

## **ENGINEERING DESIGN STANDARDS**

### **SECTION 5 – STORM WATER MANAGEMENT**

#### **5.0 GENERAL**

The management of increased storm water which results from the development of vacant land or expansions to existing facilities will be considered as a critical component of all development plans which are submitted to Commerce Township for approval. The intent of this standard is to provide guidelines for the sound management of increased storm water run-off and to provide sufficient flexibility for design professionals to develop innovative solutions that protect the resources of Commerce Township while meeting the objectives of water quality preservation and flood control.

The use of natural drainage features, shallow swales and landscape areas shall be incorporated into the drainage planning for a site whenever possible. The objective is to achieve a functional and aesthetically pleasing development that minimizes the use of extensive enclosed storm drains and large obtrusive storm water detention or retention basins while providing for the proper management of storm water runoff.

Development plans must present a unified design that, as a minimum, provides the following protections:

1. The design must show that the development will not cause any impact to downstream properties or upstream properties. Both the rate of storm water discharge, and the volume of storm water discharge must be considered.
2. The development plan shall be fitted to the topography and soil to create the least erosion potential and to effectively accommodate the increased runoff caused by changed soil and surface conditions during and after development.
3. The design must demonstrate the use of “Best Management Practices” for minimizing erosion and controlling sedimentation and other pollutants through all phases of construction.
4. The design must demonstrate that proposed buildings or other permanent structures on, and adjacent to, a proposed development are safe from flooding.

## **5.1 SOIL EROSION AND SEDIMENTATION CONTROL**

The Soil Erosion and Sedimentation Control Ordinance is hereby incorporated into these Engineering Design Standards by reference and are included in Appendix A. All individuals who are involved with a proposed land development should be familiar with the requirements of the Ordinance and the penalties for failing to comply with the Ordinance.

## **5.2 STORM WATER MANAGEMENT BASINS AND PRETREATMENT SYSTEMS**

On-site storm water detention or retention is necessary for all developments in the Township whenever runoff is increased. Waiver of this requirement will be considered by the Planning Commission upon submittal of a request for waiver, and report stating the reasons why detention or retention should not be necessary. Such report shall include maps, charts, and calculations prepared by a Professional Engineer registered in the State of Michigan.

Generally speaking, detention basins temporarily store storm runoff for a period of time in which the runoff is released through a positive outlet, at a controlled rate. Retention basins do not have a positive outlet, so that the stored runoff will either percolate or evaporate.

Infiltration (recharge) systems that store and release run-off through permeable soils to the groundwater may be allowed under specific circumstances and with the review and approval of the Township Engineer.

In cases where the requirements for detention/retention basins have been waived, storm water pretreatment (in the form of permanent debris and sedimentation control systems) will be required.

### **5.2.1 Design Considerations**

#### **A. Detention Basins**

1. Detention basins may only be used when the design shows that there is an adequate outlet for the storm water, and where the increased volume of storm water will not damage downstream property owners. Construction drawings must include sufficient off-site information to demonstrate the existence of an adequate outlet.
2. Water originating from off-site is not required to be detained in the detention basin. Storm water originating

from off-site should be diverted around the detention basin whenever practical, and where the diversion will not increase the erosion of soils. If a diversion is not feasible, the detention basin must be designed for this additional runoff.

3. Detention basins shall be designed so that the resulting storm water discharge from the developed site does not exceed the agricultural rate of discharge from the site. The Township has defined an agricultural rate of storm water run-off as 0.2 cubic feet per second per acre; or the capacity of the existing storm drainage facilities downstream of the detention basin outlet, whichever is less.
4. Signs shall be posted by the proprietor to alert residents to hazards and use limitations of any storm water basin.
5. The volume of detention provided must be equal to or in excess of that calculated by the Oakland County Drain Commissioner's "Simplified Detention Basin Design Procedure" for a 10-year frequency storm
6. The maximum water level shall be controlled by gravity outlets. The use of pumps for dewatering is not allowed.
7. Detention basin volumes shall not include volumes below the invert of outlet pipe (s). Provide an additional 2' of volume below the outlet pipe invert to be used for sediment storage.
8. Detention basins shall be provided with an overflow spillway or manhole set at the high water levels capable of passing a 100-year frequency storm. The overflow spillway shall be located such that adjacent properties are not damaged when an overflow occurs. All overflow spillways shall be protected from erosion by surfacing with concrete, asphalt, or rip-rap. The edges of the surface shall have headers of the same or similar materials to prevent undercutting by the storm water overflow.
9. One foot of freeboard shall be provided above the high water elevation.

10. Side slopes for detention basins shall not be steeper than one (1) vertical to four (4) horizontal. Fencing of basins is not allowed in the Township.
11. The bottom of detention basins shall have a minimum slope of one (1.0) percent to the outlet for dewatering purposes unless designed as a wet basin.
12. Detention basins will not be permitted within a flood plain.
13. Storm water detention in paved parking lots will be considered under the following conditions:
  - a. The area contributing to any detention area within a paved area shall not exceed eight thousand (8,000) square feet.
  - b. Storm water run-off on sites with tributary areas greater than eight thousand (8,000) square feet may be detained within paved areas provided the area contributing to any individual paved detention area, shall not exceed eight thousand (8,000) square feet and individual paved detention areas shall be separated by landscaped greenbelts a minimum of ten (10') feet in width broken only by a circulation drive.
  - c. Storm water detained in paved areas shall not exceed six (6) inches depth. A positive overflow to an acceptable outlet shall be provided to control the six (6) inches maximum depth for each detention area.
  - d. Restricted catch basin covers shall be used to provide storage in paved areas. Manhole covers with two (2) vent holes often meet discharge requirements. The covers are designed to let the allowable discharge of water into the storm system. Flow calculations shall be submitted for the restricted covers specified. The flow shall be calculated for the maximum storage head.
  - e. Show limits of detention on plans.

14. Underground Detention will be considered on a case-by-case basis with the following conditions:
  - a. Provisions must be made in the design for the collection and removal of sediment and debris accumulated in the system. All applicable health and safety requirements shall also be incorporated in the design of systems that require access by inspection or maintenance personnel.
  - b. Detailed shop drawings are required for underground detention systems, including pertinent engineering calculations and soils information.
  
15. Detention in wetland areas will be considered with the following conditions:
  - a. If in a regulated wetland, an MDEQ permit is required.
  - b. A permanent pretreatment system for the removal of sediment is required prior to out letting to the wetland.
  - c. Storm water Runoff discharged to Wetlands must be diffused to a Non-Erosive Velocity before it reaches the Wetlands.
  - d. That part of the Wetlands used for storage or detention area is set back at least 100 feet from any lake or stream.
  - e. The Wetlands does not have significant wildlife habitat or ecological values, which are likely to be impaired or destroyed by storm water.
  - f. Adequate Soil Erosion control is provided to protect the natural integrity of the Wetlands.
  - g. If off-site Wetlands are used for storm water management, easements must be provided in accordance with the requirements of this ordinance.

- h. Calculations indicating what the water elevation will rise to during the design storm event will be required. The design must show that properties adjacent to the wetland area will not be negatively impacted by the increase in storm water runoff. Consideration must be given to future developments in the immediate area that could also use the wetland for storm water management purposes.

B. Retention Basins

- 1. If a gravity outlet cannot be provided, then the storm water holding facility shall be designed as a retention basin with a volume equal to or in excess of the volume of storm water run-off from two consecutive 100-year frequency storms. The storm water storage volume shall be calculated by:

Volume = 16,500 x 2 x total tributary acres x run-off coefficient.

- 2. Off-site tributary areas: Retention basins must be sized for storm water that originates off-site and which cannot be bypassed around the proposed retention basin to a site where the storm water originally flowed to. In such cases, the retention basin must be sized using the following design parameters:

Tributary acres: On-site area plus the off-site area

C Factor: Weighted C factor of the entire tributary area that considers the existing off-site conditions, and the proposed on-site conditions.

- 3. Retention basin volumes shall not include volumes below the existing groundwater table, permanent water elevation or invert of outlet pipe(s).
- 4. One foot of freeboard shall be provided above the high water elevation.
- 5. Side slopes for retention basins shall not be steeper than one (1) vertical to four (4) horizontal. Fencing of basins is not allowed in the Township.

6. Retention basins will not be permitted within a flood plain.
7. Retention of storm water in parking will not be considered.

C. Infiltration (Recharge) Systems

1. An infiltration system will be considered if the design engineer can demonstrate that all of the following conditions exist:
  - a. An adequate positive outlet is not available or it is not possible to construct an off-site drainage system to convey basin discharge to the nearest outlet, and the installation of a retention basin is not feasible or practical.
  - b. The natural underlying soils are well-drained (hydrologic groups A or B) and the ground water is suitable for percolation.
  - c. The underlying soils and ground water table have the ability to move water away from the site for the area and volume being drained.
  - d. Permanent pretreatment system upstream of inlet point to prevent any material from potentially clogging the infiltration medium (both surface and subsurface).
  - e. An overflow for a 100-year storm must be provided.
  - f. Infiltration system can be easily accessed for maintenance and replacement if necessary. The use of perforated storm pipe under pavements is discouraged.
  - g. There must be a method for determining a failure in the infiltration system. The system cannot be designed such that a failure in the infiltration system results in short circuit to the emergency overflow without on-site ponding.
2. The following information will be supplied and/or incorporated in the design of infiltration systems:

- a. Soil boring logs/sieve analysis/geotechnical report indicating type and properties of both surface and subsurface soils, suitability of surface soils for infiltration, capability of subsurface soils to conduct seepage to the underlying groundwater table, and flow from the system under mounding conditions at the maximum infiltration rate.
- b. Computed percolation rate and infiltration/exfiltration calculations. Conditions of >6"/hr. percolation rate will not be allowed.
- c. Drainage area map, including any off-site contributing areas and emergency overflow route in the event of system failure.
- d. Construction methods to prevent compacting the surface soils which may reduce the infiltration capacity of the soils.

D. Permanent Pretreatment Systems

1. Permanent pretreatment systems, when called for on the plans, shall be sized for a "first flush" depth of 0.5 inches of runoff from the entire drainage basin area of the project. Permanent systems are required when discharging to an existing lake, stream, waterway or wetland.
2. Pretreatment can be in the form of open basins or engineered treatment systems.
  - a. Open basins shall be designed with minimum side slopes of one (1) vertical to six (6) horizontal, one (1) foot of freeboard above design storm water elevation, emergency sodded overflow, and outlet control devices. Fencing of open basins is not allowed.
  - b. Design calculations, plans and shop drawings for engineered treatment systems shall be certified by a Professional Engineer licensed in the State of Michigan.



- c. Horizontal velocities through the system shall be minimized to prevent turbid flows and allow particles to settle in the pretreatment system.
3. Permanent pretreatment facilities will not be allowed within a flood plain.

#### 5.2.2 Off-Site Storm water Management:

- A. Waiver Option: In lieu of on-site storm water detention, the use of an Off-site Facility may be proposed. In such cases, the Proprietor shall request a waiver of the requirements for on-site storm water detention. This waiver option does not allow for changes in requirements for on-site Erosion control.

Off-site storm water management areas may be shared with other landowners, provided that Maintenance Agreements have been approved by the Planning Commission and the Township Board, and properly recorded.

### 5.3 GRADING AND SURFACE DRAINAGE

For all new subdivisions and site plans within the Township, a grading plan shall be submitted for review and approval.

This standard establishes the minimum requirements for the design of grading and surface drainage in the Township.

#### 5.3.1 Design Considerations

1. The grading plan shall be designed to insure that if a failure occurs in any storm drainage system, storm waters will drain away in overland swales without flooding buildings or adjacent properties.
2. Positive drainage of all yard areas is required for all developments. In special cases involving extreme vertical relief and wooded areas, isolated undrained potholes will be considered. These undrained areas must be provided with an easement for surface drainage and retention which will encompass the storm water storage level for two 100 year frequency storms plus one (1) foot of freeboard.

3. Generally, residential lot drainage shall be split at the building; drainage from the front of the building shall drain to the road and drainage from the rear of the building shall drain to the rear lot line. Rear to front surface drainage shall be avoided and will only be permitted under extreme topographic conditions. If rear to front drainage is permitted, only the drainage from the rear of the specific lot is allowed.
4. Side yard swales shall be a minimum of 0.5 feet below the building brick ledge grade of the building and located a minimum of ten (10) feet away from the building. These swales shall prohibit any cross-lot drainage between neighboring homes.
5. Rear to front lot drainage shall have protective drainage swales around the building. The high point of the swale shall generally be located a minimum distance of 15 feet off the rear of the building and generally one (1) foot (0.5 foot minimum) below the building brick ledge grade.
6. Rear-yards shall be drained with swales and shallow ditches unless topographic features prevent surface drainage.
7. Meet existing ground at the property boundaries. Construct an intercepting swale to prevent drainage onto adjacent property or lots.
8. All building footing drains and sump pumps shall discharge into enclosed storm systems if available. When footing drains or sump pumps are discharged onto the ground surface, the point of discharge shall generally be in rearward directed away from side lot lines and road right-of-way.
9. In residential developments with poor draining soils or high groundwater table, an enclosed drainage system for footing Drains/sump pumps discharge is required. (See Underdrain/Sump Pump Collection Systems).
10. No rear yard drainage system shall be constructed until rear yard grading is completed and approved.

A. SLOPE REQUIREMENTS

1. Protective perimeter slope: A minimum slope of 5% is required for areas within 10 feet of building perimeter.

2. Minimum ground slope for any portion of the site shall be two (2) %. A one (1) % minimum will be considered for occasional use.
3. Drainage swales along side and rear property lines, and the protective swale around buildings shall generally have a two (2) % slope. A one (1)% minimum will be considered for occasional use. Rear yard swales shorter than 300 feet may have a minimum slope of 0.8%.
4. Maximum ground slope for any graded portion of the site shall be 25% (one (1) vertical to four (4) horizontal). A maximum slope of 33% (one (1) vertical to three (3) horizontal) will be considered for occasional use and for side slopes of landscape berms.

#### **5.4 STORM SEWERS AND OPEN DRAINS**

The following details and specifications shall be required for developments utilizing storm sewers and/or open drains to convey runoff from the site. All such storm drainage systems must outlet to a detention basin, retention basin, infiltration system, or pretreatment facility as outlined in Section 5.2 of this Standard prior to discharging to any natural or man-made watercourse, wetland, drain or other body of water.

This standard establishes the minimum requirements for the design of storm drainage systems in the Township.

##### **5.4.1 Design Considerations**

###### **A. STORM SEWER CAPACITY**

1. Sufficient capacity shall be provided in the storm sewer system to allow existing runoff from upstream drainage to "pass through" the proposed storm sewer system.
  - a. When a storm sewer is designed to provide capacity for upstream areas, the hydraulic gradient shall remain in the pipe. For storm sewer designed to take on-site drainage only, the hydraulic gradient must be no higher than one (1) foot below storm structure rim elevations.
  - b. When the hydraulic gradient is above the top of the sewer pipe the design elevation of the hydraulic gradient shall be indicated on the profile at each manhole.

- c. If the heights of the hydraulic gradient exceed two (2) feet above the top of pipe, rubber joints shall be used.

B. HYDRAULICS AND HYDROLOGY

- 1. Storm drainage systems shall be designed for a minimum of a ten-year storm. To determine the storm water runoff, the rational method shall be used ( $Q=CIA$ )

where Q = peak rate of runoff in cubic feet per second

A = area in acres

C = runoff coefficient for drainage area

I = average rainfall intensity in inches per hour for a given time of concentration

- 2. The formula for rainfall intensity (I) shall be determined by using the formula  $I = 175/(T+25)$ , where T is the time of concentration in minutes. For residential areas, T shall usually be 20 minutes; for commercial and office areas, T shall be 15 minutes or less.

- 3. Run-off coefficients shall be determined for each individual drainage area. Drainage area coefficient determination shall generally be based on the following:

<u>SURFACE</u>	<u>C</u>
Agricultural/Grass	0.15 - 0.20
Pavement/Buildings	0.80 - 0.90
Residential	0.25 - 0.35
Multiple Housing	0.55
Commercial/Industrial	0.75
Pond/Wet Areas	1.0

The above run-off coefficients are minimum. Actual site design may require an increase in run-off coefficient. A weighted run-off coefficient can be used (provide calculations). Coefficients proposed for a project are subject to approval by the Township Engineer.

- 4. An overland flood route for a 100-year storm frequency shall be provided and shown on the plans. A minimum freeboard of six inches shall be provided from any building's exterior finished grade (brick ledge) to the 100 year flood elevation.

5. In Manning's formula,  $n = 0.013$ , shall be used.
6. Minimum design velocity shall be 2.5 feet per second and maximum design velocity shall be 10 feet per second, with the pipe flowing full.
7. Allowable pipe slopes:

<u>Pipe Diameter (in)</u>	<u>Minimum Slope (ft/100 ft)</u>
12	0.32
15	0.24
18	0.18
21	0.14
24	0.12
27	0.10
30	0.09
36	0.08
42	0.06
48	0.05
54	0.04
60	0.04

8. For changes in pipe size, the maximum flow velocity for full pipe flow shall be maintained by continuity of the 0.80 diameter depth above invert.
9. For changes in direction, a drop of 0.10 feet in the downstream sewer invert shall be provided for direction changes of 30 degrees or greater to compensate for velocity head loss of the incoming flow.
10. All catch basin and inlet leads shall be laid on a minimum slope of 1%.
11. Wherever differences in manhole pipe invert elevations exceed two (2) feet, a two (2) foot sump shall be provided to prevent channel erosion.

C. SEWER PIPE

1. Size

Storm Sewer:

1. The minimum pipe size for storm sewers, catch basin leads and inlet leads shall be 12 inches in diameter.
2. Rear yard under drain system with no inlets: 8" perforated plastic pipe.

2. Location

- a. Storm sewer shall have a minimum of four (4) feet of cover unless approved by the Township Engineer.
- b. Storm sewers shall generally be located on the opposite sides of streets from water mains. Storm sewers shall be located ten feet from the right-of-way line in the public right-of-way.
- c. A minimum ten feet horizontal separation is required between storm sewer and water mains.

3. Special Backfill Requirements:

- a. Granular material meeting the requirements for MDOT Granular Material, Class II, compacted to 95% maximum density, shall be required for full depth backfill of trenches under existing or proposed road surfaces, pavements, curbs, driveways, parking areas, and sidewalks, and where the storm sewer is within a one-on-one influence of the edge of existing or proposed pavements. An independent laboratory shall perform compaction testing.
- b. Storm sewer leads shall have compacted granular backfill within the entire street right-of-way where sidewalks are required. Compacted granular backfill shall be provided between all utility crossings.

D. MANHOLES

1. Location

a. Manholes shall be located at:

- Points where the sewer changes direction
- Points where the size of the sewer changes
- Points where the slope of the sewer changes
- The junction of sewer lines
- Street intersections or other points where catch basins or inlets are to be connected
- The end of the sewer line

b. Maximum distance between manholes shall be as follows:

<u>Diameter of Sewer</u>	<u>Maximum Manhole Spacing</u>
8" - 15"	350'
18" - 30"	400'
36" - 48"	500'
54" - 60"	550'
66" - 72"	650'
78" & Larger	1000'

E. CATCH BASINS, INLETS, AND END-SECTIONS

1. Size

- a. Inlets and rear-yard catch basins up to four (4) feet deep from invert to top of casting may be (two) 2 feet in diameter.
- b. Inlets and rear-yard catch basins more than four (4) feet deep from the inlet to top of casting and all other catch basins shall be four (4) feet in diameter.

2. Location

a. Catch Basins shall be located:

- At the radius return of street intersections. A maximum distance of 150 feet is allowed when drainage is required to go around a corner between a high point and a corner catch basin.
  - At maximum intervals of 500 feet along a continuous slope.
  - At all low points in streets, swales and ditches, where applicable.
  - At a location to provide a maximum of 800 feet of drainage from two directions.
- b. Standard rear yard basins shall be provided at all low points in easements. All catch basins shall be located within four (4) feet of lot corners. 12-foot side yard easements to the street shall be included at all rear yard basins.
- c. All catch basins and inlets located at low points in poor draining soils shall have a minimum of two ten (10)-foot runs of six (6) inches perforated pipe with pea gravel bedding and backfill. Other trench collecting underdrains may be required, as required by the Township Engineer.
- d. Catch basin leads may tap directly into sewers 48 inches in diameter and larger.
- e. End-sections or headwalls shall be placed at all culverts and pipe inlets or outlets.
- f. A prefabricated bar screen shall be used on all storm sewer openings 18 inches in diameter and larger. The bar screens shall be constructed according to an approved separate enlarged detail in the drawings and shall be designed to be sturdy, permanent easily maintained, non-clogging and shall have clear openings of no more than six (6) inches. Bar screens shall not be required on driveway culverts.



## F. UNDERDRAIN/SUMP PUMP SYSTEMS

1. Where the proposed ground surface slope is less than 2% (two percent), supplementary drainage shall be provided by an underdrainage system.
2. Locate the underdrain/sump pump systems in a six (6) foot drainage easement along the rear or side lot lines at three (3) feet from the property line. Where abutting off-site property, it shall be located six (6) feet from the property line in a twelve- foot easement.
3. Place underdrain at a minimum grade of 0.30%.
4. Trench for underdrain shall have adequate depth to provide gravity flow of sump pump lines to underdrain, and shall have a minimum depth of three (3) feet from the property line.
5. Install two (2) foot diameter inlets at 400-foot maximum intervals along the underdrain and located three (3) feet from side lot lines.
6. Install a two (2) inch P.V.C. capped tee at each lot for the sump pump outlet.
7. Show the underdrain system with sump pump tees on the storm sewer plan, with a dimension to the nearest lot line for each sump pump tee.
8. The sump pump collector system may be combined with the underdrain system, as noted above.
9. Minimum pipe material shall be eight (8) inch PVC constructed with a minimum of 3.0 feet of cover and 0.30 percent slope.
10. Eight (8) inch lines must not be used for the collection of surface runoff and therefore structures on these size lines must have solid covers.

## G. OPEN DRAIN REQUIREMENTS

1. Open drains shall have slope protection (rip-rap) at bends with radius of 500 feet or less and other points as designated by the Township Engineer.
2. The drain bottom and slopes, to the hydraulic gradient line, shall be sodded. The remainder of the drain shall be seeded. The Township will not approve the work until all turf is established.
3. Specific drain cross-section and velocity control measures will be approved by the Township Engineer on an individual basis.

## **5.5 EASEMENTS**

1. Necessity of Easements: Storm water management easements shall be provided by the property owner if necessary to assure: (1) access for storm water management and Erosion control facility inspection and maintenance; and (2) preservation of storm water management conveyance, infiltration, and storage areas, including Flood routes for the 100-year storm event.
2. Easements for Off-Site Storm water Management: Storm water management and Flood easements are required for all areas used for off-site storm water management, unless the areas are under the ownership of the Proprietor at the time of storm water management plan submittal.
3. Easements for storm sewers shall have a minimum width of twelve feet, centered upon the sewer.
4. Provide a minimum 12-foot wide easement for access for maintenance and/or inspection of storm water management facilities.
5. An easement shall be provided for the pretreatment system to allow access for maintenance and/or inspection.
6. When drainage is required to flow across an adjacent lot, a 12-foot wide storm water easement, centered on the drain, must be provided. This easement shall be dedicated to the Homeowners Association or Township with restriction against use or occupation of easements by the property owners and/or by other utilities in any manner that would restrict storm system maintenance or repair operations.

7. A written description and drawing of the easement shall be prepared by the Designing Engineer and be presented to the Township for examination before recording.
8. Easements for possible extensions shall be provided to the property lines at locations designated by the Township Engineer.
9. The easement must be large enough to accommodate a slope of 1 horizontal to 1 vertical from the sewer invert to the edge of easement.
10. The horizontal alignment of sewers that are not proposed to generally follow street, drive, or parking area pavements, shall parallel property lines or building lines.
11. Recording of Easements: Easements shall be recorded with the Oakland County Register of Deeds according to Oakland County Requirements.
12. Recording Prior to Building Permit Issuance: The Proprietor must provide the Township Building and Zoning Administrator with evidence of the recording prior to the issuance of a building permit.

#### **5.6 Maintenance Agreement -**

- A. Purpose of Maintenance Agreement: The purpose of the Maintenance Agreement is to provide the means and assurance that maintenance of storm water management and Erosion control facilities shall be undertaken.
- B. Maintenance Agreement Required:
  1. The Proprietor of a development and/or Earth Change subject to Soil Erosion Control Plan (Major Development) requirements (Article 6) shall submit a Maintenance Agreement to the Township Clerk.
  2. The Township Board prior to the issuance of any building permit or final preliminary plat approval shall approve maintenance Agreements.
- C. Maintenance Agreement Provisions.

1. The Maintenance Agreement shall provide for routine maintenance and emergency maintenance.

The Maintenance Agreement shall be binding on all subsequent owners of land served by the storm water management and Erosion control facilities, and shall be recorded in the land records of Oakland County within thirty (30) days after approval by the Township Board.

## **5.7 FINAL ACCEPTANCE**

1. All sewer systems shall be subject to a Final Township Inspection prior to acceptance of the system by the Township Engineer.
2. A set of approved Record Drawings and a copy of any recorded easements that were required for construction are required for final acceptance of the storm sewer.
3. The entire detention/retention basin must be vegetated and turf established prior to acceptance by the Township. For detention basins designed as a dry basin, the bottom and sides up to the high water elevation shall be vegetated with a dense turf of water tolerant grass. The remainder of the side slopes and top of bank can be seeded or sodded.