

ORDINANCE NO. 49
CHARTER TOWNSHIP OF GARFIELD
STORM WATER CONTROL ORDINANCE

Description of Purpose and Nature:

AN ORDINANCE TO PROVIDE FOR STORM WATER MANAGEMENT PRACTICES AND REVIEW OF STORM WATER MANAGEMENT PLANS IN CONFORMANCE WITH STANDARDS ADOPTED BY THE GRAND TRAVERSE COUNTY DRAIN COMMISSIONER.

The Charter Township of Garfield, Grand Traverse County, Michigan
Ordains:

Section 1. Applicability. Except as otherwise provided in this Ordinance, any earth changes, as defined as in Part 91, 1994 PA 451, being MCL 324.9101(9), as amended, that meet any of the following criteria require a Storm Water Runoff Control Permit:

- A. Disturb 1 or more acres of land
- B. Within 500 feet of the ordinary high water mark of a lake or stream
- C. Commercial use development
- D. Mobile home park or manufactured home development
- E. Multiple family residential development or P.U.D.
- F. Site condominium or condominium developments as defined by Act 59 of the Public Acts of 1978, as amended
- G. Platted subdivision development
- H. Private roads which access 3 or more development parcels

Section 2. Design Standards. "Design standards" as used in this ordinance means the Uniform Storm Water Control Design and Installation Standards for Municipalities in Grand Traverse County and are adopted as if fully set forth herein.

Section 3. Enforcement Agent. The Grand Traverse County Drain Commissioner is authorized as the primary enforcement agent for the Charter Township of Garfield ("Township") for carrying out this ordinance, and may

designate such agents, as the Drain Commissioner deems necessary to carry out the purposes of this ordinance. In addition, the Township, is also authorized to act as enforcement agent, and retains the discretion to enforce this Ordinance by the Township's Ordinance Enforcement Officer if, in the Township's discretion, exigent or other appropriate circumstances require the Township to enforce this Ordinance.

Section 4. Earth Change Permit.

A) **Application.** Permit applications shall be submitted to the enforcement agent. Copies of the permit application form shall be made available by the enforcement agent. Application for a permit and issuance of the permit shall be made prior to the start of any earth change requiring a permit under this ordinance. Submission of an application for permit shall constitute consent by the property owner for the enforcement agent or his designated representative to enter upon the property for purposes of inspections attendant to the application. The application shall contain, at a minimum, all of the following:

- 1) A map or maps at a scale of not more than 200 feet to the inch or as otherwise determined by the enforcement agent, including a legal description and site location sketch that includes the proximity of any proposed earth change to lakes, streams, and or wetlands; predominant land features; and contour intervals or slope description and all applicable set backs.
- 2) A soils survey or a written description of the soil types of the exposed land areas contemplated for the earth change.
- 3) A description and the location of the physical limits of each proposed earth change.
- 4) The location of all lakes, streams, and wetlands partially or completely contained within the boundaries of the site or within 50 feet of the site boundary.
- 5) A description and the location of all existing and proposed on-site storm water management and dewatering facilities.
- 6) The timing and sequence of each proposed earth change.
- 7) The location and description for installing and removing all proposed temporary soil erosion and sedimentation control measures.
- 8) A description and the location of all proposed permanent storm water control measures or devices.

- 9) The enforcement agent may require, as defined in Section 1, that the storm water runoff control plan be prepared by a State of Michigan licensed landscape architect, architect, land surveyor or professional engineer. If the enforcement agent also requires an additional professional consultant (engineer and/or attorney) to review the plans submitted, all review costs shall be paid for by the developer
- 10) The person(s) or organization(s) responsible for maintenance shall be designated in the plan. Options include:
 - a) Property owner
 - b) Homeowner's association, provided that provisions for financing necessary maintenance are included in deed restrictions or other contractual agreements
 - c) Grand Traverse County Drain Commissioner, in accordance with the Michigan Drain Code, Public Act 40 of 1956, as amended, if the storm water conveyance facilities are within a designated Drain District.

B) Sequential Application.

1. If a development on a site is so large or complex that a storm water control plan encompassing all phases of the project cannot reasonably be prepared prior to initial ground breaking, then an application for a permit for successive major incremental earth change activities may be allowed.
2. Requests for sequential applications shall be approved by the enforcement agent prior to submittal of the initial permit application. Approval of sequential applications shall take place in two phases. First, the overall conceptual plan for the entire development shall be submitted for review and approval. Second, detailed plans for sections of the total project shall be submitted for review and approval upon the request of the enforcement agent.
3. All permits processed and issued for phases of a project shall be clearly defined as to the nature and extent of work covered. Each phase of the project must be reviewed and permitted by the enforcement agent prior to construction.

- C) Permit Application Review.** Concurrent with and pursuant to the Grand Traverse County Soil Erosion Control Ordinance #25, the enforcement agent shall approve, approve with conditions, or deny an application after the

completed application is submitted together with all required plans and fees. The enforcement agent shall reject any application which is incomplete.

- D) **Approval – Certification Not Required.** Approval shall be granted if the storm water control plan meets the requirements set forth in the design standards and the requirements of this ordinance.
- E) **Approval – Certification Required.** For any site requiring that a storm water control plan be prepared by a State of Michigan registered professional, the enforcement agent shall grant approval if the storm water control plan meets the requirements set forth in the design standards and upon receipt by the enforcement agent of a letter from the registered professional certifying that the storm water control plan meets all of the requirements of the design standards.
- F) **Approval with Conditions.** If the application is approved with conditions, the enforcement agent must state in writing the conditions upon which approval is based.
- G) **Denial.** The enforcement agent shall notify the applicant in writing if the application is denied and the reasons for the denial.
- H) **Permit Expiration.** All permits approved by the enforcement agent shall expire upon the occurrence of project completion date provided on the application or 1 year, which ever occurs first. The enforcement agent may extend the permit for a period not to exceed one year upon good cause shown by the landowner or permit applicant. The enforcement agent may charge an additional fee to cover the cost of continued inspections, the amount of which is specified in the current permit and review fee schedule, in effect for the Grand Traverse County Drain Commissioner’s Office and may be amended by the County concurrent with and pursuant to the Grand Traverse County Soil Erosion Control Ordinance #25. All fees are to cover administrative expenses of processing the storm water control permit and the soil erosion control permit including inspections and monitoring of projects.
- I) **Permit Revocation or Suspension.** A permit issued under this ordinance may be revoked or suspended by the enforcement agent for any of the following reasons:
 - 1) A violation of a condition of the permit
 - 2) Misrepresentation or failure to fully disclose relevant facts in the application
 - 3) A change in condition that requires a temporary or permanent change in the activity

- 4) Authorized work is abandoned or suspended for a period of six months or more.
- 5) A non-approved waiver of the buffers and setbacks established in the design standards.

Notification of a revocation or suspension shall be made in writing. The notice will specify the reason(s) for the revocation or suspension and the time for an appeal of the revocation or suspension.

Section 5. Storm Water Management Easements. All easements that are necessary to implement the approved drainage plan and to otherwise comply with this ordinance in form and substance shall be recorded with the Grand Traverse County Register of Deeds prior to issuance of a permit by the enforcement agent. The easements shall assure access for proper inspection and maintenance of storm water runoff facilities and shall provide adequate emergency overland flow-ways.

Section 6. Performance Guarantees. As a condition of issuance of a permit, the enforcement agent may require the applicant to deposit cash, a certified check, or an irrevocable letter of credit acceptable to the enforcement agent in an amount sufficient to assure the installation and completion of the storm water control plan. Irrevocable letters of credit, if used as a performance guarantee, shall extend for a minimum of one year with the option of renewal. The required security shall be held in the office of the enforcement agent, and shall be released only upon final inspection and approval of the storm water control systems.

Section 7. Final Inspection and Approval or Denial of Completed Storm Water Control Measures or Devices. Upon completion of a storm water control plan, the property owner, applicant, or other authorized representative of the property owner shall notify the enforcement agent. The enforcement agent shall conduct a final inspection within 10 days after being notified of the completion. The enforcement agent shall either approve or not approve the completed storm water control measures and devices on a form prepared by the enforcing agent within 30 days following inspection. If changes occur to the original plan during the course of construction, the enforcement agent may require final "as built" drawings before making a final inspection or in making a determination as to final approval or denial of the installed storm water control plan

A. Approval – Certification Not Required. Approval shall be granted if the storm water control measures as completed meet the requirements set forth in the storm water control plan.

B. Approval – Certification Required. For any site requiring that a storm water control plan be prepared by a registered professional, the enforcement agent shall grant approval if the storm water control measures as completed meet the requirements set forth in the storm water control plan and upon receipt by the enforcement agent of a letter from a licensed professional civil engineer certifying that all storm water measures have been completed in accordance with the storm water control plan.

C. Denial. The enforcement agent shall notify the applicant in writing if the request for closure of the permit is denied and the reasons for the denial.

Section 8. Maintenance.

A) Routine Maintenance

- 1) All storm water control plans shall be maintained according to the measures outlined in the design standards, and as approved in the permit.
- 2) The person(s) or organization(s) responsible for maintenance shall be designated in the plan. Options include
 - a) Property owner
 - b) Homeowner's association, provided that provisions for financing necessary maintenance are included in deed restrictions or other contractual agreements
 - c) Grand Traverse County Drain Commissioner, in accordance with the Michigan Drain Code, Public Act 40 of 1956, as amended, if the storm water conveyance facilities are within a designated Drain District.
- 3) Maintenance agreements shall specify responsibilities for financing maintenance and shall be recorded with the Register of Deeds before the permit can be closed.

B) Non-Routine Maintenance. Non-routine maintenance includes maintenance activities that are expensive but infrequent, such as pond dredging or major repairs to storm water structures.

- 1) Non-routine maintenance shall be performed on an as needed basis based on information gathered during regular inspections.

- 2) If non-routine maintenance activities are not completed in a timely manner or as specified in the approved plan, the Grand Traverse County Drain Commissioner may complete the necessary maintenance at the owner's/operator's expense.

C) Maintenance Inspections

- 1) The person(s) or organization(s) responsible for maintenance shall inspect storm water control systems on a regular basis, as outlined in the plan.
- 2) Authorized representatives of the enforcement agent may enter at reasonable times to conduct on-site inspections or routine maintenance.
- 3) For storm water control systems maintained by the property owner or homeowner's association, inspection and maintenance reports shall be filed with the enforcement agent as provided in the plan.
- 4) Authorized representatives of the enforcement agent may conduct inspections to confirm the information in the reports filed under section c.

Section 9. Fees. All fees shall be paid to Grand Traverse County in accordance with the current permit and review fee schedule, in effect for the Grand Traverse County Drain Commissioner's Office and may be amended by the County concurrent with and pursuant to the Grand Traverse County Soil Erosion Control Ordinance #25. All fees are to cover administrative expenses of processing the storm water control permit and the soil erosion control permit including inspections and monitoring of projects.

Section 10. Enforcement.

A. Violations. It shall be a violation of this ordinance to do any of the following:

- 1.To make an earth change without first obtaining a permit as required by this ordinance
- 2.To provide false or misleading information in an application for permit
- 3.To fail to follow approved storm water control plan
- 4.To fail to maintain a storm water control measure or device in accordance with an approved storm water control plan

B. Notice of violation. Whenever there is a failure to comply with the provisions of this ordinance, the enforcement agent shall notify the applicant/owner that he/she has five calendar days from the receipt of the notice to temporarily correct the violation and 30 days from receipt of the notice to permanently correct the violation. The enforcement agent for good cause demonstrated by the permittee may make reasonable extensions. Notice shall be made by certified mail, return receipt requested.

C. Enforcement Actions. Should the applicant/owner fail to take the corrective actions specified in the notice of violation, the enforcement agent may take any or all of the following actions:

- 1) Issue or cause to be issued a municipal civil infraction
- 2) Take whatever remedial actions are necessary and assert a lien on the subject property in an amount equal to the costs of remedial actions. The lien shall be enforced in the manner provided or authorized by law for the enforcement of common law liens on personal property. The lien shall be recorded with the Grand Traverse County Register of Deeds and shall incur legal interest from the date of recording. The imposition of any penalty shall not exempt the offender from compliance with the provisions of this ordinance, including assessment of a lien on the property.

D. Emergency Actions. When emergency actions are necessary to moderate a nuisance, to protect the public safety, health, and welfare, and/or to prevent the loss of life, injury, or damage to property, the enforcement agent is authorized to carry out or arrange for all such emergency actions, and to enforce penalties and/or liens as described herein.

E. Cease & Desist Orders. The enforcement agent may issue a cease and desist order or revoke a permit upon the determination that there is a violation of this ordinance. A cease and desist order, when issued, shall require all earth change activities to stop immediately.

F. Injunctive Relief. Notwithstanding any other remedy available under this ordinance, the enforcement agent may maintain an action in a court of competent jurisdiction for an injunction or other process against a person to restrain or prevent violations of this ordinance.

G. Fines & Penalties.

1. A violation of this ordinance is a municipal civil infraction punishable by a fine not exceeding \$500.00 per day of violation.
2. A knowing violation of this ordinance or interference with the enforcement of this ordinance by the enforcement agent or any person duly authorized to

carry out the purposes of this ordinance is a misdemeanor punishable by imprisonment for up to 90 days, and/or a fine of up to \$500.00 or both.

3. An action for the violation of this ordinance shall be instituted in the 86th District Court for Grand Traverse County. Fines and costs imposed or assessed in such an action shall be distributed in accordance with section 8379 of the revised judicature act of 1961, 1961 PA 236, MCL 600.8379.

Section 11. Waiver. The enforcement agent responding to a specific earth change as provided for in Section 3 may waive certain requirements specified in the ordinance upon being provided with demonstrable evidence of special circumstances warranting waiver, but only upon finding that both of the following requirements are met:

- A) The application of the ordinance provisions will present or cause practical difficulties for a development or development site; provided, however, that practical difficulties shall not include the need for the developer to incur additional reasonable expenses in order to comply with the ordinance; and
- B) The granting of the relief requested will not substantially prevent nor result in less effective management of storm water runoff.

Section 12. Appeals. Any person aggrieved by the action or inaction of the enforcement agent related to this ordinance may appeal to the Grand Traverse County Construction Code Board of Appeals. All requests for appeal shall be filed in writing within 30 days of the action or inaction appealed from and includes the basis of the appeal. In considering any such appeal, the Board may grant a variance from the terms of this ordinance so as to provide relief, in whole or in part, from the action being appealed, but only upon finding that both of the following requirements are met:

- A) The application of the ordinance provisions being appealed will present or cause practical difficulties for a development or development site; provided, however, that practical difficulties shall not include the need for the developer to incur additional reasonable expenses in order to comply with the ordinance; and
- B) The granting of the relief requested will not substantially prevent nor result in less effective management of storm water runoff

The filing of an appeal does not preclude other remedies available to either party, nor does it act as a stay of any order from the enforcement agent for the installation of measures or controls to reduce or eliminate storm water runoff pending the outcome of the appeal.

Section 13. Separate Causes of Action. Nothing in this ordinance impairs or precludes a separate cause of action provided by statute or common law for conduct prohibited herein.

Section 14. Other Ordinances. This ordinance shall be in addition to other ordinances of The Charter Township of Garfield and shall not be deemed to repeal or replace other ordinances or parts of other ordinances except to the extent that such repeal is specifically provided for in this ordinance. This ordinance is intended to work in conjunction with the Grand Traverse County Soil Erosion and Sedimentation Control Ordinance #25, other state, and federal laws affecting water and quality.

Section 15. Notice. Notice means delivery by first class mail unless otherwise specified in this ordinance.

Section 16. Severability. The provisions of this ordinance are severable and if any part is declared void or unenforceable by a court of competent jurisdiction, the remaining parts shall remain in force.

Section 17. Effective Date. This ordinance shall take effect on June 1, 2007 or 30 days after publication, whichever occurs later.

**UNIFORM STORM WATER CONTROL
DESIGN AND INSTALLATION STANDARDS
FOR
MUNICIPALITIES IN
GRAND TRAVERSE COUNTY**

GRAND TRAVERSE COUNTY, MICHIGAN

APRIL 2007

ADMINISTERED BY THE OFFICE OF THE DRAIN COMMISSIONER, GRAND TRAVERSE COUNTY

2650 La Franier Road, Traverse City MI 49686 Telephone: 231-995-6042

TABLE OF CONTENTS

PREAMBLE	1
DETERMINATION OF SURFACE RUNOFF	1
Method	1
Design Rainfall.....	1
CONVEYANCE CONTROLS	2
Storm Sewers	2
Sizing.....	2
End Treatment.....	3
Manholes and Catch Basins	3
Material.....	3
CULVERTS AND BRIDGES	4
Sizing.....	4
End Treatment.....	4
Material.....	4
GRASSED WATERWAYS.....	4
Sizing.....	4
Soil Erosion and Sedimentation Control	5
Layout.....	5
BUFFERS AND SETBACKS	5
STORM WATER FACILITIES	6
INFILTRATION/RETENTION SYSTEMS	6
Physical Feasibility.....	6
Design Criteria.....	7
Volume.....	7
Maximum Drain Time	8
Underground Infiltration and Retention Systems.....	8
Construction.....	8
Snow Storage	8
Treatment Criteria	9
Treatment Forebay	9
Sizing	9
Material	10
Sediment Forebay.....	11
Controls	11
Erosion Control.....	11
Geometry.....	11
Public Safety	12
Maintenance.....	12
STORM WATER WETLANDS.....	12
Physical Feasibility	12
Design Criteria.....	12
Pre-Treatment Criteria	13
Controls	13
Geometry.....	13
Public Safety	13
Landscaping	13
Maintenance.....	14
DETENTION SYSTEMS	14
Physical Feasibility	14
Design Criteria.....	14
Treatment Volume	14
Flood Control Volume.....	14
Wet Basins.....	15
Snow Storage	15
Pre-Treatment Criteria	15
Sediment Forebay	15

TABLE OF CONTENTS

Controls	15
Inlet Design	15
Outlet Design	15
Emergency Overflow	17
Erosion Control	17
Geometry.....	17
Public Safety	18
Maintenance.....	18
OPERATION AND MAINTENANCE AGREEMENTS	18
PRIVATE SYSTEMS	18
MAINTENANCE PLANS.....	19
DRAINAGE EASEMENTS.....	19
LOCATION.....	20
Within the Plat	20
County Drains	20
Surface Drainage.....	20
Yard Drainage.....	20
Outside the Development.....	21
Easements.....	21
Agreements	21
WIDTH	21
Open Drains	21
Enclosed Drains	21
Surface Yard Drains.....	21
Storm Water Facilities	22
UTILITIES	22
EXISTING EASEMENTS	22
Soil Erosion Control - Temporary and Permanent	23

LIST OF TABLES

Table 1	•	Runoff Curve Numbers for Selected Agricultural, Suburban, and Urban Land Use	25
Table 2	•	Runoff Coefficients	26
Table 3	•	Manning's Roughness Coefficients ("n")	27
Table 4	•	Minimum Slopes for Storm Sewers	28
Table 5	•	Minimum Required Detention Basin Flood Control Volume.....	29

LIST OF APPENDICES

Appendix 1	•	Storm Water Pollutant Risks
Appendix 2	•	Maintenance Plan and Budget
Appendix 3	•	Submittal Checklists
		3.1 Checklist for Preliminary Plats and Developments
		3.2 Checklist for Final Plats
Appendix 4	•	Standard Forms and Agreements
		4.1 Agreement to Establish an Existing Private Drain Under Section 433, of the Drain Code of 1956
		4.2 Drainage Easement
		4.3 Flooding Easement
		4.4 Detention Basin Easement
		4.5 Certification Form
Appendix 5	•	Irrevocable Commercial Letter of Credit
Appendix 6	•	Repair Bond
Appendix 7	•	Schedule of Fees
Appendix 8	•	Bulletin 71 Rainfall Frequency Atlas Of The Midwest
Appendix 9	•	Percolation Test & Percolation Test Data Form

PREAMBLE

These standards were developed to be used in conjunction with the *Municipalities of Grand Traverse County Storm Water Runoff Control Ordinance*. These standards may be updated from time to time to reflect new technology available to deal with storm water runoff on sites within Grand Traverse County.

DETERMINATION OF SURFACE RUNOFF

METHOD

The proprietor's engineer may be required to use the curve number method or an equivalent modeling approach to generate hydrographs and perform reach and reservoir routing for large sites and/or smaller sites of sufficient complexity. However, the Rational Method of calculating storm water runoff is generally acceptable for sites less than 120 acres, and is given by the equation:

$$Q = C I A$$

Where:	Q	=	Peak Discharge (cfs)
	C	=	Runoff Coefficient
	I	=	Rainfall Intensity (in/hr)
	A	=	Contributing Drainage Area (acres)

When applicable, a permit is required, pursuant to the Floodplain Control Section (Part 31) of Act 451, PA 1994, as amended. The Michigan Department of Environmental Quality will compute flood frequency discharges for the watercourse upon request.

Values of runoff curve number and average percent impervious for various development types for use with the curve number method are included in Table 1. Values of runoff coefficients for various development types, for use with the Rational Method, are included in Table 2.

The minimum time of concentration value shall be 15 minutes.

An antecedent moisture condition of 2, reflective of normal soil moisture, shall be used with the curve number hydrologic method.

DESIGN RAINFALL

The 24-hour rainfall amounts in Bulletin 71 (Appendix 8), located at the end of this section, shall be used to calculate peak runoff rates. A Type II rainfall distribution shall be used with the curve number

hydrologic method. The rainfall duration-frequency table from Bulletin 71 shall be used with the Rational Method to determine a rainfall intensity for a rainfall duration equal to the time of concentration.

CONVEYANCE CONTROLS

STORM SEWERS

SIZING

The storm sewer system shall be designed to convey runoff from a 10-year frequency rainfall event. The effect of the 25-year storm must be evaluated to ensure no adverse increase in water elevation off the development property, or flooding of structures within the development.

Storm sewer design velocities, capacities, and friction losses shall be based on Manning's equation:

$$Q = \frac{1.49 AR^{\frac{2}{3}} S^{\frac{1}{2}}}{n}$$

Where:	Q	=	Discharge (cfs)
	A	=	Wetted Area (sft)
	R	=	Hydraulic Radius (ft)
	S	=	Slope (ft/ft)
	n	=	Manning's Coefficient

Manning's coefficients for closed conduit are included in Table 3. Acceptable slopes for circular pipe ("n" = 0.013) are included in Table 4. Minimum grade for other Manning's "n" values must be calculated based on the allowable minimum velocity of 2.5 feet per second.

Surcharging the pipe will be allowed to 1 foot below the top of casting at design flow. However, minor losses must be considered in hydraulic grade line calculations.

Storm sewer pipe shall have a minimum diameter of 12 inches.

The minimum depth of cover shall be 24 inches from finished grade to the top of pipe.

Restricted conveyance systems designed to create backflow into storm water storage facilities are not permitted.

END TREATMENT

Outlet protection consisting of flared end sections, riprap, or other measures shall be provided as necessary to prevent erosion.

MANHOLES AND CATCH BASINS

Manhole spacing shall not exceed 400 feet for sewers less than 42 inches in diameter and 600 feet for larger sewers.

Manholes shall be placed at all changes in pipe direction, pipe size, and all inlet connection locations. A catch basin or manhole shall be installed at the upstream end of the storm sewer. 48-inch- or 24-inch-diameter catch basins can be substituted for manholes at the two most upstream locations.

Pipe inverts at junctions shall be designed to minimize junction losses (e.g., match point of sewers at 80% of diameter).

Minimum inside diameter of all manholes shall be 48 inches. Minimum inside diameters for catch basins and inlet structures shall be 24 inches. Catch basins and inlet structures shall include a minimum 2-foot sump.

Inlet structures shall be placed at low points of streets and yards, and be spaced a maximum of 400 feet apart. Spacing and/or number of catch basins and inlet structures required to accommodate the design flows in streets, private drives, and parking areas shall be provided based on inlet capacity with no ponding occurring during a 10-year storm.

No more than 150 feet of street drainage will be allowed to flow around a corner.

No flow will be allowed across a street intersection.

MATERIAL

Storm sewer pipe shall be reinforced concrete or smooth interior wall polyethylene in accordance with the current Michigan Department of Transportation (MDOT) Standard Specifications.

Pipe joints shall be designed to prevent excessive infiltration or exfiltration.

Connections to manholes shall be made with a resilient connector for pipe diameters 24 inches or less.

CULVERTS AND BRIDGES

SIZING

Crossings must meet the requirements of the Floodplain Control Section (Part31) of Act 451, PA 1994, as amended where applicable.

Bridges shall be designed to provide a 1-foot minimum freeboard to the underside (low chord) of the bridge for a 100-year flood. Footings shall extend at least 4 feet below the bottom of the channel.

Culverts not requiring a permit under Part 31 shall be designed for a minimum 10-year storm in the developed watershed with a maximum outlet velocity of 8 feet per second (ft/s). A maximum of 1 foot of inlet submergence may be permitted, if this does not backup water out of the easement.

Sizing of culverts and bridges shall include consideration for entrance and exit losses, and tail water condition.

Minimum diameter of a drive culvert shall be 12 inches.

Minimum diameter of a road crossing culvert shall be 15 inches or equivalent pipe arch.

END TREATMENT

Headwalls, wingwalls, and all other end treatments shall be designed to ensure the stability of the surrounding soil. MDOT, Grand Traverse County Road Commission, or manufacturer's designs may be used.

MATERIAL

Culverts may be reinforced concrete pipe, smooth interior wall polyethylene pipe, corrugated steel pipe, box culvert, or pipe arch in accordance with the current MDOT Standard Specifications.

GRASSED WATERWAYS

SIZING

The minimum required discharge capacity shall be for a 10-year frequency rainfall event with 0.5 foot of freeboard to top of bank.

Velocities, capacities, and friction losses shall be based on Manning's formula. Typical Manning's "n" values for open channels, swales, and ditches are included in Table 3.

A minimum "n" value of 0.035 shall be used as the roughness coefficient for open channels, unless special treatment is given to the bottom and sides (riprap, paving, mown sod).

Minimum bottom width for grassed waterways shall be 1 foot or an equivalent parabolic section.

Minimum bottom slope shall be 0.50%.

Side slopes shall be no steeper than 3:1 (horizontal:vertical[H:V]).

SOIL EROSION AND SEDIMENTATION CONTROL

Grassed waterway flow velocities shall be neither siltative or erosive. The minimum velocity for vegetated channels shall be 1.5 ft/s. The maximum velocity shall be 4 ft/s. Riprap protection or equivalent erosion control measures shall be used where the velocity exceeds 4 ft/s, up to maximum allowable design velocity of 8 ft/s.

Where maximum velocities are exceeded due to channel slope, rock check dams, or grade control structures shall be used to reduce overall flow velocities.

Erosion control blankets shall be used to protect bare channels.

LAYOUT

Outlets into the grassed waterway shall enter at an angle of 90 degrees or less with the direction of flow.

A minimum clearance of 4 feet is required between vegetated swale and ditch inverts and underground utilities unless special provisions are approved. In no case will less than 2 feet of clearance be allowed.

BUFFERS AND SETBACKS

Soil disturbance and removal of natural ground vegetation and tree roots within 50 feet of the ordinary high water mark of any lake or stream, or within 25 feet of a regulated wetland shall be prohibited unless approved by the Drain Commissioner. A lake or stream buffer area greater than 50 feet may be required by the Drain Commissioner, if necessary, for soil erosion control purposes. Structures, roads, parking lots, storm water facilities, and similar site improvements shall not be located within the buffer area.

STORM WATER FACILITIES

The three groups of urban Best Management Practices (BMPs) identified as storm water facilities, or "end-of-pipe" storage and treatment measures are as follows:

Infiltration/Retention Systems

Detention Systems (dry, wet)

Storm Water Wetlands

Performance criteria is given for each to ensure an effective and durable BMP. Performance criteria is based on eight factors:

Physical Feasibility

Design Criteria

Pre-treatment Criteria

Controls

Geometry

Public Safety

Landscaping

Maintenance

INFILTRATION/RETENTION SYSTEMS

An infiltration system is designed to promote percolation of storm water into the ground. The system may or may not include an outlet and/or spillway based on the adequacy of downstream conveyance systems. A retention system is designed to completely retain storm water runoff without a low flow outlet or emergency spillway.

PHYSICAL FEASIBILITY

Infiltration systems will be required at all sites with soil permeability greater than 1 inch per hour.

The bottom of the infiltration system shall be a minimum of 4 feet above the highest known water table elevation.

DESIGN CRITERIA

VOLUME

The volume of the infiltration system shall be calculated by comparing the volume of runoff of the undeveloped site during a 2-year, 24-hour duration storm versus the volume of runoff from the developed site during a 25-year, 24-hour duration storm.

The infiltration system volume shall be designed to store the runoff from back-to-back 100-year, 24-hour rainfall events from the entire contributing area for retention systems or if the discharge will cause downstream flooding. Certification that an adequate outlet for infiltration systems is available shall be provided by a licensed professional engineer.

Infiltration of runoff within the basin may be used to reduce the required storage volume subject to the following provisions:

- 1) An infiltration test with a report must be done within each proposed basin to a depth of 5' below the bottom of the basin.
- 2) The infiltration test must be conducted and report prepared as detailed in Appendix 9.
- 3) The maximum allowable infiltration rate used in the calculation for runoff storage shall be 0.5 times the actual measured infiltration rate.
- 4) The most restrictive soil lens must be used in the infiltration calculation. The topsoil lens may be the most restrictive in sandy soils. If necessary specify only sandy topsoil is to be used in the basin bottom.
- 5) For basins without outlets the maximum water level must be calculated (without deduction for infiltration) and shown on the plan where areas outside of the basin will be inundated with runoff. This is necessary to ensure buildings, roads, etc will not be flooded during frozen soil conditions. Note the basin will be sized using the allowable infiltration rate but this second calculation must be used for safety and flood control.
- 6) Maximum allowable deduction for the infiltration volume shall be based on a 24 hour period or the time of concentration – whichever was used in the total runoff volume calculation.

MAXIMUM DRAIN TIME

The infiltration basin shall be designed to drain completely within 72 hours. A design infiltration rate of 0.5 times the infiltration rate determined by geotechnical investigation (not to exceed 1 in/hr for underground systems), or an infiltration rate of 0.52 in/hr, shall be used to estimate the maximum time to drain by the equation:

$$72 > 12D/I$$

Where:	72	=	Maximum allowable drain time (hours)
	12	=	Factor to convert inches to feet
	D	=	Basin depth (feet)
	I	=	Design infiltration rate (in/hr)

UNDERGROUND INFILTRATION AND RETENTION SYSTEMS

Underground infiltration or retention systems are discouraged and will be allowed only when adequate space for an aboveground system is not available. The site grading shall provide for parking lot storage of excess runoff should the underground infiltration or retention system fail to function adequately.

CONSTRUCTION

The contractor shall avoid compacting the soil in the infiltration or retention basin area during excavation and grading. Use of equipment with low earth pressure loading is required. The final 2 feet of depth shall be removed by excavating to finished grade.

SNOW STORAGE

Snow storage in the infiltration or retention system shall not displace more than 50% of the available storage volume and shall not impede drainage through the system.

TREATMENT CRITERIA

TREATMENT FOREBAY

General

A treatment forebay or equivalent storm water filter shall be used to treat storm water runoff prior to an infiltration or retention system for all sites with a significant potential of exposing storm water to oil, grease, toxic chemicals, or other polluting materials. A list of representative sites is included in Appendix 1.

A treatment forebay shall be provided for all underground infiltration or retention systems and sites with over 5 acres of parking area.

A sediment forebay or equivalent system shall be used to treat storm water runoff prior to the infiltration or retention system at all other sites.

The treatment forebay is designed to store the "first flush" of pollutants typically found in urban storm water runoff, and to capture slug pollutant loads from accidental spills of toxic materials (spill containment volume).

The treatment forebay shall be a wet basin or approved structure with an impermeable bottom and sides to the design high water level.

SIZING

The treatment forebay shall be sized to store the water quality volume (V_{wq}) defined as 0.5 inch of runoff from the directly connected impervious area. This volume can be included in the overall flood control volume.

The minimum required water quality volume is given by the equation:

$$V_{wq} = 1815 A I$$

Where :

V_{wq}	=	Water quality volume (cft)
1815	=	0.5 inch of runoff x 3,630 to convert ac-in to cft
A	=	Contributing drainage area (ac)
I	=	Percent impervious expressed as a ratio

Capacity for the water quality volume shall be provided above the normal water level.

The overflow structure from the treatment forebay shall be sized for the peak inflow from the design rainfall event.

The top-of-berm elevation between the treatment forebay and the infiltration basin shall be a minimum of 1 foot below the outer berm elevation.

The treatment forebay shall have a minimum 1-foot-deep sump below the inlet pipe for sediment accumulation.

The outlet structure from the treatment forebay shall be designed to draw water from the central portion of the water column within the forebay to trap floatables and contain sediments. The top of the inlet structure shall be located a minimum of 1 foot below the normal water level, and the invert shall be a minimum of 1.5 feet above the bottom of the treatment forebay.

MATERIAL

Treatment forebays shall be lined with impermeable materials extending up to the design high water elevation. A minimum 18-inch-thick clay layer, or an impermeable liner protected with a minimum 12 inches of soil cover are acceptable alternatives. Maximum allowable permeability shall be 1×10^7 cm/sec as determined by a geotechnical engineer for clay placement, or manufacturer's certificate for liner products.

Premanufactured systems for oil/gas separation and sedimentation can be used as treatment forebays for sites of less than 5 acres of paved surface. The premanufactured treatment systems shall be sized in accordance with manufacturer's recommendations and approved by the Grand Traverse County Drain Commissioner (GT CDC).

SEDIMENT FOREBAY

Sediment forebays or equivalent upstream treatment shall be used to provide energy dissipation and to trap and localize incoming sediment.

The forebay shall be a separate sump, which can be formed by grading, a compacted earthen berm, or other suitable structure.

The capacity of the forebay shall be equivalent to 5% of the 25-year flood control volume.

The length to width ratio shall be a minimum of 1.5:1 (L:W) and a maximum of 4:1.

CONTROLS

Detention basin design criteria for inlets and the emergency overflow shall also apply to the design of infiltration basins.

EROSION CONTROL

Upland construction areas shall be completely stabilized prior to final infiltration basin construction. All accumulated sediment shall be removed prior to final acceptance.

Overflow spillways shall be protected with riprap or a permanent erosion control blanket to prevent erosion of the structure.

Inlets and outlets require energy dissipation and transition from outlet to open channel based on the maximum velocities given in Section II - Grassed Waterways.

GEOMETRY

The floor of the infiltration basin shall be flat to encourage uniform ponding and infiltration.

The floor of the basin shall be scarified to a depth of 4 to 6 inches after final grading has been established.

PUBLIC SAFETY

Side slopes shall not be steeper than 3:1 (H:V).

A minimum 5-foot-wide safety ledge with a maximum slope of 6% shall be provided around the perimeter of open basins with water depths over 5 feet. The safety ledge shall be located 3 feet above the bottom of the infiltration basin at open dry basins, or 1 foot below the normal water level. Fencing to prevent unauthorized access may be provided in lieu of the safety ledge.

MAINTENANCE

A minimum 15-foot-wide maintenance access route from a public or private right-of-way to the basin shall be provided. The access way shall have a slope of no greater than 5:1 (H:V), and shall be stabilized to withstand the passage of heavy equipment. Direct access to the forebay, control structures, and the overflow shall be provided.

Infiltration basin maintenance plans will require that sediment be removed from the treatment forebay when it reaches a depth equal to 50% of the depth of the forebay or 12 inches, whichever is less.

STORM WATER WETLANDS

All of the detention basin design criteria also apply to the design of storm water wetlands. Additional criteria exclusive to storm water wetlands is presented in this section.

PHYSICAL FEASIBILITY

A water balance must be performed to demonstrate that a storm water wetland can withstand a 30-day drought at summer evaporation rates without completely drawing down.

DESIGN CRITERIA

The surface area of the entire storm water wetland shall be at least 1% of the total drainage area to the facility.

At least 25% of the total water quality volume shall have a minimum depth of 4 feet (deep water). The forebay and micro pool may meet this requirement.

A minimum of 35% of the total surface area shall have depth of 6 inches or less (high marsh), and at least 65% of the total surface area shall be shallower than 18 inches (low marsh).

PRE-TREATMENT CRITERIA

No additional criteria.

CONTROLS

A micro pool shall be located at the outlet of the storm water wetland to protect the low flow pipe from clogging and prevent sediment resuspension.

The micro pool shall be 3 to 6 feet deep, and have a minimum surface area equivalent to that of the forebay.

GEOMETRY

An overall length to width ratio of 1.5:1 (length: width [L:W]) is recommended.

Irregular flow paths shall be used to maximize flow length from inflow to outflow points. These paths may be achieved by constructing internal berms (high marsh wedges, rock filters).

Micro topography is encouraged to enhance wetland diversity.

PUBLIC SAFETY

No additional criteria.

LANDSCAPING

A landscape plan shall be prepared by a qualified wetland consultant and indicate methods used to establish and maintain wetland coverage. Minimum elements of the plan include:

- Delineation of pondscape zones
- Selection of corresponding plant species
- Planting configuration
- Sequence for preparing wetland bed
- Schedule for planting

Re-use of existing wetland material
Suitable (hydric) soils

MAINTENANCE

If a minimum coverage of 50% is not achieved in the planted wetland zone after the second growing season, a reinforcement planting will be required.

DETENTION SYSTEMS

Dry Detention System
Wet Detention Basin (Storm Water Pond)

PHYSICAL FEASIBILITY

A reliable supply of base flow is required for wet basins to prevent excessive drawdown of the permanent pool.

DESIGN CRITERIA

TREATMENT VOLUME

The water quality treatment volume shall be defined as the routed volume of runoff from the 1.5-year, 24-hour rainfall event (2.06 inches) with post-development conditions. The minimum required treatment volume is given by the equation:

$$\text{Minimum Treatment Volume} = 5,000 \text{ cft/impervious acre}$$

The maximum release rate to detain this volume for at least 24 hours is 0.05 cfs/impervious acre.

FLOOD CONTROL VOLUME

The flood control volume shall be sized to detain the 25-year rainfall event from the entire contributing area with a maximum release rate of 0.13 cfs/ac. The minimum storage required per acre is given in Table 6.

The water quality and treatment volume may be included in the flood control volume.

Certification that an adequate outlet is available shall be provided by a licensed professional engineer, surveyor, or architect.

WET BASINS

Water quality treatment and flood control volumes must be provided above the permanent pool elevation. Any volume provided below the invert of the outlet is considered "dead storage" and will not be considered as detention volume.

SNOW STORAGE

Snow storage in the detention system shall not displace more than 50% of the available storage volume and shall not impede drainage through the system.

PRE-TREATMENT CRITERIA

SEDIMENT FOREBAY

Sediment forebays or equivalent upstream pre-treatment shall be used to provide energy dissipation and to trap and localize incoming sediments.

The forebay shall be a separate sump, which can be formed by grading, a compacted earthen berm, or other suitable structure.

The capacity of the forebay shall be equivalent to 5% of the 25-year flood control volume.

The length to width ratio shall be a minimum of 1.5:1 (L:W) and a maximum of 4:1.

CONTROLS

INLET DESIGN

Inlet pipes shall not be fully submerged at normal pool elevations.

A forebay shall be provided at each inlet, unless the inlet supplies less than 10% of the total design flow into the detention basin.

OUTLET DESIGN

The outlet may be designed using the orifice equation, rearranged to solve for area.

$$Q = cA (2gH)^{1/2}$$

Where:	A	=	Required area (sft)
	Q	=	Required outflow (cfs)
	c	=	Orifice Coefficient (approx. 0.6)
	2g	=	Two times the gravitation constant (g = 32.2 ft/s)
	H	=	Height of design high water level above center of orifice outlet

Other types of outlet devices shall have full design calculations provided for review.

The outlet shall be designed to prevent clogging.

Orifice plates shall have a minimum diameter of 4 inches. Perforated risers with stone filters or buried perforated piping with stone filters shall be used if the required design flow is less than the capacity of a 4-inch orifice.

Riser pipes with holes or slits less than 4 inches in diameter shall have a stone and gravel filter placed around the outside of the pipe.

Hoods and trash racks shall be placed on riser pipes. Grate openings shall be a maximum of 3 inches on center.

Orifices used to maintain a permanent pool shall be designed to withdraw water a minimum of 1 foot below the surface of the pond.

Riser pipes shall have a minimum diameter of 24 inches. Riser pipes greater than 5 feet in height shall be 48 inches in diameter.

Riser pipes shall be constructed of reinforced concrete or corrugated metal and be set in a concrete base. Plastic is not acceptable as a riser material.

Outlet control structures shall be placed near or within the embankment to facilitate maintenance access.

Where feasible, a drain for completely dewatering the detention system shall be installed for maintenance purposes.

EMERGENCY OVERFLOW

All detention systems must have a provision for overflow at the high water level. A spillway shall be designed for the 100-year rainfall event from the fully developed watershed with a maximum flow depth of 1 foot. The spillway shall be sized using the weir equation:

$$Q = 2.6 LH^{3/2}$$

Where: Q	=	Discharge (cfs)
2.6	=	Coefficient of Discharge
L	=	Length of spillway crest (ft)
H	=	Total head measured above spillway crest (ft)

The top of berm elevation shall be a minimum of 1 foot above the design maximum water level.

EROSION CONTROL

Upland construction areas shall be completely stabilized prior to final detention basin construction. The detention basin may be constructed first as a temporary erosion control measure during construction.

Overflow spillways shall be protected with riprap or a permanent erosion control blanket to prevent erosion of the structure.

Inlets and outlets require energy dissipation and transition from outlet to open channel based on the maximum velocities given in the Grassed Waterways section of these guidelines.

GEOMETRY

The distance between inlets and outlets shall be maximized. If possible, inlets and outlets should be offset at opposite longitudinal ends of the facility. The length of the flow path across the basin can be maximized by increasing the length to width ratio of the entire design (a minimum length to width ratio of 3:1 shall be used unless structural measures are used to extend the flow path) and by increasing the dry weather flow path within the system to attain maximum sinuosity.

The bottom of dry detention systems shall be graded to provide positive flow to the pipe outlet. For open detention systems, a minimum flow line bottom slope of 1% should be provided and cross slopes shall be 2% minimum. If continuous flow is anticipated, a low-flow channel shall be provided, with necessary crossings, and sloped to eliminate standing water.

Permanent pools for wet basins shall be a minimum of 3 feet deep in the center of the basin.

Storm water ponds which are wedge-shaped are preferred, narrower at the inlet and wider at the outlet where possible. Irregular shorelines are preferred.

PUBLIC SAFETY

Detention basins that have an impoundment area of 5 acres or more, and a hydraulic head of 6 feet or more, must meet the requirements of the Dam Safety Section (Part 315) of Act 451, PA 1994, as amended.

Side slopes for open dry basins and wet basins shall not be steeper than 3:1 (horizontal: vertical).

A minimum 5-foot-wide safety ledge with a maximum slope of 6% shall be provided around the perimeter of open basins over 5 feet deep. The safety ledge shall be located 3 feet above the bottom of open dry basins or 1 foot below the normal water level of wet basins. Fencing to prevent unauthorized access may be provided in lieu of the safety ledge.

Warning signs prohibiting swimming and skating shall be posted for wet basins.

MAINTENANCE

A minimum 15-foot-wide maintenance access route from a public or private right-of-way to the basin shall be provided. The access way shall have a slope of no greater than 5:1 (H:V), and shall be stabilized to withstand the passage of heavy equipment. Direct access to the forebay, control structures, and the outlet shall be provided.

Detention basin maintenance plans will require that sediment be removed when it reaches a depth equal to 50% of the depth of the forebay or 12 inches, whichever is less.

OPERATION AND MAINTENANCE AGREEMENTS

PRIVATE SYSTEMS

A legally binding maintenance agreement shall be executed before final approval is granted. The agreement shall be included in the property deed restrictions or condominium master deed documents so that it is binding on all subsequent property owners.

MAINTENANCE PLANS

Maintenance plans may be required with the construction drawings and should be included in the subdivision agreement (or for other developments, legally binding documents such as the property deed or condominium master deed). The plan should include the following information:

An annual maintenance budget, itemized by task. The financing mechanism shall also be described.

A copy of the final approved storm water management system for the development that delineates the conveyance system, storm water facilities, easements, and buffer areas.

A listing of tasks defined for each component of the storm water management system. A list of typical maintenance activities is included in Appendix 2.

The party responsible for performing each maintenance activity.

A detailed description of the procedures for record keeping of maintenance operations and expenditures.

A schedule for implementation, and a time frame for corrective measures to be taken. Language shall be included which states that if the private entity fails to act within the time frame specified, the responsible governmental entity may perform the needed maintenance and assess the costs against the property owners within the subdivision (or other development).

Routine maintenance inspections will be conducted at least twice a year in the spring and in the fall, including inspection of all structural elements conducted annually. Corrective action shall be completed within thirty (30) days of regularly scheduled inspection or notification that action is required.

Emergency inspection on an as-needed basis. Corrective action shall be completed within 36 hours of notification unless threat to public health, safety, and welfare requires immediate action.

DRAINAGE EASEMENTS

An easement, or release of right-of-way, not land ownership, is the approved method of providing access to, and protection of, public storm drainage facilities. Transfer of land ownership to Grand Traverse County, the Drain Commissioner, or an established Drainage District in the County is not allowed unless permitted in writing by the Drain Commissioner or other applicable authorities.

LOCATION

WITHIN THE PLAT

All natural watercourses, drainage ditches or swales, enclosed storm drains detention or retention facilities, or established drains within the plat shall have granted easements.

COUNTY DRAINS

Private (exclusive) easements for county drains shall be granted to the appropriate drainage district and must be shown on the final plat. An acceptable drainage easement form is included in Appendix 4.2.

SURFACE DRAINAGE

Private easements for surface drainage are for the benefit of upland lots within the subdivision or upland sites that currently drain across the proposed plat. Any improper construction, development, or grading that occurs within these easements will interfere with the drainage rights of those upland lots. Private easements for surface drainage are for the continuous passage of surface water and each lot owner will be responsible for maintaining the surface drainage system across his property. No construction is permitted within a private easement for surface drainage. This includes swimming pools, sheds, garages, patios, decks, or any other permanent structure or landscaping feature that may interfere with surface drainage.

YARD DRAINAGE

Private easements for yard drains are for the benefit of individual lots within the subdivision. Any improper construction that occurs with these easements will interfere with the future maintenance of the enclosed yard drain system. Provisions applying to surface drains shall apply to yard drains.

OUTSIDE THE DEVELOPMENT

EASEMENTS

Easements will be required downstream of a development when the receiving watercourse is not an established drain and lacks sufficient capacity or grade to be of ongoing service to the plat without regular maintenance. An acceptable release of right-of-way form for drainage is included in Appendix 4.2. Easements will not be required through public rights-of-way (i.e., county roads). Recordable release of rights-of-way shall be submitted to the Drain Commissioner prior to construction. The Drain Commissioner may require downstream drain construction and/or maintenance prior to plat approval.

AGREEMENTS

When the proposed project will alter drainage patterns or increase flooding on private property (other than that owned by the developer), an agreement between the owners may be required relieving the drainage district, or municipality if there is no drainage district, of any and all responsibility for damage that might occur. An acceptable "flooding" easement form is included in Appendix 4.3. The agreement must be submitted to the Drain Commissioner prior to construction, if required.

WIDTH

The following minimum right-of-way widths are required within the confines of the proposed development:

OPEN DRAINS

Open drains and water courses shall have a minimum right-of-way equal to the extreme top width of the channel, plus 30 feet. The easement shall be centered on the centerline of the open channel or water course.

ENCLOSED DRAINS

Enclosed drains shall have a minimum right-of-way of 30 feet centered on the centerline of the enclosure. The Drain Commissioner may reduce this requirement to 20 feet if it has been demonstrated that adequate space is available for maintenance.

SURFACE YARD DRAINS

Surface drainage swales and enclosed yard drains located between or within lots shall have a minimum right-of-way of 20 feet centered on the swale or pipe.

STORM WATER FACILITIES

A minimum 15-foot-wide maintenance access route shall be provided to all storm water facilities. Access shall be provided to the forebay, control structures, and the outlet. Adequate access for routine sediment removal shall be provided.

UTILITIES

If any utilities are to be located within the drainage easement of the proposed subdivision, the proprietor's engineer shall present plans detailing such utilities to the Drain Commissioner for his approval as to location. Utility plans shall be presented at the same time as drainage plans so that all details of construction and location may be checked and properly oriented with each other.

EXISTING EASEMENTS

The Liber and page reference of all recorded easements shall be shown on the final plat. Drainage District Easements, Private Easements for Drainage Purposes, Drainage Easements, Drainage Easements to the Drain Commissioner or the Drainage District, or other variations of these recorded subdivisions are considered exclusive easements that may be utilized by the Drain Commissioner for the purposes of accessing, maintaining, and constructing open or enclosed drains.

SOIL EROSION CONTROL - TEMPORARY AND PERMANENT

All earth changes and utilities shall be designed, constructed, and maintained in such a manner as to minimize the extent and duration of earth disruption.

Sedimentation control facilities shall be designed to remove sediment from storm water before the storm water leaves the site of the earth change activity.

Vegetative stabilization or other soil erosion control measures shall be installed and maintained throughout the development process.

Earth changes shall be staged to keep the exposed areas of the soil as small as practicable. Critical areas exposed during construction shall be protected with temporary vegetation, mulching, filter fences, or other methods of stabilization. A schedule and staging plan shall be included with the soil erosion control plan.

If lakes, ponds, streams, or wetlands are located on or near the site, both temporary and permanent erosion control measures must be provided which intercept runoff and trap sediment before runoff reaches any water body.

Soil disturbance and removal of natural ground vegetation and tree roots within 50 feet of the ordinary high water mark of any lake or stream, or within 25 feet of regulated wetlands shall be prohibited unless approved by the Drain Commissioner. A lake or stream buffer area greater than 50 feet may be required by the Drain Commissioner if necessary, for soil erosion control purposes. Structures, roads, parking lots, storm water facilities, and similar site improvements shall not be located within the buffer area.

Storm water runoff control and soil erosion control measures shall be installed before grading, filling, or removal of vegetative cover is initiated.

Sediment basins, desilting basins, or silt traps are required as needed for all earth changes. Basins and traps shall be sized to contain sediment-laden runoff. A minimum of 250 cf/ac capacity shall be provided in the sediment basin.

Sediment basins shall be designed with an overflow spillway or other design features to minimize the potential for breaching during the 100-year storm event.

Filter fences and other soil erosion control facilities installed at the perimeter of a development site shall be installed to allow for onsite maintenance.

Temporary seeding with 0.5 lb/1,000 sq.ft. of oats, barley, or annual ryegrass shall be completed within 48 hours of an earth change.

Erosion control blankets shall be installed in accordance with manufacturer's recommendations in all disturbed areas where concentrated runoff may occur, including ditches, swales, and open channels. Erosion control blankets shall also be placed on all steep slopes in excess of 1 vertical to 2 horizontal.

Permanent erosion control measures for all slopes, channels, ditches, or any disturbed land area shall be completed within 5 calendar days after final grading or the earth change has been completed. All temporary soil erosion control measures shall be maintained throughout the duration of the earth change, including the later stages of development. Maintenance activities include, but are not limited to, removal of accumulated sediment, structural repairs, and reseeded or replacement of vegetative cover.

Table 1 • Runoff Curve Numbers For Selected Agricultural, Suburban, and Urban Land Use. (Antecedent Moisture Condition 2 and Ia = 0.2S)

Grand Traverse County Drain Commissioner
Soil Erosion and Storm Water Design Criteria

Land Use Description	Hydrologic Soil Group			
	A	B	C	D
Cultivated land ¹ : Without conservation treatment	72	81	88	91
With conservation treatment	62	71	78	81
Pasture or range land: Poor condition	68	79	86	89
Good condition	39	61	74	80
Meadow: Good condition	30	58	71	78
Wood or forest land: Thin stand, poor cover, no mulch	45	66	77	83
Good cover ²	25	55	70	77
Open spaces, lawns, parks, golf courses, cemeteries, etc.				
Good condition: Grass cover on 75% or more of the area	39	61	74	80
Fair condition: Grass cover on 50% to 75% of the area	49	69	79	84
Commercial and business areas (85% impervious)	89	92	94	95
Industrial districts (72% impervious)	81	88	91	93
Residential: ³ (house + drive + lawn)				
<u>Average lot size</u> <u>Average % Impervious⁴</u>				
1/8 acre or less 65	77	85	90	92
1/4 acre 38	61	75	83	87
1/3 acre 30	57	72	81	86
2 acre 25	54	70	80	85
1 acre and larger 20	51	68	79	84
Paved parking lots, roofs, driveways, etc. ⁵	98	98	98	98
Streets and roads:				
Paved with curbs and storm sewers ⁵	98	98	98	98
Gravel	76	85	89	91
Dirt	72	82	87	89

¹ For a more detailed description of agricultural land use curve numbers, refer to *National Engineering Handbook*, Section 4, Hydrology, Chapter 9, Aug. 1972.

² Good cover is protected from grazing and litter and brush cover soil.

³ Curve numbers are computed assuming the runoff from the house and driveway.

⁴ The remaining pervious areas (lawn) are considered to be in good pasture condition for these curve numbers.

⁵ In some warmer climates of the country, a curve number of 95 may be used.

Source: Soil Conservation Service, 1986.

Table 2 • Runoff Coefficients
 Grand Traverse County Drain Commissioner
 Soil Erosion and Storm Water Design Criteria

Type of Development	Runoff Coefficients
	Imperviousness Low High
Business Downtown Neighborhood	0.70 to 0.95 0.50 to 0.70
Residential Single family Multi-units (detached) Multi-units (attached)	0.30 to 0.50 0.40 to 0.60 0.60 to 0.75
Residential (suburban)	0.25 to 0.40
Apartment	0.50 to 0.70
Industrial Light Heavy	0.50 to 0.80 0.60 to 0.90
Park, Cemeteries	0.10 to 0.25
Playgrounds	0.20 to 0.35
Railroad Yard	0.20 to 0.35
Unimproved	0.10 to 0.30
Character of Surface	
Pavement Asphaltic and Concrete Brick	0.98 0.85
Roofs	0.95
Lawns, Sandy Soil Flat 2% Average 2% to 7% Steep 7%	0.10 0.15 0.20
Lawns, Heavy Soil Flat 2% Average 2% to 7% Steep 7%	0.17 0.22 0.35

Source: *Design and Construction of Sanitary and Storm Sewers*, American Society of Civil Engineers and the Water Pollution Control Federation, 1969.

Table 3 • Manning's Roughness Coefficients ("n")

Grand Traverse County Drain Commissioner
Soil Erosion and Storm Water Design Criteria

Conduit	Manning's Coefficients
Closed Conduits	
Asbestos-Cement Pipe	0.011 to 0.015
Brick	0.013 to 0.017
Cast Iron Pipe Cement-lined and seal-coated	0.011 to 0.015
Concrete (Monolithic) Smooth forms Rough forms	0.012 to 0.014 0.015 to 0.017
Concrete Pipe	0.011 to 0.015
Corrugated-Metal Pipe (½- x 2½-inch corrgrn.) Plain Paved invert Spun asphalt-lined	0.022 to 0.026 0.018 to 0.022 0.011 to 0.015
Plastic Pipe (Smooth)	0.011 to 0.015
Vitrified Clay Pipes Liner channels	0.011 to 0.015 0.013 to 0.017
Open Channels	
Lined Channels Asphalt Brick Concrete Rubble or riprap Vegetative	0.013 to 0.017 0.012 to 0.018 0.011 to 0.020 0.020 to 0.035 0.030 to 0.040
Excavated or Dredged Earth, straight and uniform Earth, winding, fairly uniform Rock Unmaintained	0.020 to 0.030 0.025 to 0.040 0.030 to 0.045 0.050 to 0.140
Natural Channels (minor streams, top width at flood stage <100 feet) Fairly regular section Irregular section with pools	0.030 to 0.070 0.040 to 0.100

Source: *Design and Construction of Sanitary and Storm Sewers*, American Society of Civil Engineers and the Water Pollution Control Federation, 1969.

**Table 4 • Minimum Slopes For Storm Sewers
(Manning's "n" = 0.013)**

Grand Traverse County Drain Commissioner
Soil Erosion and Storm Water Design Criteria

Pipe Size	Minimum Grade (%)
12"	0.32
15"	0.24
18"	0.20
21"	0.16
24"	0.14
27"	0.12
30"	0.10
36"	0.08
42"	0.06
48"	0.06
54"	0.04
60"	0.04
66"	0.04

Table 5 • Minimum Required Detention Basin Flood Control Volume

(For Standard Release Rate of 0.13 cfs/ac)

Grand Traverse County Drain Commissioner

Soil Erosion and Storm Water Design Criteria

Rational Formula Runoff "C"	Minimum Required Storage Volume* (cf/ac)
0.10	375
0.15	770
0.20	1,170
0.25	1,580
0.30	1,990
0.35	2,420
0.40	2,930
0.45	3,540
0.50	4,190
0.55	4,850
0.60	5,500
0.65	6,150
0.70	6,810
0.75	7,460
0.80	8,120
0.85	8,770
0.90	9,420
0.95	10,080
1.00	10,730

*Includes 1.25 safety factor.

STORM WATER POLLUTANT RISKS

The following land uses and activities present a significant risk of exposing storm water to oil, grease, toxic chemicals, or other polluting materials:

- Vehicle salvage yards and recycling facilities #
- Vehicle fueling, service, and maintenance facilities
- Vehicle and equipment cleaning facilities #
- Fleet storage areas (bus, truck, etc.) #
- Industrial sites
- Marinas (service and maintenance) #
- Facilities that generate or store hazardous waste materials #
- Commercial container nursery
- Other land uses and activities as designated by an appropriate review authority

indicates that the land use or activity is required to prepare a storm water pollution prevention plan under the EPA NPDES Storm Water Program.

MAINTENANCE PLAN AND BUDGET

Sample Maintenance Plan and Budget

"XYZ" Leasing Company

Storm Water Management System Maintenance Plan

1. Responsibility For Maintenance
 - a. During construction, it is the developer's responsibility to perform the maintenance.
 - b. Following construction, it will be the responsibility of "XYZ" Company to perform the maintenance.
 - c. The Master Deed will specify that routine maintenance of the storm water facilities must be completed within ___ days of receipt of written notification that action is required, unless other acceptable arrangements are made with the (Township of _____), (Grand Traverse County Drain Commissioner) or successors. Emergency maintenance (i.e., when there is endangerment to public health, safety, or welfare) shall be performed immediately upon receipt of written notice. Should "XYZ" Company fail to act within these time frames, the (Township) (County) or successors may perform the needed maintenance and assess the costs against "XYZ" Company.
2. Source Of Financing

"XYZ" Company is required to pay for all maintenance activities on a continuing basis.
3. Maintenance Tasks And Schedule
 - a. See the charts on the next two pages: The first describes maintenance tasks during construction to be performed by the developer, the second describes maintenance tasks by "XYZ" Company.
 - b. Immediately following construction, the developer will have the storm water management system inspected by an engineer to verify grades of the detention and filtration areas and make recommendations for any necessary sediment removal.

MAINTENANCE TASKS AND SCHEDULE DURING CONSTRUCTION COMPONENTS

Tasks	Storm Sewer System	Catch Basin Sumps	Catch Basin Inlet Casings	Channels	Outflow Control Structure	Riprap	Filtration Basins	Storm Detention Areas	Wetlands	Emergency Overflow	Emergency Overflow	Schedule
Inspect for sedimentation accumulation				X	X		X	X				Weekly
Removal of sediment accumulation				X	X		X	X				As needed & prior to turnover
Inspect for floatables and debris				X	X		X	X				Quarterly
Cleaning of floatables and debris				X	X		X	X				Quarterly & at turnover
Inspection for erosion				X	X		X	X				Weekly
Re-establish permanent vegetation on eroded slopes				X			X	X				As needed & prior to turnover
Replacement of stone				X	X							As needed
Mowing				X			X	X				0-2 times per year

MAINTENANCE TASKS AND SCHEDULE DURING CONSTRUCTION COMPONENTS												
Tasks	Storm Sewer System	Catch Basin Sumps	Catch Basin Inlet Casings	Channels	Outflow Control Structure	Riprap	Filtration Basins	Storm Detention Areas	Wetlands	Emergency Overflow	Emergency Over flow	Schedule
Inspect structural element during wet weather and compare to as-built plans by professional engineer reporting to developer)				X	X		X	X				Annually and at turnover
Make adjustments to placements determined prior to removal inspection				X	X		X	X				As needed

PERMANENT MAINTENANCE TASKS AND SCHEDULE
 Components

Tasks	Catch Basin Inlet Castings	Ditches & Swales	Outflow Control Structures	Riprap	Filtration Basins	Storm Detention Areas	Wetlands	Emergency Overflow	Schedule
Inspect for sediment accumulation		X	X		X	X			Annually
Removal sediment accumulation		X	X		X	X			Every 2 years as needed
Inspect for floatables and debris	X	X	X		X	X			Annually
Cleaning of floatables and debris	X	X	X		X	X			Annually
Inspection for erosion		X	X		X	X			Annually
Re-establish permanent vegetation on eroded slopes		X			X				As needed
Replacement of stone			X						Every 3-5 years as needed
Clean streets									Semi- Annually
Mowing		X		X	X				0-2 times per year
Inspect storm water system components during wet weather and compare to as-built plans (by professional engineer reporting to XYZ Co.)	X	X	X	X	X	X	X	X	Annually

Grand Traverse County Drain Commissioner
 Storm Water Control Standards
 Appendix 2

Tasks	Catch Basin Inlet Castings	Ditches & Swales	Outflow Control Structures	Riprap	Filtration Basins	Storm Detention Areas	Wetlands	Emergency Overflow	Schedule
Make adjustments or replacements as determined by annual wet weather inspection	X	X	X	X	X	X	X	X	As Needed
Keep records of all inspection and maintenance activities and report to XYZ Co.									Annually
Keep records of all costs for inspection, maintenance, and repairs. Report to XYZ, Co.									Annually

Grand Traverse County Drain Commissioner
Storm Water Control Standards
Appendix 2

I. Maintenance Plan And Budget

Annual inspection for sediment accumulation	\$100.00
Removal of sediment accumulation every 2 years as needed	\$500.00
Inspect for floatables and debris annually and after major storms	\$100.00
Removal of floatables and debris annually and after major storms	\$150.00
Inspect system for erosion annually and after major storms	\$100.00
Re-establish permanent vegetation on eroded slopes as needed	\$350.00
Replacement of stone	\$100.00
Mowing 0-2 times per year	\$400.00
Inspect structural elements during wet weather and compare to as-built plans every 2 years	\$150.00
Make structural adjustments or replacements as determined by inspection as needed	\$400.00
Have professional engineer carry out emergency inspections upon identification of severe problems	\$200.00
A. Total Annual Budget	\$2,550.00

Note: Maintenance plans and budgets vary widely due to the size and unique characteristics of each storm after management system proposed. Appendix 2 is intended for use as a starting point in the development of an appropriate maintenance plan specific to the size and components of each system.

CHECKLIST FOR PRELIMINARY PLATS AND DEVELOPMENTS

Development Name:	Date:
Location:	Reviewed By:
Developer/Owner:	
Developer's Engineer:	
Contact Person:	Telephone:
	Fax:
Reviewing Agency:	
Contact Person:	Telephone:
	Fax:

General	<u>Provided</u>	<u>Satisfactory</u>	<u>Comments</u>
1. Development name/subdivision number.	_____	_____	_____
2. Description of location (including section and fractional portion thereof, Town and Range, township, city or village, and county, Michigan)	_____	_____	_____
3. Location map.	_____	_____	_____
4. Name, address, and telephone number of proprietor.	_____	_____	_____
5. Name, address, and telephone number of engineer or surveyor.	_____	_____	_____
6. North arrow and scale.	_____	_____	_____
Legend			
7. Development boundary.	_____	_____	_____
8. Identification of all adjoining parcels (for sub-divisions show lot number, subdivision name, liber, and page numbers; for metes and bounds parcels show permanent parcel number).	_____	_____	_____
9. Overall property description metes and bounds (with ties to government corner).	_____	_____	_____
10. Lot dimensions (scaled or computed).	_____	_____	_____
11. Lot numbers.	_____	_____	_____
12. Building setback lines.	_____	_____	_____

		<u>Provided</u>	<u>Comments</u>
Topographical			
13.	Existing buildings (label those under construction with address).	_____	_____
14.	Existing roads (with name, ROW width, and type of surface).	_____	_____
15.	Proposed roads (with name, ROW width, and type of surface).	_____	_____
16.	Existing contours (no greater than a 2' interval inside the plat; no greater than a 10' interval outside the plat).	_____	_____
17.	Proposed contours.	_____	_____
18.	Typical lot grading plan (detail, statement, or drainage arrows).	_____	_____
19.	Available soils data, soil boring logs, and locations (include ground elevation and water table information).	_____	_____
Drainage			
20.	Offsite watershed areas (with boundaries, acreage and existing drainage courses to be shown on location map).	_____	_____
21.	All existing drainage courses and structures (with proper labeling as to type, size, and invert elevations).	_____	_____
22.	County drains (permission required to connect).	_____	_____
23.	Proposed drainage systems (clearly identify all open and enclosed portions).	_____	_____
24.	100-Year floodplain contour (existing and proposed).	_____	_____
25.	Wetlands (existing and proposed).	_____	_____
26.	Lake, stream, and wetland buffers.	_____	_____
27.	Proposed storm water facilities (detention/infiltration).	_____	_____
Storm Water Management System Design			
28.	Calculation of runoff.	_____	_____
29.	Effective Layout.	_____	_____
30.	Inlet capacity/spacing.	_____	_____
31.	Adequate size/slopes.	_____	_____

Provided

Grand Traverse County Drain Commissioner
 Storm Water Control Standards
 Appendix 3.1

	<u>Satisfactory</u>	<u>Comments</u>
32. Pipe material.	_____	_____
33. Submergence.	_____	_____
34. Outlet erosion control.	_____	_____
35. High water level in relation to low top-of-casting elevation.	_____	_____
36. Storm water facilities appropriately selected.	_____	_____
37. Minimum basement floor elevations/ openings in structures adjacent to storm water facilities.	_____	_____
38. Ensure proper siting.	_____	_____
39. Required volume/release rate.	_____	_____
40. Pre-treatment.	_____	_____
41. Overflow spillway.	_____	_____
42. Soil erosion controls.	_____	_____
43. Hydraulic calculations for transfer or outlet pipe.	_____	_____
44. Geometry.	_____	_____
45. Side slopes.	_____	_____
Easements		
46. Utility easements (with dimensions and type of utility).	_____	_____
47. Existing and proposed drainage easements.	_____	_____
Maintenance		
48. Identification of agency proposed to assume ownership of the storm water management system.	_____	_____
Fee		
49. Development fee.	_____	_____

COMMENTS:

CHECKLIST FOR FINAL PLATS

SUBDIVISION NAME: _____

DEVELOPER: _____

LOCATION: _____

REVIEWED BY: _____

Initial Reviews

Dates Completed

- 1. Preliminary plat (including site plan, grading & drainage plan, and engineering calculations) and review fees:

Submitted

Approved

- 2. Construction drawings:

Submitted

Approved

Prior to Construction

- 3. Evidence of contractor's insurance coverage.

- 4. Construction contract information.

- 5. Soil erosion and sedimentation control permit (Part 91 Act 451, P.A. 1994).

- 6. Inspection deposit paid.

- 7. Recordable rights-of-way for downstream properties, or "flooding" easement agreement submitted.

- 8. Certification of adequacy of existing receiving drains.

- or -

Approval has been given for any improvements required to existing county drains, and permit fees are paid.

Prior to Final Plat Approval

Dates Completed

9. Certification that county drains and storm water system have been improved in accordance with approved construction drawings (same as item no. 15).

or -

The proprietor has entered into an agreement with the Drain Commissioner and has posted surety for faithful performance of the agreement.

10. Recordable release of rights-of-way within the plat provided in the name of the drainage district.

11. A drainage district has been established (adjusted), legal descriptions and maintenance agreement provided, and maintenance deposit paid.

- or -

A letter of commitment from the local municipality, governmental agency, or association has been executed.

12. Maintenance plan submitted.

13. Copies of restrictive covenants.

14. Guarantee for repairs (repair bond) of any defects in the work for a period of one year.

Upon Completion of Construction

15. Construction record drawings.

16. Certification that county drains and storm water system have been improved in accordance with approved construction drawings (same as item no. 9).

17. Release of surety (posted per item no. 9).

1-Year After Final Completion of Construction

18. Return repair bond.

**AGREEMENT FOR THE ESTABLISHMENT OF A COUNTY DRAIN
AND COUNTY DRAINAGE DISTRICT
PURSUANT TO SECTION 433 OF ACT NO. 40 OF
THE PUBLIC ACTS OF 1956, AS AMENDED**

THIS AGREEMENT, made and entered into this _____ day of _____, 20____, by and between KEVIN P. MCELYEA, GRAND TRAVERSE COUNTY DRAIN COMMISSIONER, hereinafter referred to as "Drain Commissioner" on behalf of the proposed _____ Drain Drainage District; and _____, as owner(s) of land described in Exhibit A attached hereto, hereinafter referred to as "Landowner".

WITNESSETH:

WHEREAS, Section 433 of Act No. 40 of the Public Acts of 1956, as amended, authorizes the Drain Commissioner to enter into an Agreement with the Landowner and developer, if any, to establish a Drain which was constructed by the Landowner or developer to service an area of its own land as a County Drain; and,

WHEREAS, Landowner, pursuant to Section 433 of Act No. 40 of 1956, as amended, wishes to provide drainage service to its own lands as has requested same to be established and dedicated as a County Drain under the jurisdiction of the Grand Traverse County Drain Commissioner; and,

WHEREAS, Landowner has been advised and understands and agrees to assume the total cost of the construction of the Drain to include engineering, inspection, easement acquisition, legal, and administrative expenses and costs attendant to this Agreement; and,

WHEREAS, Landowner further understands that the Drain constructed, or to be constructed, pursuant to this Agreement, when finally accepted by the Drain Commissioner, will be known as the _____ Drain and that the land to be known as and constitutes as the _____ Drain Drainage District and will be subject to assessments, for costs of future operation, inspection, maintenance, and improvement; and,

WHEREAS, Landowner has agreed to assume and pay all costs as set forth herein; and

WHEREAS, Landowner has obtained, at its own expense, a certificate from a registered professional engineer satisfactory to the Drain Commissioner to the effect that the Drain has sufficient capacity to provide adequate drainage service without detriment to or diminution of the drainage service which the outlet currently provides. A copy of said certificate being attached hereto as Exhibit B.

NOW, THEREFORE, in consideration of the premises and covenants of each, the parties agree as follows:

1. The Landowner agrees to pay the costs of construction of said Drain and drainage facilities, including the acquisition of the necessary rights-of-way or easements, engineering, surveying, inspection, legal, and administration costs. In addition, the Landowner has deposited with the Drain Commissioner an amount of money equivalent to five (5%) percent of the costs of construction of the Drain, not to exceed Two Thousand Five Hundred and No/100 (\$2,500.00) Dollars, which monies are to be deposited in a special drain fund to be used for future maintenance of the Drain, hereinafter referred to as " _____ Drain Maintenance Fund".

FLOODING EASEMENT

THIS AGREEMENT, made and entered into this _____ day of _____, 20____, for and in consideration of \$_____ and prospective benefits to be derived by reason of the construction, operating, improving, and maintaining of a certain Drain under the supervision of the Grand Traverse County Drain Commissioner as hereinafter described, _____, (the "Landowners") do hereby convey and release to Kevin P. McElyea, Grand Traverse County Drain Commissioner, on behalf of the Grand Traverse County Drainage District, (the "Drainage District") a public body corporate, of 2650 LaFranier Road, Traverse City, MI 49686, an Easement for the _____ Drain situated in the County and State aforesaid. Landowners do hereby convey and release to Drainage District a Drainage Easement with an elevation of approximately _____ feet above mean sea level, USGS datum, for drainage purposes and flood control.

WHEREAS, Landowners are the owners of lands in the aforesaid County described as:

WHEREAS, the Drainage District wishes to obtain an easement from Landowners in the event that there is an increase in the velocity or quantity of water flowing onto Landowners' property as a result of the construction, maintenance, improvement, or operation of the Drain.

NOW THEREFORE, the parties agree as follows:

1. Landowners hereby grant, convey, and release unto Drainage District as Easement over and upon their lands for the purpose of allowing for increases in velocity or quantity of water flow onto Landowners' property.
2. Said Easement is described separately as follows:
3. Landowners, their heirs, executors, administrators, successors, and assigns reserve their rights and privileges to the area encompassed by the Easement as may be used and enjoyed to include the planting and harvesting of agricultural crops so long as the use(s) do not interfere with or abridge the rights granted to and Easement hereby acquired by the Drainage District;
4. Landowners, their heirs, executors, administrators, successors, and assigns hold Drainage District harmless to all claims to damages in any way arising from or incident to the drainage and any increased flow onto said premises by reason of the Drain and maintenance or improvement thereof. During the time of maintenance and improvement of said Drain, or at any time in the future, such release for damages releases the Drainage District, its successors, and assigns from any damages whatsoever arising out of the flooding of said lands within the Easement right-of-way to any depth at any time in the future by reason of the construction of such drainage improvements and the flooding caused by such construction, or their use during the time of construction or at any time in the future;
5. This Easement may be terminated in whole or in part by written agreement of all of the parties.

6. This conveyance shall be deemed sufficient to vest in Drainage District and Easement in said lands for the uses and purposes of any increased flow onto Landowners' property.

In witness whereof, the parties hereto have executed this Agreement the day and year first above written.

WITNESSES:

LANDOWNERS:

sign _____
type/print:

sign _____
type/print:

sign _____
type/print:

sign _____
type/print:

WITNESSES:

DRAIN DRAINAGE DISTRICT

sign _____
type/print:

sign _____
Kevin P. McElyea
Grand Traverse County Drain Commissioner.

sign _____
type/print:

STATE OF MICHIGAN)
) ss.
COUNTY OF _____)

The foregoing instrument was acknowledged before me this ____ day of _____, 20____,
By _____.

_____, Notary
_____, County, Michigan
My commission expires: _____

STATE OF MICHIGAN)
) ss.
COUNTY OF _____)

The foregoing instrument was acknowledged before me this ____ day of _____, 20____,
By _____.

_____, Notary
_____, County, Michigan
My commission expires: _____

DETENTION BASIN EASEMENT

NAME OF PLAT

THIS INDENTURE, entered into this ____ day of _____, 20__ by DEVELOPER, a Michigan Corporation, (hereafter referred to as the "Grantor"), and the NAME OF PLAT Drainage District, a public body corporate, 2650 LaFranier Road, Traverse City, MI 49686 (hereafter referred to as the "District")

WITNESSETH:

WHEREAS, the Grantor is developing certain property located in the CITY or TWP, County of Grand Traverse, to be known as NAME OF PLAT, and

WHEREAS, the Grantor, in order to develop said property in the manner it desires, finds it necessary to construct a storm water detention basin for the benefit of the property and to give the District certain Easement rights therein.

NOW THEREFORE, in consideration of the respective covenants contained herein, the parties agree as follows:

1. In consideration of less than One Hundred Dollars (\$100.00), the receipt of which is hereby acknowledged, the Grantor does hereby grant, warrant, and convey to the District, an Easement for storm water detention over, across, and within the following described land in the CITY or TWP, County of Grand Traverse, State of Michigan, described as follows:

LEGAL DESCRIPTION OF STORM WATER DETENTION EASEMENT

2. The Grantor agrees for itself, its heirs, administrators, successors, and assigns, that it shall be the property owner's responsibility to maintain the Easement area grounds including the removal of debris in such a manner that the proper functioning of the detention basin is not interfered with, and that the property owner will not make any changes in size, shape, capacity, rate of flow, rate of outflow, or changes in any other characteristics of the detention pond without the prior written approval of the District, which approval can only be given by the way of amendment to this instrument, properly recorded.
3. The Drainage District shall be responsible for the maintenance and control of the hydraulic functioning of the detention basin pursuant to MPA 40, DRAIN CODE OF 1956, as amended, or successor statute. Cost for maintenance by the NAME OF PLAT DISTRICT may be charged against the property owners within the plat pursuant to MPA 40, DRAIN CODE OF 1956, as amended, or its successor statute. The property owner on whose parcel the Easement rests is responsible for the turf maintenance.
4. The Grantor, its heirs, administrators, successors, and assigns, shall save and hold the District, its officers, employees, and agents harmless and indemnify the District against any claim or suit which seeks damages for an injury, death, or damage resulting from the construction, operation, and existence of the detention pond.
5. The District agrees to maintain the detention basin outlet in accordance with the provisions under MPA 40, Drain Code of 1956, as amended. It is further understood that a provision of these statutes allow the District to specially assess the property owners in the plat, if it so chooses.
6. In the event the basin grounds are not properly maintained, or changes are made to the Easement area pursuant to Paragraph 2 above, which impair the function of the detention basin or Drainage Easement, the District may order the property owner(s), upon whose property the changes are located, or improper maintenance has occurred, to make the necessary repairs or maintenance immediately. If such ordered repairs or maintenance are not completed within five (5) days, the District shall perform such maintenance or have such repairs made at the property owner's expense.

Grand Traverse County Drain Commissioner
Storm Water Control Standards
Appendix 4.4

All costs incurred by the District shall be billed to the property owner(s) and shall become a lien against the property(ies) in accordance with MPA 40, Drain Code of 1956, as amended.

IN WITNESS WHEREOF, the Grantor has hereunto set their hands and seals the day and year first above written.

SIGNED, SEALED AND DELIVERED

DEVELOPER IN THE PRESENCE OF:

By _____

By _____

STATE OF MICHIGAN)

) ss.

COUNTY OF _____)

The foregoing instrument was acknowledged before me this _____ day of _____ 20__ by PERSON'S NAME, president and PERSON'S NAME, Secretary/Treasurer of the NAME of CORPORATION described herein, and who executed the above instrument, on behalf of said Corporation.

Notary Public _____ County, MI
My Commission expires _____

Prepared By _____

CERTIFICATION FORM

[Development Name]
[Location]
Grand Traverse County, Michigan

"I, _____, a Licensed Professional Engineer in the State of _____,
do hereby certify that:

1. The lands to be developed naturally drain into the area served by the existing Drain, or that the existing Drain is the only reasonably available outlet for the drainage from the lands to be developed.
2. There is adequate capacity in the existing Drain to service lands to be developed without detriment or diminution of drainage service provided or to be provided in the foreseeable future to the area in the existing district.

Sign _____
Type/print

Date _____

Engineer's Seal

IRREVOCABLE COMMERCIAL LETTER OF CREDIT NO. -----

Grand Traverse County
Drain Commissioner's Office
2650 LaFranier Road
Traverse City, Michigan 49686

Dear Soil Erosion Control Officer:

We hereby establish our Irrevocable Letter of Credit No. _____ in your favor for account of (name and address of proprietor) up to an aggregate amount of (amount of letter of credit in figures and words).

We are advised that (proprietor's name) is to install structures for storm water management and for soil erosion control or provide seeding and mulching of the proposed (project) in accordance with plans and specifications approved by you or as deemed necessary by the Drain Commissioner or his authorized representative to fulfill the requirements promulgated by the Grand Traverse County Soil Erosion, Sedimentation and Storm Water Runoff Control Ordinance and Design Guidelines.

In the event (proprietor's name) shall fail to install, in the allotted time, satisfactorily, the above named erosion controls, you may draw a draft at sight on (name of bank) for amounts not exceeding in aggregate the aforesaid sum of (amount of letter of credit) when accompanied by:

"Your signed statement certifying that (proprietor) failed to install the erosion control practices and storm water management facilities in the time and quality as planned."

Upon receipt of your resolution authorizing a release in the amount you will accept under this credit, we shall issue our formal amendment reducing our liability to an amount equal to the original amount of this credit, less any amounts released by you resolution and drawings hereunder.

All drafts drawn under this credit must be marked "drawn under Letter of Credit No. _____, dated _____ of (bank)." Any amendments to the terms of this credit must be in writing over authorized signatures of this bank.

This credit is subject to the Uniform Customs and Practice of Documentary Credits (1993 revision), International Chamber of Commerce, Publication 500.

It is a condition of this Irrevocable Letter of Credit that it shall be automatically extended without amendment for additional periods of one year from the present or each future expiration date unless not less than 30 days prior to such expiration date we notify you in writing, by courier, at the above address, that we elect not to extend this Letter of Credit, provided, that under no circumstances shall this Irrevocable Letter of Credit be automatically extended without amendment for any period extending beyond the date that is eight (8) years after Issue Date listed above.

We agree with you that all drafts drawn under and in strict compliance with the terms of this credit will be duly honored by us upon presentation of your statement, as specified, at this office on or before our close of business on _____ or any automatically extended expiry date.

Very truly yours,

Authorized signature and Title
County Representative accepting
terms of Commercial Letter of Institute
Credit

Authorized Signature and Title
Representative of Financial

REPAIR BOND

KNOWN ALL MEN BY THESE PRESENTS, that we, the undersigned, _____,
,as Principle, and _____, as Surety, are held and firmly bound onto the Grand Traverse
County Drain Commissioner, Owner, in the sum of _____dollars (\$_____) to
be paid to the Owner for which payment well and truly to be made we jointly and severally bind ourselves,
our heirs, our executors, administrators, and assigns, firmly by these presents.

Sealed with our seals and dated this _____ day of _____, 20_____.

WHEREAS, the above named Principle has entered into a certain written contract with the Grand
Traverse County Drain Commissioner dated _____, 20 _____, wherein the Principle agreed as
follows:

NOW THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH that by and under said Contract,
the above named Principle has agreed with the Owner, for a period of one (1) year from the date of
payment of the final estimate, to keep in good order and repair any defect in all work done under said
Contract, either by the Principle or his subcontractors, or his suppliers, that may develop during said
period due to improper materials, defective equipment, workmanship or arrangements; any other work
affected in making good such imperfections, shall also be made good, all without expense to the Owner,
excepting only such part or parts of said work as may have been disturbed without the consent or
approval of the Principle after final acceptance of the work, and that whenever directed so to do by the
Owner, by notice served in writing, either personally or by mail, on the Principle, legal representative,
successor, or on the Surety, he will at once make such repairs as directed by the Owner; and in the case
of failure to do so within one (1) week from the date of service of such notice, then the Owner shall have
the right to purchase such materials and employ such labor and equipment as may be necessary for the
purpose and to undertake to do and make such repairs, and charge the expense thereof to and receive
same from said Principle or Surety. If any repair is necessary to be made at once to protect life and
property, then and in that case, the Owner may take immediate steps to repair or barricade such defects
without notice to the Contractor. In such accounting the Owner shall not be held to obtain the lowest
figure for doing of the work or any part thereof, but all sums actually paid therefore shall be charged to the
Principle or Surety. In this connection, the judgment of the Owner is final and conclusive. If the said
Principle, for a period of one (1) year from the date of the final estimate payment, shall keep such work so
constructed under the contract in good order and repair, excepting only such part or parts of such work as
may have been disturbed without the consent or approval of said Principle after the final acceptance
of the same, and shall, whenever notice is given as herein specified, at once proceed to make repair as is
said notice directed or shall reimburse the Owner for any expense incurred by making such repairs
should the Principle or Surety fail to do as hereinbefore specified, and shall fully indemnify, defend and
save harmless the said Owner from all suits and actions for damages of every name and description
brought or claimed against it for or on account of any party or parties, by or from any of the acts or
omissions or through the negligence of said Principle, servants, or employees, in the prosecution of the
work included in the said Contract, and from any and all claims arising under the Workmen's
Compensation Act, so-called, of the State of Michigan, then the above obligation shall be void, otherwise
to remain in full force and effect.

Grand Traverse County Drain Commissioner
Storm Water Control Standards
Appendix 7

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be executed by their respective authorized officers this ____ day of _____, 20__.

Signed, Sealed, and Delivered
in the presence of:

_____	_____ (L.S.)
_____	_____ (L.S.)
_____	_____ (L.S.)

PERMIT AND REVIEW FEE SCHEDULE

GRAND TRAVERSE COUNTY DRAIN COMMISSIONER'S OFFICE

RESIDENTIAL GRADING PERMITS

Site Evaluation	66.00
Beach Sand & Deck/Stairway Placement & Minor Permits	40.00
Beach Stabilization (Seawalls, Rip Rap, etc.)	66.00
Disturbance of 1 Acre or Less	73.00
Each Additional Acre (or portion of an acre)	46.00
Residential Work Requiring an Engineered Site Plan	106.00

COMMERCIAL GRADING PERMITS

Site Evaluation	99.00
Beach Sand & Deck/Stairway Placement	40.00
Beach Stabilization (Seawalls, Rip Rap, etc.)	66.00
Minor Permits (No Engineering Required)	73.00
Disturbance of 1 Acre or Less	178.00
Each Additional Acre (or portion of an acre)	46.00
Preliminary Reviews (PUDs, Site Condos, Commercial, etc.)	140.00

Commercial projects require sealed engineered site plans with runoff calculations, a signed letter of acknowledgment and an acceptable performance guarantee as determined by the Drain Commissioner. If the Drain Commissioner feels that it is necessary to have a professional consultant (engineer and/or attorney) review the plans submitted to the County, all review costs will be paid for by the developer.

UTILITIES

Underground Pipelines & Underground Cables:

Up to 1/2 Mile	178.00
Each Additional 1/2 Mile (to nearest 1/2 Mile)	132.00

PLAT REVIEW FEES

Preliminary Plat.	248.00
Final Plat.	110.00

COMMENCEMENT OF WORK PRIOR TO RECEIVING THE APPROVED PERMIT is a municipal or state civil infraction that may subject you to a fine of not more than \$2,500.00. Knowingly violating the Soil Erosion & Sedimentation Control Act, 2000 P.A. No. 504 or knowingly making a false statement on the permit application or a soil erosion or sedimentation control plan may subject you to a civil fine of not more than \$10,000.00 for each day of the violation. In addition, knowingly violating section 9112 or 9117, relating to a determination that the work undertaken does not conform to a permit or plan or adversely affects adjacent land or waters, may be responsible for a civil fine of not less than \$2,500.00 nor more than \$25,000.00 for each day of the violation.

REFUND POLICY: The site evaluation is a non-refundable fee. Permit fees for sites that are determined, by the inspector, not to need a permit are 100% refundable. If a request is received, prior to the first site inspection, to cancel the permit, the permit fees are 100% refundable. If a request is received, after the first site inspection, to cancel the permit, the permit fees are 50% refundable. Plat fees, preliminary review fees and land split fees are non-refundable.

If there is any doubt as to whether or not a permit is required, please contact (231) 995-6042.

All recipients of Earth Change Permits shall be provided with an all weather card to be conspicuously posted where it can be seen from the highway.

SECTIONAL MEAN FREQUENCY DISTRIBUTIONS FOR STORM PERIODS OF 5 MINUTES TO 10 DAYS
 AND RECURRENCE INTERVALS OF 2 MONTHS TO 100 YEARS IN MICHIGAN
 BULLETIN 71
 RAINFALL FREQUENCY ATLAS OF THE MIDWEST

Section	Duration	2-month	3-month	4-month	6-month	9-month	1-year	2-year	5-year	10-year	25-year	50-year	100-year
03	10-day	1.63	1.96	2.26	2.66	3.06	3.33	3.99	4.92	5.65	6.66	7.50	8.35
03	5-day	1.29	1.54	1.75	2.02	2.33	2.53	3.10	3.91	4.57	5.46	6.23	7.04
03	72-hr	1.09	1.27	1.44	1.67	1.92	2.09	2.62	3.36	3.96	4.86	5.56	6.35
03	48-hr	0.97	1.13	1.26	1.46	1.68	1.83	2.34	3.02	3.55	4.31	4.94	5.60
03	24-hr	0.89	1.04	1.13	1.31	1.49	1.62	2.09	2.70	3.21	3.89	4.47	5.08
03	18-hr	0.84	0.97	1.06	1.23	1.40	1.52	1.96	2.54	3.02	3.66	4.20	4.78
03	12-hr	0.78	0.90	0.99	1.14	1.30	1.41	1.82	2.35	2.79	3.38	3.89	4.42
03	6-hr	0.67	0.78	0.85	0.99	1.12	1.22	1.57	2.03	2.41	2.92	3.35	3.81
03	3-hr	0.57	0.67	0.73	0.84	0.96	1.04	1.34	1.73	2.05	2.49	2.86	3.25
03	2-hr	0.52	0.60	0.66	0.76	0.86	0.94	1.21	1.57	1.86	2.26	2.59	2.95
03	1-hr	0.42	0.49	0.53	0.62	0.70	0.76	0.98	1.27	1.51	1.83	2.10	2.39
03	30-min	0.33	0.38	0.42	0.49	0.55	0.60	0.77	1.00	1.19	1.44	1.65	1.88
03	15-min	0.24	0.28	0.31	0.36	0.40	0.44	0.56	0.73	0.87	1.05	1.21	1.37
03	10-min	0.19	0.22	0.24	0.28	0.31	0.34	0.44	0.57	0.67	0.82	0.94	1.07
03	5-min	0.10	0.12	0.13	0.15	0.17	0.19	0.25	0.32	0.39	0.47	0.54	0.61

Appendix 9 – Percolation Tests¹

PREPARATION

Bore a minimum of two (2) holes, 4" to 6" in diameter to a depth of 5' below the bottom elevation of the proposed storm water infiltration basin. Carefully scrape all smeared soil from the side of the hole and remove. Place 2" of coarse sand or fine gravel in the bottom of the hole to prevent scouring when filling the hole with water.

SOAKING

Pour clean water into the hole to a depth of 12". Use care in pouring to avoid scouring the sides and bottom of the hole.

For sandy soils: Add water as necessary to maintain at least 6' water depth in the hole for one (1) hour. If the water level in the hole then drops to the bottom of the hole in the next 30 minutes, proceed with the tests.

For loamy soils: To permit saturation and swelling to occur, fill the hole with clear water to at least 12" above the gravel. Maintain this water level for a minimum of 24 hours. The percolation rate should be determined 24 hours after water was first added to the hole.

LEVELING

Place a narrow board flat on the ground, across one edge of the hole, to use as a reference mark for measuring to water surface. If the board moves to the touch, level the land surface, remove grass, or weight the board to assure its immobility. Adjust water level in the hole by adding or removing water until the water depth is 6".

MEASUREMENT

Measure the distance from the top of the reference board to the water surface, record the measurement and record the clock time of reading. Make similar measurements, recording the measurement and time, at approximately five (5) minute intervals for a minimum of one (1) hour or longer, until a stabilized percolation rate occurs. Water may be added as required to maintain at least a water depth of 2"; record the depth and time after each refill.

STABILIZED RATE

The stabilized percolation rate is the number of minutes elapsing during which time the water level in the hole drops one inch, measured at least 60 minutes after the start of the test, in clay textured holes. To determine if the percolation rate has stabilized, compare the drop in water level for successive five (5) minute periods near the end of the hour. If the drop is approximately the same for the last several periods, stabilization has occurred.

REPORT

The field record, showing all measurements of depth to water, times of measurement, descriptions of saturation, with a statement attesting to the accuracy of the data and signed by the person who conducted the test, together with a soil sample (approximately one (1) pint) taken from the bottom of the hole before conducting the test, comprises the Percolation Test Report.

Notes: ¹ Based on Northern Michigan Health Department Regulations

