental awareness and public participation, and contributes to citizen adherence to Township ordinances and reporting of environmental ordinance violations.	N/A	Citizens including the general public and county and municipal employees; commercial, industrial and institutional entities	Link to CRWC website includes subwatershed maps and plans and education resources; link to the Oakland County Water Resources Commissioner's Office contains the pollution incident reporting hotline; links to MDOT and the Michigan Water Stewardship Program contain information about stormwater management.	Web site	Ongoing	The website is in place and is continuous	Township Administration	Number of links and amount of materials posted.
A B C D E F G H I J K	Newsletter Articles	Write or publish articles about watersheds and stormwater pollution prevention in existing municipal newsletters, such as: Healthy Lawn Care Tips, Septic System Care and Maintenance, and Household Hazardous Waste Collection Day. Hardcopies of the newsletter are disseminated to approximately 8,000 households/addresses two to four times per year. The newsletter is also published on the Township's website.	N/A	Citizens including the general public and county and municipal employees; commercial, industrial and institutional entities	Pollution prevention, lawn & vehicle care, hazardous chemicals storage & disposal, pet waste clean-up, water conservation, storm drain awareness	Newsletter	Annually	2 to 4 times annually	Township Administration	One article and/or event announcement in each published newsletter.

MDEQ Water Resources Division – Stormwater Discharge Permit Application

Table 2. Public Education Program Best Management Practices (BMPs)

PEP Topic	BMP Identifier	BMP Descriptor	Partner Collaboration	Target Audience	Key Messages	Delivery Mechanism	Year	Frequency	Responsible Party	Measurable Goal & Evaluation Method
A B C D E G K	Household Hazardous Waste Information	Advertize Household Hazardous Waste Collection Days being held by North Oakland Household Hazardous Waste Consortium in the Township newsletter and website, and in flyers and brochures.	North Oakland Household Hazardous Waste Consortium; Oakland County	Citizens including the general public and county and municipal employees	Responsible disposal of household hazardous waste	Newsletter, Web Site, Flyers	Annually	4 to 5 times annually	Oakland County Economic Development & Community Affairs, Oakland Township administration provides announcements locally	Event announcements on web site and in newsletters.

Table 3. Illicit Discharge Elimination Program - Charter Township of Oakland

Permit Task Number/Procedure	Description	Schedule
1. Field Observation and Response		
<p>Task 10 - Field Observations. Perform visual inspections of Township-owned or operated stormwater outfalls.</p>	<p>Observe the four outfalls for indications of non-stormwater discharge (Deposits or stains on discharge structure or bank, vegetation condition, structural condition of outfall, biological indicators, water clarity, color, odor, floatable materials) once per permit cycle.</p>	<p>Dry-weather screening of visual indicator parameters at 4 outfalls once every 5 years (next screening Fall 2016).</p>
<p>Task 11 - Field Screening. Perform dry-weather screenings of Township-owned or operated stormwater outfalls.</p>	<p>If dry-weather flow is found, analyze discharge from the four outfalls for indicator parameters (ammonia, fluoride, surfactants, hardness, and <i>E. coli</i>) once per permit cycle.</p>	<p>Water quality sampling and analysis, as needed, conducted during dry-weather screening (next screening Fall 2016).</p>
<p>Task 12 - Source Investigation. Evaluate potential sources of illicit discharge into the Township MS4.</p>	<p>Township-owned properties are the only potential sources of illicit discharge into the Township MS4, therefore monitoring of potential sources by Township facilities staff will be ongoing. Train appropriate township staff regarding illicit connections and discharges, failed stormwater and sewage infrastructure, safety issues, and natural occurring phenomena which may be confused with illicit discharges.</p>	<p>Annual inspection for potential illicit discharge sources during routine catch basin and outfall housekeeping inspection.</p>

Table 3. Illicit Discharge Elimination Program - Charter Township of Oakland

Permit Task Number/Procedure	Description	Schedule
<p>Task 13 - Illegal Dumping/Spill Response. Respond to complaints and conduct clean-up activities as needed.</p>	<p>The Township ordinance enforcement team responds to complaints as needed, notifying Township Fire Department and County Sheriff's Department as appropriate. County Sheriff notifies County Environmental Health Services as needed. Township Fire Department staff receive annual training on emergency clean-up response and participate in regional response team. Annual clean-up day and adopt-a-roadway program engage citizen participation in clean-up of illegally dumped items.</p>	<p>Response to emergency dumping/spill conditions is immediate via 911 notification. Response to ordinance violation complaints is same-business-day. Township-wide clean-up day is held annually, and adopt-a-roadway activity by individuals and groups is ongoing.</p>
<p>Task 15 - 24-Hour Hotline for Reporting Illicit Discharge. Report release of polluting material from the MS4 to surface waters or groundwaters of the state to MDEQ.</p>	<p>Any release of a polluting material from the Township MS4 to waters of the state will be reported to the MDEQ Southeast Michigan District Office if during business hours (586-753-3700), or to the MDEQ 24-Hour PEAS Hotline (800-292-4706). This notification information is posted on the Township web site.</p>	<p>Ongoing.</p>
<p>Task 17 - Illicit Discharge Response. Respond to complaints and conduct enforcement activities as needed.</p>	<p>The Township ordinance enforcement team responds to complaints as needed, notifying Township Fire Department and County Sheriff's Department as appropriate. County Sheriff notifies County Environmental Health Services as needed.</p>	<p>Response to emergency dumping/spill conditions is immediate via 911 notification. Response to ordinance violation complaints is same-business-day. Tracking of enforcement response occurs in Township BS&A Software.</p>

Table 3. Illicit Discharge Elimination Program - Charter Township of Oakland

Permit Task Number/Procedure	Description	Schedule
2. IDEP Training and Evaluation		
Task 18 - IDEP Training.	Township staff that provide ordinance enforcement, facilities maintenance, and fire prevention services receive on-going training. Training regarding techniques for identifying illicit discharges and reporting procedures will be added to their annual training by 2016. Staff training is provided annually and materials and videos are provided for self-directed training. Grounds maintenance contractors are provided with information on best management practices at time of contract renewal and during contract as needed.	Annual training for applicable Fire and Building Department personnel. Monthly participation in Michigan Association of Code Enforcement Officers for applicable staff. Contract renewal as needed.
Task 19 - Evaluation of IDEP Effectiveness.	Review field observations and screening results for the four outfalls. Evaluate program efficiency and effectiveness, and document any recommendations for program changes for next permit cycle.	Once per permit cycle (next evaluation 2016)
3. Ordinances		
Task 20, 21, 22, 23, 24, 25, 26 - Review existing legal authority to implement the IDEP and develop adequate legal authority as necessary. Comprehensive ordinance review to determine compliance with State enabling legislation and other applicable codes.	The Township is in the process of codifying their ordinances. Once that process has been finalized, earlier efforts to review individual Township ordinances will be resumed. This will include review and update, as necessary, of the stormwater ordinance. The Michigan Plumbing Code (2009 MPC) includes language authorizing Township officials to investigate and correct illicit discharges. The Plumbing Code, and the Township's police powers to protect the health, safety, and welfare of its citizens were deemed adequate to conduct the township-wide illicit discharge investigations and dry-weather screening conducted in 2005 and 2011.	If existing code is deemed insufficient then Oakland Township will include elements of the County's model IDEP ordinance in its stormwater standards. It is anticipated that the Township's stormwater ordinance will be reviewed and revised during the permit cycle.

DRAINAGE SYSTEM SCREENING

GENERAL

Date 7/7/11 Time 12:30 ID 28-02
 Crew Initials PSR Chk By: _____ Air Temp ~80°F Clear/Sunny
 Photographs: Roll # _____ Picture # _____ Rain Yes No Partly Cloudy
 Overcast

FLOW MEASUREMENTS

Pipe Sampled: Size (in) 18 CMP Direction SW

Depth: <input type="checkbox"/> Dry, No Water Present <input checked="" type="checkbox"/> Trace, insufficient to quantify Velocity: <input checked="" type="checkbox"/> Insufficient to quantify Method: <input type="checkbox"/> Area * Velocity <input type="checkbox"/> Bucket <input type="checkbox"/> Manning's Flow: <u>None</u> Intermittent <input checked="" type="checkbox"/> Not Checked Flow Check <input type="checkbox"/> Left Sand Bag in Channel <input type="checkbox"/> Removed Sand Bag, intermittent DWF present <input type="checkbox"/> Yes <input type="checkbox"/> No <i>if possible describe frequency, duration, time of day of flow slugs - put in comments section</i>	General Data Depth, (in) <u>1 SUBMERGED</u> Dist Traveled, (ft) _____ Bucket Vol, (gal) _____ Channel Slope (%) _____ Channel Material _____ Channel, n _____	Travel Time Trials #1 (sec) _____ #2 (sec) _____ #3 (sec) _____ Avg (sec) _____ Vel (fps) _____
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OBSERVATIONS (if "other" checked fill in description at bottom of page)

Odor	<input checked="" type="checkbox"/> None	<input type="checkbox"/> Musty	<input type="checkbox"/> Sewage	<input type="checkbox"/> Rotten Egg	<input type="checkbox"/> Gas	<input type="checkbox"/> Oil	<input type="checkbox"/> Other
Color	<input checked="" type="checkbox"/> Clear	<input type="checkbox"/> Light Brown	<input type="checkbox"/> Dark Brown	<input type="checkbox"/> Green	<input type="checkbox"/> Grey	<input type="checkbox"/> Black	<input type="checkbox"/> Other
Turbidity	<input checked="" type="checkbox"/> Clear	<input type="checkbox"/> Slightly Turbid	<input type="checkbox"/> Moderate Turbid	<input type="checkbox"/> Highly Turbid	<input type="checkbox"/> Opaque		<input type="checkbox"/> Other
Floatables	<input checked="" type="checkbox"/> None	<input type="checkbox"/> Trash	<input type="checkbox"/> Sewage	<input type="checkbox"/> Green Scum	<input type="checkbox"/> Oil Sheen		<input type="checkbox"/> Other
Deposits/ Stains	<input checked="" type="checkbox"/> None	<input type="checkbox"/> Mineral	<input type="checkbox"/> Sediment	<input type="checkbox"/> Oily	<input type="checkbox"/> Grease		<input type="checkbox"/> Other
Vegetation	<input checked="" type="checkbox"/> None	<input checked="" type="checkbox"/> Normal	<input type="checkbox"/> Excessive	<input type="checkbox"/> Algae			<input type="checkbox"/> Other
Structural	<input checked="" type="checkbox"/> Normal	<input type="checkbox"/> Cracking	<input type="checkbox"/> Spalling	<input type="checkbox"/> Corrosion	<input type="checkbox"/> Settlement		<input type="checkbox"/> Other

CHEMICAL ANALYSIS

FIELD ANALYSIS

LAB SAMPLE COLLECTED Chem. Sample ID _____
 Bact. Sample ID _____

Temperature _____ °F
 pH _____

Chemistry
 Fluoride _____ mg/L
 Ammonia (as N) _____ mg/L
 Hardness (as CaCO3) _____ mg/L
 Surfactant _____ mg/L

 E. Coli _____ per 100ml

Comments DISCHARGE TO PAINT CREEK ACCESS FROM OAK Co SHERIFF'S OFFICE + TOWNSHIP MUNICIPAL COMPLEX, NO EVIDENCE OF FLOW OR ILLEGAL DISCHARGE

APPENDICES

APPENDIX A

STORMWATER MANAGEMENT REGULATIONS AND DESIGN STANDARDS

Chapter 6. ENVIRONMENT

ARTICLE III. Stormwater Management and Erosion Control

DIVISION 1. GENERALLY

Sec. 6-211. Purposes.

[Ord. No. 54, § 2.00, 8-11-1987]

The purposes of this article shall be:

- (1) To protect public health, safety and welfare by requiring stormwater management whenever new, expanded or modified developments are proposed.
- (2) To promote for the most efficient and beneficial uses of land and water resources.
- (3) To ensure that stormwater runoff from development is controlled so that lake and stream water quality is protected, siltation minimized, and flooding problems avoided.
- (4) To provide for cost-effective and functionally effective stormwater management, and to reduce the need for future remedial projects.
- (5) To prevent soil erosion and sedimentation by requiring temporary and permanent erosion control measures.
- (6) To use the natural drainage system for conveying and receiving stormwater runoff, and to minimize the need to construct storm drain pipes.
- (7) To encourage multiple-purpose stormwater management which enhances the environmental character of the Township.
- (8) To allow wetlands to be used for stormwater detention in selected locations, while ensuring that the natural functions and quality of wetlands throughout the Township are protected to the maximum feasible extent.
- (9) To recognize private responsibility to incorporate stormwater management systems into the early stages of site planning and design.
- (10) To allow for off-site stormwater management under specified conditions.
- (11) To ensure that all stormwater conveyance and detention facilities will be properly maintained.
- (12) To provide penalties for violation of the provisions of this article.

Sec. 6-212. Construction of language.

[Ord. No. 54, § 2.01, 8-11-1987]

The following rules of construction apply to the text of this article:

- (1) Particulars provided by way of illustration or enumeration shall not control general language.

- (2) Ambiguities, if any, shall be construed liberally in favor of protecting natural land and water resources.
- (3) Words used in the present tense shall include the future, and words used in the singular number shall include the plural, and the plural the singular, unless the context clearly indicates the contrary.
- (4) Terms not specifically defined in this article shall have the meaning customarily assigned to them.
- (5) In case of conflict between Township maps and the definitions in this article, the definition shall control.

Sec. 6-213. Abrogation and conflict of authority.

[Ord. No. 54, § 2.02, 8-11-1987]

- (a) Nothing in this article shall be interpreted to conflict with present or future state statutes in the same subject matter. Conflicting provisions of this article shall be abrogated to the extent of the conflict. The provisions of this article shall be construed, if possible, to be consistent with and in addition to relevant state regulations and statutes.
- (b) In their interpretation and application, the provisions of this article shall be held to be minimum requirements and shall be liberally construed in favor of the Township board and shall not be deemed a limitation or repeal of any other powers granted by state statutes.
- (c) This article is not intended to repeal, abrogate or impair any existing easements, covenants, or deed restrictions. However, where this article imposes greater restrictions, the provisions of this article shall prevail. If there is another ordinance that is inconsistent, the terms of the ordinance that is most restrictive shall apply.

Sec. 6-214. Definitions.

[Ord. No. 54, § 3.00, 8-11-1987]

The following words, terms and phrases, when used in this article, shall have the meanings ascribed to them in this section, except where the context clearly indicates a different meaning:

ACCELERATED SOIL EROSION

Means the increased movement of soils that occurs as a result of man's activities.

CONVEYANCE FACILITY

Means a storm drain, as defined in this article.

DETENTION BASIN

Means a structure or facility, natural or artificial, which stores stormwater on a temporary basis and releases it at a controlled rate. A detention basin may drain completely after a storm event, or it may be a pond with a fixed minimum water elevation between runoff events.

DISCHARGE

Means the rate of flow of water at a given point and time, measured in cubic feet per second.

DISTURBED AREA

Means an area of land subjected to the removal of vegetative cover and/or earth-moving activities.

DRAINAGE SYSTEM

Means all facilities, measures, areas, and structures which serve to convey, catch, filter, store, and/or receive stormwater, either on a temporary or permanent basis (also see definitions for primary drainage system and secondary drainage system).

EARTH CHANGE

Means a human-made change in the natural cover or topography of land, including cut and fill activities, which may result

in or contribute to soil erosion or sedimentation of watercourses or wetlands. Earth change does not include the practice of plowing and tilling soil for the purpose of crop production.

ENGINEERED GRADING PLAN

Means a map which shows alterations of topography, alterations of watercourses, flow directions of stormwater runoff, and proposed stormwater management and erosion control measures.

FLOOD

Means a temporary rise in the level of any waterbody, watercourse or wetland which inundates areas not ordinarily covered by water.

FLOODPLAIN

Means the relatively flat areas or lowlands adjoining a watercourse or a body of water which has been or may be covered by floodwater.

INFILTRATION FACILITY

Means a structure or designated area which allows runoff to gradually seep into the ground, e.g. french drains, seepage pits, infiltration basin, dry well, or perforated pipe.

MAINTENANCE AGREEMENT

Means a binding agreement which sets forth the terms and conditions for the maintenance of erosion control measures and stormwater facilities.

NONEROSIVE VELOCITY

Means a rate of flow of stormwater which does not cause erosion.

OFF-SITE FACILITY

Means all or part of a drainage system which is located partially or completely off of the development site which it serves.

PEAK RATE OF DISCHARGE

Means the maximum allowable rate of stormwater flow from a storm event, as measured at a given point and time in cubic feet per second.

PERSON

Means any individual, firm, partnership, association, corporation, company, or organization of any kind, including government agencies, conducting operations within the Township.

PRIMARY DRAINAGE SYSTEM

Means facilities, structures, and areas which convey, store, or receive runoff from storms up to a ten-year frequency.

PROPRIETOR

Means a person, public corporation or authority, or a government agency that holds an interest in land, whether recorded or not.

PUBLIC STORM SEWER

Means a drainage system serving a platted subdivision or other development which has been designed and constructed to be operated and maintained by the county drain Commissioner or the county road commission.

RECEIVING BODY OF WATER

Means any watercourse, lake, pond or wetland into which surface waters are directed, either naturally or artificially.

RETENTION BASIN

Means a holding area for stormwater, either natural or human-made, which does not have an outlet to adjoining watercourses or wetlands. Water is removed from retention basins through infiltration and/or evaporation processes, and retention basins may or may not have a permanent pool of water.

RUNOFF

Means the part of precipitation which flows over the land.

SECONDARY DRAINAGE SYSTEM

Means facilities, structures and areas which convey, store or receive runoff from storms of more than a ten-year frequency and up to a one-hundred-year frequency.

SEDIMENT

Means mineral or organic solid particulate matter that has been removed from its site of origin by the processes of soil erosion, is in suspension in water, or is being transported.

SITE

Means any tract, lot or parcel of land or combination of tracts, lots or parcels of land proposed for development.

SOIL EROSION

Means the wearing away of land by the action of wind, water, gravity or a combination thereof.

SOIL EROSION CONTROL MEASURES

Means a structure, facility, barrier, berm, vegetative cover, basin, and/or other installations designed to control accelerated soil erosion. Temporary measures are installed to control soil erosion during construction or until soils in the contributing drainage area are stabilized. Permanent measures remain after the project is completed.

STORAGE FACILITY

Means a basin, structure, or area, either natural or human-made, which is capable of holding stormwater for the purpose of reducing the rate of discharge from the site.

STORM DRAIN

Means a conduit, pipe, swale, natural channel or human-made structure which serves to transport stormwater runoff. Storm drains may be either enclosed conduits or unenclosed drains.

STORMWATER MANAGEMENT MEASURES AND FACILITIES

Means any facility, structure, channel, area, or measure which serves to control stormwater runoff in accordance with the purposes and standards of this article.

STORMWATER MANAGEMENT PLAN

Means maps and written information which describe the way in which soil erosion and stormwater flows are proposed to be controlled, both during and after construction.

STORMWATER MANAGEMENT SYSTEM

Means the primary drainage system, the secondary drainage system, and all erosion control measures, whether temporary or permanent.

SWALE

Means low-lying area with gradual slopes which transports stormwater.

WATERCOURSE

See the definition of "watercourse" in section 6-32.

WATERSHED

Means a land area which contributes runoff to a receiving body of water, otherwise known as a drainage area.

WETLANDS

See the definition of "wetlands" in section 6-32.

Sec. 6-215. Applicability.

[Ord. No. 54, § 4.00, 8-11-1987]

- (a) Generally. Every new development or earth change in the Township shall have either a stormwater management plan or an engineered grading plan, depending on the type of development, as listed below.
- (b) Stormwater management plan. A stormwater management plan shall be submitted and reviewed in accordance with requirements of division 2 of this article. The following types of developments and earth changes require a stormwater management plan:
 - (1) Land development proposals subject to site plan review requirements in the Township zoning ordinance set out in chapter **36**.
 - (2) Subdivision plat proposals.
 - (3) Land divisions which involve public or private road developments regulated under article **IV** of chapter **12**.
 - (4) Any proposal to mine, excavate, or clear and grade one acre or more of land for purposes other than agriculture, routine landscaping, and gardening.
 - (5) Development projects of federal, state and local agencies.
Approval of final development plans, site plans, and final preliminary subdivision plats shall not be granted prior to approval of the stormwater management plan.
- (c) Engineered grading plan. An engineered grading plan shall be submitted and reviewed in accordance with requirements of division 3 of this article. The following types of new construction of single-family housing units require an engineered grading plan:
 - (1) Acreage parcels.
 - (2) Platted subdivision lots.
The engineered grading plan shall be approved by the Township Engineer and the designated Township Building Official prior to the issuance of any building permit.

Sec. 6-216. Municipal civil infraction.

[Ord. No. 54, art. XI, 8-11-1987; Ord. No. 81, art. X, 6-8-1999]

- (a) Any person found responsible for violation of any of the provisions of this article shall be subject to a civil fine in the amount of \$75 plus costs and other sanctions for each first offense, and a civil fine in the amount of \$150, plus costs and other sanctions for each repeat offense. In addition to ordering the person determined to be responsible for a municipal civil infraction to pay a civil fine, costs, damages and expenses, the judge or magistrate shall be authorized to issue any judgment, writ or order necessary to enforce or enjoin violation of the article.
- (b) The Township board, in addition to other remedies, may institute any appropriate action or proceeding to abate or restrain the violation.
- (c) Each day's continuance of a violation shall be deemed as separate and distinct offense. Expenses in connection with such action shall be assessed as damages against the violation.
- (d) The approval or disapproval of any stormwater management plan shall not have any effect on any remedy of any person at law or in equity.

Sec. 6-217. through Sec. 6-240. (Reserved)

DIVISION 2. STORMWATER MANAGEMENT PLAN REQUIREMENTS

Sec. 6-241. Preapplication conference.

[Ord. No. 54, § 5.00, 8-11-1987]

A preapplication conference shall be held with the Township supervisor and/or his designee prior to the submittal of a stormwater management plan. The purpose of the preapplication conference is to provide information and guidance that will assist the proprietor in preparing the required plan.

Sec. 6-242. Contents.

[Ord. No. 54, § 5.01, 8-11-1987]

- (a) Clarity of plan presentation.
 - (1) Through maps, illustrations, reports, and calculations, the stormwater management plan shall display the required information in a clear and logical sequence.
 - (2) Information submitted to the Township on a site plan or tentative preliminary subdivision plat may be used to meet the requirements of this section, provided that a written statement identifying the applicable data is provided.
 - (3) The stormwater management plan must be sufficiently detailed to specify the type, location, and size of stormwater management and erosion control facilities, using preliminary calculations. Detailed construction drawings are not required at the stormwater management plan review stage.
 - (4) If it is proposed to develop a parcel in two or more phases, the stormwater management plan shall be prepared and submitted for the total project unless a variation has been approved by the Township board.
- (b) Plan preparation. The stormwater management plan shall be prepared by a registered civil engineer, registered landscape architect, registered surveyor, and/or registered architect. Other persons and professionals may assist in the preparation of the plan.
- (c) Scale for mapping. The stormwater management plan shall be drawn to a scale of at least one inch equal to 50 feet for property less than three acres and one inch equal to 100 feet for property three acres or more in size.
- (d) Required information; identification and description. The following information is required for all stormwater management plans:
 - (1) Proprietor's name, address and telephone number.
 - (2) Name of the Township, city or village where residing.
 - (3) Date (month, day, year) including revisions.
 - (4) Title block, scale, and north point.
 - (5) Name of planner, architect, engineer, surveyor, wetland specialist, landscape architect, and/or other technical experts who have prepared or assisted in the preparation of the stormwater management plan.
 - (6) Existing lot lines, building lines, structures, parking areas, etc., on the parcel and within 100 feet of the site.
 - (7) Proposed lot lines, property lines, and all structures, parking areas, etc., within the site and within 100 feet of the site.
 - (8) Zoning classification of petitioner's parcel and all abutting parcels.
- (e) Required information; existing conditions. The following information describing existing site conditions is required:
 - (1) A site location and vicinity map at a scale of not less than one inch equal to 2,000 feet which shows watercourses,

wetlands, topography, and other features relevant to stormwater management. U.S. Geological Survey quadrangle map information may be submitted to meet this requirement. The approximate boundaries of the small watershed within which the site is located shall be delineated (maps available for reference at the Township offices).

- (2) Topography on the site and within 100 feet of the site at two-foot contour intervals, referenced to a U.S. Geological Survey benchmark.
 - (3) Designation of soils with a high infiltration rate, including soil map units 14B, 14C, 15B, 15C, 15E, 35A, 62B, 62C, and 63A, as shown on the soil survey maps of the county, published by the U.S. Soil Conservation Service.
 - (4) Location and flow direction of all watercourses (including lakes, ponds, creeks, and streams) on the site, including permanent and intermittent features, as indicated on aerial photographs or U.S. Geological Survey topographic quadrangle maps, and verified through field survey. Elevations shall be indicated, referenced to a U.S. Geological Survey benchmark.
 - (5) Location of wetlands, based upon the National Wetland Inventory maps (available for reference in the Township offices) and verified by field survey.
 - (6) Location of the one-hundred-year floodplain for all watercourses.
 - (7) Outlet points and associated drainage area boundaries.
 - (8) Preliminary engineering analysis of the existing peak rate of discharge from the site.
 - (9) Entry points where stormwater runoff and watercourses enter the site from off-site locations, with arrows indicating the direction of the flow.
 - (10) Location of existing storm drains, ditches, basins, and other stormwater management facilities.
- (f) Required information; proposed conditions. The following information describing the site after the proposed alteration or development is required:
- (1) Proposed changes to the land surface and existing vegetative cover, including delineation of areas to be cut and filled. Final contours at two-foot contour intervals shall be provided.
 - (2) A plan and timetable for the staging of site grading and preparation activities.
 - (3) General description and proposed location of temporary and permanent soil erosion control facilities and measures, including but not limited to sediment traps, sediment basins, diversion structures, stone filters around storm drain inlets, berms with filter fabric, straw bale berms, seeding and vegetative cover.
 - (4) Preliminary calculations of the effect of the development upon the peak rate of discharge, and a preliminary determination of the amount of detention storage required to limit the proposed discharge to the existing levels.
 - (5) General description and proposed location of all temporary and permanent stormwater management facilities, including facilities for the conveyance, infiltration, and/or storage of runoff. The anticipated benefits of stormwater management facilities for water quality and/or flood control shall be indicated.
 - (6) Proposed outlet points and associated drainage area boundaries.
 - (7) Proposed flow routes with directional arrows for stormwater runoff from both the ten-year storm frequency event and the one-hundred-year storm frequency event.
 - (8) The receiving watercourses, drains, ditches, and/or basins for stormwater runoff, whether located on-site or off-site.
 - (9) Approximate location of easements to protect and provide access for the maintenance of the primary and secondary drainage systems.

- (10) Expected alterations of wetlands, floodplains, and watercourses, including expected changes in the type of vegetation and water level.
- (11) Preliminary listing of activities proposed to maintain stormwater management and erosion control facilities.

Sec. 6-243. Plan submission.

[Ord. No. 54, § 5.02, 8-11-1987]

- (a) The stormwater management plan for each development and earth change required under section 6-215(b) shall be submitted to the Township Clerk.
- (b) For developments subject to site plan review, the proprietor shall submit a stormwater management plan to the Township Clerk at the time that the site plan is submitted.
- (c) For developments subject to subdivision plat review, the proprietor shall submit a stormwater management plan to the Township Clerk at the time that the tentative preliminary plat is submitted.
- (d) For other earth changes or activities subject to stormwater management plan requirements, the plan shall be submitted to the Township Clerk before construction drawings are submitted.
- (e) The stormwater management plan must be received at least three weeks prior to a planning commission meeting in order to be reviewed at that meeting.
- (f) Compliance with the requirements of this article does not eliminate the need for the proprietor to obtain permits and approvals from county and state agencies. Such permits and approvals include, but are not limited to, soil erosion permits from the county drain Commissioner, drainage approvals from the county drain Commissioner, road drainage approvals from the county road commission, wetlands permits from the state department of environmental quality, and dam construction permits from the state department of environmental quality.
- (g) Compliance with the requirements of this article does not eliminate the need for the proprietor to comply with other applicable Township ordinances and regulations.
- (h) No grading, site preparation, or removal of vegetative cover shall take place without stormwater management plan approval and the installation of erosion control facilities.
- (i) If it becomes necessary to alter a development or earth change proposal after the stormwater management plan has been approved, a revised stormwater management plan may be submitted. All requirements and standards for stormwater management plans (this division) shall apply.

Sec. 6-244. Review procedures.

[Ord. No. 54, § 5.03, 8-11-1987]

- (a) Planning commission review.
 - (1) The planning commission shall review stormwater management plans to assure compliance with the approval standards listed in section **6-246**.
 - (2) Engineered grading plans do not require planning commission review.
 - (3) When the stormwater management plan appears on the planning commission's agenda for the first time, it will be distributed to Township consultants and staff.
 - (4) If the planning commission determines that all required information has not been received, the proprietor may request that the matter be tabled to allow for the submittal of the required information.

- (5) A recommendation to the Township board to approve, approve with conditions, or deny approval shall be made at a regular planning commission meeting.
- (b) Township board review.
- (1) The stormwater management plan approval request shall be placed on the Township board agenda no sooner than 15 days after approval or denial by the planning commission.
 - (2) Following completion of its review of the stormwater management plan and the planning commission's recommendations, the Township board shall approve or deny the proposed stormwater management plan, with or without modifications.

Sec. 6-245. Review fees.

[Ord. No. 54, § 5.04, 8-11-1987]

The Township board shall establish fees and escrow requirements by resolution. Fees and escrow account payments shall be sufficient to cover administrative and technical review costs anticipated to be incurred by the Township including the costs of on-site inspections.

Sec. 6-246. Standards for approval.

[Ord. No. 54, § 5.05, 8-11-1987]

All developments and earth changes subject to review under the requirements of this article shall be designed, constructed, and maintained to prevent flooding and protect water quality. The particular facilities and measures required on-site shall reflect the natural features, wetlands, and watercourses on the site; the potential for on-site and off-site flooding, water pollution, and erosion; and the size of the site.

- (i) 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 run-off and soil erosion from the proposed development.
 - b. Stormwater from upstream and off-site locations shall be conveyed around or through the site, or stored on-site.
 - c. A primary drainage system which manages runoff from storms up to a ten-year frequency storm event shall be provided.
 - d. A secondary drainage system, such as an overland flow routing system to manage runoff from storms up to a one-hundred-year frequency storm event shall be provided (secondary drainage system).
 - e. Every detention basin shall control the release of stormwater for the ten-year and one-hundred-year frequency storm events. For the ten-year frequency storm event, the peak rate of discharge shall not exceed 0.2 cubic feet per second per acre. For the one-hundred-year frequency storm event, the runoff rate shall not exceed the predevelopment rate.
 - f. 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.
 - g. Alterations to natural drainage patterns shall not create flooding or water pollution for adjacent or downstream property owners.
 - h. Watercourses shall not be dredged, cleared of vegetation, deepened, widened, straightened, stabilized or otherwise altered without applicable permits or approvals from the Township board and the state department of environmental quality. If the watercourse is a designated county drain, approval from the county drain Commissioner shall also be obtained.

- i. No modifications of major watercourses shall be permitted when the primary purpose is to increase the flow capacity of the watercourse.
 - j. Discharge of runoff from any site which may contain oil, grease, toxic chemicals, or other polluting materials is prohibited unless measures to reduce and trap pollutants meet the requirements of the state department of environmental quality and the Township, based upon professionally accepted principles.
 - k. Drainage systems shall be designed to protect public health and safety and to be visually attractive.
- (2) Soil erosion control.
- a. Cutting, filling and grading shall be minimized and the natural topography of the site shall be preserved to the maximum feasible extent, except where specific findings demonstrate that major alterations will still meet the purposes and requirements of this article.
 - 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 possible period of time.
 - c. Soil erosion control measures shall be installed between the disturbed area and any watercourses (including rivers, streams, creeks, lakes, ponds and other watercourses), wetlands, or roadways on or near the site.
 - d. Sediment resulting from accelerated soil erosion shall be removed from runoff water before it leaves the site of the development or earth change.
 - e. Temporary and permanent soil erosion control 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 nonerosive velocity.
 - f. Temporary soil erosion control measures shall be removed after permanent soil erosion control measures have been implemented. All developments and earth change areas shall be stabilized with permanent soil erosion control measures.
 - g. If lakes, ponds, rivers, creeks, streams or other watercourses and wetlands are located on or near the site, erosion control 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 sediment basins, sediment traps, filter fabric, and rock filters in lieu of straw bale berms shall be strongly encouraged. 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 30 calendar days.
 - i. Permanent soil erosion control measures for all slopes, channels, ditches, or any disturbed land area shall be completed within 15 calendar days after final grading or the final earth change has been completed. All temporary soil erosion control measures shall be maintained until permanent soil erosion control measures are implemented.
 - j. Vegetated buffer strips shall be created or retained along the edges of all lakes, ponds, creeks, streams, other watercourses, and wetlands, when reasonably determined to be necessary to protect the watercourse.
- (3) Stormwater storage and infiltration facilities.
- a. Stormwater storage and/or infiltration facilities which protect water quality and minimize flooding shall be required for all developments. Storage facilities may include, but are not limited to, detention basins, retention basins, infiltration trenches, swales with check dams, and other facilities.
 - b. All detention basins shall be designed to maximize the ability of the basin to hold and trap sediment. The types of basins listed in this subsection b. meet Township requirements. The following types of basins are listed in order

of preference, with the most desirable listed first:

1. Infiltration facilities, provided that soils and groundwater conditions are suitable.
 2. Detention basins with a fixed minimum water elevation between runoff event (wet basins). Wet basins which serve to trap soil particles on-site are preferable to dry basins.
 3. Detention basins which hold stormwater from the one-year storm event for more than 24 hours before completely draining to become a dry basin (extended detention). Dry basins without extended detention shall not be permitted.
- c. Detention and retention basins shall be designed to hold runoff from a one-hundred-year frequency storm event. Basins shall be permanently stabilized to minimize erosion.
 - d. Retention and detention basins shall have an overflow system. If the overflow system cannot discharge to a creek, lake or wetland without causing flooding on adjacent or downstream properties, then the basin shall be designed to hold stormwater runoff from two back-to-back one-hundred-year frequency storm events.
 - e. Unless a variation is approved by the Township board (see division 4 of this article), detention and retention basins with banks sloping more than one on five (vertical to horizontal) shall not be permitted.
 - f. Detention basins and associated berms and landscaping shall be designed to protect public safety and to be visually attractive.
 - g. Constructed detention basins shall not be a part of a platted subdivision lot, but shall be provided in platted outlots or open space areas.
- (4) Discharge of stormwater runoff to wetlands.
- a. Stormwater runoff discharged to wetlands must be diffused to nonerosive velocities before it reaches the wetland.
 - b. Wetlands may be used for stormwater detention if the following conditions are met:
 1. The wetland storage or detention area is set back at least 100 feet from the edge of any lake or stream.
 2. The wetland does not have significant wildlife habitat or ecological values which would likely be impaired or destroyed.
 3. The wetland has sufficient holding capacity for stormwater, based upon calculations prepared by the proprietor and reviewed and approved by the Township Engineer.
 4. Adequate on-site soil erosion control is provided to protect the natural functioning of the wetland.
 - c. During the construction phase of development, adequate erosion control and protection of wetlands shall be provided as required, including such things as:
 1. One or more sediment traps or soil settling basins located in upland locations; and/or
 2. Open-water sediment traps within or adjacent to wetlands, provided that the proposal meets the wetland protection requirements of the state department of environmental quality and the Township for wetlands alteration.
 - d. If off-site wetlands are used for stormwater management, an easement must be ensured in accordance with the requirements of division 6 of this article.

Sec. 6-247. Off-site stormwater management.

[Ord. No. 54, § 5.06, 8-11-1987]

- (a) Waiver option. In lieu of on-site stormwater detention, the use of off-site stormwater conveyance, infiltration, and/or detention areas may be proposed. In such cases, the proprietor shall request a waiver of the requirements for on-site stormwater detention. This waiver option does not allow for changes in requirements for on-site erosion control. Off-site stormwater management areas may be shared with other landowners, provided that maintenance agreements have been approved by the Township board and recorded.
- (b) Review by planning commission and Township board. The planning commission shall review the waiver request and shall make a recommendation to the Township board. The final decision on a waiver request shall be made by the Township board.
- (c) Stormwater management plan submittal. The waiver request shall be submitted with a stormwater management plan as provided in this division, including proposed stormwater management and erosion control measures, on-site and off-site.
- (d) Applicable standards. In addition to the stormwater management standards specified in this division, the proprietor must demonstrate and provide assurances for the following:
 - (1) Stormwater flows and management controls shall not result in excessive stream channel erosion on-site or off-site;
 - (2) High value or unique wetlands and natural areas shall not be significantly altered by stormwater flows on-site or off-site;
 - (3) Soil erosion shall be managed off-site as well as on-site;
 - (4) Off-site stormwater facilities shall be protected through appropriate easements; and
 - (5) Adequate provision and agreements for maintenance of stormwater management facilities shall be made.
- (e) Performance guarantees, inspections, maintenance, and enforcement. All provisions of section **6-216** and division 6 of this article shall apply to off-site stormwater conveyance and detention.

Sec. 6-248. through Sec. 6-270. (Reserved)

DIVISION 3. ENGINEERED GRADING PLANS

Sec. 6-271. Contents.

[Ord. No. 54, § 6.00, 8-11-1987]

- (a) Engineered grading plans for single-family homes and private road developments shall be submitted by the proprietor.
- (b) Engineered grading plans shall be prepared by any of the following registered professionals, alone or in combination: civil engineer, land surveyor, architect, and/or landscape architect.
- (c) The engineered grading plan shall include the following information:
 - (1) The legal property description.
 - (2) The benchmarks used.
 - (3) Existing grades on a fifty-foot cross section to a minimum of 50 feet beyond the site property line and sufficient intermediate grades to determine such things as ditches, swales, adjacent pavement, buildings and other pertinent features.

- (4) All existing topography.
- (5) Location of any watercourses, wetlands, lakes and ponds on the site.
- (6) Off-site topography, adjacent building grades, paved parking areas or drives (indicate direction of drainage), drains, culverts and other pertinent features. Show typical cross sections of existing drains or swales.
- (7) Existing easements.
- (8) Existing utilities (size, depth, location), manholes (in and inverts), and culverts.
- (9) Street rights-of-way, existing and proposed.
- (10) Proposed topography of the site.
- (11) Location and description of any proposed stormwater management and erosion control measures.
- (12) Flow direction of stormwater runoff from the site before and after development, including the direction of overland flow.
- (13) Proposed elevations should be underlined or boxed in to differentiate from existing elevations. It is expected that all hard surface elevations, such as foundation tops, pavement, and structures be in hundredths of a foot and all ground elevations be in tenths of a foot.
- (14) A location map.

Sec. 6-272. Review procedures and standards.

[Ord. No. 54, § 6.01, 8-11-1987]

- (a) The Township Engineer shall review engineered grading plans to ensure compliance with the following standards:
 - (1) Cutting, filling and grading shall be minimized and the natural topography of the site shall be preserved to the maximum possible extent.
 - (2) Sediment caused by accelerated soil erosion shall be trapped and retained on the site through the use of effective soil erosion control measures.
 - (3) Seeding, mulching, establishment of a vegetative cover, or other permanent soil erosion control measures for all disturbed land areas shall be completed within 15 calendar days after final grading or the final earth change has been completed.
 - (4) 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 30 calendar days. All temporary soil erosion control measures shall be maintained until permanent soil erosion control measures are implemented.
 - (5) Through the design of site contours, yards, paved areas, roadways, and driveways, the on-site infiltration and detention of stormwater runoff shall be reasonably required when determined to be necessary.
 - (6) Diversions of stormwater runoff to adjacent properties which increase the volume, rate of discharge, or pollutants carried by stormwater shall be prohibited.
- (b) Engineered grading plans shall be reviewed and approved by the Township Engineer prior to the issuance of a building permit.

Sec. 6-273. through Sec. 6-290. (Reserved)

DIVISION 4. Variations

Sec. 6-291. Township board authority.

[Ord. No. 54, § 7.00, 8-11-1987]

The Township board shall have the authority to grant variations from the strict terms of this article in accordance with the terms of this article.

Sec. 6-292. Written application requirements.

[Ord. No. 54, § 7.01, 8-11-1987]

A written application shall be submitted to the Township Clerk demonstrating that:

- (1) Special conditions and circumstances exist which are peculiar to the land or project involved, and which are not generally applicable to other plans or projects;
- (2) The special conditions and circumstances do not result or have not resulted from the actions of the applicant or the applicant's predecessor;
- (3) Literal interpretation of the provisions of this article would deprive the applicant of rights commonly enjoyed by other properties under the terms of this article; and
- (4) Grant of the variation shall not result in an unreasonable risk of impairment or destruction of property and/or natural resources which this article is designed to protect.

Sec. 6-293. Hearing required.

[Ord. No. 54, § 7.02, 8-11-1987]

Variations from the terms of this article shall not be granted unless and until a hearing shall be held.

Sec. 6-294. Conditions for approval.

[Ord. No. 54, § 7.03, 8-11-1987]

- (a) Variations shall not be granted unless and until the Township board finds that:
 - (1) The application requirements set forth in section **6-292** have been met;
 - (2) The reasons set forth in the application justify the granting of the variation, and that the variation is the minimum variation required; and
 - (3) Granting of the variation will be in harmony with the general purpose and intent of this article.
- (b) In granting any variation, the Township board may prescribe appropriate conditions and safeguards consistent with the purposes and standards of this article.

Sec. 6-295. through Sec. 6-310. (Reserved)

DIVISION 5. Construction Drawings and Engineering Specifications

Sec. 6-311. Submittal requirements.

[Ord. No. 54, § 8.00, 8-11-1987]

- (a) Construction drawings and engineering specifications shall be submitted following stormwater management plan approval but prior to the issuance of any construction or building permits.
- (b) Construction drawings and engineering specifications shall be submitted to the Township Clerk in accordance with reasonable information requirements and calculations specified by the Township Engineer.

Sec. 6-312. Review and approval procedures.

[Ord. No. 54, § 8.01, 8-11-1987]

- (a) Engineering drawings and specifications shall be reviewed and approved by the Township Engineer.
- (b) A building permit, construction permit or certificate of occupancy shall not be issued unless the detailed engineering drawings and specifications meet the standards of this article, additional requirements of the Township Engineer, and any applicable requirements of other government agencies.

Sec. 6-313. Off-site and upstream runoff calculations.

[Ord. No. 54, § 8.02, 8-11-1987]

The peak rate of stormwater discharge from upstream and off-site locations for both the ten- and one-hundred-year frequency storm event shall be included in detailed engineering drawings and specifications. Stormwater runoff conveyed by watercourses and conveyed via overland flow shall be determined.

Sec. 6-314. Engineering design standards.

[Ord. No. 54, § 8.03, 8-11-1987]

Engineering design standards approved by the Township shall be the basis for the Township Engineer's review of engineering drawings and specifications.

Sec. 6-315. through Sec. 6-330. (Reserved)

DIVISION 6. Performance Guarantees, Easements, and Maintenance

Sec. 6-331. Applicability of requirements.

[Ord. No. 54, § 9.00, 8-11-1987]

Requirements of this division concerning performance guarantees, easements, and maintenance agreements shall apply to proprietors required to submit a stormwater management plan to the Township for review and approval. These requirements do not apply to engineered grading plans.

Sec. 6-332. Performance guarantees.

[Ord. No. 54, § 9.01, 8-11-1987]

- (a) The proprietor shall post some acceptable form of performance bond, cash escrow, certified check, or other performance security, if required by the Township board. The performance guarantee shall be an amount sufficient to complete stormwater management and erosion control facilities as specified in the stormwater management plan. Required performance guarantees shall be provided to the Township after stormwater management plan approval but prior to the initiation of any earth change.
- (b) After determination by the Township Engineer that all facilities are constructed in compliance with the approved plan,

the performance bond or other securities shall be released.

Sec. 6-333. Stormwater management easements.

[Ord. No. 54, § 9.02, 8-11-1987]

- (a) Necessity. Stormwater management easements shall be provided by the proprietor to ensure:
 - (1) Access for inspections;
 - (2) Access to stormwater management facilities for maintenance purposes; and
 - (3) Preservation of primary and secondary drainage ways which are needed to serve stormwater management needs of other properties.
- (b) Off-site stormwater management. Stormwater management is required for all areas, including wetlands, used for off-site stormwater management.
- (c) Recording required. Easements shall be recorded with the county register of deeds according to county requirements.
- (d) Recording prior to building permit issuance. The proprietor must provide the Township administrative official with evidence of the recording of the easement prior to final subdivision plat approval or final construction approval.

Sec. 6-334. Maintenance agreement.

[Ord. No. 54, § 9.03, 8-11-1987]

- (a) Purpose. The purpose of the maintenance agreement is to provide the means and assurance that maintenance of stormwater management and erosion control facilities shall be undertaken.
- (b) Submittal; approval.
 - (1) All development or earth change subject to stormwater management plan requirements (division 2 of this article) shall submit a maintenance agreement to the Township Clerk.
 - (2) Maintenance agreements shall be approved by the Township board prior to final subdivision plat approval in the case of subdivisions, and prior to construction approval in other cases.
- (c) Required provisions; agreement to be binding; recording.
 - (1) The maintenance agreement shall include sufficient terms and provisions to ensure that both routine and emergency maintenance shall be accomplished.
 - (2) The maintenance agreement shall be binding on all subsequent owners of land served by the stormwater management and erosion control facilities, and shall be recorded in the land records of the county prior to approval by the Township board.
- (d) Establishment of county drains and maintenance for subdivisions.
 - (1) Prior to final plat approval, all stormwater management facilities for platted subdivisions shall be established as county drains, as authorized in the Drain Code, Public Act No. 40 of 1956 (MCL 280.1 et seq.).
 - (2) Maintenance fees, as specified by the county drain Commissioner, shall be provided to the drain Commissioner.
 - (3) This requirement may be waived by the Township board if compelling reasons are outlined by the proprietor or the drain Commissioner.
 - (4) As part of the agreement establishing the county drain, stormwater facility maintenance responsibilities shall be

assigned to the county drain Commissioner.

Sec. 6-335. Notification.

[Ord. No. 54, § 9.04, 8-11-1987]

In the event that an owner or developer fails to comply with the requirements of this article or requirements of any maintenance agreement, the Township shall notify the proprietor in writing of the violations. Such notification shall set forth the nature of the violation and establish a time limit for correction.

Sec. 6-336. through Sec. 6-360. (Reserved)

**OAKLAND COUNTY
WATER RESOURCES COMMISSIONER**

**ENGINEERING DESIGN STANDARDS
FOR STORM WATER FACILITIES**

**Requirements, Rules and Design Criteria for
Storm Water Management**



**January 1, 2006
Revised July 8, 2014**

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- Act 288 of the Public Acts of 1967, as amended, is known as the Subdivision Control Act of 1967 (the "Plat Act"). All subdivision plats to be recorded with the County Register of Deeds must conform to this Act. Under the Plat Act, the Water Resources Commissioner is required to review and approve the storm water drainage for the plat.
- The provisions of Section 192 of the Plat Act include:
 - a. That the Proprietor provides for adequate storm water facilities within the lands proposed for platting and outlets thereto.
 - b. That the Proprietor provide adequate storm water retention basins where deemed necessary.
- The rules presented herein, with the authority provided for in Section 105, sub-section (c) of the Plat Act, are issued to guide land developers, engineers and surveyors interested in developing land in Oakland County and to provide for a uniform method of preparing plats and construction plans submitted to the office of the Oakland County Water Resources Commissioner for review and approval.
- The Plat Act gives the Water Resources Commissioner the authority to require that County Drains and natural water courses, both inside and outside the plat boundaries, be improved to the standards established by the Water Resources Commissioner when deemed necessary.
- The Water Resources Commissioner will also require that an appropriate entity be responsible for the perpetual maintenance of all storm water drainage facilities within the plat or the storm drainage system may be established as a County Drain, at the Proprietor's expense, to insure adequate maintenance.
- The rules presented herein will also apply to:
 - Mobile home development plans submitted to the Water Resources Commissioner under Act 96 of the Public Acts of 1987
 - Site development plans that require review and approval by the Water Resources Commissioner's office
 - Site condominium development plans prepared under Act 59 of the Public Acts of 1978 that require review and approval by the Water Resources Commissioner's office
 - Private storm drain systems that are to be established as a County Drain under Chapter 18 of the Drain Code.
 - Any other storm drainage system review requested to be performed by the Water Resources Commissioner's office.
- These rules are the minimum design standard accepted by this office. In addition to the rules herein, the Proprietor must also abide by the rules, standards, specifications and master plan of the municipality where the site is located. In the case where conflicting standards arise, the more stringent requirements will govern.
- These rules will be revised as necessary with the most recently dated sheets being applicable.
- These storm water standards are intended to generally comply with the requirements of the Phase II National Pollutant Discharge Elimination System Storm Water Regulations, however, more stringent storm water standards may be required to meet the goals and objectives of State of Michigan approved Watershed Management Plans. Storm water Best Management Practices should be incorporated to the maximum extent practicable as required.

DEFINITIONS

BMP-Best Management Practice – Structural device, measure, facility or activity that helps to achieve storm water management control objectives at a designated site. Ex: A detention basin is a BMP.

Commissioner - The Water Resources Commissioner of the County of Oakland, State of Michigan.

County Drain- The Water Resources Commissioner of Oakland County, through legislative enactment, has acquired jurisdiction over a storm water conveyance system. Ex: An enclosed drain or an open watercourse.

Design Storm- The rain storm used as the basis of design for storm water drainage facilities.

Detention Basin- A reservoir or structure that stores storm water and releases it at a controlled rate.

Drainage Area- The area of land that has runoff tributary to a specific point.

Drainage System- All storm drainage facilities within a site, including storm drains, detention basins, swales and channels.

Easement- A right afforded to a person or entity to make limited use of another's real property.

Engineer - The Engineer of the Office of the Oakland County Water Resources Commissioner.

Forebay- A pond-like structure that pre-treats storm water runoff to remove pollutants, predominantly sand, dirt and silt, before discharging into an adjacent storm water pond.

Freeboard- The space between the high water elevation and the top of bank of a storm water pond or storage structure.

Hydrograph- A graph of discharge or flow rate as a function of time.

Infiltration- A process whereby precipitation seeps into the ground.

In-line Basin- A storm water reservoir constructed within a watercourse.

Low-Flow Channel- A small swale within a basin designed to convey the runoff from a small rain event through the basin in a manner that will facilitate infiltration.

Precipitation- Any water or ice with sufficient mass that it falls to the earth.

Proprietor - Any person, firm, association, partnership, corporation, or combination of any one of them.

Retention Basin- A reservoir that stores storm water without releasing it. The storm water ultimately evaporates or infiltrates into the ground.

Runoff- Precipitation that flows over land.

Storm Drain- A pipe, conduit or open watercourse that conveys storm water.

Surcharge- A condition in which the water level in a storm drain rises above the crown of the conduit.

Swale- A natural or constructed wide, shallow ditch that conveys storm water.

Watercourse- A natural or artificial channel for flowing water.

Watershed- Area of land that drains to a single outlet and is separated from other watersheds by a divide.

100-yr Storm- A rainstorm that has a 1% chance of occurring in a year.

10-yr Storm- A rainstorm that has a 10% chance of occurring in a year.

PROCEDURES FOR SUBMITTAL AND REVIEW

I. APPLICATION FOR REVIEW

An application for review must accompany all plans submitted to WRC for review. The application shall be submitted by the Owner/Developer or the Design Engineer on behalf of the Owner/Developer. Application for review shall be made prior to the start of any work requiring a permit from WRC.

For project sites that will be developed in phases an application is required for the initial work and new applications will be required for additional work not indicated on the original application.

A minimum, non-refundable, up-front application fee is required for certain developments. The total review and permit fees will be determined upon completion of the review.

The review period begins upon the receipt of a completed application, plans and fees.

II. SUBDIVISIONS- Sites to be platted under Act 288

A. Preliminary Plat

1. General Requirements

A preliminary or tentative plan showing the layout of the area intended to be platted shall be submitted by the Proprietor. This plan shall be prepared under the direction of and sealed by a registered professional engineer or a registered land surveyor. The plan shall be drawn to a standard engineering scale no smaller than 1" = 100' and the sheet(s) of paper must not be larger than 24" x 36". This preliminary plan is what the Subdivision Control Act of 1967 refers to in Section 111 as a "preliminary plat".

Section 114, Sub-section (3) of the Subdivision Control Act of 1967 requires that the Water Resources Commissioner approve or reject preliminary plats within 30 days of their receipt.

Three copies of the preliminary plat, prepared in accordance with the following requirements, shall be submitted with a letter of transmittal requesting that the preliminary plan be reviewed and, if found satisfactory, approved. The names of the Proprietor and engineering or surveying firm with mailing addresses, telephone and fax numbers for each shall be included with the transmittal.

The preliminary plat shall include:

- a. The location of the proposed subdivision with reference to the section and part of section in which the parcel is situated, the name of the township, city or village, a proposed legal description of the site, the number of acres proposed to be platted and a location map with north arrow.
- b. The proposed street and alley layout and approximate lot and plat dimensions.
- c. All on-site and off-site pertinent factors, the existence and description of which might be of value in determining the overall requirements for the subdivision, such as:
 - Adjoining roads, subdivisions and parcels
 - Railroads
 - High-tension tower lines, under ground transmission lines and gas pipelines
 - Cemeteries and parks
 - Rivers, natural water courses, county drains, lagoons, slips, waterways, streams, lakes, bays, canals, wetlands, wetland boundaries and floodplains
 - Existing utilities; storm drains, sanitary sewers, water main, telephone, cable or fiber optic lines
 - Existing and proposed easements

- d. Contour information in two-foot intervals with North American Vertical Datum of 1988 (NAVD 88), or most current national datum, shall be shown on the same plan, otherwise it shall be submitted on a separate sheet.
- e. A drainage map, using a United States Geological Survey (USGS) topographic map, or equivalent, that shows the existing drainage area and flow patterns and indicates the proposed drainage pattern.

Inasmuch as improper utility easement location can result in a change in plat layout, the Proprietor is advised to consult with the respective utility companies before presentation of the preliminary plan for approval.

In the case where the Proprietor wishes to subdivide a given area but wishes to begin with only a portion of the total area, the original plan shall include the proposed general layout for the entire area. The part that is proposed to be subdivided first shall be clearly superimposed upon the overall plan in order to illustrate clearly the method of development which the Proprietor intends to follow. Each subsequent plat shall follow the same procedure until the entire area controlled by the Proprietor is subdivided. The final acceptance of a subdivision that is a partial development of a larger general layout does not automatically insure the final acceptance of the overall layout. The intent is to permit some flexibility in the overall layout if future conditions make it desirable or necessary to make any changes.

If the proposed preliminary plan as submitted meets with all the requirements, one approved copy of the preliminary plan will be returned. Approval of the preliminary plan is recommended before proceeding with the preparation of final construction plans. If the proposed plan is not approved as originally submitted, the Commissioner notifies the Proprietor in writing setting forth the reasons for withholding approval and requests that the necessary changes be made and the revised layout resubmitted.

In accordance with Section 560.120 of Act 288, the preliminary plat approval is valid for two years. If construction plans have not been submitted within that time, a new preliminary plat must be submitted and approved. The two-year period may be extended if applied for by the proprietor and approved by the Water Resources Commissioner in writing.

2. *Drainage Requirements*

The preliminary plan must include the general drainage scheme for the proposed subdivision, or the plan will be rejected. The general drainage scheme shall indicate how storm drainage will be provided and where it will outlet. Preliminary calculations for detention and contributing off-site flow must be included on the plan.

Drainage proposed for subdivisions shall conform to established County Drain districts, existing natural drainage patterns and community master plans. The design shall consider the effect that the drainage proposed in the subdivision has upon the entire drainage basin.

The preliminary plan shall indicate in general, on a USGS topographic map, any drainage originating outside of the subdivision limits which has previously flowed onto or across the subdivision, as well as any natural watercourses and County Drains that traverse or abut the subdivision.

The preliminary plan shall indicate in general any proposed onsite and/or offsite facilities, proposed or existing, required to conduct the drainage to an adequate outlet.

The Water Resources Commissioner's office is not responsible for roadside ditches. Road drainage ditches are under the jurisdiction of the Road Commission for Oakland County (RCOC) or other authority. Any drainage plan that proposes to outlet storm water to a road ditch must be approved by the RCOC or authority that has jurisdiction.

The Water Resources Commissioner shall require that the developer provide assurance of adequate maintenance and inspection of the installation of both the external and internal storm drainage facilities.

3. *Easement Requirements*

The following minimum easement widths are required for all storm drainage facilities within the boundaries of the subdivision:

a. Open drains and watercourses-

The extreme width of the drain or watercourse plus 15 feet from top of bank on both sides of the channel.

b. Enclosed drains-

A minimum of twenty (20) feet centered on the centerline of the pipe . However, larger pipe size, certain soil conditions, or depth of pipe may require larger easements.

c. Rear yard drains-

For pipe sizes less than 12 inches in diameter, a minimum of twelve (12) feet centered on the centerline of the pipe.

d. Pump stations, detention/retention basins and other storm drainage facilities-

Sufficient easement area to allow for operation and maintenance of the entire facility, including freeboard area, the banks and any berms at the top of the banks.

Easement widths for legally established County Drains shall be sized by the Oakland County Water Resources Commissioner's office. In general these will conform to the above referenced requirements. Additional easements may be required by the Water Resources Commissioner's office should soil, construction conditions or other circumstances so warrant.

Easement information shall be shown on the preliminary plan, final construction plans and final "Mylar" plat.

The wording relative to easement information shown on the final plat shall be as specifically required by the Water Resources Commissioner's office. All County Drain easements shall be labeled as follows: "Permanent private easement for the NAME County Drain".

The Oakland County Water Resources Commissioner's office reserves the right to modify easement requirements at its discretion.

B. Construction Plans

The Proprietor will submit final construction plans that have been prepared under the direction of, and sealed by, a Registered Professional Engineer with a completed application form. The Water Resources Commissioner's Office will review the plans for adequacy of storm water management design to ensure that the proposed storm water drainage system has the capacity to handle all contributing flow without diminution of the existing off-site natural drainage patterns.

Two complete sets of final construction plans shall be submitted. The plans must be drawn to a scale not smaller than 1"= 50' on sheets no larger than 24" x 36" and designed in accordance with the design criteria presented herein.

1. *Required Information*

The plans should include, at minimum, the following:

- a. A cover sheet which includes a site legal description and location map with north arrow and the number of acres proposed to be platted. For phased developments, indicate clearly the phase limits and the number of acres in each phase.
- b. Subdivision layout of lots, roads and all existing and proposed easements.

- c. Plans, profiles and details of all roads.
- d. Plans, profiles and details of all enclosed storm drains, open ditch drains, drainage swales and drainage structures.
- e. Plans and details of the soil erosion and sedimentation control measures. Indicate which measures are temporary or permanent and the party responsible for maintaining the control measures.
- f. Plans, cross-section views and details of the detention or retention basins and the outlet. If an existing basin on or off-site will be used then as-built information must be provided.
- g. A drainage breakup sheet indicating the number of acres, calculated to the nearest tenth, contributing to each specific drainage structure.
- h. Topographic map or maps at two foot contour intervals with North American Vertical Datum of 1988 (NAVD 88), or most current national datum, showing existing topography and proposed grades of the entire area to be subdivided, as well as the topography of all adjacent property to the extent that off-site contributing flow can be determined. All off-site contributing flow must be accommodated. This map or maps shall also show all existing watercourses, lakes and swamps.
- i. Design data and criteria used for sizing all drainage structures, channels and detention/ retention basins.
- j. Storm drain hydraulic, detention/ retention and runoff coefficient calculations as well as design calculations for all drainage swales and overflow structures. Overflow structures must be sized to pass all contributing off-site flow.
- k. Specifications governing construction, i.e. material specifications, pipe bedding, construction notes, compaction requirements, etc.
- l. A plan and a proposed schedule for the perpetual maintenance of the complete storm drainage system. Indicate who will be responsible (i.e. municipality or homeowners' association) for the maintenance. If the homeowners' association will be responsible for the system, the subdivision deed restrictions must have a section indicating such responsibility and a copy must be submitted to the Water Resources Commissioner. If there is a maintenance agreement with the City, Village or Township, a copy of the agreement must be submitted to the Water Resources Commissioner. The maintenance plan must be submitted prior to plan approval.

2. *Review Time*

The Water Resources Commissioner's office will attempt to review these plans in the shortest possible time. A preliminary plan must be submitted and approved prior to submitting the final construction plans, so that no time is wasted on a drainage design that would be unacceptable. The construction plan approval is valid for one (1) year. The one-year period may be extended if applied for by the proprietor and approved by the Water Resources Commissioner in writing.

3. *Changes To The Plans*

Approval of the final construction plans is intended to be final approval, and the actual signing of the "Mylar" plat is only a formality, as long as there are no changes in the final construction plans from what was approved. If either the Proprietor or the Commissioner find it advantageous to make changes before the "Mylar" plat is presented to the Commissioner for signature, such changes can be made, provided that the same procedures outlined above are repeated with each change in the layout. The Proprietor is reminded that approval of the proposed subdivision by the local governing body is also required under the Plat Act. Such changes shall be incorporated in the layout and revised construction plans shall be resubmitted even though the original layout may have already been approved by the Commissioner. If the Proprietor does not present his "Mylar" plat to the Commissioner for approval within a period of one year after receiving approval of the final construction plans, it may be necessary that he resubmit the layout for review in the light of new information which may have become available during the interim.

C. Final Plat

The Proprietor shall submit the final "Mylar" plat to the Water Resources Commissioner for certification. The plat will be reviewed for accurate drainage easements and equivalence with the approved construction plans. If the Commissioner approves the plat, he will affix his signature to it and the plat will be executed. If the Commissioner rejects the plat, written notice of such rejection and the reasons therefore are given to the Proprietor within ten days.

Prior to the Proprietor submitting the final "Mylar" plat for certification, the following is required:

- ✓ Approval of the preliminary plat.
- ✓ Approval of the final construction plans.
- ✓ Assurance of adequate maintenance and inspection of the installation of both the external and internal storm drainage facilities.
- ✓ A soil erosion and sedimentation control permit under Part 91 of Act 451 of the Public Acts of 1994 as amended.
- ✓ Payment by the Proprietor of the plat review fee, according to the latest schedule posted on the Oakland County Water Resources Commissioner's website www.co.oakland.mi.us/drain .
- ✓ A minimum, non-refundable application fee is required upon submittal of the preliminary plat and the construction plans.

III. MOBILE HOME DEVELOPMENTS

Public Act 96 of 1987, The Mobile Home Commission Act, requires a developer of a Mobile Home Park to submit a preliminary plan to the Water Resources Commissioner.

A. Preliminary Plan

The preliminary plan shall include the location, layout, general design and a general description of the project. The preliminary plan does not include detailed construction plans.

B. Outlet Drainage

The Water Resources Commissioner must review and may approve the outlet drainage for the park. The design standards covered in Section II of Design Criteria and Engineering Methods will be used for this review. All pertinent design calculations must be submitted. The interior drainage within the park will not be reviewed unless the park storm drain system is to be established as a County Drain under Chapter 18 of the Drain Code.

The Water Resources Commissioner may approve or reject preliminary plans within 60 days of their receipt, otherwise the plan is considered approved.

Mobile home park construction plans are reviewed by the Mobile Home Commission.

IV. DRAINS UNDER THE JURISDICTION OF THE WATER RESOURCES COMMISSIONER

A. Permits

A permit shall be required from the Water Resources Commissioner prior to performing any work to a County Drain or its appurtenances. The following are examples of work:

- a. Connecting to any part of an open ditch, enclosed drain or manhole or drainage structure. A tap can be a direct connection or a pipe outlet.
- b. Crossing any part of an open ditch or enclosed pipe. Examples of crossings are utility lines, driveways, culverts and bridges. A minimum clearance of five (5) feet for an open ditch drain and eighteen (18) inches for an enclosed drain must be maintained between the drain and any proposed utility or other underground crossings of the drain.
- c. Relocating any part of a County Drain.
- d. Enclosing any portion of an existing open ditch drain.
- e. Performing work within a County Drain easement.
- f. When the installation of a fence, driveway, patio, pool or other structure that does not have a foundation, encroaches into the County Drain easement.

The following requirements of the permit must be met:

- Construction plans must be submitted to this office for review. The plans shall include design calculations for storm water storage volume and allowable outflow. A drainage area map must be included with the plans.
- The review application and application fee, appropriate permit fee and inspection deposit must be submitted before a permit is issued. Permit fees are determined on a site-specific basis.
- A notice of 48 hours must be given to the Oakland County Water Resources Commissioner's Inspection Department prior to any construction affecting the drain. In the event that our Inspection Department is not notified as stipulated herein the entire inspection deposit will be forfeited.
- Flow shall be maintained in the drain at all times during construction.
- All work must be completed in accordance with the plans and specifications submitted by the Owner/Developer and approved by this office.
- Work performed on the County Drain or its appurtenances must be performed in accordance with the Oakland County Water Resources Commissioner's Storm Drain Notes and Details Sheet.
- A drain permit issued by the Water Resources Commissioner's Office will not relieve the applicant and/or his contractor of the responsibility of obtaining permits, approvals or clearances as may be required from federal, state or local authorities, the public utilities and private property owners.
- An as-built plan of the drain involvement must be submitted.
- The Water Resources Commissioner shall be notified in writing within ten days of the completion of a project. A final inspection will be performed and a letter of permit closure may be issued.
- A letter of permit closure must be issued by the Water Resources Commissioner before any remaining deposit money is refunded.

- A permit shall expire when work has not commenced within one year of the date of issuance. The Water Resources Commissioner may extend the permit for a period of time upon the request of the Owner/Developer in writing.
- The Water Resources Commissioner may revoke a permit if there is a violation of the conditions of the permit or if there is a misrepresentation or failure to disclose relevant facts in the application.

☞ A drain permit is separate from a Soil Erosion Control permit.

B. Construction Plans

Any development that will outlet storm water directly to a County Drain will be reviewed by the Water Resources Commissioner for adequate storm water storage volume and outlet drainage. The standards covered in the Design Criteria and Engineering Methods section will be used for this review. All other involvements will have a drainage review performed relevant to the work proposed.

The Proprietor shall submit three (3) sets of construction plans with a transmittal requesting plan review. The plans must be prepared in accordance with the design standards presented herein and sealed by a Registered Professional Engineer or Land Surveyor. All pertinent design calculations must be submitted with the final construction plans. Preliminary plans may be submitted, but are not required.

Certain County Drains have limited capacity. The allowable discharge to these drains will be dictated by the Water Resources Commissioner and may be more stringent than these design requirements.

C. Drainage Districts and Easements

County Drain Drainage District limits must be adhered to when designing the site. Drainage Districts do not necessarily conform to existing topography. If drainage originating outside of a certain district is discharged within the district, a drainage district enlargement will be required. Contact the Water Resources Commissioner's office regarding this process.

Drains constructed prior to 1956 may not have a recorded easement, however the easement exists in the permanent records at the Water Resources Commissioner's office. At that time easements for drainage purposes were not required to be recorded with the County Clerk; it was legally sufficient to have them on file at the drain office. Therefore, it may be necessary to record a new County Drain easement, depending upon the work that is proposed and the County Drain involved. If a new easement is required, contact the Water Resources Commissioner's Office regarding this process.

V. CHAPTER 18 DRAINS

Chapter 18 drains are new developments within Oakland County where the local municipality has passed an ordinance that requires all residential and certain commercial drainage systems to be established as County Drains in accordance with the provisions of Section 433, Chapter 18 of the Public Acts of 1956, as amended, the Michigan Drain Code. At present, Oakland and West Bloomfield Townships each have such an ordinance.

A. Construction Plans

Plan submittal must be in accordance with the regulations of the municipality where the development is located. It is the responsibility of the Developer to contact the municipality and ascertain whether plans should be submitted directly to WRC or to the Municipality first.

When submitting plans directly to WRC, the Developer must submit three (3) complete sets of construction plans prepared according to the same specifications as a platted subdivision along with a letter from the Developer requesting that the storm drainage facilities be established as a County Drain. In the case where the Chapter 18 Drain development will be platted, the procedures for a preliminary and final plat must also be adhered to.

Final construction plan approval will not be granted until all required documents and fees have been received. Construction of the storm drain system may not begin until the construction plans have been approved. This office will provide full time construction inspection of the storm drain system. Drainage facilities constructed without appropriate inspection by this office or its designated representative may not be accepted by this office as a County Drain.

After the construction plans have been approved, this office will process the final subdivision plat as set forth in the Subdivision Control Act of 1967, as amended.

B. Required Documents and Information

- A letter from the Developer requesting that the storm drainage facilities be established as a County Drain.
- A certificate from the design engineer certifying the adequacy of the storm drainage outlet. The Developer's Engineer must certify that the outlet for the proposed drain is adequate and will not cause detriment or diminution of the drainage service presently provided. An Engineer's Certificate must be sealed.
- A copy of the Title Policy or other proof of land ownership.
- A metes and bounds property description with proof of survey closure.
- Sidwell number(s) of all property proposed to be included in the drainage district.
- An estimate of the construction cost of the drainage facilities.
- The Developer and/or Landowner of Record must enter into an Agreement to establish the new County Drain or Branch Drain of an existing Chapter 18 County Drain. The Agreement will be prepared by the Water Resources Commissioner.
- Company name and address and name and professional title of individuals who will execute the Agreement.
- Payment of fees and contingency deposit. The Developer must pay administrative, inspection and maintenance fund fees and deposit a construction contingency amount.
- A copy of the recorded deed restrictions which includes the appropriate County Drain easement language.

C. Final Acceptance

Following construction, submittal of all required documents and final as-built mylars of the storm drain system, the drain may be conditionally accepted for operation and maintenance if the site is substantially vegetated and stabilized.

One year after conditional acceptance of the Drain the Developer may request, in writing, a refund of the contingency deposit. Our Maintenance Unit will perform a final walk through inspection of the Drain and the project file will be reviewed by this office. If all requirements have been met, then a final accounting will be made and a letter of final acceptance will be issued along with any remaining refundable amounts of the contingency deposit.

Chapter 18 Drain requirements are explained in further detail in Section IV of "Design Criteria and Engineering Standards".

DESIGN CRITERIA AND ENGINEERING STANDARDS

I. SITE DRAINAGE

The standards and design criteria set forth herein are intended to guide designers to develop a storm water management system that controls the quantity and quality of storm water discharge from a site. The internal drainage for a site as well as the downstream conditions will be reviewed. Every site is part of an overall watershed and the system should be designed with this in mind. The system should conform to natural drainage patterns both on and off-site. These standards are the minimum requirements of the Oakland County Water Resources Commissioner and should not be construed as all-inclusive. The design engineer should consider many factors when planning the storm water management system. In particular, Federal, State and Local standards may be more strict than these standards. In the case where conflicting standards arise, the more stringent requirements will govern. Exceptions will be considered when conforming to a local community master plan or storm water management plan is required.

A. General Information

The County Water Resources Commissioner has been given the responsibility of determining the adequacy of the proposed storm drainage, and therefore the engineering unit will review the final construction plans for conformance with the following general drainage standards.

- An adequate outlet for the storm water must be demonstrated. The designer must show that the outlet has the capacity to handle the discharge from the site. *In no case will the discharge be allowed to exceed the site's pro-rata share of the capacity of the outlet.* There shall be no diminution of the drainage service presently provided by the outlet for the area that it serves. The site's pro-rata equitable share of the outlet capacity should be calculated and shown on the construction plans.
- There may be cases where the existing outlet has limitations due to downstream conditions. In this situation the discharge from the site will be restricted to conform to the governing downstream conditions.
- There may also be cases where the outlet has already reached capacity. The burden is on the proprietor to design and construct, at his expense, any necessary improvements to the downstream outlet. Such designs will be reviewed by the Water Resources Commissioner's office for adequacy. Additional controls may be required in these cases in order to protect downstream properties.
- The discharge from a site should outlet within the watershed, drainage sub-basin or county drain drainage district where it originated. The drainage should not be diverted to another sub-basin.
- Storm water detention or retention shall be provided. The detention basin shall be designed for a 100-year storm event and include a sediment fore bay or manufactured storm water treatment system.

B. Lot Grading

The Water Resources Commissioner will review the grading plan for sites that will be platted under Act 288 and a subdivision or site included in the Chapter 18 Drain program. Positive drainage is required. Final lot grading inspection is under the jurisdiction of the local municipality. The minimum requirements are as follows:

- The grading of the lot shall be such that surface runoff is directed away from homes and towards swales, ditches or drainage structures. Provision for drainage either by filling and grading or by providing some type of outlet shall be made for all areas within the proposed subdivision.
- A proposed finished floor grade and proposed lot grading must be shown for each home or structure. A minimum of ½ foot of fall is required away from the home and between lots. Proposed grades may be indicated with spot grades or contours. A distinction between existing and proposed should be evident.

- Where a walkout or daylight basement is proposed, sufficient grades should be shown at the location of the walkout to indicate positive drainage away from the walkout. Additional spot grades at the house corners and rear yard should be shown.
- Where finished grades indicate a substantial amount of drainage across adjoining lots, a drainage swale of sufficient width, depth and slope shall be provided on the lot line to intercept this drainage.
- Sufficient off-site topography must be shown to determine the extent of contributing runoff. Provisions must be made to accommodate the off-site contributing flow.
- Lots that lie within a flood plain shall satisfy the Michigan Department of Environmental Quality and FEMA requirements for subdivisions within a flood plain. In no case will the filling of a lot be permitted if the flood plain is so restricted as to cause possible flooding or back up of the stream.

Examples of correct lot grading are included in Appendix 1.

C. Determination of Surface Runoff

1. Rational Method

For small areas, such as sizing swales, channels and culverts, the “Rational Method” will be used to determine surface runoff. Because the “Rational Method” assumes a uniform rainfall intensity, it is best suited for small areas. The “Rational Method” is defined as follows:

$$Q = C \times I \times A$$

Where,	Q =	peak runoff (cfs)
	C =	runoff coefficient, a composite for the drainage area shall be used
	I =	average rainfall intensity (inches/ hour) 100-yr storm will be used and $I = 275 / (T_c + 25)$
	T_c =	Time of Concentration, in minutes
	A =	drainage area in acres

Larger sites should use a more appropriate method of determining flow. For watersheds up to 20 square miles, the suggested method for determining surface runoff is the Soil Conservation Service (SCS) Methodology. The computations should be based on the Type II rainfall distribution, 100-year, 24-hr storm. It is the responsibility of the design engineer to determine the best method to use for the site.

2. Coefficient of Runoff

A realistic coefficient of runoff will be used based upon the imperviousness of the contributing acreage. The range of this coefficient may vary from 0.15 for completely grassed areas to 0.90 for impervious areas and 1.0 for open water. The runoff coefficient calculation must be included with plan submittal.

Certain calculations require a composite runoff coefficient value. A composite runoff coefficient is calculated as follows:

$$\bar{C} = \frac{\sum_{i=1}^n (A_i \times C_i)}{\sum_{i=1}^n A_i}$$

Where, $C_i =$ runoff coefficient for each sub-area
 $n =$ total number of sub-areas
 $A_i =$ drainage area in acres for each sub-area

3. *Time of Concentration*

An initial time of concentration of 20 minutes will be used on residential subdivisions. The time of concentration must be calculated for commercial and industrial subdivisions.

The design engineer may also use a calculated time of concentration if desired. The methodology and computations must be submitted for review. The time of concentration for unimproved, pre-development lands will be checked using the following formulas:

Small tributary-
$$T_c \text{ (min)} = \frac{L'}{2.1 * \sqrt{S_o * 60}}$$

Waterway-
$$T_c \text{ (min)} = \frac{L'}{1.2 * \sqrt{S_o * 60}}$$

Sheet Flow-
$$T_c \text{ (min)} = \frac{L'}{.48 * \sqrt{S_o * 60}}$$

Where, $L' =$ flow length, in feet
 $S_o =$ slope, in %

When more than one type of flow exists, the individual flows should be summed up to find the total time of concentration.

These equations were taken from: Richard C. Sorrell, SCS Methodology, Michigan Department of Natural Resources, May, 1977

4. *Allowable Discharge Rate*

The allowable discharge rate from a site shall be restricted to agricultural runoff, which is defined by this office as a maximum of 0.20 cfs per acre.

There may be cases where the existing outlet has limitations due to downstream conditions. In this situation the discharge from the site will be restricted to conform to the governing downstream conditions. For example, if there is an existing culvert downstream, then the allowable outflow from the proposed site will be limited to the pro-rata share of the capacity of the culvert. The site's pro-rata equitable share of the outlet capacity should be calculated and shown on the construction plans.

Certain established Oakland County Drains have limited capacity and the allowable discharge will be less than agricultural rate.

II. **Storm Water Storage Facilities**

On-site storage of storm water runoff is required for all sites. Cases where the outlet or community master plan allows for undetained storm water discharge will be evaluated on an individual basis.

A. Determining Storm Water Storage Volume Required

1. Detention Basin

a. General Requirements

Following are the minimum requirements for a detention facility:

- A sediment fore bay, or equivalent structure, designed to capture the runoff from a 1 year storm is required for all sites. The fore bay should be a separate cell from the main detention basin and designed such that it will dewater within 48 hours. The volume of detention within the fore bay, above any proposed permanent pool of water, can be considered when calculating total detention volume required for a site.
- A manufactured storm water treatment system may be used in lieu of a sediment fore bay.
- The volume of detention provided must be equal to or in excess of that required by the Oakland County Water Resources Commissioner's "A Simple Method Of Retention Basin Design" for a 100-year frequency storm, included in Appendix 4.
- Detention volume must be provided for all on-site acreage contributing to the detention basin. All offsite tributary acreage must be accommodated by sizing the basin overflow structure to pass the off-site flow.
- Detention volume on a gravity outflow detention basin is defined by this office as the volume of detention provided above the invert of the outflow pipe. Any volume provided below the invert of the outflow pipe is considered a permanent pool of water and will not be considered as detention volume.
- All detention basins must have a positive method by which to be de-watered. Use of a pumped outlet is discouraged. If a permanent pool of water is proposed, the basin must completely de-water to the elevation of the permanent pool.
- The velocity of storm water entering the storage facility should be a non-erosive velocity. This velocity is generally between 2.5 fps and 5 fps.
- Detention basin side slopes may not exceed 1foot vertical to 6 feet horizontal for a wet basin and 1 foot vertical to 4 feet horizontal for a dry basin unless fencing is provided. Requirements regarding fencing will be evaluated on a case by case basis.
- The basin shape should be such that flow entering the basin is evenly distributed and no stagnant zones can develop. An irregularly shaped basin is best. The inlet and the outlet should be at opposite ends with the maximum distance possible between them. For dry basins, use of swales or berms on the bottom of the basin to maximize travel distance during periods of low flow are encouraged.
- When there is no permanent pool of water, the bottom of all detention basins shall be graded in such a manner as to provide positive flow to the pump or pipe outlet.
- All detention basins must have an internal overflow.
- One foot of freeboard shall be provided above the 100-year storm water elevation.
- Fencing will be required as needed, depending upon basin depth, steepness of side slopes, depth of permanent pool, etc. Requirements regarding fencing will be evaluated on a case by case basis.
- All detention basins must be permanently stabilized to prevent erosion.
- Detention basins constructed by building up on existing grade must have berms with a clay core keyed into native ground.

Provisions for maintenance of the detention basin shall be made by the developer with the subdivision association or the local municipality. Evidence of such provisions must be submitted. This office will not accept the responsibility for the maintenance of any detention basin unless it is being constructed as a Chapter 18 County Drain.

b. Design Procedure

When calculating the volume of an irregularly shaped basin or lake, the Oakland County Water Resources Commissioner will use the formula for calculating the volume of a frustum of a circular cone. This formula is:

$$V = \frac{H}{3} (A_1 + A_2 + \sqrt{A_1 \times A_2})$$

Where: V = volume
 H = difference in depth between two successive depth contours
 A_1 = area of the basin within the outer depth contour being considered
 A_2 = area of the basin within the inner depth contour line under consideration

The procedure consists of determining the volumes of successive layers of water (frustums), and then summing these volumes to obtain the total volume of the basin.

Taken from: Clarence M. Taube., Chapter 12: Three Methods for Computing the Volume of a Lake, Manual of Fisheries Survey Methods II, Michigan Department of Natural Resources, 2000

An example calculation is included in Appendix 2. The following procedure will be used to review detention basin volume calculations:

- 1) Using the Oakland County Water Resources Commissioner's "A Simple Method Of Retention Basin Design" for a 100-year frequency storm, calculate the total volume of storage required for the entire site. This is the volume required (V_t).
- 2) Using the formula for computing the volume of an irregularly shaped basin, calculate the total volume of the proposed detention basin by summing the volumes of successive contour elevations. This is the actual volume provided (V_{prov}). The volume provided must be equal to or greater than the total volume required.
- 3) Calculate the actual discharge rate from the basin at each of the successive elevations used to compute the volume provided. This is the actual flow rate out of the basin (Q_{act}) at each elevation.
- 4) Using the calculated discharge rates (Q_{act}) calculate the volume required (V_{req}) at each of the elevations used to compute a volume provided. The elevation at which the required volume and provided volume are approximately equal will be the 100-year storage level in the detention basin. The actual flow rate out of the basin at the 100-year storage level must be equal to or less than the allowable outflow ($Q_{allowable}$) for the basin.

2. *Retention Basin*

A "no-outlet" retention basin is only permissible subject to certain conditions that include, but are not limited to, the following:

- There is no other available positive outlet for the storm water runoff from the property. Every effort should be made to provide a means to de-water the basin, including a pump outlet and possible downstream improvements.
- The permeability of the existing soils must be demonstrated such that percolation of the retained storm water is possible. Soil boring logs must be submitted for review. The borings must be taken within the proposed basin bottom area to a distance of 20 feet below the proposed basin bottom elevation. Calculations performed by a professional geotechnical engineer must be submitted. The calculations must indicate the percolation rates for the soils encountered during soil boring.

- An infiltration trench is not considered an acceptable substitution for permeable soils.

The proposed storage volume of the retention basin is calculated on the basis of total contributing acreage, including all offsite areas that flow onto the property. Sufficient storage capacity must be provided for two consecutive 100-year storm events, which WRC defines by the following formula:

$$V = 2 \times 16,500 \times A \times C$$

Where, V = volume Required (ft.³)
 A = contributing acreage
 C = composite runoff coefficient

- The retention storage is calculated as volume provided in the basin above the existing ground water elevation.
- The side slopes of the proposed retention basin can be no steeper than one foot vertical to six foot horizontal.
- An overflow facility from the retention basin must be provided. Elevations of surrounding buildings, development or other features that would be impacted by a basin overflow must be indicated. If an overflow structure cannot be constructed a defined overflow route must be indicated. The overflow route may not endanger any existing structures or features. Downstream drainage easements may be required for the overflow route.
- One foot of freeboard must be provided above the proposed storage elevation.

3. *Sediment Forebay*

All detention and retention basins shall have a sediment forebay. A forebay must be installed at all incoming discharge points to the basin. The purpose of the forebay is to capture sediment in one area and prevent sediment buildup in the main basin. The forebay shall be a separate basin, which can be formed within the main basin by creating a separation with an earthen berm, riprap berm or rock or concrete retaining wall. A manufactured storm water treatment system can be used in lieu of a sediment forebay.

- The sediment forebay shall be sized to accommodate a one-year storm event. This office will use the "Detention Time" method of design from the WRC Erosion Control Manual to check the forebay design calculations. An example calculation is included in Appendix 2.
- The forebay may be included as part of the total required basin volume, above any permanent pool of water. The forebay cannot be included as available storage if it remains full of water.
- The side slopes cannot exceed 1 foot vertical to 4 feet horizontal.
- The forebay should have a sump a minimum of 2 feet deep to capture sediment and prevent resuspension of sediment. The bottom of the basin should slope toward the sump area to capture the sediment.
- The outlet shall be designed to capture the one-year storm event and dewater the basin within 48 hours. An outlet structure with restricted discharge may also be used within the separation.
- An outlet (overflow) spillway should be constructed on the separation which allows water to exit the forebay at non-erosive velocities.
- An access road should be provided for forebay maintenance. An access road is required for all facilities that will be established as a Chapter 18 County Drain.

- The forebay should also have a fixed sediment depth marker to measure the amount of sediment that has accumulated. The sediment should be removed when half of the sediment storage capacity has filled in.

4. *Manufactured Storm Water Treatment Systems*

Manufactured treatment systems may be used in lieu of a sediment forebay. These devices are used to remove sediment and other particulate matter from storm water runoff. The following are requirements for manufactured treatment systems:

- Manufactured treatment systems must be installed upstream of the storm water detention system. If the site is not required to provide storm water detention, a manufactured treatment system must be installed upstream of the connection to a county drain.
- The system shall conform to the standards set forth by the New Jersey Department of Environmental Protection (NJDEP) for manufactured treatment systems, as defined at <http://www.njstormwater.org/treatment.html>, including inline and/or offline use, manhole diameter size, and custom or multiple units.
- Calculations for determining peak discharge (qp) from a particular site shall be based on the Michigan Department of Environmental Quality Stormwater Management Guidebook, Graphical Peak Method (Appendix 5). The following factors shall be used for determining the peak discharge (qp) as defined in the said Graphical Peak Method:
 - Frequency shall be a 2-year, 24-hour storm
 - Rainfall, P (24-hour) shall be 2.24 inches
 - Runoff, Ro shall be 0.9 inches

The NJDEP Certified Treatment Flow rate (cfs) for a manufacturer and model shall be higher than the calculated peak discharge (qp) for a particular site.

5. *Underground Detention Facilities*

Generally, underground detention facilities are discouraged because of difficulty in maintaining them. However, underground detention facilities may be allowed on sites where traditional storm water management measures are infeasible, such as sites less than 1 acre in size or renovation of an existing site that originally did not have a basin. Each site will be evaluated on an individual basis.

Complete details, calculations and specifications must be submitted for the facility. The underground facility must comply with all standards imposed on traditional facilities; Including, but not limited to, a restricted outlet, overflow structure and a perpetual maintenance plan.

Underground detention facilities are prohibited in developments where the storm water detention facilities are under the jurisdiction of this office.

6. *Infiltration Trench*

An infiltration trench is not considered a preferred means of discharging storm water. Routing storm water runoff directly to an infiltration trench could contaminate ground water. Storm water must be routed through a facility or structure that filters the storm water prior to discharging to the trench. No outflow credit will be given for detention basins with an infiltration trench that is intended to function as a basin outlet.

7. *Leaching Basin*

A leaching basin is not an effective means of controlling and treating storm water runoff. A leaching basin must be used in conjunction with other drainage facilities.

8. *Innovative BMP's*

Non-traditional storm drainage facilities that improve the quality and reduce the quantity of storm water runoff are encouraged as long as the required detention volume and allowable outflow are achieved.

Complete details and specifications for the proposed storm drainage facilities must be submitted. There should be sufficient information provided such that a comprehensive review can be performed. Each case will be evaluated on a site-specific basis.

B. Utilizing Wetlands, Waterbodies and Natural Low Areas for Storage

Prior to approval of any proposed plan to use existing wetlands or waterbodies for detention purposes, permits from the appropriate state and local agencies must be applied for. Proof of such application must be submitted.

Direct discharge of storm water runoff to a wetland or waterbody is not allowed. The runoff must be routed through a facility that is specially designed to remove silt, sediment, trash, oil, grease and other debris and pollutants before discharging.

The minimum design requirements are as follows:

- Calculations must be submitted that indicate the stage rise of the wetland or waterbody due to the runoff. Each site is entitled to their pro-rata share of the capacity of the wetlands.
- A freeboard elevation must be established at one foot above the calculated stage rise.
- The stage rise should be calculated from the ordinary high water elevation.
- There shall not be point discharge of storm water to wetlands. The discharge must be routed through a level spreader or through stones, on the wetland fringe, prior to discharging to the wetlands to avoid erosion.
- A natural buffer strip is recommended around the perimeter. A drainage easement that encompasses the entire area on site, including freeboard and buffer strip, will be required. In addition, off site easements may be necessary.
- The character of the wetlands must not be altered by the addition of the storm water. A control structure must be constructed at the outflow of the wetland area to release storm water at a restricted rate as determined in Section 1. The wetland must return to its normal water level within 24 to 48 hours.

☞ In no case will retention of storm water within a wetland area be allowed.

- Storm water runoff directed to natural low areas will be considered the same as retention. The area must have the capacity to hold two consecutive 100-yr storm events and have a designated overflow route. Each site is entitled to their pro-rata share of the capacity of the depression for the land area tributary to it. A drainage easement that includes the entire area up to the freeboard elevation will be required.

C. Detention Basin Outlet Design and Overflow Structure Design

If an adequate outlet for the site's storm water has been demonstrated, the allowable outflow from a detention basin is a maximum 0.20 cfs per acre. The allowable discharge calculations must be submitted.

☞ There may be cases where the existing outlet has limitations due to downstream conditions. In this situation the discharge from the site will be restricted to conform to the governing downstream conditions. For example, if there is an existing culvert downstream, then the allowable outflow from the proposed site will be limited to the pro-rata share of the capacity of the culvert. The site's pro-rata equitable share of the outlet capacity should be calculated and shown on the construction plans.

☞ There may also be cases where the outlet has already reached capacity. The burden is on the proprietor to design and construct, at his expense, any necessary improvements to the downstream outlet. Such designs will be reviewed by the Water Resources Commissioner's office for adequacy.

Additional controls may be required in these cases in order to protect downstream properties.

- The basin outlet must control the runoff from the 100-year storm event. The actual outflow from the basin at the design storm water level may not exceed the allowable outflow.
- The outlet pipe or drainage path must be designed to carry the flow from all on-site and off-site contributing acreage.
- A cut-off collar or anti-seep diaphragm may be required to be installed around the outlet pipe within the bank of the basin, depending on the depth of storage in the basin.

The standard orifice equation will be used to check restrictor sizing calculations:

$$Q = C \times A \sqrt{2gh}$$

Where,

- Q = allowable outflow (cfs)
- C = orifice coefficient
- A = orifice area (ft²)
- g = gravity constant, 32.2 ft/s²
- h = total head on orifice measured from the design water level (feet)

- The minimum restrictor size is 3" diameter. If a 3" diameter restrictor permits discharge in excess of the allowable outflow then a different restricted outlet design may be required, such as a weir. For storm drain systems being established as Chapter 18 Drains, the restrictive orifice outlet must be grouted inside a minimum 12" diameter pipe with an end section, at the upstream end of the pipe. The restrictor must be sized for the on-site flow that is tributary to the basin. The basin overflow structure shall be sized to pass the on-site flow and the off-site tributary flow.

The following equations will be used to check weir design:

Sharp-Crested Weir-

$$Q = C \times L \times h^{3/2}$$

Where,

- Q = Discharge over the weir (cfs)
- C = Discharge coefficient, 3.33
- L = Length of weir crest (ft)
- h = Head above the weir crest (ft)

Triangular Sharp-Crested Weir-

$$Q = C \times h^{5/2}$$

Where,

- Q = Discharge over the weir (cfs)
- C = Discharge coefficient for a 90° triangular weir, 2.5
- h = Head above the weir notch bottom (ft)

Broad-Crested Weir-

$$Q = C \times L \times h^{3/2}$$

Where, Q = Discharge over the weir (cfs)
 C = Discharge coefficient, 3.0
 L = Length of weir crest (ft)
 h = Head above the weir crest (ft)

Trapezoidal Weir-

$$Q = C \times L \times h^{3/2}$$

Where, Q = Discharge over the weir (cfs)
 C = Discharge coefficient, 3.367
 L = Length of weir crest (ft)
 h = Head above the weir crest (ft)

Equations taken from: Michael R. Lindeburg, P.E., Civil Engineering Reference Manual, Professional Publications, Inc., CA, 1999

- All detention basins must have an internal overflow structure located at the design water level. This is a structure that will discharge the storm water by by-passing the restrictor in emergency situations. The overflow must have the capacity to pass the on-site flow as well as the off-site tributary flow and have a bar screen or trash hood.

Examples of basin outlet and overflow calculations are included in Appendix 2.

III. STORM WATER CONVEYANCE

Storm water drainage systems may consist of open ditch drains, swales, closed conduits or a combination of methods to convey storm water. Drainage facilities shall be constructed in accordance with these WRC minimum specifications. Other standards such as: Michigan Department of Transportation, Road Commission for Oakland County, City or Township, which may be more stringent shall also be adhered to. WRC construction standards for enclosed storm drains are available from the WRC office.

A. Enclosed Storm Drains

An enclosed storm drain system must be designed to accommodate the storm water runoff from a 10-year storm from the entire contributing watershed. The “Manning” formula will be used to check the pipe size:

$$Q = \frac{1.486}{n} \times A \times R^{\frac{2}{3}} \times S^{\frac{1}{2}}$$

where,

- Q = flow capacity (cfs)
- n = Manning coefficient of roughness
- A = cross-sectional area of pipe (ft²)
- R = hydraulic radius of pipe, A/P (ft)
- P = wetted perimeter of pipe (ft)
- S = pipe slope (ft/ft)

The following values will be used for “n”:

<i>pipe material</i>	<i>n</i>
smooth concrete pipe, approved flexible pipe	0.013
unlined cmp	0.025

- The hydraulic grade line must be calculated for the entire system. The hydraulic grade will be assumed to start at the elevation of 0.80 x pipe diameter of the outlet pipe or the permanent pool elevation, whichever is higher. The hydraulic gradient should be kept below the top of the pipe; in no case shall it be higher than the rim elevation of any structure.
- The minimum pipe size for storm drains accepting surface runoff is 12” diameter. Rear yard pipes may be smaller, but must be used in conjunction with a drainage swale that directs runoff to a minimum 12” diameter pipe structure.
- Pipe joints must prevent excessive infiltration.
- Storm drains shall be designed to have a minimum velocity flowing full of 2.5 ft/sec and a maximum velocity of 10 ft/sec. The velocity at a pipe outfall should be between 2.5 to 5 ft/sec to prevent scouring at the outlet.
- Riprap shall be installed at all outlets according to the Oakland County Water Resources Commissioner’s Storm Drain Notes and Details Sheet. Riprap may consist of minimum 8” diameter to 15” diameter fragmented limestone or other suitable rock underlain with geotextile fabric. Cobblestone, broken concrete or grouted riprap is not preferred. Larger diameter outlets may require larger riprap as velocity and flow conditions dictate.
- A bar screen is required for all pipe outlets and inlets 18” diameter and larger.

A sample calculation for enclosed drains is included in Appendix 2.

B. Drainage Structures

The flows to specific catch basin or inlet covers shall conform to the following:

1. Combination curb and gutter inlet (MDOT Cover K, or equivalent):
A maximum of 3.1 cfs at 0% grade (sump condition), and then decreasing as grade increases.
2. Gutter inlet (MDOT Cover D, or equivalent):
A maximum of 3.2 cfs as 0% grade (sump condition), and then decreasing as grade increases.
3. Rear yard or ditch inlet (MDOT Beehive Cover E, or equivalent):
In general, a maximum of 2.5 cfs at 0% grade (sump condition), and then decreasing as grade increases. However, a smaller or larger maximum inflow may be allowed as is warranted by surrounding finished grading.

See Appendix 3 for MDOT cover specifications. Calculations for grate inlet capacities must be submitted if different inlets are used.

Drainage inlets shall be located as follows:

1. To assure complete positive drainage of all areas of the site.
2. At all low points of streets and rear yards.
3. Such that there is a maximum of 600 feet of drainage from any particular point on the site to a structure.

C. Open Watercourses

Appropriate permits from agencies such as the Michigan Department of Environmental Quality must be applied for and a copy of such application must be submitted.

The "Rational Method", SCS method or other prior approved method will be used to determine the amount of flow contributing to the watercourse. All watercourses must be sized to accommodate the runoff from a 10-yr storm event. The "Manning" formula will be used to check the capacity of the watercourse. Appropriate values will be used for "n".

Examples of Manning "*n*" values for open channels

<u>surface</u>	<u><i>n</i></u>
maintained grass channel, rear yard swales, earth channel with stones and weeds	0.025
natural channels, somewhat irregular side slopes; fairly even, clean and regular bottom, very little variation in cross-section	0.035
dredge channel, irregular sideslopes and bottom, sides covered with some saplings and brush, slight and gradual variations in cross-section	0.045

- Open channel flow velocities shall be neither siltative nor erosive. In general the minimum acceptable non-siltative velocity will be 2.5 ft/sec. Every effort should be made to reduce the velocity of flow as much as possible at all storm drain outlets. The outlet velocity should be at maximum 2.5 to 5 feet/second.
- Outlets to channels shall be placed at the bottom of the channel with headwalls or flared end sections with erosion protection as required. Natural stabilization shall be provided where necessary to prevent erosion.
- Erosion protection shall be placed at bends, drain inlets and outlets, and other locations as required in all open ditches.
- Back slopes of channels shall be no steeper than 1 foot vertical to 3 feet horizontal, unless fencing is provided. Ditches with steep grades shall be protected by sod, vegetation or other means to prevent scour.
- A minimum of 5-foot clearance shall generally be between open ditch inverts and underground utilities.
- All bridges shall be designed to provide a 2 foot minimum flood stage freeboard to the underside of the bridge. The bridge footings shall be deep enough to be below the frost line and to allow a 3 foot channel deepening and may not be located within the open channel.
- Areas within open drain rights-of-way, which have been cleaned, re-shaped or in any manner disturbed shall be seeded and mulched or vegetated in some manner.
- A manhole sump or catch basin should be provided at the last structure prior to a storm drain outletting to an open drain as a minimum method of erosion protection.

D. Determination of Culvert Size

All culvert design calculations must be submitted to this office for review. Calculations must be sealed by a Professional Engineer and must include:

1. Delineation on a topographic map of the area contributing to the culvert.
 2. Hydrologic calculations to determine the amount of flow.
 3. Hydraulic calculations used to determine the size of the culvert.
 4. Calculations for height of cover, gage size and expected loads.
 5. When an existing culvert is proposed to be modified, backwater calculations and/ or downstream calculations may also be submitted.
- This office will use the "Rational Method", the SCS Method or other prior approved method to determine the flow contributing to the culvert. Culverts shall be sized to pass a minimum 10-year storm event or the governing design storm of the watercourse, which may be higher.
 - The velocity within the culvert shall be neither siltative nor erosive.
 - The "Manning" formula or inlet headwater control or outlet tailwater control nomographs will be used to check the culvert design.

Construction requirements and end section treatments are as stated on the Oakland County Water Resources Commissioner's Storm Drain Notes and Details Sheet.

E. Easements

Easement provisions shall conform to the widths indicated in the "Preliminary Plat" section (Part 3, "Easement Requirements").

All drainage easements, including freeboard and buffer strip, shall be so designated on the plans as well as on the "Mylar" plat.

All existing easements are to be shown and identified on the mylar including the Liber and Page.

Existing County Drain easements shall be indicated on the plans as well as the "mylar" plat and shall be designated as 'XX feet wide easement for the "Name" (County) Drain as recorded in Liber___ Page___'.

In cases where storm water is discharged to a drain or watercourse on adjoining private property, an improvement to the drain and an agreement with the property owner may be necessary. An off-site drainage easement will be required if:

- a. The watercourse is not depicted as a blue line on a USGS map.
- b. It is not indicated on the MIRIS map.
- c. The watercourse is not considered wetlands by the governing municipality.

F. Drains Under The Jurisdiction Of The Water Resources Commissioner

When a County Drain is the proposed outlet for a site's storm drainage system, the standards outlined herein regarding storm water storage volume and allowable outflow must be complied with. There may be cases where the existing outlet has limitations due to downstream conditions. In this situation the discharge from the site will be restricted to conform to the governing downstream conditions. The allowable outflow from the proposed site will be limited to the pro-rata share of the capacity of the drain. The site's pro-rata equitable share of the outlet capacity should be calculated and shown on the construction plans.

There may also be cases where the outlet has already reached capacity. The burden is on the proprietor to design and construct, at his expense, any necessary improvements to the downstream outlet. Such designs will be reviewed by the Water Resources Commissioner's office for adequacy.

Locations, easements and drainage service area boundaries for County Drains are available from the Water Resources Commissioner's Office. Permanent structures may not be constructed within the easement of a County Drain. This includes storm water storage facilities. All basins must be located entirely outside of the permanent easement.

1. Easements

Prior to 1956, County Drain easements were not required by statute to be recorded with the County Clerk; it was legally sufficient to have them on file at the drain office. Therefore, it is necessary to check the permanent records of the Water Resources Commissioner's Office to see if a drain easement is in existence on the subject property.

It may be necessary to record a new easement for that part of the County Drain that traverses the site. The existing easement may be abandoned in consideration for the granting of the new easement.

For open ditch drains, the easement must be at minimum, wide enough to include the extreme width of the open ditch drain plus 15' on each side measured from the top of bank. In addition, a vegetated buffer strip may be required. For enclosed drains, the easement must be a minimum of twenty (20) feet centered on the centerline of the pipe. However, larger pipe size, certain soil conditions, or depth of pipe may require larger easements.

The proposed easement must be submitted to this office for review. Upon completion of the project the owner's engineer will be required to provide the Oakland County Water Resources Commissioner's Right-of-Way Department with an existing or "as-built" metes and bounds centerline description of the entire length of the drain through the referenced property. Upon submittal of the description, along with proof of property ownership, WRC Right-of-Way Department will prepare the necessary documents for execution by the owner(s).

This office must also be provided with one set of "As-Built" mylars reproduced from the original engineering drawings, cleaned of all background debris, showing plan, profile and the new easement of the drain. A digital version of the "As-Built" plans must also be submitted.

Proposed County Drain easements shall be indicated on the plans as well as the "mylar" plat and shall be designated as 'permanent private easement for the "Name" (County) Drain'. In addition the following note must be added to the mylar:

"Use of the word "private" does not limit in any way the scope of the easement granted to the "Name" (County) Drain Drainage District"

2. *Drainage Service Areas (Districts)*

A Drainage Service Area and Special Assessment District are each a legally established boundary for the area served by a County Drain. Drainage Service Areas do not always match the topographical area tributary to a County Drain. Drainage Service Areas shall not be violated when designing a drainage system.

Alterations to a Drainage Service Area and/or a Special Assessment District may be made by following the procedure established in the Drain Code. Approval must be granted by the Water Resources Commissioner or the Drainage Board.

G. Soil Erosion and Sediment Control

Soil erosion and sediment control devices shall be installed as required by the Oakland County Water Resources Commissioner's "Erosion Control Manual" within municipalities where the Soil Erosion and Sedimentation Control Program is administered by the Oakland County Water Resources Commissioner. The following points should be kept in mind when designing an erosion control plan for a site:

- Areas within open drain rights-of-way, which have been cleaned, re-shaped or in any manner disturbed shall be seeded and mulched or otherwise vegetated.
- The smallest practical area of raw land should be exposed at one time during development.
- When raw land is exposed during development, the exposure should be kept to the shortest practical period of time.
- Temporary vegetation and/or mulching should be used to protect critical areas exposed during development.
- The permanent final vegetation and structures should be installed as soon as practicable in the development.
- The development plan should be fitted to the topography and soil so as to create the least erosion potential.
- Wherever feasible, natural vegetation should be retained and protected.

IV. CHAPTER 18 DRAINS

Chapter 18 drains are new developments within Oakland County where the local municipality has passed an ordinance that requires all residential and certain commercial drainage systems to be established as County drains in accordance with the provisions of Section 433, Chapter 18 of the Public Acts of 1956, as amended, the Michigan Drain Code. At present, Oakland and West Bloomfield Townships each have such an ordinance.

Following are the specific requirements of the Oakland County Water Resources Commissioner in accordance with the provisions of the Drain Code.

A. Request To Establish a County Drain

The Developer must submit three (3) complete sets of construction plans prepared and sealed by a Registered Professional Engineer or Professional Surveyor. A letter from the Developer requesting that the storm drainage facilities be established as a County Drain and a certificate from the design engineer

certifying the adequacy of the storm drainage outlet must accompany the construction plans. An Engineer's Certificate must be sealed.

B. Agreement to Establish a County Drain

The Developer and/or Land Owner of Record must enter into an Agreement to establish the proposed drainage system as a County Drain or Branch Drain of an existing legally established County Drain. A district enlargement may be necessary for Branch Drain establishment. The Developer and/or Land Owner must provide this office with the following items for Agreement preparation:

- A copy of the Title Policy or other proof of land ownership
- A metes and bounds property description with proof of closure
- Sidwell number(s) of all property proposed to be included in the drainage district
- An estimate of the construction cost of the drainage facilities
- Company name and address and name and title of individuals who will execute the Agreement.

Once this office has received all of the above information, the Agreement will be prepared. The Agreement must be executed prior to construction plan final approval.

After the Agreement has been signed by all parties and notarized the Water Resources Commissioner will have the Agreement recorded with the County Clerk's Office.

C. Construction Plans

The construction plans must be prepared according to the design standards and specifications presented herein. If the local municipality has more stringent standards then the municipality standards will govern.

In the case where the Chapter 18 Drain development will be platted, the procedures for a preliminary and final plat must also be adhered to.

Final construction plan approval will not be granted until all required documents and fees have been received. Construction of the storm drain system may not begin until the construction plans have been approved. After the construction plans have been approved, this office will process the final subdivision plat as set forth in the Subdivision Control Act of 1967, as amended.

This office will provide full time construction inspection of the storm drain system. Drainage facilities constructed without appropriate inspection by this office or its designated representative may not be accepted by this office as a County Drain.

D. Easement Requirements

The Developer and/or Land Owner shall provide easements for the proposed drainage facilities. Easement requirements vary with the type of site being developed. If the site is a platted subdivision, the easements must be shown on the plat mylar and the standard WRC easement language must be included in the deed restrictions. If the site is a condominium development, the easements must be shown on the "Exhibit B" drawings and the standard WRC easement language must be included in the deed restrictions. A copy of the proposed deed restrictions must be submitted to this office for review. A recorded copy must be on file at this office prior to the final inspection.

Easement widths are to be in accordance with Part F of Section III of these standards.

E. Inspections

This office or its designated representative will perform daily inspection of the construction of the storm drainage facilities. Full time inspection is required for all aspects of storm drain construction. This is to ensure that the storm drainage system is constructed according to the plans and specifications approved by this office.

The Developer and/or Land Owner is responsible for the liability and maintenance of the storm drainage system until it is accepted for service by the Water Resources Commissioner.

The WRC Inspection Department must be notified **2 WORKING DAYS** prior to commencing construction and for all acceptance inspections.

All field changes must be **PRE-APPROVED** by the Oakland County Water Resources Commissioner prior to installation.

1. *First Inspection*

The purpose of the first (Construction) inspection approval is to release the underground contractor from responsibility of damage to the underground drainage system by others during future construction on the project site. The requirements of the first inspection are as follows:

- a. All pipes and structures must be free of dirt and debris.
- b. Structures must be complete, plastered or pointed with channels, benches and castings in place.
- c. All inlets and outlets must be completed with riprap in place.
- d. The storm water storage facility is constructed and stabilized.
- e. The storm drainage system must be completed and fully functional.
- f. All erosion control measures in place and all outstanding soil erosion violation addressed.

2. *Second Inspection*

The second inspection will be performed after the completion of the road paving to insure that the drainage system has not been damaged by the paving process. The purpose of the second inspection is to relieve the Pavement Contractor from responsibility for future damage to the storm drainage system.

3. *Third Inspection*

The purpose of the third inspection is to conditionally accept the drainage system for maintenance and operation by the Oakland County Water Resources Commissioner and to relieve the Developer and/or Land Owner from the responsibility of maintenance of the storm drainage system. The Developer and/or Land Owner is still responsible for the integrity of the system until the completion of the final accounting and final acceptance by the Oakland County Water Resources Commissioner.

The third inspection will consist of a thorough and complete inspection of the entire storm drain system. A punch list of outstanding construction items will be generated and forwarded to the Developer and/or Developer's representative for resolution. Once these punch list items have been addressed and corrected, then a third inspection approval may be issued.

The third inspection can be scheduled after the following requirements have been met:

- a. All disturbed areas must be vegetated. Right-of-ways, easement areas, detention ponds and swales must be sodden or vegetated with an approved plant material.
- b. As-built drawings have been submitted to the Oakland County Water Resources Commissioner.
- c. The local governing body has no objections
- d. There are no outstanding soil erosion issues and no history of poor soil erosion practices by the Developer and/or Land Owner.
- e. All required documents and fees have been submitted and approved, including "Exhibit B" drawings, offsite drainage easements and recorded Deed Restrictions or a Master Deed with the appropriate drain easement language.

F. As-built Plans and Mylar Requirements

Immediately following the completion of construction, the Developer and/or Land Owner shall furnish this office with a set of drawings corrected to indicate as-built conditions. Upon approval of these "As-Built" drawings, the Developer and/or Land Owner shall submit one (1) set of reproducible "Mylar" as-built construction drawings. A digital version of the "As-Built" plans must also be submitted.

G. Final Acceptance and Final Accounting

One year from the date of the third inspection approval (conditional acceptance) the Developer may request, in writing, a final accounting of the project. The project file will be reviewed and a final walk through inspection of the Drain will be performed to ensure that the integrity of the system is intact. The final inspection can be scheduled after the following requirements have been met:

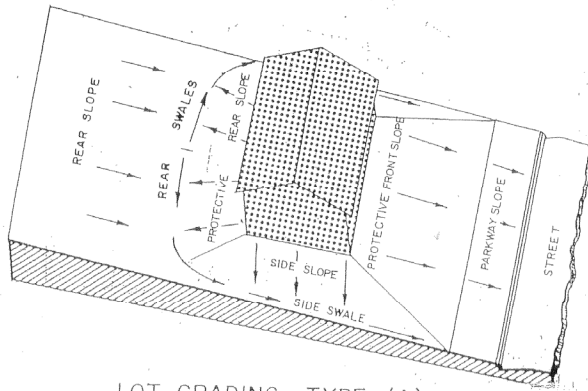
- 1) All conditions of the Agreement are satisfied,
- 2) The drain is functional and serviceable,
- 3) There are no outstanding liens or judgments against the storm drainage system,
- 4) A Developer's Declaration and Developer's affidavit are on file at this office.

If all requirements are met and the final inspection approval has been issued, a final accounting will be made of the project fund. A letter of final acceptance will be issued along with the remaining refundable amount of the deposit.

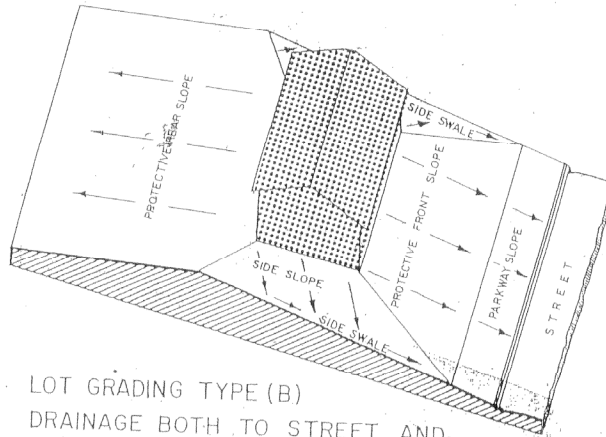
Appendix 1



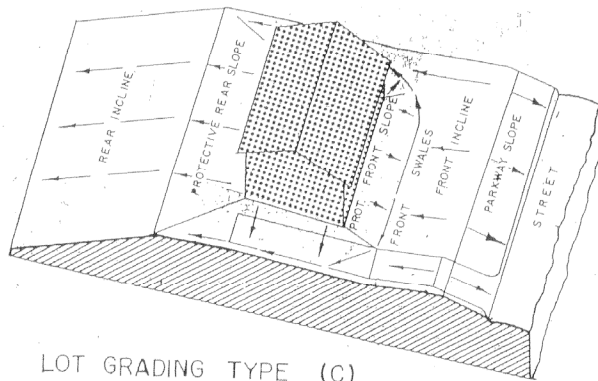
Lot Grading Sketches



LOT GRADING TYPE (A)
ALL DRAINAGE TO STREET

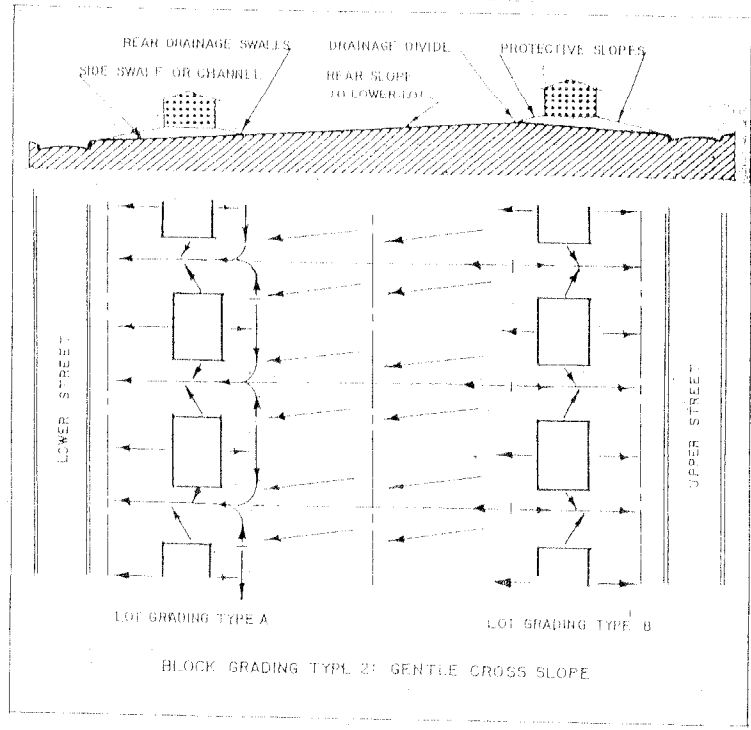
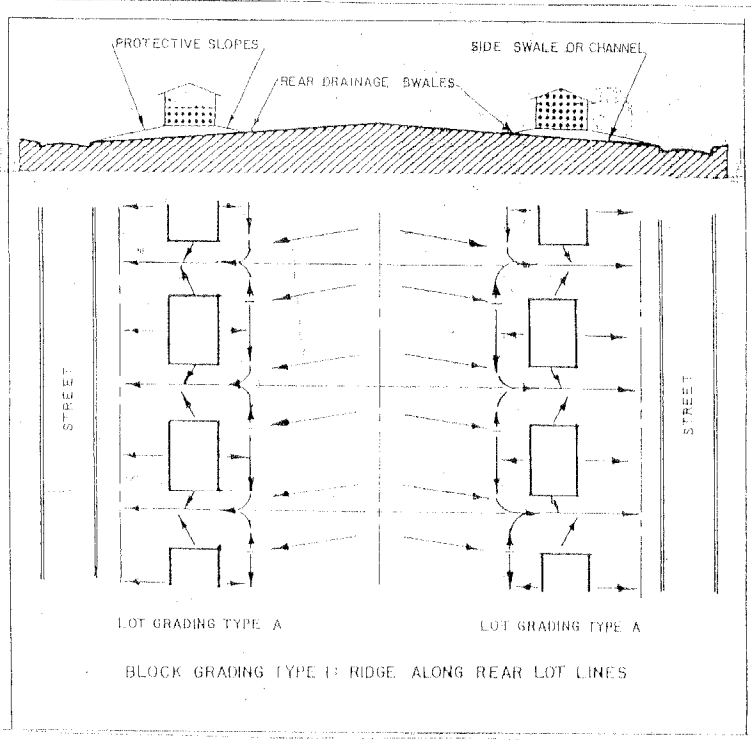


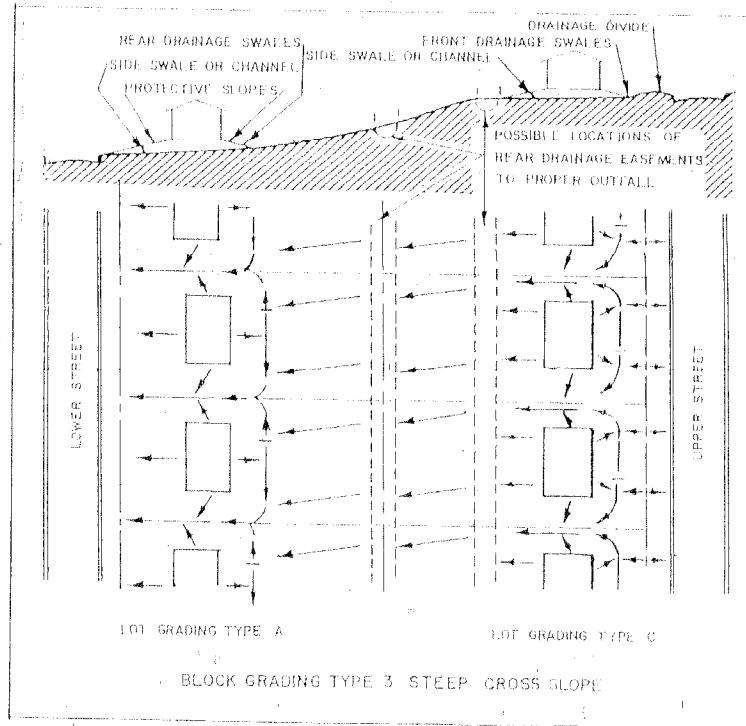
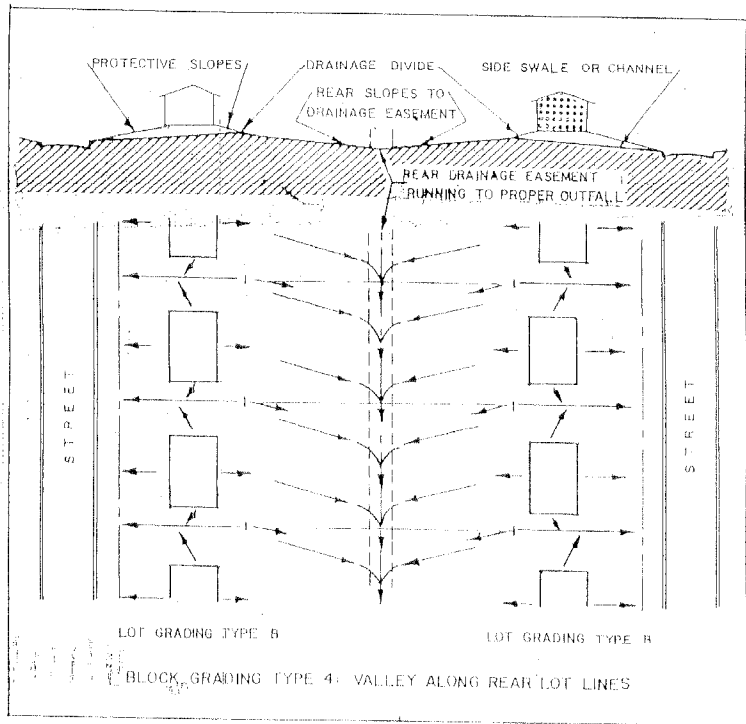
LOT GRADING TYPE (B)
DRAINAGE BOTH TO STREET AND
TO REAR LOT LINE



LOT GRADING TYPE (C)
ALL DRAINAGE TO REAR LOT LINE

(LEAST DESIRABLE: CHECK WITH COMMUNITY BUILDING CODE)





Appendix 2

Sample Calculations

SAMPLE CALCULATIONS

Example Problem:

The proposed project is a 20 acre subdivision with a composite runoff coefficient of 0.35. There are 5 acres of off-site contributing acreage. The basin will have a permanent pool of water up to elevation 100.00' and the depth of storage will be approximately four feet. The proposed invert of the discharge pipe into the basin is 101.00'. The proposed invert of the restrictor is 99.50'. The outlet pipe for the basin is 24" diameter. Determine the following:

- 1) The volume required for the forebay, the median surface area and the size of the outlet, in order to dewater the forebay within 48 hrs.
- 2) The volume required for the detention basin and the size of the restricted outlet pipe.
- 3) The elevation and size of the basin overflow structure and the size of the overflow outlet pipe.
- 4) The size of a portion of storm drain on the site and the hydraulic grade line of the pipe run.

Solution:

1)

Volume of storage $V_r = 4,320 (0.35) (20ac)$
 $V_r = 30,240 \text{ cuft}$

Median surface area $A_m = V_r / 5 \text{ ft}$
 $A_m = 6,048 \text{ sqft}$

Size of outlet $a = (0.3988 (6,048) \sqrt{5}) / 172,800$
 $a = 0.0312 \text{ sqft}$

- 2) The volume provided for the forebay can be counted as part of the volume required for the detention basin.

Calculate volume required

$Q_{allow} = 4.00 \text{ cfs}$
 $Q_o = 0.57$
 $T = 109.51$
 $V_s = 10936.49$
 $V_t = 76555 \text{ cf}$
 $V_{adj} = 76555 \text{ cf}$

Estimate restrictor size using the orifice equation. The restrictor should be sized using on-site area only.

outlet inv. = 99.50
 springline = 99.83
 $h = 4.17 \text{ ft.}$
 $a = 0.39 \text{ sf}$
 $d = 6.67 \text{ in.}$
 try outlet size = 8.00 in.

Make a chart to calculate the volume provided in the basin. The volume should be calculated in one foot increments starting at the permanent pool elevation. Calculate the actual outflow from the basin at each elevation.

elevation	Area	h	sum Vprov	ha	Qact
100.00	10000	0.00	0	0.17	0.709
101.00	20000	1.00	14714	1.17	1.876
102.00	30000	1.00	39546	2.17	2.556
103.00	40000	1.00	74426	3.17	3.091
103.15	41500	0.15	80538	3.32	3.163
104.00	50000	0.85	112597	4.17	3.545
105.00	freeboard	1.00			

Using the value for **Qact** at each elevation, calculate the volume required at each elevation. The elevation at which **Vreq** and **sum Vprov** are approximately equal is the storage elevation. Interpolate between elevations to find the values that are approximately equal.

elevation	Qo	T	Vs	Vreq
100.00	0.10	294.08	14016	98110
101.00	0.27	171.17	12562	87937
102.00	0.37	143.04	11956	83690
103.00	0.44	127.83	11543	80804
103.15	0.45	126.07	11491	80436
104.00	0.51	117.70	11225	78575
105.00	freeboard			

The overflow rim should be set at the 100-year storage elevation **103.15'**. At this elevation the actual flow out is less than the flow allowed, 4.00 cfs. Therefore, an 8" diameter restrictor is adequate.

3) Try a four foot diameter structure to start. The overflow structure will act as a weir. If the structure is near the bank of the basin, only approximately 50% of it's perimeter will be utilized. If the structure were located in the center of the basin, 100% of the perimeter would be used. The off-site contributing acreage is assumed to be undeveloped.

Sizing Overflow Structure-

size of overflow manhole:	<u>4.00</u> ft
% of MH that can be used as a weir:	<u>50.00</u> %
calculated length of weir =	<u>6.28</u> ft
acreage tributary to overflow (on + off site):	<u>25.00</u> ac
composite runoff coefficient =	<u>0.31</u>
longest time of flow to basin:	<u>25.00</u> min
(from pipe flow calculations)	
sum of all flow into basin (on + off-site):	<u>30.15</u> cfs
volume of basin (Vprov from detention calc's):	<u>80538</u> cf
storage elevation:	<u>103.15</u> ft
freeboard elevation:	<u>105.00</u> ft
time to fill basin= Vprov / flow into basin =	<u>44.52</u> min
l =	<u>1.85</u>
Qexp = CIA =	<u>14.35</u> cfs
Qweir=	3.33 (L) h ^{1.5}
calculate how high the water will rise above the overflow structure to pass the expected flow:	
h=	<u>0.78</u> ft
elevation of water during overflow conditions=	<u>103.93</u> ft

Is this elevation less than the freeboard elevation?
 If yes, then the four foot diameter structure is large enough.

Sizing Overflow Outlet Pipe-

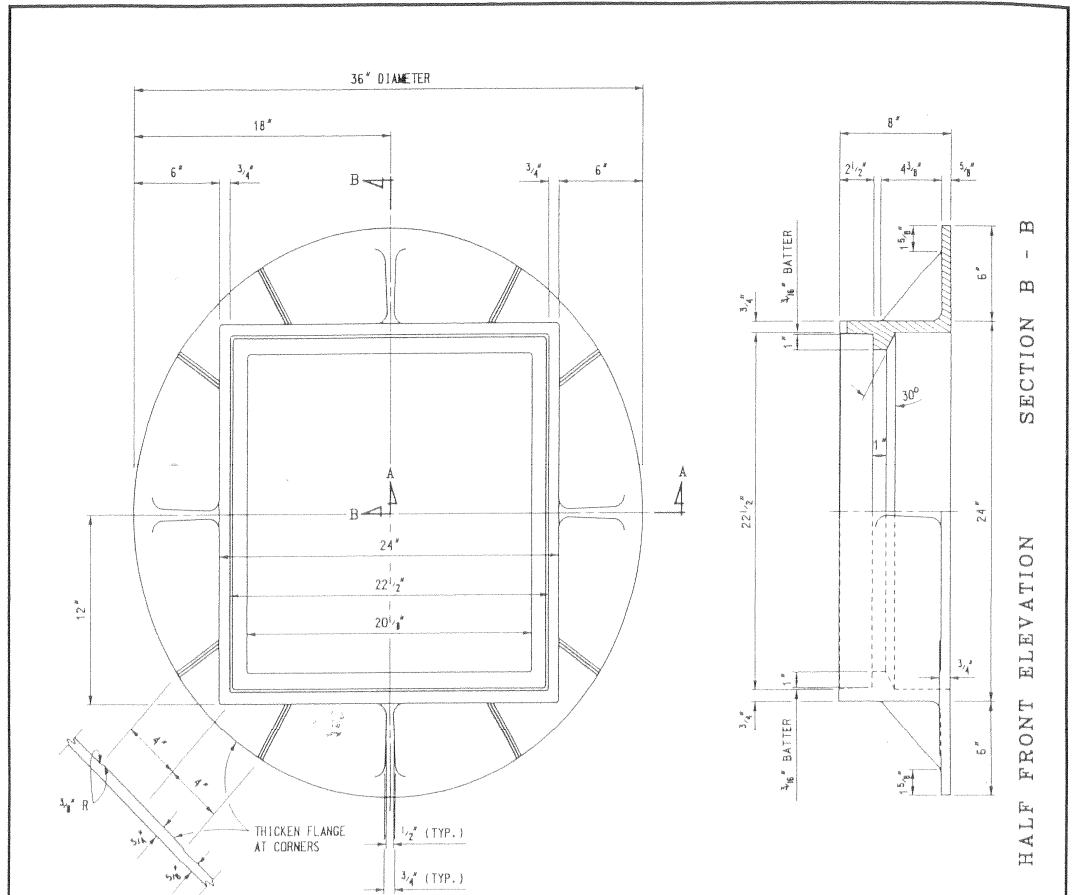
size of pipe:	<u>24.00</u> in
area =	<u>3.14</u> sf
invert of pipe:	<u>99.50</u> ft
springline=	<u>100.50</u> ft
h=	<u>2.65</u> ft
capacity, Q = 0.62* a* sqrt(64.4* h) =	<u>25.45</u> cfs

Is capacity of pipe greater than Qexp?
 If no, then outflow pipe is not large enough.

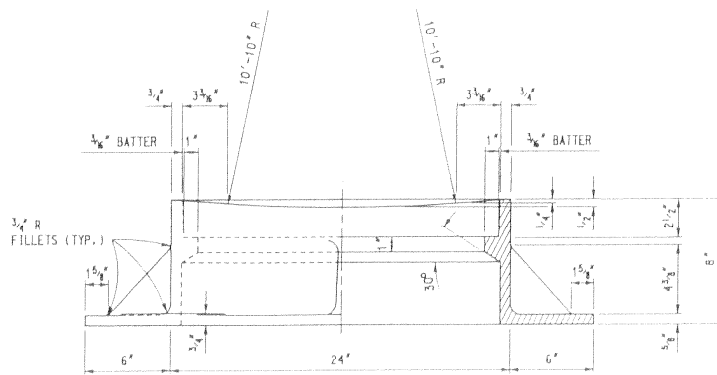
Appendix 3






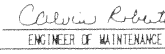
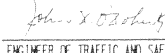

MDOT Inlet Covers

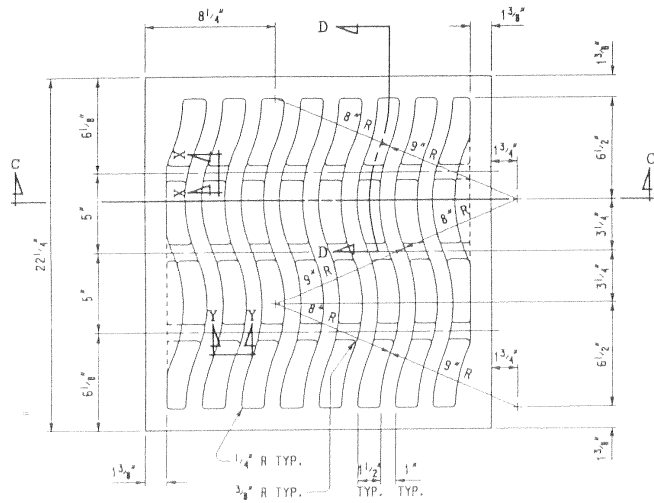


PLAN VIEW OF FRAME

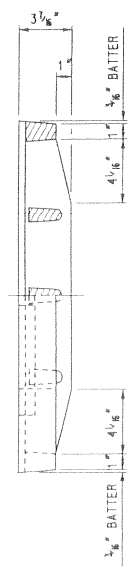


HALF SIDE ELEVATION SECTION A - A

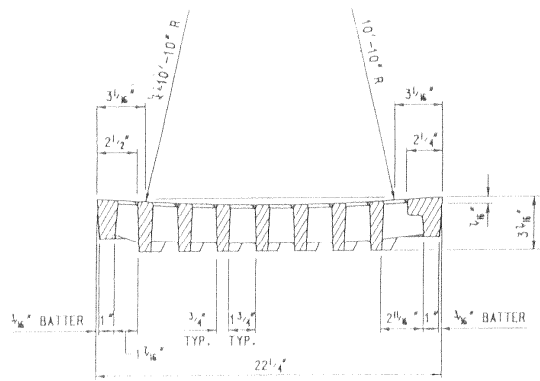
	 ENGINEER OF CONSTRUCTION & TECHNOLOGY	ENGINEER - ROAD DESIGN  ENGINEER OF DESIGN	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAY TECHNICAL SERVICES STANDARD PLAN FOR		
	PREPARED BY DESIGN DIVISION DRAWN BY: <u>B.L.T.</u> CHECKED BY: <u>W.K.P.</u>	 ENGINEER OF MAINTENANCE  ENGINEER OF TRAFFIC AND SAFETY	DEPARTMENT DIRECTOR Gregory J. Rosine BY:  CHIEF ENGINEER/DEPUTY DIRECTOR BUREAU OF HIGHWAY TECHNICAL SERVICES	COVER D FOR USE WITH STRAIGHT CURB AND CURB & GUTTER	
		9-14-2001 F.H.V.A. APPROVAL	2-26-2001 PLAN DATE	R-9-B	SHEET 1 OF 2



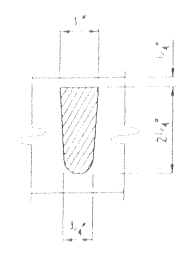
PLAN VIEW OF GRATE



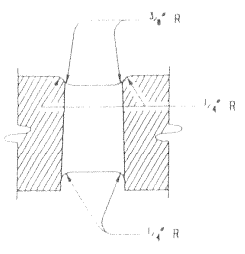
SECTION D - D
ELEVATION OF GRATE



SECTION C - C



SECTION X - X



SECTION Y - Y

NOTES:

THE CASTINGS SHALL MEET THE REQUIREMENTS OF THE CURRENT STANDARD SPECIFICATION FOR GRAY IRON CASTINGS AASHTO M 105, AND SHALL HAVE A MINIMUM STRENGTH AS PROVIDED FOR CLASS NO. 30 GRAY IRON CASTINGS.

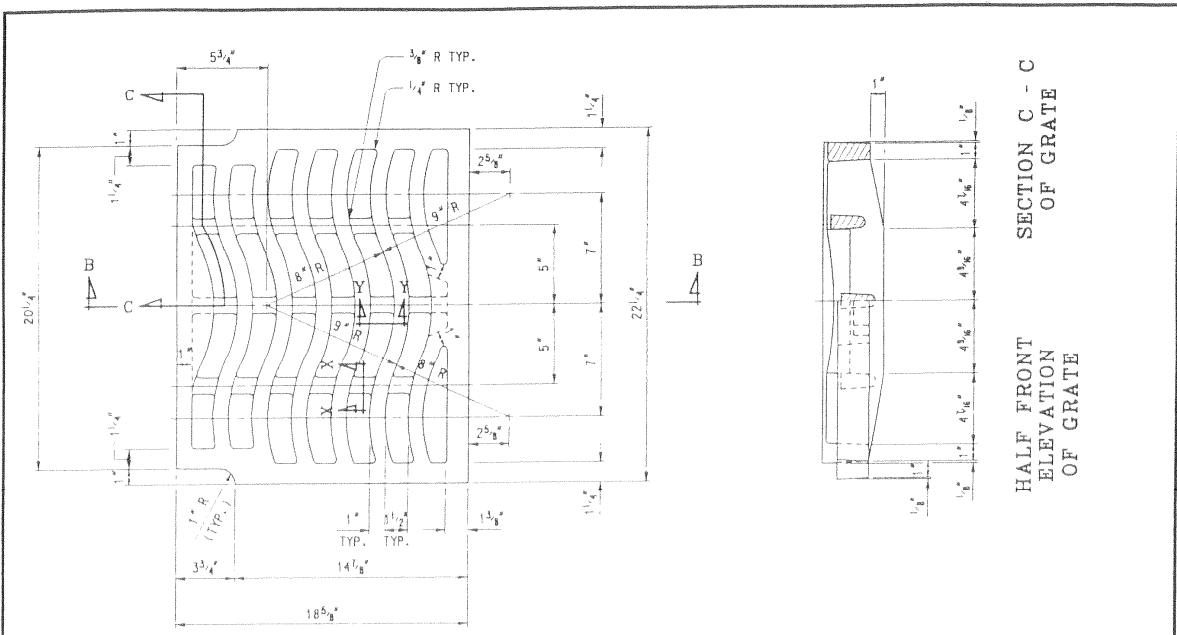
ALL CASTINGS SHALL BE CLEANED BY CURRENT APPROVED BLASTING METHODS.

THE SEATING FACE OF THE GRATE AND THE SEAT FOR THE SAME ON THE FRAME AND THE CURB BOX SHALL BE GROUND SO THAT THE GRATE WILL HAVE AN EVEN BEARING ON ITS SEAT TO PREVENT ROCKING OR TILTING.

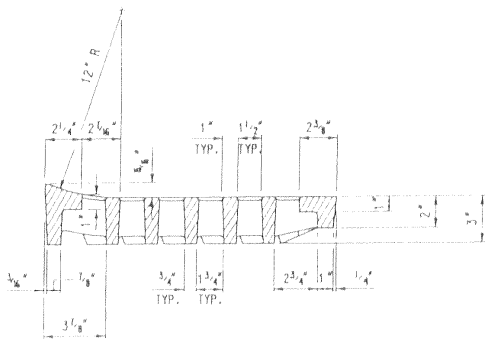
THE CASTINGS SHALL BE FREE OF POURING FAULTS, BLOW HOLES, CRACKS AND OTHER IMPERFECTIONS. THEY SHALL BE SOUND, TRUE TO FORM AND THICKNESS, CLEAN AND NEATLY FINISHED, AND SHALL BE COATED WITH COAL TAR PITCH VARNISH.

THIS COVER IS DESIGNED TO FIT ON ANY INLET, CATCH BASIN OR ON ANY EXISTING SIMILAR STRUCTURE WHEN SO DESIGNATED ON THE PLANS.

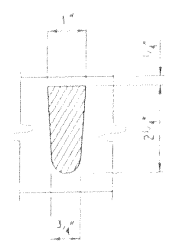
MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAY TECHNICAL SERVICES STANDARD PLAN FOR COVER D FOR USE WITH STRAIGHT CURB AND CURB & GUTTER			
9-14-2001 F.H.T.A. APPROVAL	2-26-2001 PLAN DATE	R-9-B	SHEET 2 OF 2



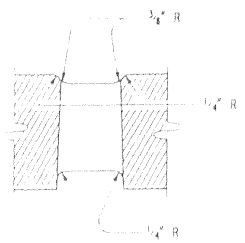
PLAN VIEW OF GRATE



SECTION B - B

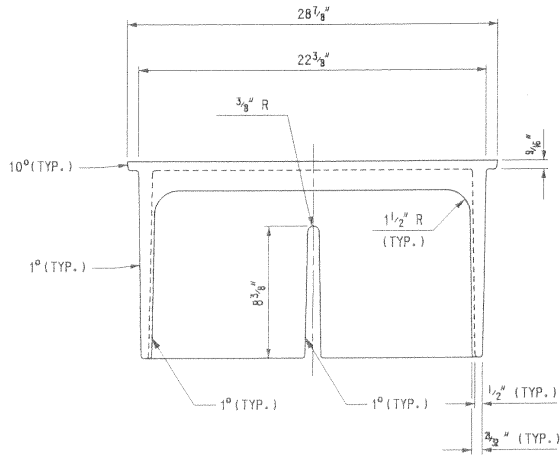


SECTION X - X

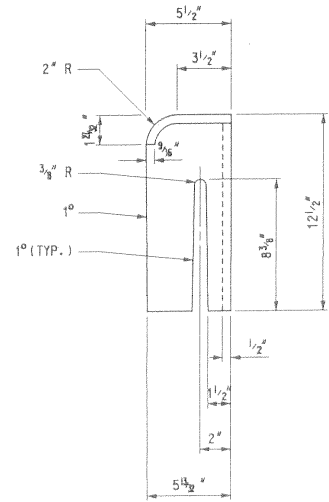


SECTION Y - Y

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAY TECHNICAL SERVICES STANDARD PLAN FOR			
COVER K			
FOR USE WITH CONCRETE CURB & GUTTER DETAILS C3, C4, C5, C6, F3, F4, F5, & F6			
3-14-2001 F.H.W.A. APPROVAL	2-26-2001 PLAN DATE	R-15-C	SHEET 2 OF 3



FRONT VIEW OF CURB BOX



SIDE VIEW

NOTES:

THE CASTINGS SHALL MEET THE REQUIREMENTS OF THE CURRENT STANDARD SPECIFICATION FOR GRAY - IRON CASTINGS AASHTO M 105, AND SHALL HAVE A MINIMUM STRENGTH AS PROVIDED FOR CLASS NO. 30 GRAY - IRON CASTINGS.

ALL CASTINGS SHALL BE CLEANED BY CURRENT APPROVED BLASTING METHODS.

THE SEATING FACE OF THE GRATE AND THE SEAT FOR THE SAME ON THE FRAME SHALL BE GROUND OR MACHINED SO THAT THE GRATE WILL HAVE AN EVEN BEARING ON ITS SEAT TO PREVENT ROCKING OR TILTING.

THE CASTINGS SHALL BE FREE OF POURING FAULTS, BLOW HOLES, CRACKS AND OTHER IMPERFECTIONS. THEY SHALL BE SOUND, TRUE TO FORM AND THICKNESS, CLEAN AND NEATLY FINISHED, AND SHALL BE COATED WITH COAL TAR PITCH VARNISH.

THE CURB BOX AND FRAME SHALL BE SHIPPED ASSEMBLED.

THIS COVER IS DESIGNED TO FIT ON ANY INLET, CATCH BASIN OR ON ANY EXISTING SIMILAR STRUCTURE WHEN SO DESIGNATED ON THE PLANS.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY TECHNICAL SERVICES STANDARD PLAN FOR

COVER K

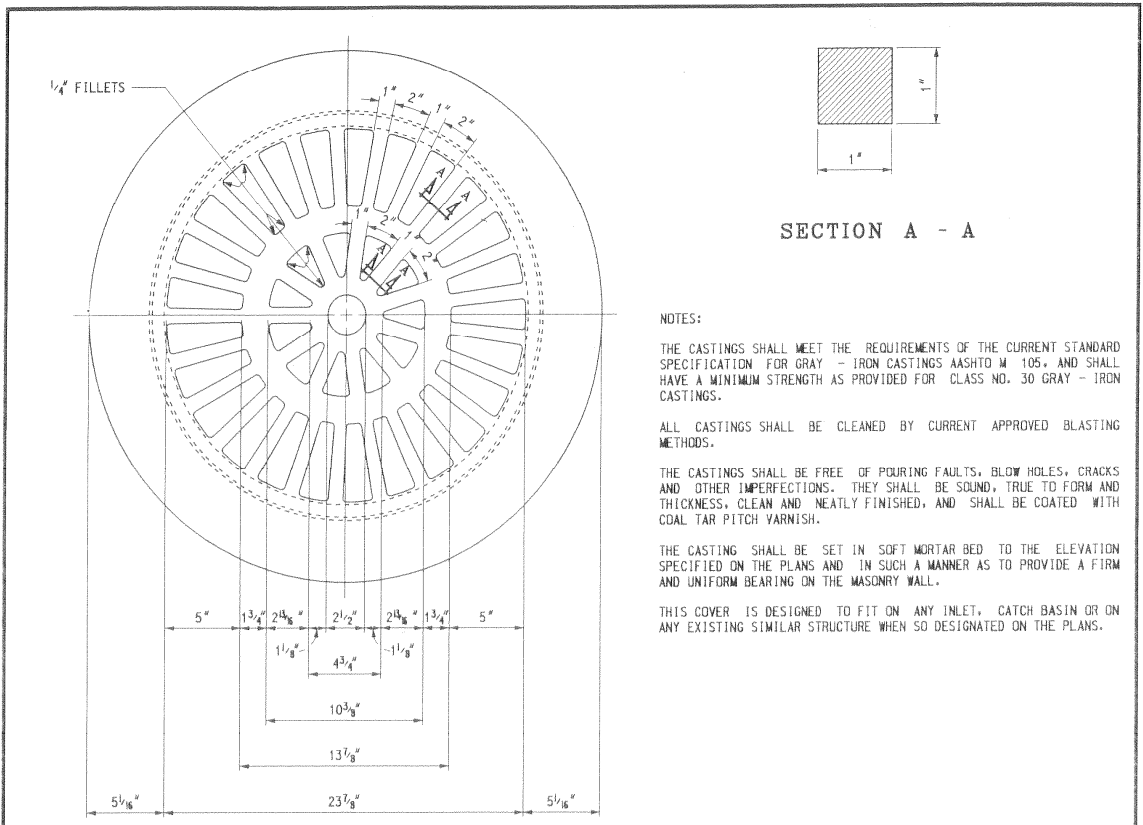
FOR USE WITH CONCRETE CURB & GUTTER
DETAILS C3, C4, C5, C6, F3, F4, F5, & F6

9-14-2001
F.H.W.A. APPROVAL

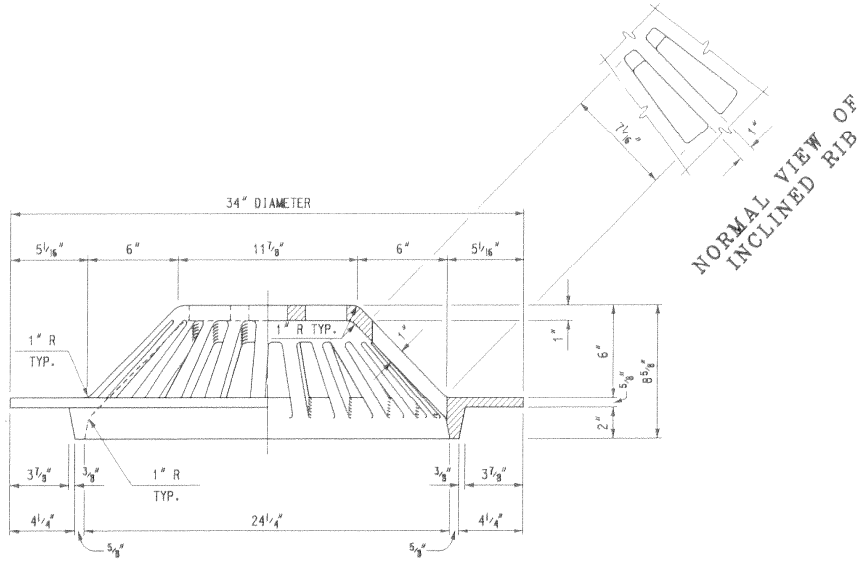
2-26-2001
PLAN DATE

R-15-C

SHEET
3 OF 3



PLAN VIEW



HALF ELEVATION HALF SECTION

	<i>James D. Culp</i> ENGINEER OF CONSTRUCTION TECHNOLOGY	ENGINEER - ROAD DESIGN	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAY TECHNICAL SERVICES STANDARD PLAN FOR COVER E FOR USE ON STRUCTURES IN DITCHES WHERE NOT SUBJECT TO TRAFFIC			
	PREPARED BY DESIGN DIVISION	<i>Calvin Roberts</i> ENGINEER OF MAINTENANCE			<i>Gregory J. Rosine</i> DEPARTMENT DIRECTOR Gregory J. Rosine	
DRAWN BY: <i>B.L.T.</i>	<i>John S. Roberts</i> ENGINEER OF TRAFFIC AND SAFETY	BY: <i>Gregory J. Rosine</i> CHIEF ENGINEER/DEPUTY DIRECTOR BUREAU OF HIGHWAY TECHNICAL SERVICES	9-14-2001 F.H.W.A. APPROVAL	2-26-2001 PLAN DATE	R-10-B	SHEET 1 OF 1

Appendix 4

“A Simple Method of Detention Basin Design”

VII. A SIMPLE METHOD OF DETENTION BASIN DESIGN

(By Glen Yrjanainen, P.E., Civil Engineer and Alan W. Warren, Engineering Technician)

A. INTRODUCTION

Because development of land from agrarian to residential, commercial or industrial use continues to increase, the temporary storage of storm runoff in an onsite detention basin has become essential, due to inadequate outlets for the increased storm runoff created by development. In most cases, and primarily for economic reasons, adequately designed collector storm water systems (capable of handling the storm runoff from ultimate development) lag behind the development increases. Because of ever increasing construction costs and the infeasibility of installing large diameter storm drains, the concept of ultimate design or improvement of collector storm water systems is impractical. The detention basin that meters or restricts flow is here to stay.

B. THE USE OF CALCULUS

If a detention basin were to have no outlet, all of the storm runoff would have to be stored. However, most detention basins do have an outlet, with the outflow depending upon the amount of water that is ponded and the depth of detention. The outflow is instantaneously changing as the head varies. This type of outlet can be analyzed by applying basic calculus to the controlling outflow equation. If the outflow is at a constant rate, i.e., a pump, the analysis is easier. The volume of storm water into the detention basin can be determined by the rational formula. The required storage volume is the volume of runoff that flows into the basin minus that which flows out.

An equation can be obtained that relates volume of storage to allowable outflow using the storage time as a parameter. This equation can then be maximized by basic calculus to find the peak storage time, which in turn can be used to calculate the maximum volume of storage required. The one assumption in this method is that storm water rises in the detention basin at a constant rate to fill the basin to the peak volume, and that the maximum allowable outflow is reached only at this peak volume, and then begins to recede.

The derivations of detention equations for detention basins with a gravity flow, changing rate orifice outlet, and a constant rate pump outlet follow. These derivations are for a ten-year frequency storm in the Oakland County, Michigan area. Detention equations for different year frequency storms and other areas can be obtained in the same manner.

C. DERIVATION FOR AN ORIFICE OUTLET

1. OUTFLOW

$$Q_i = ca\sqrt{2gh} \quad (\text{Orifice Formula})$$

Assume that the storm that fills the basin to the peak volume causes the water level to rise at a constant rate. ($h = K_1t$)

$$\begin{aligned} Q_i &= ca\sqrt{2gK_1t} \\ \text{Let } K_2 &= ca\sqrt{2gK_1} \\ Q_i &= K_2t^{1/2} \\ V_o &= 60 \int_0^T Q_i dt \end{aligned}$$

A conversion factor of 60 sec./min. is required because Q_i is in cfs and t is in minutes.

$$\begin{aligned} V_o &= 60K_2 \int_0^T t^{1/2} dt \\ V_o &= 60K_2T^{3/2} (2/3) \\ V_o &= 40K_2T^{1/2} (T) \end{aligned}$$

Assume the maximum outflow occurs only at the time of peak storage, such that $Q_o = K_2T^{1/2}$

$$V_o = 40Q_oT$$

2. INFLOW

$$\begin{aligned} Q_n &= CIA \quad (\text{Rational Formula}) \\ \text{Let } C &= 100\% \\ A &= 1 \text{ Acre} \\ I &= \frac{175}{T + 25} \\ Q_n &= (100\%) \frac{175}{T + 25} \quad (1) \\ Q_n &= \frac{175}{T + 25} \\ V_n &= Q_n (T) \quad (60 \text{ sec./min.}) \\ V_n &= \frac{10,500 T}{T + 25} \end{aligned}$$

3. STORAGE

$$V_s = V_n - V_o$$

$$V_s = \frac{10,500 T}{T + 25} - 40Q_o T$$

Since Q_o is a fixed maximum outflow that will only occur at peak storage, it is necessary to find the time from the instant the storage begins until the instant the peak storage is attained. This can be done by taking the first derivative of the storage volume equation and setting it equal to zero.

$$\frac{dV_s}{dT} = \frac{10,500 T}{T + 25} - \frac{d(40Q_o T)}{dT}$$

$$\frac{dV_s}{dT} = \frac{(T + 25)(10,500) - (10,500 T)(1)}{(T + 25)^2} - 40Q_o$$

$$\frac{dV_s}{dT} = \frac{262,500}{T^2 + 50T + 625} - 40Q_o = 0$$

$$T^2 = 50T + 625 - \frac{262,500}{40Q_o} = 0$$

This is a quadratic equation that may be reduced to the form:

$$ax^2 + bx + c = 0$$

$$\text{Where } x \text{ is } T, a = 1, b = 50 \text{ and } c = 625 - \frac{262,500}{40Q_o}$$

The general solution is:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$T = \frac{-50 \pm \sqrt{(50)^2 - 4(1) \left(625 - \frac{262,500}{40Q_o}\right)}}{2(1)}$$

$$T = \frac{-50 \pm \sqrt{2,500 - 2,500 + \frac{26,250}{40Q_o}}}{2}$$

$$T = -25 + \sqrt{\frac{6,562.5}{Q_o}}$$

D. DERIVATION FOR A CONSTANT RATE OUTLET

A basin with a constant outflow device, such as a pump, is simpler to derive. The constant outlet rate implies that the total outflow is merely the rate multiplied by the storage time.

$$V_o = 60Q_oT$$

$$V_s = V_n - V_o$$

$$V_s = \frac{10,500 T}{T + 25} - 60Q_oT$$

$$\frac{dV_s}{dT} = \frac{(T + 25)(10,500) - 10,500 T(1)}{(T + 25)^2} - 60 Q_o$$

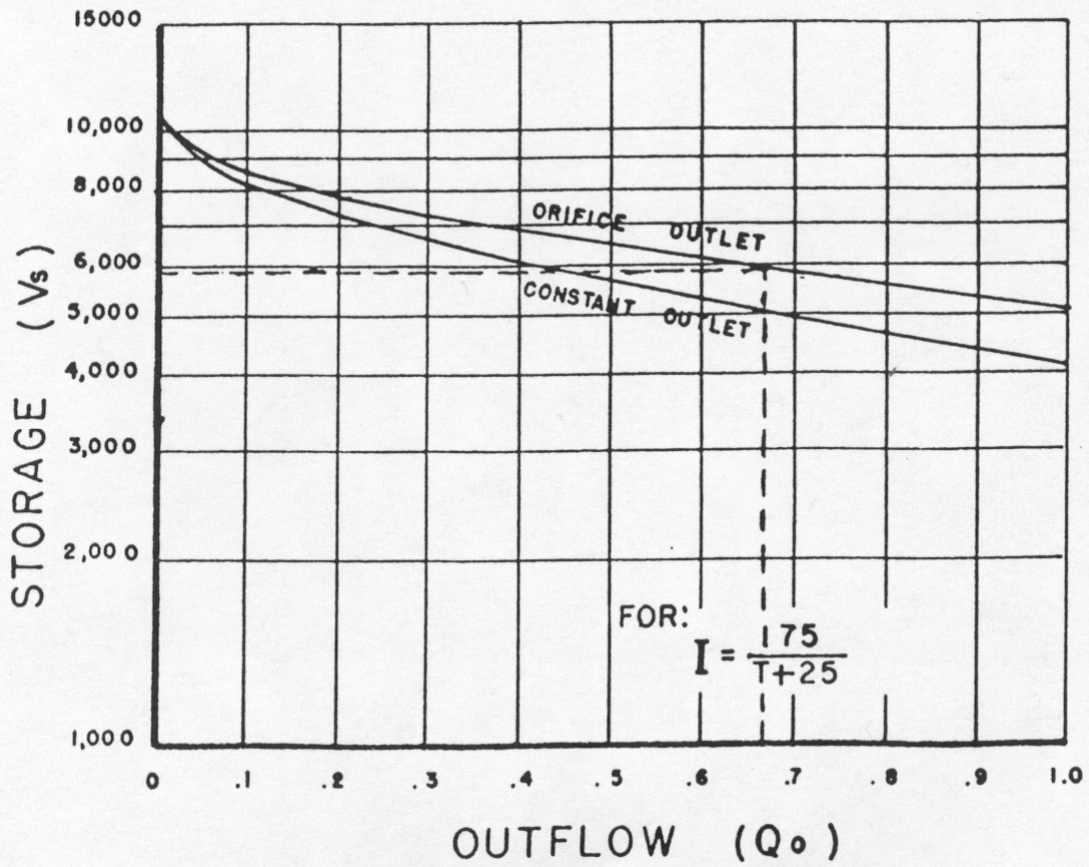
$$\frac{dV_s}{dT} = \frac{262,500}{T^2 + 50T + 625} - 60Q_o$$

$$T^2 + 50T + 625 - \frac{262,500}{60Q_o} = 0$$

$$T = -25 + \sqrt{\frac{4,375}{Q_o}}$$

E. GRAPHING THE DERIVATIONS

In both outlet situations the storage time to fill the basin to its maximum can be found as a function of the maximum outflow. The peak storage volume can then be found by substituting the storage time into the storage volume equation, reducing the storage volume equation to an equation with only one independent variable. This makes it possible to draw a graph of storage volume as a function of the maximum outflow rate. The included graph shows that as the outlet gets larger, the required storage volume decreases. The ideal basin will fall at a point on its respective curve. A basin that is oversized will fall at a point above its respective curve, and as a result, it will not reach its maximum outflow rate during the storm. An inadequate basin will fall at a point below its curve, and will rise above the design depth, producing more than the design outflow and possibly causing flooding. It should be pointed out that the constant rate system allows the least storage for a given size outlet. This is due to the fact that it functions at the maximum rate throughout the storm, while a gravity system has to head up before it will reach the maximum rate.



F. TIME OF CONCENTRATION

It should be noted that no mention has been made of the time of concentration, which is defined as the flow time, in minutes, from the most remote point in the drainage area to the point in question. The reason for this is because it is assumed that runoff from the entire drainage area contributes to the detention basin immediately, and that the time of concentration is zero. This is a reasonable assumption that can be made for developments with relatively short times of concentration, such as subdivisions, multiples and parking lots. This assumption also makes this method of design conservative, since in actuality a certain volume of runoff will have already flowed out of the detention basin before the runoff from the most remote point of the drainage area arrives. As the time of concentration increases, this method of design becomes more conservative.

G. DETENTION BASIN DESIGN PROCEDURE

1. Determine the amount of acreage (A) contributing runoff to the detention basin and its runoff coefficient (C).
2. Determine the maximum allowable outflow, Q_a , in CFS from the local municipal government regulations and/or the existing outlet conditions.
3. Calculate $Q_o = \frac{\text{allowable outflow, } Q_a}{(\text{acreage}) (\text{runoff coefficient})}$
4. Determine the type of outlet that will be used. (orifice or pump)
5. Calculate the maximum storage time (T) from the storage time equation corresponding to the type of outlet selected in step 4.
6. Calculate the maximum storage (V_s) from the storage equation corresponding to the type of outlet selected in step 4. (V_s will be in $\text{ft}^3 / (\text{acres}) (\text{runoff coefficient})$)
7. Calculate the total volume of storage required for the entire site. ($V_t = (V_s) (C) (A)$)
- 8a. If the outlet is to be a pump, select a depth of detention and a pump that will yield an outflow in CFS equal to the maximum allowable as determined in step 2.
- 8b. If the outlet is to be an orifice operating under a head, select a depth of detention and then use the orifice equation to calculate the cross-sectional area of outflow pipe required to outlet the allowable outflow, as determined in step 2, operating under a head equal to the depth of detention. After obtaining this cross-sectional area, the pipe diameter can be obtained.

Please be advised that the size of this outflow pipe may have to be increased if the outflow operates according to a Bernoulli analysis instead of as an orifice. If this is the case, then the outflow should be either (1) sized by the Bernoulli equation to yield the allowable outflow for the design depth or (2) the orifice condition should be created by selecting a larger size pipe than is calculated by the orifice equation, and then installing within this pipe a restriction plate containing an opening equal to the original cross-sectional calculated.

H. EXAMPLE PROBLEM

In order to illustrate the use of the equations and graphs derived in this article, an example problem will be worked.

1. DESIGN CRITERIA

A 50-acre parcel of land is to be developed into a residential subdivision with a developed runoff coefficient of 0.30. An open ditch drain is available adjacent to this 50 acre parcel of land and can accept storm runoff at a rate of no greater than 10 CFS from the proposed subdivision. Sufficient grade is available to allow 6.5 feet depth of detention and a gravity flow orifice outlet. Determine (1) the volume of detention required, and (2) the size of outflow pipe required.

2. SOLUTION

- a. From the design criteria, calculate Q_o

$$Q_o = \frac{\text{allowable outflow, } Q_a}{(\text{acreage}) (\text{runoff coefficient})}$$

$$Q_o = \frac{10 \text{ CFS}}{(50 \text{ ac}) (0.30)} = 0.667 \frac{\text{CFS}}{\text{acre imperviousness}}$$

- b. Calculate the storage time, T , in minutes, from the orifice outlet storage time equation.

$$T = -25 + \sqrt{\frac{6,562.5}{Q_o}}$$

$$T = -25 + \sqrt{\frac{6,562.5}{0.667}}$$

$$T = 74.22 \text{ min.}$$

- c. Calculate the maximum volume of storage per acre imperviousness, V_s , from the orifice outlet storage equation.

$$V_s = \frac{10,500 T}{T + 25} - 40Q_oT$$

$$V_s = \frac{10,500 (74.22)}{74.22 + 25} - 40 (0.667) (74.22)$$

$$V_s = 5,875.18 \text{ ft}^3 / \text{acre imperviousness}$$

- d. Calculate the total volume of storage, V_t , required for the entire site.

$$V_t = (V_s) (\# \text{ acres}) (\text{runoff coefficient})$$

$$V_t = 5,875.18 (50) (0.30)$$

$$V_t = 88,127.76 \text{ ft}^3$$

- e. Because of sufficient grade available, the design depth of detention is 6.5 feet. Now select an outflow pipe from the orifice formula that will yield the allowable outflow of 10 CFS operating under a head of 6.5 feet.

$$Q = 0.62 a \sqrt{2gh}$$

$$\text{Area} = \frac{Q}{0.62 \sqrt{2gh}} = \frac{10 \text{ CFS}}{0.62 \sqrt{64.4 \frac{\text{feet}}{\text{sec}^2} (6.5 \text{ feet})}}$$

$$\text{Area} = 0.785 \text{ ft}^2$$

Select a 12" diameter outflow pipe

- f. Plot the storage required per acre imperviousness (V_s) versus the outflow per acre imperviousness (Q_o) on the orifice outlet graph. One will see that it falls exactly on the curve.

DETENTION BASIN DESIGN FORMULAS

(Pump Outlet)

Frequency Of Storm	Rainfall Intensity	Storage Time Equation	Storage Volume Equation
1 Year	$\frac{72}{T+25}$	$T = -25 + \sqrt{\frac{1800}{Q_0}}$	$V_s = \frac{4320T}{T+25} - 60Q_0T$
5 Year	$\frac{145}{T+25}$	$T = -25 + \sqrt{\frac{3625}{Q_0}}$	$V_s = \frac{8700T}{T+25} - 60Q_0T$
10 Year	$\frac{175}{T+25}$	$T = -25 + \sqrt{\frac{4375}{Q_0}}$	$V_s = \frac{10500T}{T+25} - 60Q_0T$
25 Year	$\frac{215}{T+25}$	$T = -25 + \sqrt{\frac{5375}{Q_0}}$	$V_s = \frac{12900T}{T+25} - 60Q_0T$
50 Year	$\frac{245}{T+25}$	$T = -25 + \sqrt{\frac{6125}{Q_0}}$	$V_s = \frac{14700T}{T+25} - 60Q_0T$
100 Year	$\frac{275}{T+25}$	$T = -25 + \sqrt{\frac{6875}{Q_0}}$	$V_s = \frac{16500T}{T+25} - 60Q_0T$

(Orifice Outlet)

Frequency Of Storm	Rainfall Intensity	Storage Time Equation	Storage Volume Equation
1 Year	$\frac{72}{T+25}$	$T = -25 + \sqrt{\frac{2700.0}{Q_0}}$	$V_s = \frac{4320T}{T+25} - 40Q_0T$
5 Year	$\frac{145}{T+25}$	$T = -25 + \sqrt{\frac{5437.5}{Q_0}}$	$V_s = \frac{8700T}{T+25} - 40Q_0T$
10 Year	$\frac{175}{T+25}$	$T = -25 + \sqrt{\frac{6562.5}{Q_0}}$	$V_s = \frac{10500T}{T+25} - 40Q_0T$
25 Year	$\frac{215}{T+25}$	$T = -25 + \sqrt{\frac{8062.5}{Q_0}}$	$V_s = \frac{12900T}{T+25} - 40Q_0T$
50 Year	$\frac{245}{T+25}$	$T = -25 + \sqrt{\frac{9187.5}{Q_0}}$	$V_s = \frac{14700T}{T+25} - 40Q_0T$
100 Year	$\frac{275}{T+25}$	$T = -25 + \sqrt{\frac{10312.5}{Q_0}}$	$V_s = \frac{16500T}{T+25} - 40Q_0T$

Worksheet – Graphical Peak Method

Worksheet - Graphical Peak Method

Project _____ By _____ Date _____

Location _____ Checked _____ Date _____

1. Pertinent Data:

Drainage area A = _____ mi.²

Runoff Curve Number RCN = _____

Time of Concentration Tc = _____ hr.

Pond and Swamp Areas = _____ percent

2. Frequency yr. _____

3. Rainfall, P (24-hour), Appendix C in. _____

4. Initial Abstraction, Ia, Table 7.6 in. _____

5. Compute Ia/P

6. Unit peak discharge, qu, Figure 7.12 csm/in _____

7. Runoff, Ro in. _____

8. Pond and swamp adjustment factor, FP
(Use table 7.5) _____

9. **Peak discharge, qp** cfs _____
(Where qp = qu A Ro Fp)

Figure 7.11 - Graphical Peak Discharge Method Worksheet

(Source: Reference 46, TR-55, Second Edition, June 1986)

APPENDIX B

RAINFALL FREQUENCY FOR MICHIGAN

Figure No.

- B.1 2-year, 24-hour Rainfall
- B.2 5-year, 24-hour Rainfall
- B.3 10-year, 24-hour Rainfall
- B.4 25-year, 24-hour Rainfall
- B.5 50-year, 24-hour Rainfall
- B.6 100-year, 24-hour Rainfall

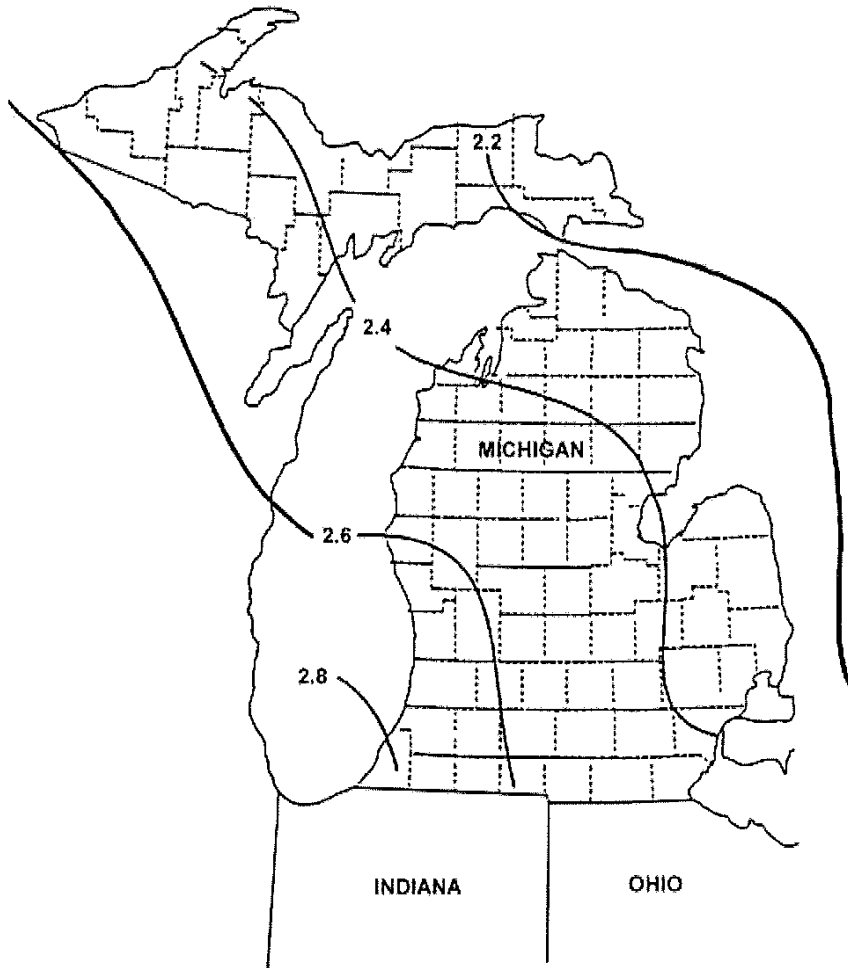


Figure B.1 - 2-year, 24-hour Rainfall

Table 7.6 - Ia values for runoff curve numbers

Curve Number	Ia (in.)	Curve Number	Ia (in.)	Curve Number	Ia (in.)	Curve Number	Ia (in.)
40	3.000	55	1.636	70	0.857	85	0.353
41	2.878	56	1.571	71	0.817	86	0.326
42	2.762	57	1.509	72	0.778	87	0.299
43	2.651	58	1.448	73	0.740	88	0.273
44	2.545	59	1.390	74	0.703	89	0.247
45	2.444	60	1.333	75	0.667	90	0.222
46	2.348	61	1.279	76	0.632	91	0.198
47	2.255	62	1.226	77	0.597	92	0.174
48	2.167	63	1.175	78	0.564	93	0.151
49	2.082	64	1.125	79	0.532	94	0.128
50	2.000	65	1.077	80	0.500	95	0.105
51	1.922	66	1.030	81	0.469	96	0.083
52	1.846	67	0.985	82	0.439	97	0.062
53	1.774	68	0.941	83	0.410	98	0.041
54	1.704	69	0.899	84	0.381		

Source: Reference 46, TR-55, Second Edition, June 1986

Example 7.7: The basin has a RCN of 75, a precipitation of 5.1 inches, Type II rainfall distribution, and 2.79 sq.mi-inches of runoff. The t_c is 1.43 hours, compute the unit peak discharge.

For a RCN = 75, from Table 7.6, the initial abstraction (Ia) is **.667 inches**.

$$Ia/P = 0.667/5.1 = 0.13$$

From figure 7.10, interpolating between Ia/P= 0.1 and 0.3, to Ia/P = 0.13, the unit peak discharge is **280 cfs/square mile-inch**.

Just like the UD-21 method, the peak flow can be determined by using equation 22:

$$\begin{aligned} Q &= Q_p \times \text{surface runoff} \\ &= 280 \text{ cfs/sq.mi.-inch} \times 2.79 \text{ sq.mi.-inch} \\ &= \mathbf{780 \text{ cfs}} \end{aligned}$$

4. Swamp and Pond Adjustment Factor

As in the UD-21 methodology, it is necessary to adjust the peak flow if there is ponding or swampy areas within the drainage basin. Table 7.5 that was used in the UD-21 method is also applicable to TR-55.

A sample work sheet for using the TR-55 graphical peak method is given in Figure 7.11.

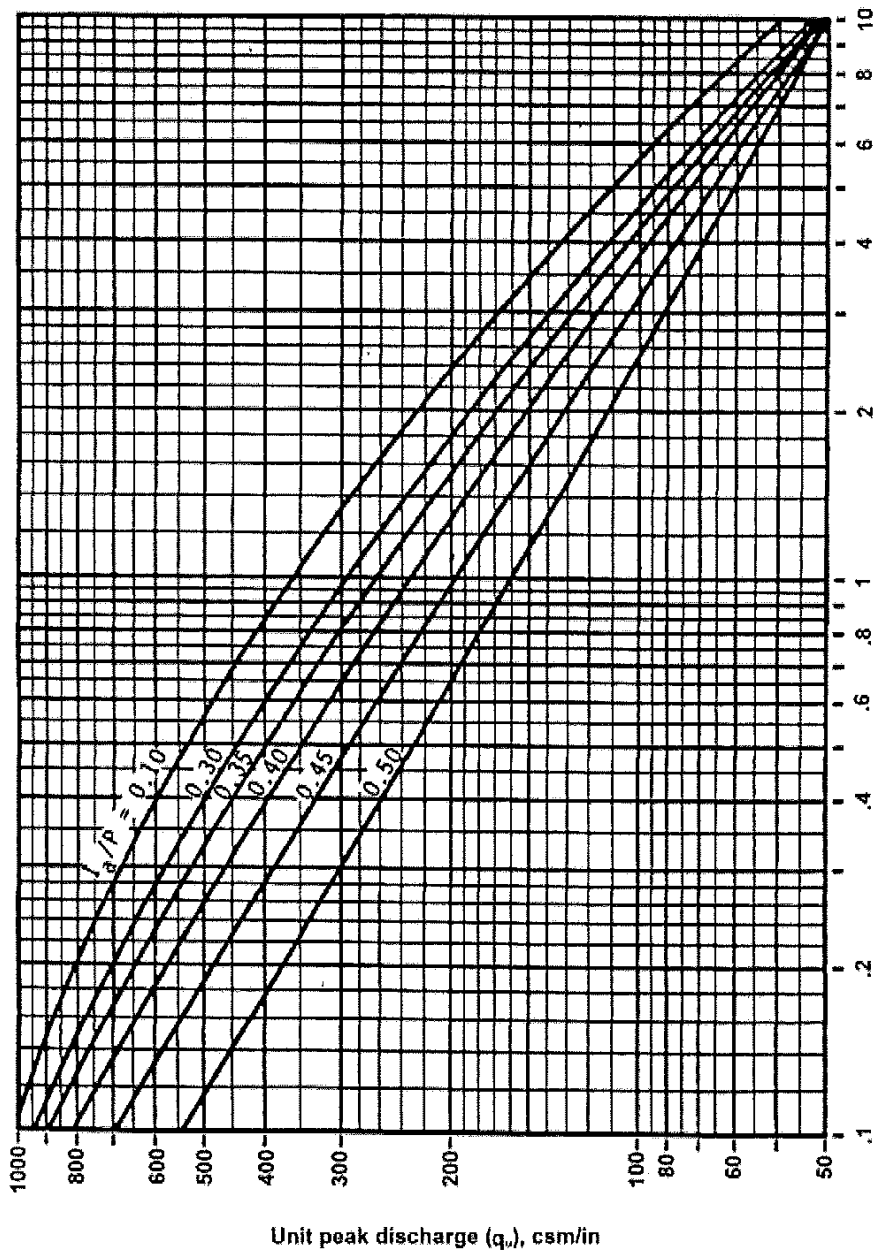


Figure 7.10 – Unit Peak Discharge (q_u) SCS Type II Rainfall Distribution

(Source: reference 46)

Figure 7.10 - Unit Peak Discharge

Table 7.5 - Swamp Adjustment Factors

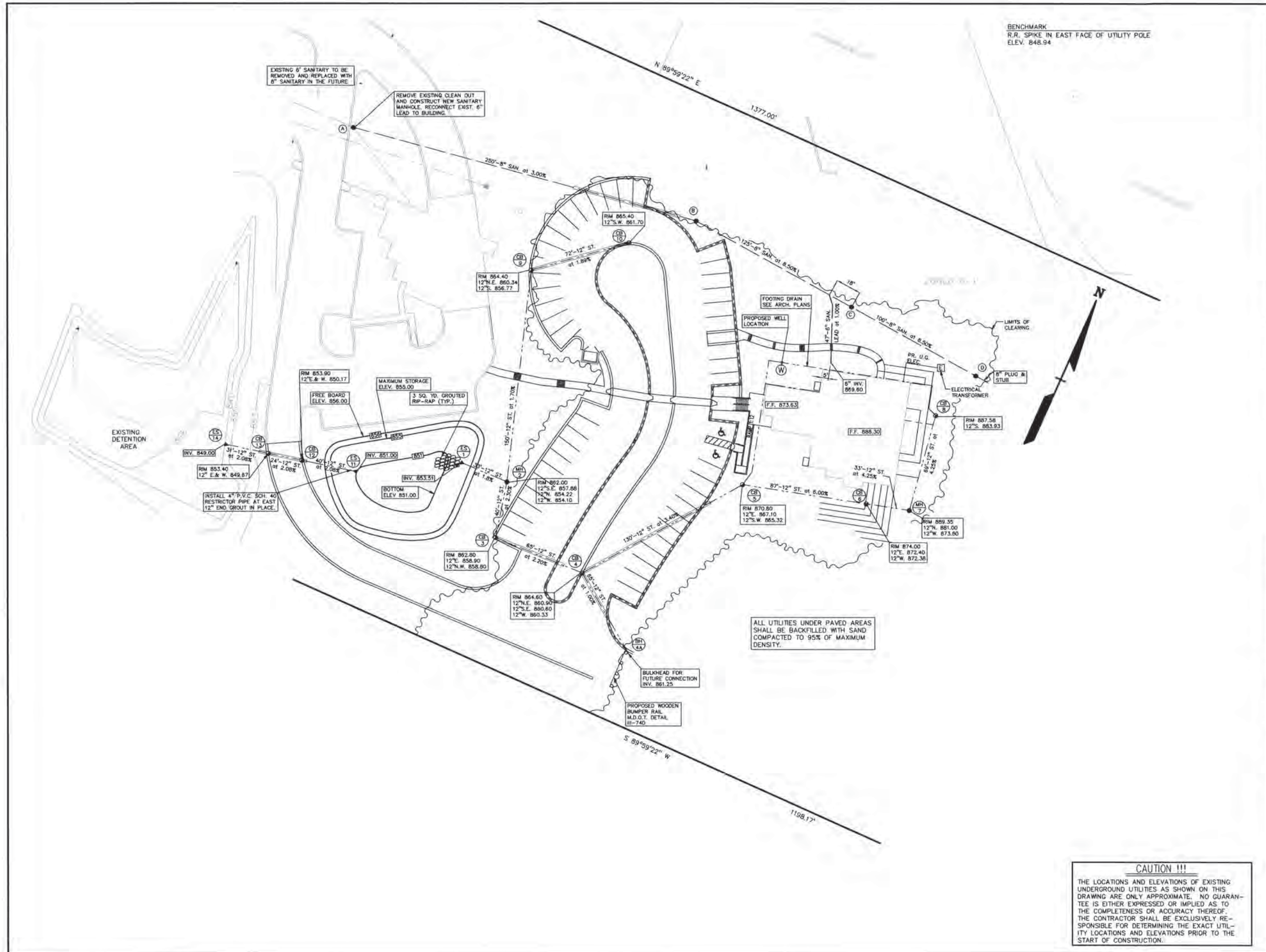
A. -- Ponding and swampy areas are at the design point							
Ratio of drainage area to ponding and swampy area	Percentage of ponding and swampy area	Storm frequency (years)					
		2	5	10	25	50	100
500	00.2	0.92	0.94	0.95	0.96	0.97	0.98
200	00.5	0.86	0.87	0.88	0.90	0.92	0.93
100	01.0	0.80	0.81	0.83	0.85	0.87	0.89
050	02.0	0.74	0.75	0.76	0.79	0.82	0.86
040	02.5	0.69	0.70	0.72	0.75	0.78	0.82
030	03.3	0.64	0.65	0.67	0.71	0.75	0.78
020	05.0	0.59	0.61	0.63	0.67	0.71	0.75
015	06.7	0.57	0.58	0.60	0.64	0.67	0.71
010	10.0	0.53	0.54	0.56	0.60	0.63	0.68
005	20.0	0.48	0.49	0.51	0.55	0.59	0.64

B. -- Ponding and swampy areas are spread throughout the watershed or occur in central parts of the watershed.							
Ratio of drainage area to ponding and swampy area	Percentage of ponding and swampy area	Storm frequency (years)					
		2	5	10	25	50	100
500	00.2	0.94	0.95	0.96	0.97	0.98	0.99
200	00.5	0.88	0.89	0.90	0.91	0.92	0.94
100	01.0	0.83	0.84	0.86	0.87	0.88	0.90
050	02.0	0.78	0.79	0.81	0.83	0.85	0.87
040	02.5	0.73	0.74	0.76	0.78	0.81	0.84
030	03.3	0.69	0.70	0.71	0.74	0.77	0.81
020	05.0	0.65	0.66	0.68	0.72	0.75	0.78
015	06.7	0.62	0.63	0.65	0.69	0.72	0.75
010	10.0	0.58	0.59	0.61	0.65	0.68	0.71
005	20.0	0.53	0.54	0.56	0.60	0.63	0.68
004	25.0	0.50	0.51	0.53	0.57	0.61	0.66

C. -- Ponding and swampy areas are located only in the upper reaches of the watershed.							
Ratio of drainage area to ponding and swampy area	Percentage of ponding and swampy area	Storm frequency (years)					
		2	5	10	25	50	100
500	00.2	0.96	0.97	0.98	0.98	0.99	0.99
200	00.5	0.93	0.94	0.94	0.95	0.96	0.97
100	01.0	0.90	0.91	0.92	0.93	0.94	0.95
050	02.0	0.87	0.88	0.88	0.90	0.91	0.93
040	02.5	0.85	0.85	0.86	0.88	0.89	0.91
030	03.3	0.82	0.83	0.84	0.86	0.88	0.89
020	05.0	0.80	0.81	0.82	0.84	0.86	0.88
015	06.7	0.78	0.79	0.80	0.82	0.84	0.86
010	10.0	0.76	0.77	0.78	0.80	0.82	0.84
005	20.0	0.74	0.75	0.76	0.78	0.80	0.82

APPENDIX B

MS4 ENGINEERING DRAWINGS



BENCHMARK
R.R. SPIKE IN EAST FACE OF UTILITY POLE
ELEV. 848.94

LEGEND

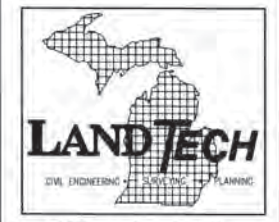
EX. STORM SEWER	
EX. SANITARY SEWER	
EX. WATER MAIN	
OVERHEAD LINES	
UNDERGROUND LINES	
GAS LINE	
UTILITY POLE	
BARB WIRE FENCE	
WOOD STOCKADE FENCE	
TREE AND BRUSH LINE	
MAILBOX	
LIGHT POLE	
TELEPHONE RISER	
STREET SIGN	
EXISTING CONTOUR	
EXISTING GROUND SHOT	
PR. SANITARY SEWER	
PR. STORM SEWER	
PR. CATCH BASIN	
PR. SPOT ELEVATION	
PR. CONTOUR	
PROP. GUARDRAIL	
PR. SAND BACKFILL	
REVERSE CURB	



NOTE: UTILITY INFORMATION ON THIS DRAWING MAY BE FROM INFORMATION DISCLOSED TO THIS FIRM BY THE VARIOUS UTILITY COMPANIES, CITY/COUNTY AGENCIES, AND OTHER VARIOUS SOURCES. NO GUARANTEE IS GIVEN AS TO THE COMPLETENESS OR ACCURACY THEREOF.

PRIOR TO CONSTRUCTION, ALL LOCATIONS AND DEPTHS OF EXISTING UTILITIES (IN CONFLICT WITH PROPOSED IMPROVEMENTS) SHALL BE VERIFIED IN THE FIELD. CALL MISS DIG.

DATE	DESCRIPTION
4-14-97	PER ARCH.
5-7-97	PER ARCH.



39000 Inxster Road Suite 120
Southfield, MI 48034
(248) 357-7900
Fax (248) 357-3646

PROJECT
OAKLAND TOWNSHIP HALL
TITLE
UTILITY PLAN

CLIENT
CHARTER TOWNSHIP OF OAKLAND
4393 COLLINS ROAD
ROCHESTER, MI 48306

SCALE: Horizontal 1" = 30'
Vertical

DRAWN BY: S.R.B.
CHECKED BY: M.G.K.

DATE ISSUED: 1-28-97

PROJECT No. OA2816

SHEET No. C-5

CAUTION !!!
THE LOCATIONS AND ELEVATIONS OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THIS DRAWING ARE ONLY APPROXIMATE. NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL BE EXCLUSIVELY RESPONSIBLE FOR DETERMINING THE EXACT UTILITY LOCATIONS AND ELEVATIONS PRIOR TO THE START OF CONSTRUCTION.

ALL UTILITIES UNDER PAVED AREAS SHALL BE BACKFILLED WITH SAND COMPACTED TO 95% OF MAXIMUM DENSITY.



LEGEND

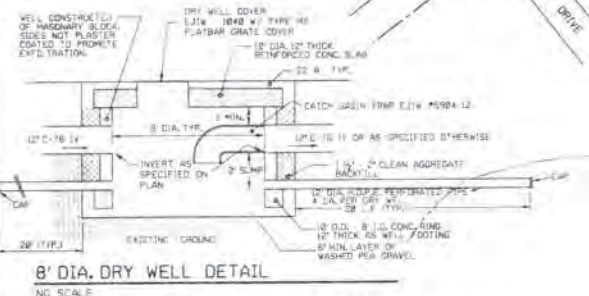
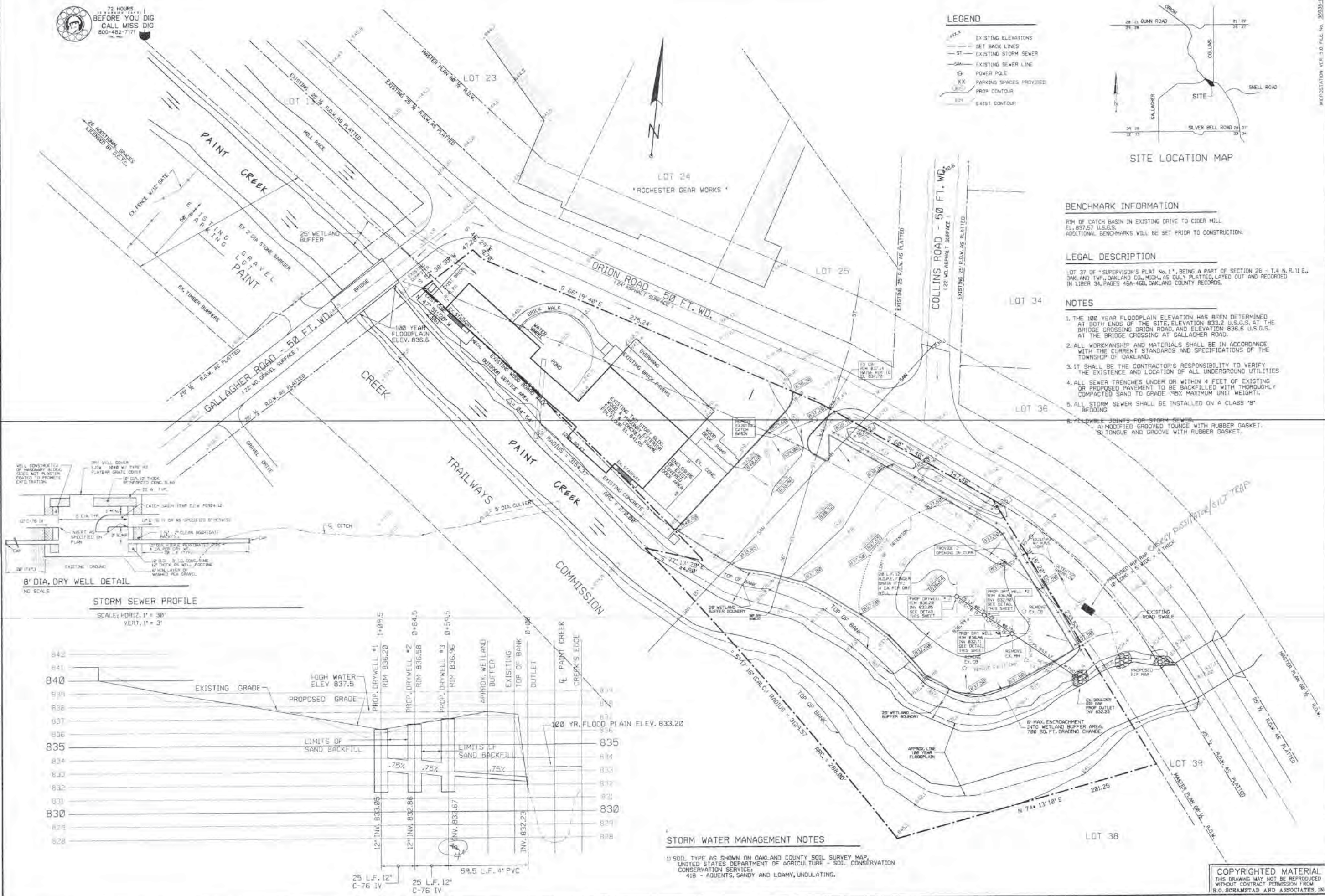
- EXISTING ELEVATIONS
- SET BACK LINES
- EXISTING STORM SEWER
- EXISTING SEWER LINE
- POWER POLE
- PARKING SPACES PROVIDED
- PROP. CONTOUR
- EXIST. CONTOUR



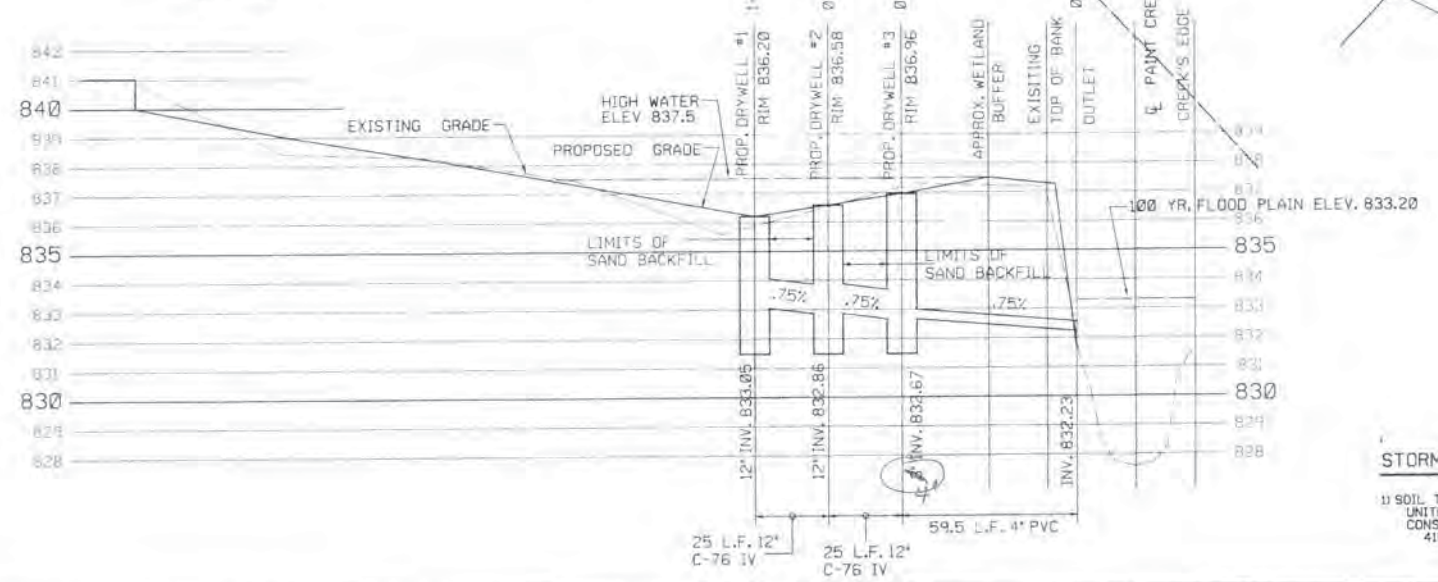
BENCHMARK INFORMATION
 RIM OF CATCH BASIN IN EXISTING DRIVE TO CIDER MILL
 61.83757 U.S.G.S.
 ADDITIONAL BENCHMARKS WILL BE SET PRIOR TO CONSTRUCTION.

LEGAL DESCRIPTION
 LOT 37 OF "SUPERVISOR'S PLAT No. 1", BEING A PART OF SECTION 26 - T.4 N. R. 11 E. OAKLAND TWP., OAKLAND CO., MICH., AS DULY PLATTED, LAYED OUT AND RECORDED IN LIBER 34, PAGES 46A-46B, OAKLAND COUNTY RECORDS.

- NOTES**
1. THE 100 YEAR FLOODPLAIN ELEVATION HAS BEEN DETERMINED AT BOTH ENDS OF THE SITE, ELEVATION 833.2 U.S.G.S. AT THE BRIDGE CROSSING ORION ROAD, AND ELEVATION 836.5 U.S.G.S. AT THE BRIDGE CROSSING AT GALLAGHER ROAD.
 2. ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH THE CURRENT STANDARDS AND SPECIFICATIONS OF THE TOWNSHIP OF OAKLAND.
 3. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THE EXISTENCE AND LOCATION OF ALL UNDERGROUND UTILITIES.
 4. ALL SEWER TRENCHES UNDER OR WITHIN 4 FEET OF EXISTING OR PROPOSED PAVEMENT TO BE BACKFILLED WITH THOROUGHLY COMPACTED SAND TO GRADE (95% MAXIMUM UNIT WEIGHT).
 5. ALL STORM SEWER SHALL BE INSTALLED ON A CLASS "B" BEDDING.
 6. ALLOWABLE JOINTS FOR STORM SEWER:
 - a) TONGUE AND GROOVE WITH RUBBER GASKET.
 - b) MODIFIED GROOVED TONGUE WITH RUBBER GASKET.
 - c) TONGUE AND GROOVE WITH RUBBER GASKET.



STORM SEWER PROFILE
 SCALE: HORIZ. 1" = 30'
 VERT. 1" = 3'



STORM WATER MANAGEMENT NOTES

- 1) SOIL TYPE AS SHOWN ON OAKLAND COUNTY SOIL SURVEY MAP, UNITED STATES DEPARTMENT OF AGRICULTURE - SOIL CONSERVATION CONSERVATION SERVICE: 418 - AQUEOUS, SANDY AND LOAMY, UNDULATING.

MODIFICATION V.C. 5.0, FILE NO. 96036-01.004

REV.	DATE	DESCRIPTION
G	8-18-96	FOR REVIEW
H	8-27-96	FOR FINAL APPROVAL
C	11-30-92	REVISED PER TOWNSHIP COMMENTS
D	12-15-92	REVISED PER TOWNSHIP COMMENTS
E	01-15-93	ADD PARKING LOT DETENTION/STORM WATER HANDT.
F	02-02-93	REV. PER CLIENT

CONSULTING ENGINEERS: R. O. SCRAMSTAD AND ASSOCIATES, INC. ENGINEERING PLANNING SURVEYING

PROJECT: PAINT CREEK CIDER MILL

CLIENT: Mr. JERRY MANCOUR

PROJECT NUMBER: 96036

DRAWING NUMBER: 2

SCALE: 1" = 30'

TITLE: GRADING / UTILITY PLAN

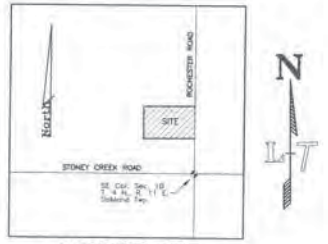
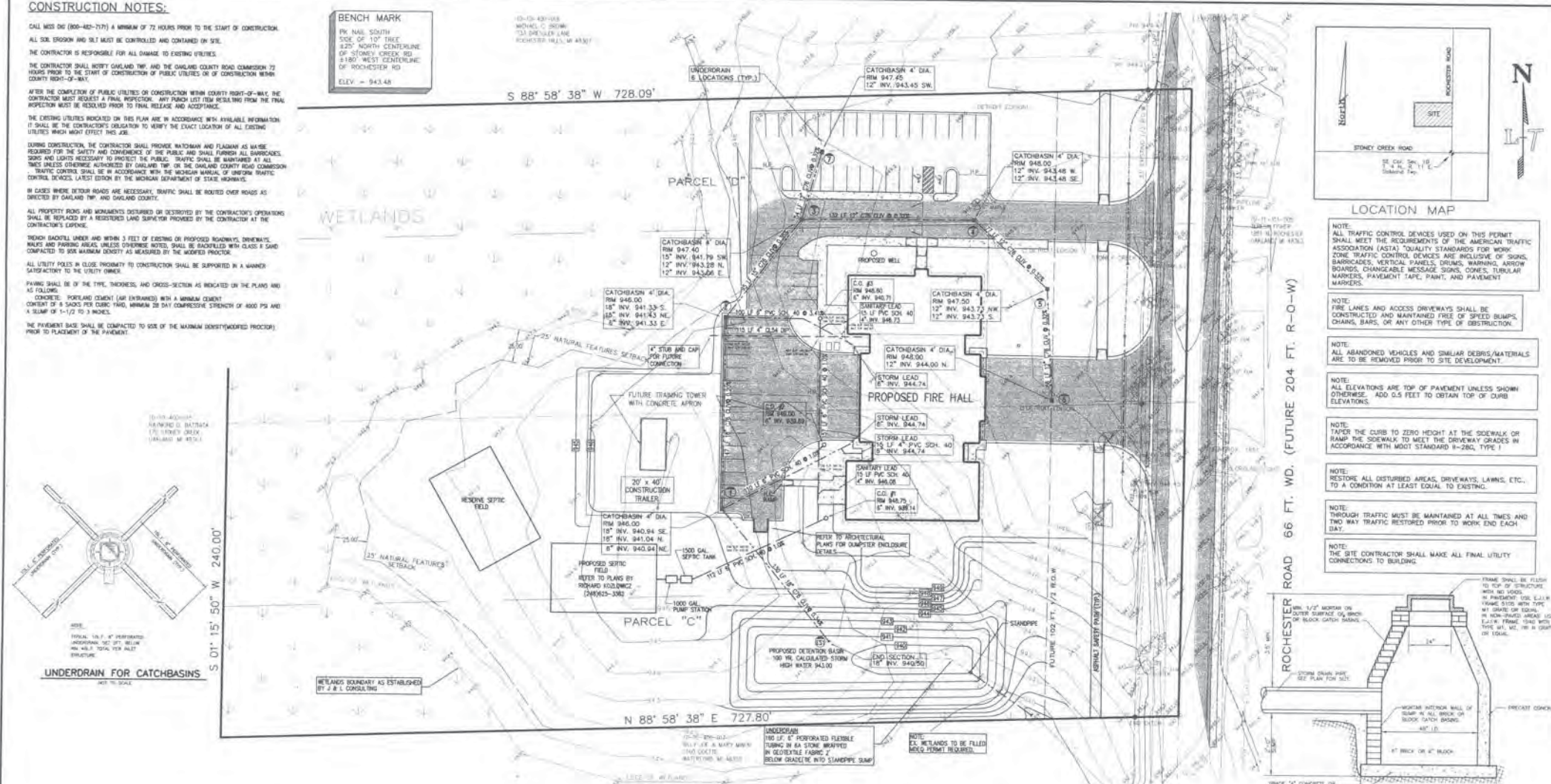
STATE OF MICHIGAN RICHARD O. SCRAMSTAD ENGINEER No. 29996 LICENSED PROFESSIONAL ENGINEER

COPYRIGHTED MATERIAL THIS DRAWING MAY NOT BE REPRODUCED WITHOUT CONTRACT PERMISSION FROM R.O. SCRAMSTAD AND ASSOCIATES, INC.

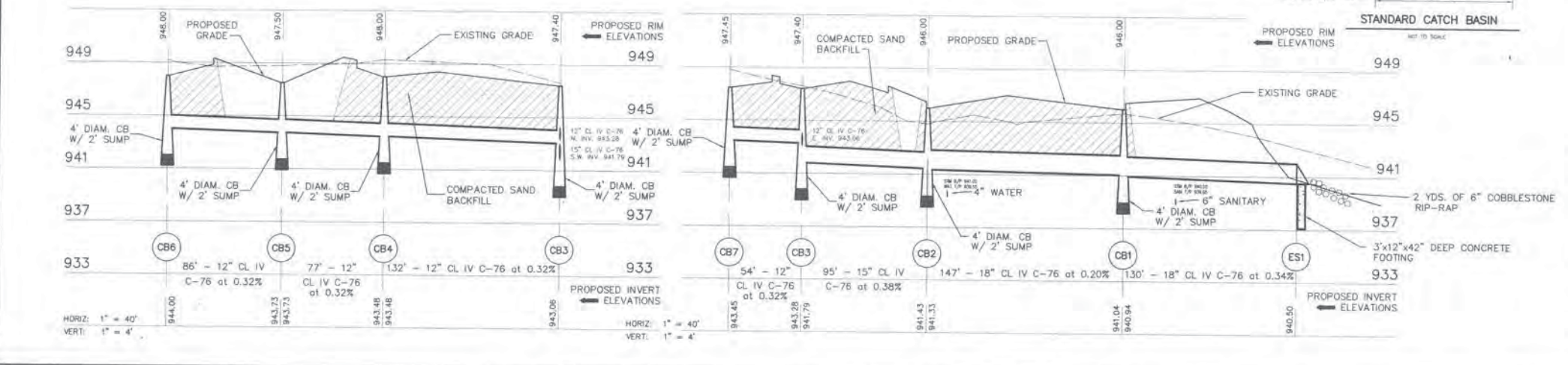
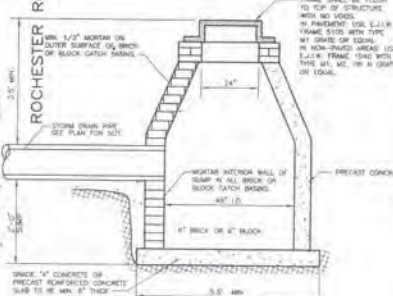
CONSTRUCTION NOTES:

CALL MISS DIG (800-482-7171) A MINIMUM OF 72 HOURS PRIOR TO THE START OF CONSTRUCTION. ALL SOIL EROSION AND SILT MUST BE CONTROLLED AND CONTAINED ON SITE. THE CONTRACTOR IS RESPONSIBLE FOR ALL DAMAGE TO EXISTING UTILITIES. THE CONTRACTOR SHALL NOTIFY OAKLAND TWP. AND THE OAKLAND COUNTY ROAD COMMISSION 72 HOURS PRIOR TO THE START OF CONSTRUCTION OF PUBLIC UTILITIES OR OF CONSTRUCTION WITHIN COUNTY RIGHT-OF-WAY. AFTER THE COMPLETION OF PUBLIC UTILITIES OR CONSTRUCTION WITHIN COUNTY RIGHT-OF-WAY, THE CONTRACTOR MUST REQUEST A FINAL INSPECTION. ANY PUNCH LIST ITEM RESULTING FROM THE FINAL INSPECTION MUST BE REPAIRED PRIOR TO FINAL RELEASE AND ACCEPTANCE. THE EXISTING UTILITIES INDICATED ON THIS PLAN ARE IN ACCORDANCE WITH AVAILABLE INFORMATION. IT SHALL BE THE CONTRACTOR'S OBLIGATION TO VERIFY THE EXACT LOCATION OF ALL EXISTING UTILITIES WHICH MIGHT AFFECT THIS JOB. DURING CONSTRUCTION, THE CONTRACTOR SHALL PROVIDE WATCHMAN AND FLAGMAN AS NEEDED FOR THE SAFETY AND CONVENIENCE OF THE PUBLIC AND SHALL FURNISH ALL BARRICADES, SIGNS AND LIGHTS NECESSARY TO PROTECT THE PROJECT. TRAFFIC SHALL BE MAINTAINED AT ALL TIMES UNLESS OTHERWISE AUTHORIZED BY OAKLAND TWP. OR THE OAKLAND COUNTY ROAD COMMISSION. TRAFFIC CONTROL SHALL BE IN ACCORDANCE WITH THE SIGNAGE MANUAL OF OAKLAND COUNTY TRAFFIC CONTROL DEVICES LATEST EDITION BY THE MICHIGAN DEPARTMENT OF STATE HIGHWAYS. IN CASES WHERE DETOUR ROADS ARE NECESSARY, TRAFFIC SHALL BE ROUTED OVER ROADS AS DIRECTED BY OAKLAND TWP. AND OAKLAND COUNTY. ALL PROPERTY POINTS AND MONUMENTS OBTAINED OR DESTROYED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPLACED BY A REGISTERED LAND SURVEYOR PROVIDED BY THE CONTRACTOR AT THE CONTRACTOR'S EXPENSE. TRUCKS BACKLIFT UNDER AND WITHIN 3 FEET OF EXISTING OR PROPOSED ROADWAYS, DRIVEWAYS, WALKS AND PARKING AREAS UNLESS OTHERWISE NOTED SHALL BE BACKLIFTED WITH CLASS 3 SIDS COMPACTED TO MAXIMUM DENSITY AS MEASURED BY THE WORKED PROCEED. ALL UTILITY POLES IN CLOSE PROXIMITY TO CONSTRUCTION SHALL BE SUPPORTED IN A MANNER SATISFACTORY TO THE UTILITY OWNER. PILING SHALL BE OF THE TYPE, THICKNESS AND CROSS-SECTION AS INDICATED ON THE PLANS AND AS FOLLOWS: CONCRETE - PORTLAND CEMENT (API ENHANCED) WITH A MINIMUM CEMENT CONTENT OF 8 BAGS PER CUBIC YARD, MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 4000 PSI AND A SLUMP OF 1-1/2 TO 3 INCHES. THE PAVEMENT BASE SHALL BE COMPACTED TO 95% OF THE MAXIMUM DENSITY (WORKED PROCEED) PRIOR TO PLACEMENT OF THE PAVEMENT.

BENCH MARK
PK. NAIL SOUTH SIDE OF 10" TREE 425' NORTH CENTERLINE OF STONEY CREEK RD. 518' WEST CENTERLINE OF ROCHESTER RD. ELEV. = 943.48



- LEGEND**
- EX. STORM SEWER
 - EX. SANITARY SEWER
 - EX. WATER MAIN
 - OVERHEAD LINES
 - GAS LINE
 - FENCE
 - GUARD RAIL
 - MAIL BOX
 - UNIDENTIFIED STRUCTURE
 - LIGHT POLE
 - TELEPHONE RISER
 - STREET SIGN
 - WATER SHUT OFF VALVE
 - EXISTING CONTOUR
 - EXISTING GROUND SHOT
 - AS BUILT ELEVATION
- PR. CONCRETE**
PR. STANDARD BRITANNIUM
PR. HEAVY BRITANNIUM
PR. PAVEMENT ELEVATION
- COMPACTED SAND BACKFILL
- BEFORE YOU DIG CALL MISS DIG 1-800-482-7171**
- NOTE: ALL TRAFFIC CONTROL DEVICES USED ON THIS PERMIT SHALL MEET THE REQUIREMENTS OF THE AMERICAN TRAFFIC ASSOCIATION (ATA) "QUALITY STANDARDS FOR WORK ZONE TRAFFIC CONTROL DEVICES AND INCLUDES OF SIGNS, BARRICADES, VERTICAL PANELS, DRUMS, WARNING, ARROW BOARDS, CHANGABLE MESSAGE SIGNS, CONES, FLUORANT MARKERS, PAVEMENT TAPE, PAINT, AND PAVEMENT MARKERS.
- NOTE: FIRE LINES AND ACCESS DRIVEWAYS SHALL BE CONSTRUCTED AND MAINTAINED FREE OF SPEED BUMPS, CHAINS, BARS, OR ANY OTHER TYPE OF OBSTRUCTION.
- NOTE: ALL ABANDONED VEHICLES AND SIMILAR DEBRIS/MATERIALS ARE TO BE REMOVED PRIOR TO SITE DEVELOPMENT.
- NOTE: ALL ELEVATIONS ARE TOP OF PAVEMENT UNLESS SHOWN OTHERWISE. ADD 0.5 FEET TO OBTAIN TOP OF CURB ELEVATIONS.
- NOTE: THE CURB TO ZERO HEIGHT AT THE SIDEWALK OR RAMP THE SIDEWALK TO MEET THE DRIVEWAY GRADES IN ACCORDANCE WITH MOST STANDARD R-28C, TYPE 1.
- NOTE: RESTORE ALL DISTURBED AREAS, DRIVEWAYS, LAWNS, ETC., TO A CONDITION AT LEAST EQUAL TO EXISTING.
- NOTE: THROUGH TRAFFIC MUST BE MAINTAINED AT ALL TIMES AND TWO WAY TRAFFIC RESTORED PRIOR TO WORK END EACH DAY.
- NOTE: THE SITE CONTRACTOR SHALL MAKE ALL FINAL UTILITY CONNECTIONS TO BUILDING.



PROJECT
OAKLAND TOWNSHIP
FIRE HALL

TITLE
UTILITY PLAN

CLIENT
OAKLAND TOWNSHIP
4393 COLLINS ROAD
ROCHESTER, MI 48306
ARCH. PROJ. NO. 00-199

SCALE: Horizontal 1" = 40'
Vertical

DRAWN BY: T.J.M.
CHECKED BY: M.G.K.

DATE ISSUED: 12-12-00
PROJECT No. OA1409
SHEET No. C-4

LANDTECH
29000 Inkster Road, Suite 120
Southfield, MI 48034
(248) 252-7900
Fax (248) 252-5646

C:\landtech\projects\utility\001_040.dwg 11/15/00 11:50:00 1:1

APPENDIX C

CONTRACT LANGUAGE FOR GROUNDS KEEPING SERVICES

**NOTICE OF INTENT TO ACCEPT BIDS for
2015 LANDSCAPING**

Sealed bids for 2015 landscaping will be received by the Charter Township of Oakland, Building Department at 4393 Collins Road, Rochester, Michigan 48306 until 10:00 a.m. local time, **Wednesday, April 8, 2015**, at which time and place said bids will be publicly opened and read aloud.

The complete specifications are available at the Charter Township of Oakland, Offices Located at 4393 Collins Road, Rochester, Michigan 48306 between the hours of 8:00 a.m. and 4:30 p.m. Monday through Friday.

Any deviation from the specifications must be noted on the Bid Form.

THE CHARTER TOWNSHIP OF OAKLAND RESERVES THE RIGHT TO REJECT ANY AND ALL BIDS.

Please submit bid on or before the date and time given above to:

Cari Neubeck, Deputy Clerk
Charter Township of Oakland
4393 Collins Road
Rochester, Michigan 48306

All bids must be submitted in a Sealed Envelope marked "**BID - LANDSCAPING**".

**ADVERTISEMENT FOR BIDS
CHARTER TOWNSHIP OF OAKLAND
OAKLAND COUNTY, MICHIGAN**

2015 LANDSCAPING

Sealed bids for 2015 Landscaping will be received by the Charter Township of Oakland, Building Department, at 4393 Collins Road, Rochester, Michigan 48306 until 10:00 a.m. local time, Wednesday, April 8, 2015, at which time and place said bids will be publicly opened and read aloud.

The complete specifications for the 2015 Landscaping Bid are available at the Charter Township of Oakland offices 4393 Collins Road, Rochester, Michigan 48306 between the hours of 8 a.m and 4:30 p.m. Monday through Friday.

Bids shall be in conformance with and subject to Instructions to Bidders and other bid documents. The Bid Form must be completed entirely and submitted with the Bid. The contractor shall be required to meet the Charter Township of Oakland's insurance requirements and shall maintain such coverage until the project is complete.

All bids shall be opened publicly and read aloud at the date and time specified. Each bid shall be recorded together with the name of the bidder.

PROJECT DESCRIPTION

The Charter Township of Oakland is soliciting bids to provide supervision, labor, equipment, services and expertise required to perform landscaping including lawn mowing and trimming, mulch maintenance, flower bed maintenance, weed control and property clean-up for various Charter Township of Oakland Buildings.

All bid prices shall remain in effect for at least ninety (90) days from the date of the bid opening to allow for the award of the bid.

Townships are exempt from Michigan State Sales and Federal Excise taxes. Do not include such taxes in the proposal figures. The Charter Township of Oakland will furnish the successful bidder with the tax exemption certificates when required.

No bidder may withdraw a bid after the actual date of the opening thereof except in the case where a bidder demonstrates to the Charter Township of Oakland's satisfaction that a material and substantial mistake was made in preparing the bid, in which event the bidder has 24 hours after the opening of the bid to deliver to the Charter Township of Oakland a notice in writing that he/she desires to withdraw his/her bid stating the reasons therefore. Once a bid is withdrawn, it may not be rebid.

The Charter Township of Oakland reserves the right to waive any informalities or immaterial omissions or defects not involving price, time or changes in the work. In the case the error in the extension of prices in the bid or other arithmetic error, the unit price shall govern.

Any deviation from the specifications must be noted on the Bid Form.

The Charter Township of Oakland reserves the right to split or abstract any or all bid proposals and award multiple contracts from the same quotation, based on price, availability and services when in its judgment it best serves the Charter Township of Oakland.

THE CHARTER TOWNSHIP OF OAKLAND RESERVES THE RIGHT TO REJECT ANY AND ALL BIDS.

All correspondence or inquiries from interested vendors regarding this bid proposal shall be directed to the attention of Cari Neubeck, Deputy Clerk, 4393 Collins Road, Rochester, Michigan 48306, 248-651-4440.

Only those persons designated above are authorized to seek additional information from prospective vendors regarding their bid proposals. Correspondence or inquiries made directly to vendors regarding their bid proposals from all other persons are to be directed to those Charter Township of Oakland employees designated above for appropriate review and response.

Please submit bid on or before the date and time given above to:

Cari Neubeck, Deputy Clerk
Charter Township of Oakland
4393 Collins Road
Rochester, Michigan 48306

All bids must be submitted in a Sealed Envelope marked "**BID - LANDSCAPING**".

LANDSCAPING BID

The Charter Township of Oakland is soliciting bids to provide supervision, labor, equipment, services and expertise required to perform landscaping including lawn mowing and trimming, mulch maintenance, flower bed maintenance and property clean up for various Charter Township of Oakland buildings. The Charter Township of Oakland reserves the right of option to renew for one additional year.

Bidder will be responsible for carefully examining the proposed work sites and to judge for themselves the nature of the work to be done. Proper equipment and care shall be used to prevent unnecessary damage to turf areas, trees and/or mulch areas around trees, shrubs and/or flower beds.

The Charter Township of Oakland seeks a responsible contractor to provide a high level of maintenance for the proper landscaping environment at all Charter Township of Oakland buildings in order to preserve the citizen's investment in those buildings. A neat, clean and weed free appearance along with correct plant care is required of the company bidding on this work.

The submission of a proposal hereunder shall be considered evidence that the bidder is satisfied with respect to the conditions to be encountered, and the character, quantity and quality of the work to be performed.

LOCATIONS: The following locations will be serviced under these specifications.

- Charter Township of Oakland Main Complex, 4393 Collins Road
- Fire Station #2, 1888 Rochester Road
- Paint Creek Cider Mill, 4480 Orion Road

QUALIFICATION OF BIDDERS

Bidding on this contract shall be limited to individuals, partnerships, and corporations actively engaged in the field of landscaping. Bidders shall demonstrate competence, experience, and financial capability to carry out the terms of this contract. The Charter Township of Oakland will require proof of these qualifications and work performance references. The Bidder shall provide a resume to the Charter Township of Oakland demonstrating the Bidder's ability to satisfy the requirements as set forth in these specifications. The Bidder shall include in their resume any and all information pertinent to aiding the Charter Township of Oakland in determining the abilities of the Bidder.

The contract will be awarded to the lowest responsible and responsive bidder whose proposal complies with all the prescribed requirements. However, the Charter Township of Oakland reserves the right to waive any informalities, or immaterial omissions or defects not involving price, time or changes in the work and to reject any or all bids, if to do so is deemed in the best interest of the Charter Township of Oakland. In no event will an award be made until all necessary investigations are made as to the responsibility and qualifications of the Bidder to whom it is proposed to make such award. No proposal will be accepted from or contract

awarded to any person, firm or corporation that is in arrears or is in default to the Charter Township of Oakland upon any debt or contract or that is in default as surety or otherwise, or failed to perform faithfully any previous contract with the Charter Township of Oakland.

No bidder may withdraw a bid after the actual date of the opening thereof except in a case where a bidder demonstrates to the Charter Township of Oakland reasonable satisfaction that a material and substantial mistake was made in preparing the bid, in which event the bidder has 24 hours after the opening of a bid to deliver to the Charter Township of Oakland a notice, in writing, that he/she desires to withdraw his/her bid and stating the reasons therefore. Once a bid is withdrawn, it may not be rebid.

The bidder will be required to perform and complete the proposed work in a thorough and workmanlike manner and to furnish all necessary labor, tools, equipment, material, and supplies except as may otherwise be specified as furnished by the Charter Township of Oakland.

The bidder shall not subcontract any or all portions of the work unless the Charter Township of Oakland grants prior written approval. Any subcontractor, so approved, shall be bound by the terms and conditions of this contract.

All work shall meet with the approval of the Township Manager, or his authorized representatives as conforming to the provisions and requirements of this contract.

All mowing operations shall be conducted in a manner that will not create a hazard, nor hinder, restrict, or impede traffic. The Bidder shall not operate mowing equipment on the roadway or in a manner that requires unnecessary crossing of the roadway. Equipment not in use may not be temporarily parked in the traveled portion of the roadway or on non-motorized pathways.

The bidder shall coordinate this work with other Contractors performing work within the common or adjoining areas, so as to avoid conflicts in maintaining traffic operations and the hindrance of the orderly progress of individual contract work.

Work is to be performed under this contract during the hours of daylight, and no work will be permitted at night, on Sundays or holidays unless specifically authorized or directed by the Township Manager or his/her representative.

GENERAL SPECIFICATIONS:

1. All spray applications shall be made in compliance with all applicable laws and regulations including Michigan Department of Agriculture Regulations 636 & 637.
2. All herbicide applications shall be done in a manner that does not cause harm to trees, flowers, turf and/or shrubs.
3. All granular material shall be removed from the walkways by the bidder after each application.
4. Bidder shall provide to the Charter Township of Oakland, within 24 hours, a list of mowed sites and shall include any comments on the condition of the site.

5. Billings are to be generated monthly and are to include property locations and date of each treatment. Submit to the Township Manager, for approval and payment processing.
6. Bidder shall provide Material Safety Data Sheets (MSDS) for each chemical being applied under these specifications.
7. Cut and trim all grass, weeds, and growth in the designated maintenance areas. Care shall be taken to prevent damage to trees, sign posts, sprinkler heads, mulch areas, turf, etc. that can be caused by improper use of trimmers and/or mowers.
8. Use a nylon cord trimmer to cut around trees, buildings, fence lines, mulch beds, signs or other obstacles.
9. Any mulching material that has been dislodged from the mulch beds shall be returned to the mulch bed prior to the bidders crew leaving the site.
10. Any grass that has been damaged by the bidders crew shall be restored.
11. Direct grass and weed clippings away from roadways, ponds, waterways, buildings and blower intake pipes or screens. Grass clippings shall be cleared from sidewalks and driveways/parking areas after each mowing.
12. Visually inspect for, collect and remove debris prior to mowing. Debris shall be legally disposed of.
13. Employ individuals that are properly trained in operating the specific equipment used by the bidder. Upon request, the Bidder shall provide a copy of their Written Safety Program for review by the Charter Township of Oakland.
14. Provide these maintenance services according to the Lawn Cutting Schedule.
15. Where a cost is requested on the Bid Form for lawn mowing, the bid shall be on a per-cut basis. Do not provide a lump sum.
16. Mowers shall have the mower deck ahead of the power unit.
17. Bidder shall submit, along with their bid, a list of their equipment for Charter Township of Oakland inspection.
18. The Bidders equipment shall be in good repair capable of performing the work under these specifications and shall meet all OSHA, MIOSHA and other applicable Michigan Laws, rules and regulations. Equipment shall include, but is not limited to, mowers, trailers, trimmers, etc. The Charter Township of Oakland reserves the right to inspect the Bidders equipment as a condition of contract approval.
19. Bidder shall use the proper equipment for the work to prevent scalping of the turf, disruption of mulch areas or other damage.
20. When working on Charter Township of Oakland property, the Bidder shall require that their employees wear the necessary protective gear/clothing as required by OSHA and/or MIOSHA for the type of work they are performing.
21. Weeds and grasses growing through the cracks of curbs or other paved areas shall be treated with a herbicide to control growth within these areas. This shall be done as part of the lawn cutting duties under this specification.

SPECIAL INSTRUCTIONS:

1. Sidewalks will be edged no less than once per month.
2. Grass shall not exceed a maximum height of five (5) inches between mowing. Bidder shall advise the Township Manager if additional mowing is required in order to meet this requirement.

PROPOSED LAWN CUTTING SCHEDULE: The Charter Township of Oakland reserves the right to add or delete cuttings from the Schedule. This schedule is an approximation, weather conditions may necessitate additions, or deletions to the number of times the lawn will require maintenance.

1. From the start of contract, the areas below are to be cut every week:

- Charter Township of Oakland Main Complex, 4393 Collins Road
- Fire Station #2, 1888 Rochester Road
- Paint Creek Cider Mill, 4480 Orion Road

2. From the start of the contract, the areas below are to be cut once a month:

- Bigler Cemetery, Corner of Gunn & Kern
- Kline Cemetery, Rochester Road Just South of Stoney Creek
- NW Corner of Orion & Dutton, Cut & Trim Around Sign
- NW Corner of Orion & McDuff, Cut & Trim Around Sign
- Landscape Island Orion & Territorial, In Front of Paint Creek Market
- Rochester & Romeo, Cut & Trim Around Sign
- Rochester & Mead, Cut & Trim Around Sign

MULCH MAINTENANCE:

1. **MULCH INSTALLATION:** All shrub and flower mulch beds and mulch rings around ornamental trees will be defined and maintained. Existing mulch beds and mulch rings shall be top-dressed with new mulch after the application of pre-emergents.
3. **WEED CONTROL OF MULCH AND SHRUB AREAS:** Both pre-emergent and post-emergent herbicides will be utilized to control weed growth in the mulch areas.
4. All shrub and flower mulch beds and mulch rings around trees shall be maintained to present neat and weed free appearance throughout the growing season.
5. The following locations shall be part of the Mulch Maintenance Program:
 - Charter Township of Oakland Main Complex, 4393 Collins Road
 - Fire Station #2, 1888 Rochester Road
 - Paint Creek Cider Mill, 4480 Orion Road

FLOWER BED/PERENNIAL BED MAINTENANCE:

1. Annuals may be planted by non-profit groups for the Charter Township of Oakland, but shall be maintained by the Bidder for the growing season in a neat and weed free appearance at all times.
2. Existing perennials and any new planted by non-profit groups for the Charter Township of Oakland, shall be maintained by the Bidder for the growing season in a neat and weed free appearance at all times.
3. The following locations shall be part of the Flower Bed/Perennial Bed maintenance:

- Charter Township of Oakland Main Complex, 4393 Collins Road
- Fire Station #2, 1888 Rochester Road
- Paint Creek Cider Mill, 4480 Orion Road

PROPERTY CLEAN UP:

1. A spring clean up shall be included in the Bid which will cover the removal of leaves that have collected in the shrub beds and corners of buildings. Additionally, litter that has collected over the winter months is to be removed.
2. A fall clean up shall be conducted twice, once in October, once in November, to remove leaves and debris.
3. The following locations shall be part of the property clean up:
 - Charter Township of Oakland Main Complex, 4393 Collins Road
 - Fire Station #2, 1888 Rochester Road
 - Paint Creek Cider Mill, 4480 Orion Road

SHRUB TRIMMING:

1. The shrubs shall be trimmed at least once per month at the following locations. Trimming shall be performed to provide a neat, uniform appearance to the shrubs without damaging the plant.
2. The following locations shall be part of the Flower Bed/Perennial Bed maintenance:
 - Charter Township of Oakland Main Complex, 4393 Collins Road
 - Fire Station #2, 1888 Rochester Road
 - Paint Creek Cider Mill, 4480 Orion Road

LIABILITY FOR DAMAGE TO PROPERTY AND/OR PLANT MATERIAL

The contractor will be responsible for the preservation of all public and private property along and adjacent to working area and shall exercise due care and caution to avoid and prevent any damage or injury as a consequence of the work. All trees, shrubs, ground covers, lawns and utilities shall be adequately protected.

Damage: Trees, shrubs, flowers and lawn areas damaged beyond repair, as judged by a qualified horticulturist or arborist acceptable to both parties, are to be removed at no expense to the Charter Township of Oakland and replaced by a tree, shrub, flower or sod of size and species approved by and at no additional expense to the Charter Township of Oakland; or the dollar value of such damaged trees, shrubs, flowers or sod as determined by a qualified horticulturist or arborist acceptable to the Charter Township of Oakland and the Contractor, shall be deducted from the monies owed the Contractor.

Should any direct or indirect damage or injury result to any public or private property by or on account of any act, omission, neglect or misconduct in the execution of the work or as a consequence of the execution or non-execution thereof on the part of the Contractor or any of his employees or agents, such property shall be restored, by and at the expense of the Contractor, to

a condition equivalent to that existing before the damage or injury occurred, by repairing or rebuilding the same or by otherwise making good such damage or injury in an acceptable manner.

HAZARDOUS PRACTICE

The Contractor shall not engage in any activity or practices which pose an unreasonable hazard or threat to the safety of persons or property.

OBSERVANCE OF LAWS, ORDINANCES, AND REGULATIONS

The Contractor at all times during the term of this contract shall observe and abide by all applicable Federal, State and Local laws, ordinances, regulations or rules and specifically the Michigan Department of Agriculture, Pesticide and Plant Pest Management Division, Regulation 636, Pesticide Applicators and 637, Pesticide Use. The Contractor shall comply with all orders of courts of competent jurisdiction. The Contractor shall comply fully and completely with any and all applicable State and Federal statutes, rules and regulations as they relate to hiring, wages and any other applicable conditions of employment.

SUBCONTRACTS

The Contractor shall not subcontract work under this contract unless written approval is granted by the Charter Township of Oakland. The Subcontractor, as approved, shall be bound by the terms and conditions of the contract between the Charter Township of Oakland and Contractor. The authorized Subcontractor shall perform all work in accordance with all terms of this contract and specifications. All required notices, work orders, directives and requests for emergency services will be directed to the Subcontractor as if the notice had been given directly to the Contractor.

EXECUTION OF CONTRACT

The successful Bidder shall, within 10 calendar days of mailing of written notice of selection as the successful Bidder, enter into contract with the Charter Township of Oakland on forms as included within the bidding documents for the performance of work awarded him and shall simultaneously provide the appropriate certificate of issuance required hereunder and commence with work.

MODIFICATIONS

Any alterations or modifications of the work performed under this contract shall be made only by written agreement between the Contractor and the Charter Township of Oakland and shall be made prior to commencement of the altered or modified work. No claims for any extra work or materials shall be allowed unless covered by written agreement.

WORK CREW SUPERVISION

The Contractor shall provide qualified supervision of each crew at all times while working under this contract.

APPENDIX A
INSURANCE REQUIREMENTS

Submit a Certificate of Insurance prior to the issuance of a purchase order meeting the minimum limits of liabilities as outlined. Certificate of Insurance shall have language the same as that shown in example. All insurance carriers must be acceptable to the Charter Township of Oakland and licensed in the State of Michigan.

The Vendor shall not allow for any lapse of insurance coverage in the amounts shown below. Failure of the Vendor to maintain the required insurance shall be grounds for contract cancellation.

1. Workers' Compensation Insurance;
2. Commercial General Liability Insurance;
3. Motor Vehicle Liability.

HOLD HARMLESS

To the fullest extent permitted by law, Vendor agrees to defend, pay in behalf of, indemnify and hold harmless the Charter Township of Oakland, its elected and appointed officials, employees and volunteers and others working in behalf of the Charter Township of Oakland against any and all claims, demands, suits, or loss, including all costs connected therewith, and for any damages which may be asserted, claimed or recovered against or from the Charter Township of Oakland, its elected and appointed officials, employees, volunteers or others working in behalf of the Charter Township of Oakland by reason of personal injury, including bodily injury and death and/or property damage, including loss of use thereof, which arises out of or is in any way connected or associated with this contract.

BID SUBMITTED PURSUANT TO THE TOWNSHIP OF OAKLAND
2015 LANDSCAPING

Township of Oakland
4393 Collins Road
Rochester, Michigan 48306

The undersigned, as Successful Bidder, hereby declares that this bid is made in good faith without fraud or collusion with any person or persons bidding on the same Contract; that he/she has carefully read and examined the Contract Documents, including the Invitation to Bid, General Requirements, and Program Guidelines for the designated work and understands all of the same; that he/she or his/her representative, has made such personal investigation at the site as is necessary to determine the character and difficulties attending the execution of the proposed work. Bidder proposes and agrees that if this Proposal is accepted, bidder will contract with the Township, provide necessary machinery, tools, apparatus and transportation services necessary to do all the work specified or referred to in the Contract Documents in the manner and time therein prescribed, and according to the requirements of the owner as therein set forth, to furnish the insurance required of the Contractor by the Contract Documents, and that he/she will take in full payment, the unit prices set forth in the following proposal.

All bidders understand that the Township reserves the right to accept or reject any and/or all bids, to waive any irregularities and/or informalities in the bids, negotiate with any bidder, or to select the bid(s), or portions thereof, most advantageous to the Township.

The successful bidder agrees that this bid shall be good and may not be withdrawn for a period of ninety (90) calendar days after the scheduled closing time for receiving bids.

Upon receipt of a written Notice of Award of the Bid, the successful bidder shall execute the formal Contract Agreement within ten (10) days. In the event that the Contract is not executed within the time set forth above, the Bid Proposal shall become the property of the Township as liquidated damage for the delay and additional expense to the Township caused thereby.

Pursuant to your request for Landscaping Service proposals, I submit my bid, with the understanding that if my bid proposal, or section thereof, is accepted, I will execute a written contract with the Township of Oakland, which will embody the terms as outlined in the bid proposal.

I will meet all of the requirements and provide all of the services for the amounts listed on the attached bid sheet for the items listed in this document.

The contract shall have a term of one year with the ability to extend an additional two years if agreed to by both parties. Contractor agrees to abide by all applicable Federal, State and local rules and policies in carrying out the terms of this agreement. The Township, in the event of unsatisfactory performance by the contractor, reserves the right to terminate this contract upon thirty (30) days written notice to the last address provided by the contractor. Prior to termination of this contract, the Township will provide the contractor thirty (30) days, after oral or written notice of unsatisfactory performance, to make corrections to the satisfaction of the Township.

The undersigned, by execution of this contract, certifies that he/she is the _____ of the firm named as _____, that he/she signs the bid on behalf of the firm and that he/she is authorized to execute the same on behalf of said firm.

Company:

Address:

Phone:

Authorized Agent:

Signature:

Title:

Date:

INSTRUCTIONS TO BIDDERS:

The Bidder shall provide a **resume** to the Charter Township of Oakland. The Bidder shall include in their resume any and all information pertinent to aiding the Charter Township of Oakland in determining the abilities of the Bidder.

Bidder shall submit, along with their bid, a list of their equipment for Charter Township of Oakland inspection.

The Bid Form is to be completed in legible form.

NO FAXED BIDS WILL BE ACCEPTED.

Bids are accepted **until 10:00 a.m. Wednesday, April 8, 2015.**

Please mark your envelope: "**BID - LANDSCAPING**".

BID FORM

Lawn Mowing Cost on a Per Cut Basis

- | | | |
|----|--|----------|
| 1. | Lawn Mowing: 4393 Collins Road Complex | \$ _____ |
| | Mulch Installation/Weed Control | \$ _____ |
| | Flower/Perennial Bed Maintenance | \$ _____ |
| | Property Clean Up | |
| | Spring | \$ _____ |
| | Fall #1 | \$ _____ |
| | Fall #2 | \$ _____ |
| 2. | Lawn Mowing: Fire Station #2, 1888 Rochester Road | \$ _____ |
| | Mulch Installation/Weed Control | \$ _____ |
| | Flower/Perennial Bed Maintenance | \$ _____ |
| | Property Clean Up | |
| | Spring | \$ _____ |
| | Fall #1 | \$ _____ |
| | Fall #2 | \$ _____ |
| 3. | Lawn Mowing: Paint Creek Cider Mill, 4480 Orion Road | \$ _____ |
| | Mulch Installation/Weed Control | \$ _____ |
| | Flower/Perennial Bed Maintenance | \$ _____ |
| | Property Clean Up | |
| 4. | Lawn Mowing & Trimming, Monthly Areas | \$ _____ |



1. HERBICIDE USE POLICY

1.1 MISSION

The Mission of the Oakland Township Parks and Recreation Commission (PRC) is to acquire, maintain and manage Township parkland and natural areas and to provide recreation opportunities and facilities for the benefit and enjoyment of all present and future Oakland Township residents.

1.2 CORE VALUES AND GUIDING PRINCIPLES

1. We are committed to the core value of *Environmental Conservation and Stewardship*.

We believe in these guiding principles:

- A. Environmental awareness
- B. Sensitivity to natural resources
- C. Long-term care & stewardship of parks and natural areas
- D. Respect and concern for the environment
- E. Conservation of natural areas

2. We are committed to the core value of *Informed Planning*.

We believe in these guiding principles:

- A. Learning and sharing information
- B. Thinking towards the future
- C. Educated decision-making based on best and current information
- D. Plans and actions based upon knowledge and careful consideration
- E. Flexibility in considering new ideas

3. We are committed to the core value of *Quality Service*.

We believe in these guiding principles:

- A. Quality parks and facilities
- B. Quality programs and recreation services

4. We are committed to the core value of *Community Responsiveness and Collaboration*.

We believe in these guiding principles:

- A. Teamwork and agreement
- B. Collaboration with residents, boards, commissions, and organizations
- C. Accountability
- D. Responsiveness to our community
- E. Equity and fairness

5. We are committed to the core value of *Dedicated Leadership*.



We believe in these guiding principles:

- A. Dedication and loyalty
- B. Respect for others
- C. Integrity in our conduct
- D. Creativity
- E. Leadership
- F. Innovation

6. We are committed to the core value of *Fiscal Responsibility*.

We believe in these guiding principles:

- A. Use of electronic technology
 - 1. Business model
 - 2. Costing model
- B. Business planning and financial management
- C. Financial sustainability
- D. Variety of income sources

1.3 PRINCIPLES OF VEGETATION CONTROL

Regardless of the method used to control undesirable vegetation, implement an integrated pest management (IPM) strategy. The integrated pest management strategy should include:

- Develop a vegetation management goal. Potential goals depend on the species and management objectives and include preventing establishment, suppression, or eradication of undesirable vegetation.
- Accurately identify the target vegetation and understand its biology.
- Set up a monitoring program to track the status of undesirable vegetation and response to control actions.
- Establish action thresholds to determine the amount of target vegetation to trigger control actions.
- Know the control options available. Consider other options before using herbicides. Non-herbicide options include mechanical control (mowing, trimming, tilling, hand pulling), fire (prescribed fire and flame weeding), and cultural methods (mulching or shading).

1.4 WHO MAY HANDLE AND USE HERBICIDES

- Contractors and staff that apply herbicides must be Commercial Pesticide Applicators in the State of Michigan
- Volunteers that apply herbicides must be Commercial Pesticide Applicators in the State of Michigan and have signed a consent and release form. Charter Township of Oakland Parks and Recreation staff that supervise these volunteers must be Commercial Pesticide Applicators.



- Licensing through the Michigan Department of Agriculture and Rural Development (MDARD) is a reimbursable expense when obtained while an employee of the Charter Township of Oakland Parks and Recreation or as a long-term volunteer.
- When non-licensed staff or volunteers work in the field next to licensed herbicide applicators, they will be required to wear personal protective equipment and will be educated on herbicide safety.
- Material Safety Data Sheets (MSDS) forms and herbicide labels will be available at the Parks and Recreation office, at the storage facility, and in the field.

1.5 HERBICIDE AND ADJUVANT SELECTION

The following herbicide properties must be considered when deciding which herbicide to use (not necessarily in priority order):

1. Safety for applicators
2. Application considerations (see Application Methods)
3. Human toxicity due to contact with herbicide
4. Toxicity to birds, mammals, fish, amphibians, reptiles, insects and to other non-target organisms (including algae, fungi, and soil organisms).
5. Effectiveness against the target species. Consult the Michigan DNR Best Control Practices, the Addendum to Natural Areas Management Plans (Plantwise 2011), and other literature for herbicide selection and recommendations on application rates and methods.
6. Behavior in the environment (environmental fate). Consider mechanisms of dissipation and breakdown, including persistence, degradation, and likelihood of movement via air, soil, or water to non-target organisms. When effectiveness against the target organism is equal, the herbicide that persists for a shorter time in the environment should be used.

Additional Notes on Herbicide and Adjuvant Selection

- In general for work in natural areas, it is best to select compounds that are effective against the weed, not likely to drift, leach to groundwater or wash into streams, nontoxic to people and other organisms, not persistent in the environment, and easy to apply. In some circumstances, a single application of a more toxic or persistent chemical that kills the weed, however, may be preferable to a less persistent, less toxic compound that must be applied repeatedly. Strive to do the job with the smallest total negative impact to the environment.
- Aquatic-rated herbicide and adjuvant formulations **must** be used in all areas that might be delineated as wetlands (combination of water at or near surface, wetland soils, and/or vegetation adapted to wet conditions), within 15' of water, or when the water table is within 6" of the soil surface. Non-aquatic formulations may only be used away from these wetland areas. When a non-ionic surfactant is necessary, use an aquatic-rated surfactant when working in wetland areas.
- As required by Michigan law, an Aquatic Nuisance Control Permit must be obtained from the Michigan Department of Environmental Quality for all herbicide applications in areas with standing water at the time of treatment.
- Herbicides will be handled according to the Herbicide Use Procedures and in a manner consistent with the product label and local, state, and federal laws.



1.6 PUBLIC NOTIFICATION

- Prior to application, notify on the day of application all residents who have requested to be informed of herbicide applications within the parks.
- Federal requirements for posting treated areas, if any, are found on the product label
- When treatment areas are within 25 feet of areas intended for public use (roads, trails, sport fields, lawns, parking lots, etc.), signs must be posted on the edges of the area of application during the application and at least until the herbicide is completely dry. Be sure to place signs at all trail junctions adjacent to the treated area. The signs must contain the name of the herbicide, the reason for application, the date of application, the date when safe to re-enter, and a phone number to contact with questions.
- Application records must be completed with each use of any herbicide. By law, records for general use pesticides should be kept for one year, while records for restricted use pesticides should be kept for three years. If a contractor applies herbicides, they must submit records of herbicide use to the Charter Township of Oakland Parks and Recreation.

1.7 HERBICIDE-FREE AREAS

Herbicides should not be applied in the following areas.

- Along the Paint Creek Trail on the limestone surface, around benches, and around signs
- Within playground or picnic areas
- In areas intended for frequent public use, including parking lots, paths, and spectator areas at athletic fields. If herbicides must be used in one of these areas to address safety or maintenance concerns, signs must be posted around the edge of the application area during application and at least until the herbicide is completely dry.

1.8 APPLICATION METHODS

Adapted from The Nature Conservancy Herbicide Use Guidelines

1. Foliar Applications

These methods apply herbicide directly to the leaves and stems of a plant. An adjuvant or surfactant is often needed to enable the herbicide to penetrate the plant cuticle.

- A. **Spot spray application** – Spray herbicide directly onto target vegetation only, and avoid spraying other desirable plants. Generally applied with a backpack sprayer or spray hose. Appropriate for areas include sites with little non-target vegetation and few native plants.
- B. **Boom spray application** – The herbicide mix is applied with a boom, which is a long horizontal tube with multiple spray heads. The boom is carried above the weeds while spraying herbicide, allowing large areas to be treated rapidly with each sweep of the boom. Offsite movement due to vaporization or drift, and possible treatment of non-target plants can be of concern when using this method. A drift management plan must be in place when potential for offsite movement is likely. Appropriate for site preparation of large restoration areas.
- C. **Wick application (including wet glove)** - Use a sponge or wick to wipe herbicide onto foliage and stems. Use of a wick eliminates the possibility of spray drift or droplets falling on non-target plants. Herbicide is applied directly onto a heavy cotton glove worn



over a thick rubber/latex (or nitrile) glove. The applicator can then apply the herbicide with total precision and little or no runoff. The wet glove technique can be used to apply herbicides in otherwise high quality sites.

2. Basal Bark

This method applies a 6 to 12 inch band of herbicide around the circumference of the trunk of the target plant, approximately one foot above ground. The basal bark treatment works best on young trees with smooth bark. It is usually not effective against older plants with thick corky bark. This method only affects the treated stems, with little risk of exposure to the public.

3. Drill and Fill/Frilling

The drill and fill and frilling methods are often used to treat woody species with large, thick trunks. In the drill and fill method, holes are drilled a downward angle into a woody stem at regular intervals and herbicide is injected into the holes. For frilling, cuts are made at a downward angle around a woody stem. Herbicide is then immediately applied to the cut. This method only affects the treated stems, with little risk of exposure to the public.

4. Cut-Stump

This method is often used on woody species that normally re-sprout after being cut. Cut down the tree or shrub, and immediately apply herbicide on the exposed cambium (living inner bark) of the stump. The cut stump treatment allows for a great deal of control over the site of herbicide application, and therefore, has a low probability of affecting non-target species, contaminating the environment, or public exposure.

Application Methods Summary Table

Application Method	Description	Public Exposure Risk	Appropriate Locations
Foliar application	Apply herbicide to the leaves using spot spray, boom spray, or wicking.	Low to medium. Spray areas should be closed at least until herbicide has dried.	Natural areas, athletic fields, and other areas as needed
Basal bark	Apply herbicide in a band around the stem of a woody plant.	Very low	Natural areas
Drill and fill	Drill hole in woody stems. Inject a small amount herbicide into the hole.	Very low	All locations
Cut stump	After cutting stems, herbicide is applied to the cut surface to prevent re-sprouting.	Very low	All locations