TOWN OF DEDHAM DRAINAGE & STORMWATER MANAGEMENT DESIGN STANDARDS

REVISED JULY 31, 2002

PRICE $5.00

TOWN OF DEDHAM
DRAINAGE & STORMWATER DESIGN STANDARDS

SECTION 1. INTRODUCTION

a.) The design standards contained herein have been adopted by the Town of Dedham to serve as the stormwater design and construction regulations as referenced under the Dedham Planning Board Rules and Regulations, Dedham Wetlands Protection Bylaw, Dedham Stormwater Management Bylaw and whatever other local laws and regulations which may reference this document.

b.) Nothing in these Design Standards is intended to conflict with the requirements of any Bylaws or rules and regulations adopted by the Town of Dedham. In cases where there are conflicting requirements, the stricter requirements shall take precedence.

c.) Any engineering design submitted under these Standards shall be prepared by a Massachusetts Registered Professional Engineer and/or Land Surveyor as appropriate. Any plan shall comply with the standards set forth in the Massachusetts Code for Professional Engineering Practice.

SECTION 2. DEFINITIONS

a.) The definitions contained herein this section apply to the Town of Dedham Stormwater Design Standards contained in this document.

1. **AASHTO**

   A. American Association of State Highway and Transportation Officials.

2. **ALTER**

   A. To measurably change the ability of a ground surface area to absorb water or to change existing surface drainage patterns.

3. **BEST MANAGEMENT PRACTICES (BMPs)**

   A. Structural, non-structural and managerial techniques that are recognized to be the most effective and practical means to prevent and/or reduce nonpoint source pollution.

   B. Best Management Practices are activities or equipment whose purpose is the maintenance of stormwater quality and the protection of the environment. Please see Section 3 of these Engineering Design Standards as well as the Town of Dedham Conservation Commission Rules and Regulations for a more detailed description and explanation of BMPs

4. **BOARD**

   A. The term "Board" refers to the Dedham Planning Board.

5. **COMMISSION**

A. The term "Commission" refers to the Dedham Conservation Commission.

6. **CONVEYANCE**

A. Any structure or device, including pipes, drains, culverts, curb breaks, paved swales and man-made swales of all types designed or utilized to move or direct stormwater runoff or existing water flow.

B. Any impervious surface where surface/sheet flow is utilized to remove rainfall. An example of this would be a parking lot which drains directly onto a vegetated surface without any curbing or drainage system to intercept the flow.

7. **DPW**

A. Dedham Department of Public Works.

8. **DREDGE**

A. Any cleaning, deepening, widening or excavating, either temporarily or permanently, of a channel or other conveyance of stormwater as well as any area protected under the Town of Dedham General Wetlands Protection ByLaw (Chapter 27 of the Town of Dedham Bylaws). Dredging does not include routine maintenance of items such as roof gutters or drainage pipes.

9. **DRY BASIN**

A. A dry basin is designed to completely empty at some time after stormwater runoff ends. The term "dry" implies that there is no significant permanent water pool between storm runoff events.

10. **DUPLEX HOUSE**

A. A building containing two residential units or two single-unit residential buildings on one parcel of land whether the units have the same or different owners. Only two residential units may be located on the parcel of land.

11. **ENGINEER**

A. A registered Professional Engineer (P.E) licensed to practice professional engineering within the Civil, Environmental, or Hydrogeologic disciplines in the Commonwealth of Massachusetts.

12. **EROSION CONTROL**

A. The prevention or reduction of the movement of soil particles or rock fragments.

13. **EXTENDED DETENTION POND**

A. An enhanced detention pond that provides both flood control and treatment of the first flush of stormwater runoff. Storage time for the first flush is a minimum of 24 hours.

14. **FEMA FLOODLINE**

A. The boundaries specified by the Federal Emergency Management Agency (FEMA), as located on Flood Insurance Rate Map for the Town of Dedham dated August 13, 1982 (The maps are available for inspection at the Conservation Commission office.) and as will be incorporated into the Town's GIS mapping system. This includes any map amendment letters issued by FEMA amending this map.

15. **FILL**

A. The placement or deposit of any material that raises, either temporarily or permanently, the elevation of any area subject to these regulations.

16. **FIRST FLUSH**

A. The volume generated by the first 1.00 inch of stormwater runoff. This first inch of runoff carries the majority of accumulated pollutants from impervious surfaces.

17. **FLOOD CONTROL**

A. The prevention or reduction of flooding and flood damage.

18. **FLOODING**

A. A local and temporary inundation or a rise in the surface of a body of water, such that it covers land not usually under water.

19. **FOREBAY**

A. A storage area provided at the inlet of a basin/pond which is designed to trap incoming sediments before they accumulate in a basin/pond BMP.

20. **GRASS FILTER STRIP**

A. Sometimes called biofilters or buffer strips, these are vegetated areas designed to accept sheet flow flow from an upgradient development through a flow spreader system. Vegetation may take the form of grasses, meadows, forests, etc. The primary mechanisms for pollutant removal are filtration, infiltration, and settling.

21. **GROUNDWATER**

A. All water beneath any land surface including water in the soil and bedrock beneath the bottom surface of water bodies.

22. **HOODED CATCH BASIN**

A. A catch basin which is fitted with an inverted elbow over its outlet pipe or similar structure which is designed to retain oils and other floatables within the catch basin sump and prevent them from flowing into the drainage system.

23. **HYDROLOGIC SOIL GROUP**

A. Soil characterization classification system defined by the U.S. Department of Agriculture Soil Conservation Service. Soils within the same group (A, B, C or D) have the same runoff potential under similar storm and cover conditions.

24. **HYDRONAMIC DEVICE**

A. The hydrodynamic device BMP category includes BMPs such as oil-water separators, sand interceptors, swirl-type concentrators, sedimentation vaults, and other prefabricated and package-type treatment devices.

25. **IMPERVIOUS AREA**

A. Any manmade cover or surface that impedes the natural infiltration of stormwater.

26. **INCLUSIONS**

A. Isolated pockets and areas of soils which have differing characteristics from the NRCS soil unit listed for the larger area. Due to the possibility of the existence of such soil pockets and areas, soil investigation in the field must be performed in order to verify the soil data contained on the NRCS soil maps.

27. **INFILTRATION**

A. The act of conveying of surface water into the ground for the purpose of groundwater recharge and reduction of stormwater runoff from a project site.

28. **INFILTRATION BASIN**

A. A basin that can capture a given stormwater runoff volume and infiltrate it into the ground. Such devices can be utilized to decrease the stormwater runoff volume generated by a project site.

29. **LAND UNDER WATER**

A. Land below a brook, river, stream, pond or lake.

30. **MEDIA FILTER**

A. A facility that uses some form of a granular or membrane filter, with or without a presettling basin, to remove a fraction of the constituents found in stormwater. The most typical filter is sand, but other materials, including peat mixed with sand, compost with sand, geotextiles, and absorption pads and beds are commonly used.

31. **OPERATION AND MAINTENANCE PLAN (O&M PLAN)**

A. An Operation and Maintenance plan (O&M Plan) shall be required for all projects and should identify at a minimum: The Stormwater management system(s) owner(s); The party or parties responsible for operation and maintenance: The types of maintenance tasks to be performed including removal and disposal of sediments and other collected pollutants and emergency maintenance procedures

32. **POROUS PAVEMENT**

A. There are two forms of porous pavement: modular block, which is made porous through its structure, and poured-in-place concrete or asphalt which is porous due to the mix of the materials.

B Modular block porous pavement consists of perforated concrete slab units underlain with gravel. The surface perforations are filled with coarse sand or sandy turf. It is used in low traffic areas to accommodate vehicles while facilitating stormwater runoff at the source. It

should be placed in a concrete grid that restricts horizontal movement of infiltrated water through the underlying gravels.

C. Poured-in-place porous concrete or asphalt is generally placed over a substantial layer of granular base. The pavement is similar to conventional materials, except for the elimination of sand and fines from the mix. If infiltration to ground water is not desired, a liner may be used below the porous media along with a perforated pipe and a flow regulator to slowly drain the water stored in the media over a 6 to 12 hour period.

33. **PRIVATE WATER SUPPLY**

A. Any source or volume of surface or groundwater demonstrated to be in any private use or demonstrated to have a potential for private use as water supply.

34. **RECORDED**

A. The date a plan or deed for a parcel for a newly created lot is recorded with the Norfolk Country Registry of Deeds or Massachusetts Land Court.

35. **REDEVELOPMENT**

A. Maintenance and improvement of existing roadways, including widening less than a single lane, adding shoulders, and correcting substandard intersections and drainage, and repaving.

B. Development, rehabilitation, expansion, and phased projects on previously developed sites, provided the redevelopment results in no net increase in impervious area.

36. **SEDIMENTATION**

A. The process of depositing material which has been suspended in water.

37. **SFD**

A Abbreviation for "single family dwelling". For the purpose of these regulations, a SFD is a single house lot/dwelling not associated with a new subdivision project.

38. **STORMWATER**

A. Rain water or snow and ice melt that flows across a surface or through a drainage system.

39. **STORMWATER MANAGEMENT COMPLIANCE CERTIFICATE (SMCC)**

A. A document issued by the Conservation Commission which states that all conditions of a previously issued Stormwater Management Permit have been met and that a project has been completed in compliance with the conditions set forth in a SMP.

40. **STORMWATER MANAGEMENT PERMIT (SMP)**

A. A permit issued by the Conservation Commission, after review of an application, plans, calculations, and other supporting documents, which is designed to protect the environment of the Town from the deleterious affects of uncontrolled and untreated stormwater runoff.

41. **SOIL EVALUATOR**

A. A Soil Evaluator licensed by the Massachusetts Department of Environmental Protection.

43. **STORM DAMAGE PREVENTION**

A. The prevention of damage caused by water from storms, including, but not limited to, erosion and sedimentation, damage to vegetation, property or buildings or damage caused by flooding, waterborne debris or waterborne ice.

44. **STORMWATER**

A. Water which flows across a surface or through a drainage system. The source of such water is from rainfall or from melting snow and ice.

45. **STORMWATER MANAGEMENT SYSTEM**

A. All structures, pipes, swales, culverts, and surfaces that collect and convey runoff, al structures and practices that upgrade the quality of runoff, all structures that store or recharge runoff, and all practices set forth in an Operations and Maintenance Plan.

46. **TITLE V**

A. "Title V" refers to the Massachusetts Title V Subsurface Septic Disposal System Code. Percolation tests and annual high water observation determinations as called for under these Regulations shall be done utilizing the standards and criteria outlined in Title V.

47. **TO THE EXTENT PRACTICABLE**

A. With respect to stormwater management standards, it means the applicant has made all reasonable efforts to meet the standards, including evaluation of alternative BMP designs and their locations.

48. **WET BASIN**

A. A wet basin, also commonly known as a "wet pond" because they have a permanent pool of water, unlike detention basins, which dry out between storms. The permanent pool of water is replaced in part or in total by stormwater during a storm event. The design is such that any available surcharge capture volume is released over time. The hydraulic residence time (HRT) for the permanent pool over time can provide biochemical treatment. A dry weather base flow, pond liner and/or high groundwater table are required to maintain the permanent pool.

b.) The definitions contained in Section a.) above are only with respect to these Design Standards. They are not meant to replace or supplement similar definitions which may appear in State law, or other Bylaws and regulations of the Town of Dedham.

SECTION 3. GENERAL PLAN REQUIREMENTS

a.) The plan requirements outlined in this section are in addition to any plan requirements set forth by the DPW, Planning Board and Conservation Commission in their regulations.

b.) Size. All plans shall be a minimum size of 8.5 by 11 inches to a maximum size of 24 by 36 inches. All individual plans must be submitted folded to such a size that they will fit in a standard letter size file. Bound plan sets may be rolled.

c.) Scale. All plans shall be drawn at a scale of one inch equals forty feet (1"=40') or larger. For large projects which propose the construction of stormwater detention ponds and groundwater recharge systems, details of such work shall be provided at a scale of one inch equals twenty feet (1"=20') or larger.

d.) Professional Certification. All drainage plans shall be stamped by a Professional Engineer (Civil discipline) licensed by the Commonwealth of Massachusetts.

e.) The following information is required on all Drainage and Stormwater plans filed with the Town of Dedham:

1. Title Block: All plans shall include a title block which lists the name of the project, owner's name and address, applicant's name and address, engineer's name, address, telephone number, plan date, revision date(s), and plan scale, including a graphical scale representation.

2. Resource Area Information: All plans shall show the limit of any resource areas located on the site. This includes any resource area as defined under the Massachusetts Wetlands Protection Act, the Town of Dedham General Wetlands Protection Bylaw, as well as areas of 100 year Floodplain and Aquifer Protection District.

3. Topography: Existing and proposed contours at 1 foot vertical increments shall be shown on all plans. All topographic information shall be referenced to 1988 U.S.G.S. North America Vertical Datum (N.A.V.D.). All topography shall be labeled in such a manner as to clearly indicate the contour elevation and to differentiate between existing and proposed contour lines. Reference benchmarks shall be noted on the plan with location and elevation.

4. Structures & Utilities: All existing and proposed structures shall be shown and appropriately labeled on the site plan. All utilities, including utility poles, which are located within the area of the proposed work shall be located and shown. Existing and proposed drainage structures and pipes shall be labeled to indicate invert, size, and slope.

5. Paved & Impervious Surfaces: All existing and proposed paved and impervious surfaces shall be shown and appropriately labeled on the site plan. The plans will also include a summary listing the areas of the existing paved and impervious surfaces and the proposed paved and impervious surfaces.

6. Total project area: The total project area shall be stated on the site plan. The project area consists of the total area altered by the proposed project. This includes areas of construction, including buildings, paved surfaces, landscaping, excavation, and grading, which is proposed to be performed as part of the project.

7. Trees: Limit(s) of area(s) of tree canopy shall be shown on the site plan. Both the existing and proposed tree canopy limits will be shown on the plan and clearly marked.

8. GIS/CAD Files: For all projects, the applicant's engineer shall provide the Conservation Commission with electronic copies of all plans. Plans shall met the requirements set forth by the Town GIS System Manager and any GIS Bylaw or regulations which may be adopted. This requirement may be exempted for projects associated with an existing Single Family Dwelling (SFD).

9. Profiles and structure cross-sections as required. All profiles shall be prepared with a 10:1 Vertical: Horizontal aspect ratio.

SECTION 4. PROJECTS REQUIRING DRAINAGE CALCULATIONS

a.) Any project which proposes underground drainage structures or involves the alteration of more than 5000 square feet of area shall require drainage calculations prepared by a licensed Professional Engineer. Also, any multi-family residential, commercial, or industrial project involving the construction of an access road or parking lot shall require drainage calculations prepared and stamped by a Professional Engineer licensed in the Commonwealth of Massachusetts in the Civil, Environmental, or Hydrogeologic disciplines.

SECTION 5. DRAINAGE DESIGN AND CALCULATION METHODOLOGIES

a.) Acceptable Methodology. Drainage calculations shall be prepared using one of the methods listed below. The calculations may be performed by hand or may be performed using an acceptable computer program based upon these methodologies. A list of acceptable engineering software programs which may be utilized is posted in the Planning Board and Conservation Commission offices at Town Hall. The applicant's engineer shall provide software copies of any data files generated by any computer drainage program utilized in the performance of the calculations.

1. Rational Method

A. The Rational method shall only be utilized for projects less than 10,000 s.f. in size where stormwater volume is not required to be calculated. Thus, the use of the Rational method is limited to projects which will not discharge stormwater to a public way, existing drainage system, wetland resource area as defined under the Massachusetts Wetlands Protection Act, Dedham Wetlands Protection Bylaw, or land classified as floodplain by Local, State, or Federal regulations.

B. Due to its limitations, the Rational method shall only be utilized for simple projects, such as additions to existing structures, where there proposed work will not alter existing drainage patterns. Projects which propose the alteration of ground cover beyond the proposed addition, or propose new drainage structures other than roof stormwater infiltration systems shall be required to utilize TR-55/TR-20 methodology for stormwater analysis.

TABLE 1
PROJECTS REQUIRING THE USE OF TR-55/TR-20 DRAINAGE METHODOLOGY

1	Projects proposing new drainage structures, including detention/retention ponds and Stormwater Management systems.
2	Projects proposing to modify an existing drainage system.
3	Projects discharging stormwater to a public street or drainage easement.
4	Projects discharging stormwater to a floodplain area or any resource area listed under Section 3 of the Town of Dedham Wetlands Protection Bylaw.
5	All street and roadway construction, whether associated with a new street or an existing street.
6	All projects proposing the construction of new structures or buildings other than accessory buildings associated with an existing single-family or duplex dwelling.

C. The Rational method shall be performed utilizing the storm curves contained in Appendix 1 of these Regulations. These are the Rational Method Curves from the Massachusetts Highway Department Design Manual for the Boston area.

2. TR-55/TR-20 Methodology

A. TR-55/TR-20 methodology shall be utilized for all projects where calculation of stormwater volume is necessary. Such projects generally include those listed on Table 1 above.

B. The design standards and assumptions listed in Table 2 below shall be utilized in performing drainage calculations which utilize TR-55 and TR-20 methodologies (i.e. HydroCad, Haestad Methods Pond Routing software packages).

TABLE 2
TR-55 & TR-20 DRAINAGE DESIGN REQUIREMENTS

1	Total Length of "Sheet Flow" in the calculation of Time of Concentration for a Subcatchment shall be less than 100 feet.
2	Sheet Flow on a paved road surface shall only be utilized for flow from the centerline of the road to the gutter line. Shallow Concentrated and/or gutter flow shall be utilized to model flow along the gutter line of a road.
3	Hydraulic Gradient Line shall be the maximum distance from the highest point within the drainage subcatchment to the discharge point of the subcatchment. The Hydraulic Gradient line (hydraulic length) shall be clearly illustrated on the drainage area plan(s).
4	The surface area of all ponds, rivers and other water bodies shall be assumed to be impervious for the purpose of calculating ground cover.
5	The surface area of detention ponds, up to the 100 year storm elevation level, shall be assumed to be impervious for the purpose of calculating ground cover.
6	Stormwater analyses shall be performed utilizing a SCS Type III storm of 24 hour duration (Type 3 stormwater curves).
7	For programs which have the ability to adjust the time period of the storm analysis (HydroCad & Haestad Methods), the storm shall be analyzed from time 0.0 (the start of the storm) to 30 hours after the start of the storm event. The time increment between analysis points shall be 0.02 hrs.
8	Identical design points (flows off the project property) shall be utilized for the pre-development and post-development analyses.
9	The size of the overall drainage area analyzed in the pre-development and post-development analyses shall be the same.

3. Manning's Formula – Stormwater Conveyance Sizing

A. The Manning's Formula shall be utilized for the sizing of all drainage pipes, swales and channels.

B. The Manning's coefficients on Table 3 shall be utilized for design unless a Manning's coefficient is provided by the manufacturer of the pipe material proposed to be used.

C. If the Manning's coefficient for the proposed material or surface condition of the proposed stormwater conveyance is not provided on Table 3, the values from the Manning's roughness coefficients provided on the table in Appendix 2 of these regulations.

TABLE 3
MANNING'S COEFFICIENTS* TO BE UTILIZED FOR DRAINAGE DESIGN

	CHANNEL MATERIAL	MANNING'S NUMBER
1	Concrete Pipe (rubber or mortared joints)	0.012
2	Corrugated Metal Pipe (standard 2.5" x 1.5" corrugation)	0.024
3	Cast Iron (uncoated)	0.013
4	PVC Pipe (dry fit rubber joints)	0.011
5	Grass drainage swale (mowed regularly)	0.024
6	Grass drainage swale (not mowed)	0.090
7	Rip-Rap Swale (not hand fitted)	0.028

* **This table contains only the most commonly used Manning's coefficients. Additional coefficients are contained in Appendix 2 of these Design Standards.**

b.) Calculations shall be performed for existing site conditions (pre-development) and proposed site conditions (post-development) based on the proposed site plan. Storms of 2, 10, 25, and 100 year frequency events shall be analyzed. The rainfall amounts in Table 4 below shall be used for each of the 24 hour storms:

TABLE 4
VALUES TO BE USED FOR 24 HOUR RAINFALL CALCULATIONS

STORM FREQUENCY	24 HOUR RAINFALL*
2 yr. storm	3.2 inches
10 yr. storm	4.9 inches
25 yr. storm	6.1 inches
50 yr. Storm	7.3 inches
100 yr. storm	8.5 inches

*** 24 hour rainfall values are from 1998 Cornell University Study.**

d.) Zero Runoff Rate Increase. Detention / Retention systems shall be designed to achieve a zero increase in peak runoff rate between pre-development and post-development site conditions for all four storm events analyzed. This requirement can be waived if the Applicant's Engineer can demonstrate that an increased runoff rate will not have a detrimental effect on surrounding and downstream properties.

1. The point of discharge or downgradient property boundary shall be utilized as a design point for calculating runoff rates and volumes. This may include several different discharge points or boundaries dependent on the existing and proposed topographic features of the project site.

e.) Zero Runoff Volume Increase. Projects which discharge runoff to areas designated as 100 Year Floodplain Districts by FEMA, a Resource Area listed under Section 3 of the Town of Dedham Wetlands Protection Bylaw, public streets, public property, or property not owned by the applicant shall be required to demonstrate a zero increase in stormwater runoff volume for the 25 and 100 year frequency storms. This may be accomplished through stormwater retention, infiltration.

1. In cases where stormwater runoff discharges to a floodplain area, the zero increase in stormwater runoff volume may be accomplished by creating additional floodplain storage volume by a volume equal to twice the volume of the additional stormwater runoff which will be created by the proposed project.

f.) Drainage Design Criteria. The storm events listed in Table 5 below shall be utilized for the design and sizing of the specified drainage system components:

TABLE 5
STORM EVENTS TO BE UTILIZED TO SIZE DRAINAGE ELEMENTS

	TYPE OF DRAINAGESTRUCTURE/SYSTEM	STORM EVENT TO BE UTILIZED TO DESIGN AND SIZE
1	All drainage detention/retention basins	100 year storm
2	Street drainage	25 year storm
3	Stream & natural drainage channels	100 year storm
4	Parking lot & driveway drainage systems	10 year storm
5	Drainage Culverts (Federal Jurisdiction)	50 year storm

1. All drainage pipe sizes shall be calculated using Manning's equation.

2. The maximum water velocity for street drainage pipes during the 25 year design storm event shall be 8.0 feet per second.

3. Manhole structures shall be provided at all changes in pipe size, pipe material, horizontal direction and/or vertical slope.

4. All points where pipes merge (such as a perimeter drains into which roof drain downspouts are connected) shall be equipped with inspection ports / cleanout structures.

5. Operation and Maintenance plans shall be required for all new and modified drainage systems, whether publicly or privately owned and maintained. Please refer to the Regulations adopted under the Dedham Stormwater Management Bylaw for specific requirements.

SECTION 6. STORMWATER INFILTRATION SYSTEM DESIGN AND CALCULATIONS

a). The criteria in Table 6 below shall be utilized for the design of stormwater infiltration systems.

SECTION 6. STORMWATER INFILTRATION SYSTEM DESIGN AND CALCULATIONS

a). The criteria in Table 6 below shall be utilized for the design of stormwater infiltration systems.

TABLE 6
STORMWATER INFILTRATION SYSTEM DESIGN AND CALCULATIONS

1.	Title V percolation tests shall be performed for all proposed groundwater recharge systems. Percolation test results shall be submitted as part of the project calculations. Percolation tests shall be supervised by a Professional Engineer or a DEP Certified Soil Scientist.
2.	All stormwater infiltration system plans shall be designed and stamped by a Professional Engineer.
3.	Infiltration systems shall be designed on a minimum percolation rate of 10 minutes per inch.
4.	For sites where the percolation rate is greater than 10 minutes per inch, groundwater recharge systems shall be designed based on Darcy's Equation, where additional field research (sieve testing, stand column, etc.) is required to determine permeability coefficient of the soil.
5.	In cases where the design percolation rate is greater than 20 minutes per inch, only the bottom area shall be used in sizing of groundwater recharge systems.
6.	All infiltration systems shall include inspection ports and cleanout accesses for the infiltration chamber(s). Inspection ports and cleanout accesses shall be set at the proposed finished ground elevation and shall not be landscaped or otherwise covered.
7.	Infiltration systems shall be designed to have a water storage capacity of 2 inches x the area discharging to the Infiltration system. This is to ensure that the area serviced by the infiltration system will be able to drain properly during storm events where the rainfall rate may exceed the infiltration capacity of the system for a period of time.
8.	"Leaching Field" type infiltration systems shall be vented. This is to minimize water puddling and algae growth within the system which can inhibit the system's ability to function as designed.
9.	The bottom of stormwater recharge systems shall be a minimum of 2 feet above the annual high water table in the area of the recharge system. Deep observation holes shall be performed in accordance with Title V requirements to determine the annual high water table at the location of the proposed groundwater recharge system.

b). The 2 foot separation requirement contained in Section 8 of Table 6 above may be waived by the Conservation Commission if it can be demonstrated that there is no location on the project site with sufficient depth to groundwater to permit a 2 foot separation between the annual high water table and the bottom of the groundwater recharge system.

c). Upon completion of the project, An as-built plan showing the location of the inspection and cleanout access points shall be provided to the Town of Dedham. The as-built plan shall be prepared in accordance with the specifications set forth in Section 19 of these regulations.

SECTION 7. DRAINAGE BASIN (DETENTION POND) DESIGN

a.) The criteria in Table 7 below shall be utilized for the design of detention and retention drainage basins.

1. The results of all deep observation holes and percolation tests performed as part of drainage basin design shall be included as part of the drainage report submitted to the Town. The results shall be certified by the licensed Professional Engineer or Soil Evaluator who supervised the tests.

2. Detention/Infiltration basins shall be constructed to include a minimum of one foot of bank washed gravel below the bottom of the basin. This is to aid with the infiltration of stormwater generated by small storm events.

TABLE 7
DRAINAGE BASIN DESIGN CRITERIA

1.	All detention/retention basins shall be designed based on a 100 year frequency storm.
2.	Basins shall utilized staged outlets to achieve a Zero Runoff Rate increase for each of the four storm events analyzed.
3.	Drainage basins shall be designed to have a minimum 1 foot of freeboard during the 100 year storm event.
4.	Drainage basin outlets shall be designed to minimize the possibility of erosion within the basin and at the outlet discharge point.
5.	No drainage basin volume below the 100 year flood elevation or seasonal high water table shall be counted as storage volume. Seasonal high water table to be determined using the methodology outlined in Title V subsurface sewage disposal system regulations.
6.	The volume of any stormwater forebays shall not be counted towards the storage volume of the drainage basin. Stormwater forebays are designed to capture and retain any sediment which may be in the stormwater entering the basin, and thus will become filled with sediment and require periodic cleaning.
7.	Stormwater forebays shall be sized to retain the first one inch of stormwater runoff from all impervious surfaces except for roofs (which are assumed to be infiltrated) within the drainage area served by the stormwater drainage basin.
8.	No drainage basin volume below the annual high water table shall be counted as storage volume. Deep observation holes shall be performed in accordance with the guidelines set forth in the Massachusetts Title V regulations to determine the annual high water table at the location of the proposed drainage basin.

TABLE 7- CONTINUED DRAINAGE BASIN DESIGN CRITERIA - continued	
9.	Broad crested weirs (weirs wider than 15 feet) shall not be used as the primary outlet control device to regulate the flow from storm events, other than the 100 year frequency storm event. Broad crested weirs shall have a concrete lip, to ensure that the elevation of the weir remains constant and to minimize the potential for erosion and gullying along the lip surface.
10	Percolation tests in accordance with the procedure contained in Massachusetts Title V shall be performed in the location of any proposed drainage basin. Percolation tests shall be supervised by a Professional Engineer or a DEP Certified Soil Evaluator.
11	Drainage basins shall be designed to have an emergency overflow device, such as a notched weir or overflow grate on a drainage outlet control structure. This is to prevent the overtopping and potential erosion of the detention pond berm in the case that the primary outlet control device becomes blocked.
12	For design purposes, it shall be assumed that there will be no infiltration of stormwater within the drainage basin unless a groundwater infiltration system is specifically designed as part of the drainage basin.

SECTION 8. STORMWATER QUALITY PERFORMANCE STANDARDS

a.) Water Quality. The Stormwater Quality Performance Standards contained in Table 8 below are taken from the November 1997 revised Stormwater Management policy issued by Mass. D.E.P. Water quality is also a key element of the EPA Phase II permitting process for the Town of Dedham. These performance standards serve as a basis for the design standards contained within these regulations.

b.) Applicability. The Stormwater Quality Performance Standards shall apply as follows:

1. All new stormwater conveyances (outfalls/discharges) shall not discharge untreated stormwater.

2. Existing stormwater conveyances shall be modified to comply with this regulation to the maximum deemed practical by the Conservation Commission. Such cases may be associated with the redevelopment of a previously developed site.

3. All roadway construction.

4. All commercial properties other than SFDs. This includes the expansion of existing commercial buildings and properties.

5. See the Dedham Stormwater Bylaw and associated Rules and Regulations for a complete list and explanation regarding the applicability of stormwater quality performance standards.

SECTION 9. GROUNDWATER RECHARGE (DEP Standard 3) DESIGN AND CALCULATIONS

a.) In accordance with DEP Stormwater Standard 3 on Table 8 above, the annual groundwater recharge from the post-development site shall be approximately equal to or greater than the annual groundwater recharge from the existing site. This shall be determined using soil classification and ground cover as a design basis. The values in Table 9 derived from NRCS County Soils Survey shall be utilized in design of ground water recharge:

1. Soils at planned points of stormwater runoff infiltration must be investigated and confirmed for adequate permeability, due to the generalized nature and the possibility of "inclusions" within some mapped NRCS soil units.

TABLE 8 D.E.P. STORMWATER QUALITY PERFORMANCE STANDARDS	
1	No new stormwater conveyances (e.g., outfalls) may discharge untreated stormwater or cause erosion.
2	Stormwater management systems must be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.
3	Loss of annual recharge to groundwater should be minimized through the use of infiltration measures to the maximum extent practicable. The annual recharge from the post-development site should approximate the annual recharge from the pre-development or existing site conditions, based on soil types.
4	For new development, stormwater management systems must be designed to remove 80% of the average annual load (post-development conditions) of Total Suspended Solids (TSS). It is presumed that this standard is met when: (a) Suitable nonstructural practices for source control and pollution prevention are implemented; (b) Stormwater management best management practices (BMPs) are sized to capture the prescribed runoff volume; and (c) Stormwater management BMPs are maintained as designed.
5	Stormwater discharges from areas with higher potential pollutant loads require the use of specific stormwater management BMPs (see chart on page). The use of infiltration practices without pretreatment is prohibited.
6	Stormwater discharges to critical areas must utilize certain stormwater management BMPs approved for critical areas (see list on page 1-8). Critical areas are Outstanding Resource Waters (ORWs), shellfish beds, swimming beaches, cold water fisheries and recharge areas for public water supplies.
7	Redevelopment of previously developed sites must meet the Stormwater Management Standards to the maximum extent practicable. However, if it is not practicable to meet all the Standards, new (retrofitted or expanded) stormwater management systems must be designed to improve existing conditions.
8	Erosion and sediment controls must be implemented to prevent impacts during construction or land disturbance activities.
9	All stormwater management systems must have an operation and maintenance plan to ensure that systems will function as designed.

2. Infiltration systems which do not utilize pretreatment are prohibited, with the exception of infiltration systems which receive runoff only from non-metal roofs. Infiltration systems which receive runoff from both roofs and other surfaces must provide pre-treatment for the inlets not from non-metal roof surfaces. Section 9.d below contains specifications and standards for pre-treatment.

c.) The annual groundwater recharge shall be calculated using the method outlined below.

1. The Hydrologic Grouping for the soil(s) present on the project site shall be determined utilizing the Soil Survey of Norfolk and Suffolk Counties, Massachusetts published by the United States Department of Agriculture Soil conservation Service. A plan showing the project site superimposed onto the Soils Map shall be provided as part of the submission to the Town.

TABLE 9 GROUNDWATER RECHARGE VOLUME VALUES	
HYDROLOGIC SOIL GROUP	**V_R = RECHARGE VOLUME FACTOR**
A	0.40 inches of runoff
B	0.25 inches of runoff
C	0.10 inches of runoff
D	0.00 (usually unbuildable) **(a)**

Notes:

(a) Hydrologic Group D soils are usually unbuildable because they are usually inundated with water for much of the year and are often subject to flooding. Hydrologic Group D soils are often found in wetland areas as defined under the Massachusetts Wetlands Protection Act and the Town of Dedham General Wetlands Protection Bylaw. Hydrologic Group D soils usually consist of thick layers of organic materials which lack the structural integrity and load bearing capacity to support a structure. They also often have poor compactibility and are prone to expansion when saturated with water, making them unsuitable for use as a subgrade under a paved surface or foundation footing.

2. Should the project site contain soils of more than hydrologic group, the Groundwater Recharge Volume Value shall be weighted based upon the coverage areas of each of the hydrologic soil groupings utilizing Formula 1 below. If the project site consists of soils of only a single hydrologic group, you can go directly to Formula 2 to calculate the minimum stormwater storage volume for the groundwater recharge system.

$$V_F = \Sigma(A_{IHG} \times V_R) / A_I$$

Where:

V_F = the Weighted Recharge Volume factor for the site

A_{IHG} = the impervious area located within each of the hydrologic soil groups on the site

V_R = the Volume Recharge Factor from Table 9

A_I = the total impervious area of the project site

* Please note, both A_{IHG} and A_I should be in the same units, usually square feet or acres.

$$S_V = A_I \times V_F$$

Where:

S_V = the minimum stormwater storage volume of the groundwater recharge system

A_I = the total impervious area of the project site

V_F = the Weighted Recharge Volume factor for the site

3. The groundwater recharge system shall be designed to have a minimum stormwater storage capacity calculated utilizing Formula 2 above.

4. The groundwater recharge system shall be designed to fully infiltrate the Storage Volume calculated utilizing Formula 2 above within a 48 hour period from the end of the storm event. The infiltration rate and capacity of the groundwater recharge system shall be calculated using the stormwater infiltration system design standards contained in Section 6 of these Rules and Regulations.

d.) Groundwater recharge pre-treatment shall meet the following specifications and standards:

1. Pre-treatment systems shall be designed to have a 44% TSS removal rate prior to discharging to groundwater recharge system. This is to prevent plugging and failure of the groundwater recharge system by sediment and other debris.

2. The 44% TSS removal rate is based upon the use of two separate BMPs rated as having a 25% TSS removal rate.

3. Two deep sump catch basins connected in series may not be utilized to meet this 44% TSS removal requirement for pre-treatment. Such a configuration would result in re-suspension of solids in the second catch basin.

4. For systems which discharge to critical resource areas or are associated with projects with higher potential pollutant loading as defined in Table 12 below, the Town of Dedham reserves the right to require the pre-treatment system to be designed to target specific pollutants.

TABLE 10
TYPICAL NON-STRUCTURAL PRACTICES FOR STORMWATER MANAGEMENT

1	Operation & Maintenance Plan establishing a schedule for cleaning up trash around the site and the sweeping of paved surfaces. See Section 15 for additional details. Such requirements are in addition to the maintenance schedule of the site's drainage system as required under Standard 9 of the DEP Stormwater Policy (see table 8 of this document).
2	Utilizing vegetated drainage swales instead of paved, concrete or rip-rap lined swales. This includes replacement of existing impervious drainage swale surfaces.
3	Limits on the types and amount of fertilizers and pesticides used on the site.
4	Snow disposal plan, including designated area for snow disposal on site and/or plan for having snow removed and disposed off-site at a suitable location.
5	The use of landscaping strips capable of filtering surface runoff prior to leaving site or entering resource area.
6	Proper handling and storage of any materials or chemicals which may be utilized on the site.
7	Placing prohibitions against certain types of activities on the site. For example, an auto parts store can prohibit customers from performing work on their vehicles in the parking lot.
8	Limitations on the amount of salt or other deicing chemicals used on the site. Please note that the use of any other deicing chemical other than salt must be approved by the Conservation Commission.
9	Education of business personnel (for business properties) regarding the stormwater requirements/restrictions which may be in place on the property.
10	Proper disposal of grass cuttings and other cut vegetation. Such materials should not be disposed of in a water body or wetland area.
11	Designing drainage discharges from roof areas to flow across vegetated areas in cases where groundwater recharge cannot be performed.

SECTION 10. TSS REMOVAL (DEP Standard 4) DESIGN AND CALCULATIONS

TABLE 11
BMP REMOVAL RATE TABLE

BMP List	Design Rate to be Used	Range of Average TSS Removal Rates	Brief Design Requirements	Notes
Extended Detention Pond	70%	60-80%	Sediment forebay	(a)
Wet Pond	70%	60-80%	Sediment forebay	(a) (b)
Constructed Wetland	80%	65-85%	Designed to infiltrate or retain	(c)
Water Quality Swale	70%	60-80%	Designed to infiltrate or retain	
Infiltration Trench	80%	75-80%	Pretreatment critical	
Infiltration Basin	80%	75-80% (Predicted)	Pretreatment critical	
Dry Well	80%	80% (Predicted)	Rooftop runoff	(d)
Sand Filter (e)	80%	80%	Pretreatment	
Organic Filter (f)	80%	80%	Pretreatment	
Water Quality Inlet	25%	15-35% w/ cleanout	Off-line only; 0.1* minimum Water Quality Volume (WQV) storage	
Sendiment Trap (Forebay)	25%	25% w/ cleanout	Storm flows for 2 year event must not cause erosion; 0.1* minimum WQV storage	
Drainage Channel	25%	25%	Check dams; non-erosive for 2 year storm event	
Deep Sump and Hood Catch Basin	25%	25% w/ cleanout	Deep Sump general rule=4 x pipe diameter or 4.0' for pipes 18" or less	

Notes:

(a) Design rate listed includes Sediment Forebay. Sediment forebay may not be counted separately.

(b) Includes wet extended detention ponds, wet ponds, multiple pond designs.

(c) Includes shallow marsh, extended detention wetlands, pocket wetland, and pond/wetland designs

(d) Rooftop runoff, uncontaminated only (no metal roofs)

(e) Includes surface, underground, pocket, and perimeter designs.

(f) Includes compost, peat/sand and bio/filtration designs.

a.) Stormwater management systems associated with new conveyances shall be designed to remove eighty percent (80%) of the average annual load of Total Suspended Solids based on proposed post-development conditions. The following methods shall be utilized to meet this requirement:

1. Suitable nonstructural practices for source control and pollution prevention are implemented. Table 10 above contains a list of suitable nonstructural practices which are acceptable to the Town of Dedham.

2. Stormwater management system Best Management Practices (BMPs) shall be sized to treat the calculated runoff volumes. Table 11 contains a list of the BMPs which have been approved for use in all locations. Additional BMP's may be permitted provided that sufficient supporting information is provided for the review and approval of the Conservation Commission under the provisions of the Dedham Stormwater Management Bylaw. The values in column 2 under "Design Rate to be Used" are the BMP removal rate values to be utilized in calculating the BMP removal capacity of the proposed stormwater management system.

3. TSS removal calculations shall be provided showing that the proposed system meets this design criteria. Total TSS removal shall be calculated utilizing the form provided in Appendix 3 of these Rules and Regulations. An example illustrating the use of this form is also included in Appendix 3.

4. The first inch of runoff from all impervious surfaces shall be retained and treated by the stormwater management system. Calculations shall be provided showing that the proposed system meets this design criteria.

   A. The stormwater management systems for uses with higher potential pollutant loads shall be required to retain the first inch of runoff from all impervious surfaces. A list of such uses is provided in Table 12.

   B. The stormwater management system controls must be developed for the 2, 10 and 25 year storm events. The 100 year 24 hour storm event must be evaluated to demonstrate that there will not be increased flooding impacts off-site and to ensure that the proposed TSS removal system can accommodate it. This may require the use of flow bypass systems for BMP devices with limited flow capacity such as Stormceptor type treatment units.

5. An Operation and Maintenance plan for stormwater BMPs shall be implemented and submitted as part of the project filing.

SECTION 11. STORMWATER DISCHARGES FROM AREAS WITH HIGHER POTENTIAL POLLUTANT LOADS (DEP Standard 5)

a.). The Commission shall require additional stormwater management for projects which may generate higher potential pollutant loads.

1. Such projects and uses include those listed in Table 12 below.

b.) The following will be required in areas with higher pollutant loads:

1. The first inch of runoff from all impervious surfaces shall be retained and treated by the stormwater management system. Calculations shall be provided showing that the proposed system meets this design criteria.

2. Source reduction (pollution prevention, maintenance and snow management)

3. Pretreatment (water quality inlets, sediment traps, drainage channels, water quality swales, and deep sump catch basins)

TABLE 12 PROJECTS REQUIRING ADDITIONAL STORMWATER MANAGEMENT (DEP Standard 5)	
1	Stormwater discharges associated with Standard Industrial Classifications (NPDES stormwater permit program requirements apply)
2	Auto salvage yards (auto recycler facilities)
3	Auto fueling facilities (gas stations)
4	Fleet storage areas (cars, buses, trucks, public works)
5	Vehicle service, maintenance and equipment cleaning areas and business sites
6	Commercial parking lots with high intensity use. Such areas include fast-food restaurants, convenience stores, high-turnover (chain) restaurants, shopping centers and supermarkets
7	Road salt storage areas
8	Commercial nurseries and landscaping supply operations
9	Metal rooftops, including roofs made from aluminum, tin, galvanized steel, copper, or rooftops which have been documented to contribute significant pollutant loads
10	Outdoor storage and loading/unloading areas of hazardous substances
11	SARA 312 generators (if materials or containers are exposed to rainfall)
12	Marinas (service, repainting, and hull maintenance areas

c.) Table 13 contains a list of the stormwater BMP devices which are prohibited within areas of higher potential pollutant loads:

TABLE 13 STORMWATER BMPs PROHIBITED IN AREAS WITH HIGHER POTENTIAL POLLUTANT LOADS		
Item #	**BMP List**	**Notes**
1	Infiltration Trenches	
2	Infiltration Basins (detention ponds designed to infiltrate stormwater as part of treatment)	
3	Dry Wells and underground Infiltration Chambers	
4	Sand or Organic Filters	**(a)**

5	Detention Basins	**(a)**
6	Wet Ponds	**(a)**
7	Constructed Wetlands	
8	Non-impervious Drainage Swales	**(b)**

Notes:

(a) May be permitted in areas not located within a Wellhead Protection District if constructed with an impervious liner. A waiver from the Conservation Commission would be required.

(b) All drainage swales must be lined with concrete, asphalt, or other material which prohibits groundwater infiltration. An impervious liner may be used under certain conditions.

SECTION 12. STORMWATER DISCHARGES TO CRITICAL RESOURCE AREAS (DEP Standard 6)

a.) Stormwater management systems which discharge to or near Critical Resource Areas shall be designed to treat the first inch of runoff from all impervious surfaces. Calculations shall be provided showing that the proposed system meets this design criteria.

1. Clean stormwater runoff from non-metal roof surfaces can be directly infiltrated into the ground without treatment. The impervious roof area can be subtracted from the required stormwater system treatment volume if it can be shown that the roof infiltration system is designed to accommodate the infiltration of 1 inch of runoff from the roof area in accordance with the design standards set forth in Section 6 of these Rules and Regulations.

b.) Table 14 contains a list of water bodies and other areas which qualify as Critical Resource Areas in the Town of Dedham.

TABLE 14
CRITICAL RESOURCE AREAS WITHIN THE TOWN OF DEDHAM
(DEP Standard 6)

1	Well Head Protection Areas of Dedham-Westwood Water District public water supply wells
2	Fowl Meadow ACEC (Area of Critical Environmental Concern). This area incorporates the Neponset River and its associated wetlands corridor through Dedham
3	Areas designated as an Estimated Habitat of Rare Wildlife or Vernal Pool by the Massachusetts Heritage and Endangered Species Program
4	The Wigwam Pond system, including Wigwam Pond, Little Wigwam Pond, Wigwam Brook, Little Wigwam Brook, East Brook and associated wetlands. This system contains shellfish habitat
5	The Charles River and its associated wetlands corridor. Several public water supply wells are located along the Charles River within Dedham. Also several communities downstream of Dedham utilize the Charles River for public recreation and water supply.

c.) Stormwater management systems which discharge directly to a Critical Resource Area or to an existing drainage conveyance system which discharges to a Critical Resource Area shall be designed to

incorporate an emergency shut-down and containment system in the event of an emergency oil/chemical spill or other unexpected contamination event.

1. Shut-down systems include the use of flashboards to close an outlet structure, plugs or valves to stop flow through an outlet pipe.

2. The Town shall be provided with 24 hour emergency contact numbers of the parties responsible for the operation and maintenance of the Stormwater system. The Town shall also be given access to any flashboards or other equipment utilized to shut-down the system.

d.) Table 15 on the following page contains a list of stormwater BMPs approved for use near critical areas.

e.) If a project is proposed to discharge stormwater into or near a Critical Resource Area, it is likely that the project will also require the filing of a Notice of Intent with the Conservation Commission. The Town of Dedham has a Wetlands Protection Bylaw and associated Rules and Regulations which set forth additional standards for work within and adjacent to areas subject to jurisdiction under the Wetlands Protection Bylaw.

TABLE 15
STORMWATER BMPs APPROVED FOR USE NEAR CRITICAL RESOURCE AREAS (DEP Standard 6)

Item #	BMP List	Notes
1	Wet Ponds	(a)(d)
2	Constructed Wetlands	(a)(b)
3	Extended Detention Basins	(c)(d)
4	Water Quality Swales	(a)
5	Sand Filters	(b)(d)
6	Organic Filters	(b)(d)
7	Infiltration Basins	(a)
8	Infiltration Trenches	(a)
9	Deep Sump (4' sump) & Hooded Catch Basins	

Notes:

(a) May not be utilized for projects with higher potential pollutant loads listed on Table 7.

(b) May not be utilized as primary BMP. May be used as a "finishing device" prior to discharge of water.

(c) Extended Detention Basins shall have a minimum average detention time of 12 hours.

(d) May be subject to restrictions when utilized for projects with higher potential pollutant loads listed on Table 7.

SECTION 13. REDEVELOPMENT OF PREVIOUSLY DEVELOPED SITES (DEP STANDARD 7)

a.) Redevelopment Projects shall meet the drainage and stormwater standards set forth in these Rules and Regulations to be extent practicable. Factors which may be considered when determining the "extent

practicable" are physical limitations imposed by the site as well as prohibitive cost to strictly and completely comply with these regulations.

b.) A project will only be considered a Redevelopment Project if it meets all the following applicable criteria:

1. No net increase in impervious area.

2. The proposed project will not include any work on any previously undeveloped sites.

3. For existing roadways, any widening must be less than a travel lane.

SECTION 14. EROSION AND SEDIMENTATION CONTROLS (DEP STANDARD 8)

a.) Erosion and sedimentation controls shall be required as part of any proposed construction or earthwork activities. An erosion and sedimentation control plan shall be required as part of any Drainage or Stormwater filing with the Town of Dedham. Erosion control plans may also be required for any wetlands filing with the Dedham Conservation Commission. The EPA Phase II Permitting process requires erosion and sedimentation controls for all projects proposing one acre or more disturbance area.

1. Erosion controls shall be designed to control any wastes, solid or liquid, which may potentially impact water quality.

b.) All erosion and sedimentation control plans shall include the following information:

1. Title Block: All plans shall include a title block which lists the name of the project, owner's name and address, applicant's name and address, engineer's name, address, telephone number, plan date, revision date(s), and plan scale, including a graphical scale representation.

2. Resource Area Information: The limit of any resource areas located on the site. This includes any resource area as defined under the Massachusetts Wetlands Protection Act, the Town of Dedham General Wetlands Protection Bylaw, as well as areas of 100 year Floodplain and Aquifer Protection District.

3. Topography: Existing and proposed contours at 1 foot vertical increments shall be shown on all plans. All topographic information shall be referenced to the 1988 U.S.G.S. North America Vertical Datum (N.A.V.D.). All topography shall be labeled in such a manner as to clearly indicate the contour elevation and to differentiate between existing and proposed contour lines. Reference benchmarks shall be noted on the plan with location and elevation.

5. Structures & Utilities: All existing and proposed structures shall be shown and appropriately labeled on the site plan. All utilities, including utility poles, which are located within the area of the proposed work shall be located and shown. Existing and proposed drainage structures and pipes shall be labeled to indicate invert, size, and slope.

5. Paved & Impervious Surfaces. All existing and proposed paved and impervious surfaces shall be shown and appropriately labeled on the site plan.

6. The location of all proposed erosion controls.

7. The limit of all proposed earthwork.

8. Construction details for each type of erosion control proposed for the site.

9. The proposed location for the stockpiling of excavated soil materials during construction.

10. If a project is to be constructed in stages, the plan will indicate when erosion controls will be placed.

b.) Additional erosion control barriers may be placed as required by site conditions in areas subject to erosion and sedimentation unanticipated by construction plans. Weekly inspection will help to identify any area along, the erosion control barrier requiring maintenance or repair.

c.) The following steps shall be implemented to ensure erosion and sediment control during site development:

1. Prior to the commencement of excavation or construction, the wetlands shall be flagged in such a manner as to be clearly visible to any machine operator in all areas where work is within 25 feet of the edge of Bordering Vegetated Wetland on the project site.

2. Prior to the commencement of construction, erosion control barriers shall be staked in place as detailed on the approved plan. These erosion control barriers are to consist of silt fence backed by haybales staked in place as detailed in the erosion control barrier detail.

3. Prior to commencement of additional site work, the applicant or his representative shall meet with the Stormwater Officer to review the erosion control barrier installation. Site clearing work should not commence without a clear understanding of the erosion control measures to be implemented. The applicant or his representative will also review copies of the silt fence inspection log which will be filled in weekly by the applicant or his representative and returned each month to the Town.

4. Exposed soils shall be stabilized as soon as possible following, establishment of final contours in the project area and following completion of the proposed planting program in those areas. Erosion control barriers shall be removed following satisfactory completion of the proposed construction work and the establishment of stabilizing vegetation in the areas of proposed work. If weather conditions require, the area shall be covered with mulch, hay, broadcast seed or hydromulch to reduce the potential for erosion. The appropriate seed mix is dependent on the season in which the work will be done. Seed mixes may be obtained from Erosion and Sedimentation Control Guidelines published by the Commonwealth of Massachusetts, DEQE, August 1983 as it may be updated from time to time by DEP.

5. The erosion control barriers shall be inspected weekly by the owner/applicant after each storm event. A log of checks and appropriate remedial action taken by the applicant shall be sent to the Town by the first of each month until the project has been completed and the' fencing- and haybales have been removed.

SECTION 15. OPERATION AND MAINTENANCE PLANS (DEP STANDARD 9)

a.) An Operation and Maintenance plan (O&M Plan) shall be required for all projects and should identify at a minimum:

1. Stormwater management system(s) owner(s)

2. The party or parties responsible for operation and maintenance

3. The types and frequency of maintenance tasks to be performed including:

A. Removal and disposal of sediments and other collected pollutants

B. Emergency maintenance procedures

4. The Operation and Maintenance Plan spreadsheet contained in Appendix 4 shall be used to indicate the frequency of the various maintenance tasks to be performed on the site.

b.) Maintenance Schedule. Any project which involves the use of drainage structures, including swales and ponds, shall include a scheduled maintenance plan.

1. Details of such a maintenance schedule shall be submitted to the Town at the time of application.

2. Such maintenance plans shall be designed to ensure that Water Quality standards are met throughout the year.

SECTION 16. DESIGN STANDARDS

All projects shall be designed and constructed to meet the standards set forth in the **Town of Dedham Construction Detail Manual** in addition to any applicable design and construction standards set by the Planning Board and Conservation Commission.

SECTION 17. INSPECTION REQUIREMENTS

a.) EROSION CONTROLS:

1. The Stormwater Officer shall inspect the erosion controls prior to the start of any earthwork associated with the project. The applicant shall provide the Town with a 48 hour notice prior to the start of earthwork to allow time for the erosion controls to be inspected.

b.) GROUNDWATER RECHARGE SYSTEM CONSTRUCTION & INSPECTION:

1. The Stormwater Officer shall inspect the excavation for the subsurface recharge system prior to placement of the drywell structure. This is to ensure that the underlying soils are clean and suitable for groundwater recharge and agree with the soil conditions assumed by the project designer.

2. The Stormwater Officer shall inspect the subsurface recharge system structure prior to backfilling to ensure that the structure has been constructed in accordance with approved plans.

3. The Conservation Commission will entertain alternatives to drywells, such as cisterns and other water collection systems for collection of stormwater runoff water for non-domestic use.

c.) DETENTION / INFILTRATION POND CONSTRUCTION & INSPECTION:

1. The Stormwater Officer shall inspect the excavation for the detention / infiltration pond area prior to the placement of the bank washed gravel subgrade required under Section 6.a.3 of these Rules and Regulations. This inspection is to ensure that the underlying soils present agree with the soil conditions assumed by the project designer and to determine the presence of any groundwater.

2. The Stormwater Officer shall inspect the detention / infiltration pond once it has been finish graded and the outlet structure(s) have been installed. An as-built plan of the pond shall also be submitted at this time for review to ensure that the pond has been constructed in accordance with approved plans.

SECTION 18. WAIVERS

a.) The Dedham Planning Board and Conservation Commission shall have the discretionary authority to grant waivers to any section of these Standards for any application presented before their respective boards.

b.) Any applicant may submit a written request to be granted such a waiver. Such a request shall be accompanied by an explanation or documentation supporting the waiver request and demonstrating that:

1. Strict application of the Rules and Regulations will result in an undue hardship.

2. Substantially the same level of performance and stormwater quality required by the Town of Dedham Stormwater Bylaw will be provided without strict application of the Drainage and Stormwater Regulations.

c.) All waiver requests shall be discussed and voted on at the public hearing for the project.

d.) If in the Planning Board or Conservation Commission's opinion, additional time or information is required for review of a waiver request, the body hearing the waiver request may request to continue a hearing to a date certain announced at the meeting. In the event the applicant objects to a continuance or postponement, or fails to provide requested information, the waiver request will be denied.

SECTION 19. MEETING REQUIREMENTS

a.) Pre-Submittal Meeting:

1. It is strongly recommended that applicants and their engineering consultants have pre-submittal meetings with representatives of the Planning Board, Conservation Commission and Department of Public Works.

2. Projects which should have pre-submittal meetings include:

A. Subdivision projects proposing new streets.

B. Commercial site development / redevelopment projects.

C. Residential projects other than single family and duplex houses.

b.) Pre-Construction Meeting:

1. Pre-Construction meetings shall be required for all projects other than single-family and duplex residences.

SECTION 20. AS-BUILT PLANS

a.) As-built plans are required for all drainage systems constructed within the Town of Dedham which require approval from the Town. As-built plans require the following items:

1. Certification: All as-built plans shall contain a statement certifying that the work performed has been done in conformance with the Order of Conditions issued by the Dedham Conservation Commission. This certification shall be accompanied by the signature and stamp of a Professional Engineer (Civil discipline) or a Registered Land Surveyor licensed by the Commonwealth of Massachusetts. A further certification shall state that the information contained on the as-built plan has been obtained through an actual field survey of the project.

2. Limit of Work: As-built plans shall delineate the limits of grading, clearing, and construction performed by the project.

3. Topography: As-built plans shall show the finished grades of the project. Benchmark references shall be provided as outlined in Section 3.e.3 of these Rules and Regulations.

4. Structures and Utilities: All structures and utilities constructed or altered as part of the project shall be shown on the as-built plan. Details such as floor and sill elevations for structures and inverts, pipe sizes, materials and slopes shall be included for all drainage and sewerage utilities constructed.

5. Electronic copies of all As-Built plans are required. These plans shall meet the requirements set forth by the GIS System Manager and any GIS Bylaw or regulations which may be adopted.

END OF DEDHAM DRAINAGE AND STORMWATER REGULATIONS

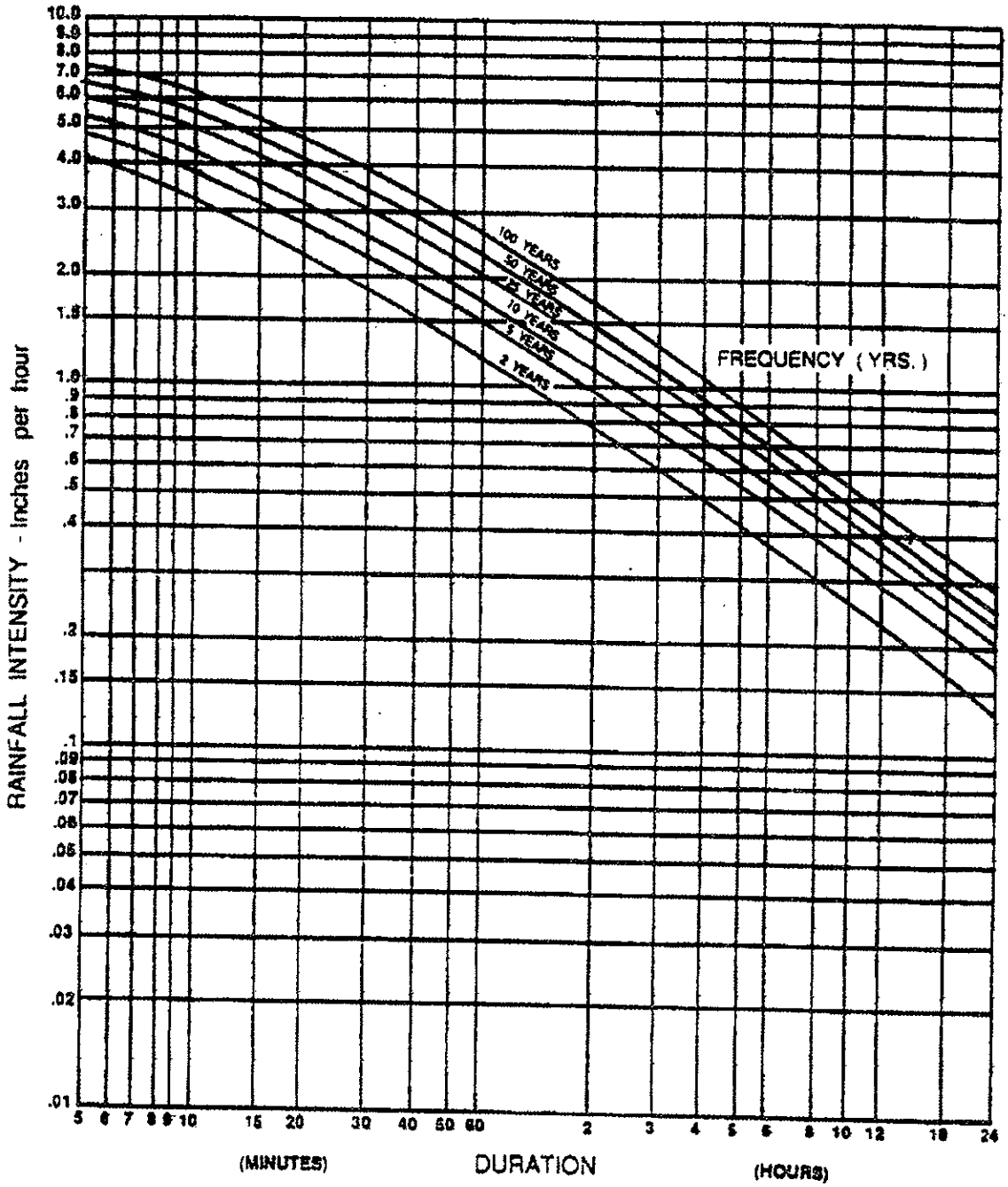
APPENDIX 1

RATIONAL METHOD CURVES

26 Bryant Street, P.O. Box 306, Dedham, MA 02027-0306 • Phone (781) 461-5980 • Fax (781) 461-5992

APPENDIX 1
RATIONAL METHOD CURVES TO BE UTILIZED FOR DRAINAGE DESIGN

RATIONAL METHOD CURVES



Source: Massachusetts Highway Department Design Manual

The TOWN OF DEDHAM
COMMONWEALTH OF MASSACHUSETTS
CONSERVATION COMMISSION

APPENDIX 2

MANNING'S COEFFICIENTS TO BE UTILIZED FOR DRAINAGE DESIGN

26 Bryant Street, P.O. Box 306, Dedham, MA 02027-0306 • Phone (781) 461-5980 • Fax (781) 461-5992

APPENDIX 2 MANNING'S COEFFICIENTS TO BE UTILIZED FOR DRAINAGE DESIGN			
CHANNEL MATERIAL			MANNING'S NUMBER
I.		**CLOSED CONDUITS**	
A		Concrete Pipe (rubber or mortared joints)	0.012
B		Corrugated Metal Pipe (standard 2.5" x 1.5" corrugation)	0.024
	1	Corrugated Metal Pipe (2.5" x 1.5") – paved invert – DESIGN FLOW FULL DEPTH	0.020
	2	Corrugated Metal Pipe (2.5" x 1.5") – paved invert – DESIGN FLOW 0.8 DEPTH	0.019
	3	Corrugated Metal Pipe (2.5" x 1.5") – paved invert – DESIGN FLOW 0.6 DEPTH	0.016
C		Corrugated Metal Pipe (6" x 2" corrugation) field bolted	0.030
D		Cast Iron (uncoated)	0.013
E		PVC Pipe (dry fit rubber joints)	0.011
F		Steel Pipe	0.011
G		Brick (well mortared joints)	0.016
H		Monolithic Concrete	
	1	Monolithic Concrete – rough wood forms	0.016
	2	Monolithic Concrete – smooth wood forms	0.013
	3	Monolithic Concrete – steel forms	0.012
I		Cemented Rubble Masonry Walls	
	1	Concrete floor and top	0.020
	2	Natural floor	0.022
J		Laminated Treated Wood	0.016
K		Vitrified Clay pipe (including vitrified clay lined pipes)	0.015
II.		**OPEN CHANNELS, LINED (straight alignment)**	
A		Concrete with surfaces as indicated	
	1	Formed, no finish	0.016
	2	Trowel finish	0.014
	3	Float finish	0.014
	4	Float finish, some gravel on bottom	0.016

	5	Gunite, good section	0.018
	6	Gunite, wavy section	0.020
B		Concrete bottom, flat finished, channel sides as indicated:	
	1	Dressed stone in mortar	0.016
	2	Random stone in mortar	0.019
	3	Cement rubble masonry	0.023
	4	Cement rubble masonry, plastered	0.019
	5	Dry rubble (rip-rap)	0.030
C		Gravel bottom, channel sides as indicated:	
	1	Formed concrete	0.019
	2	Random stone in mortar	0.022
	3	Dry rubble (rip-rap)	0.032
D		Brick	0.016
E		Asphalt:	
	1	Smooth	0.013
	2	Rough	0.016
F		Wood, planed, clean	0.012
G		Concrete lined, excavated rock:	
	1	Good section	0.019
	2	Irregular section	0.025
III.		**OPEN CHANNELS, EXCAVATED, NATURAL LINING (straight alignment)**	
A		Earth, uniform section:	
	1	Clean, after weathering (also to be utilized for recently completed channels)	0.019
	2	With short grass (mowed regularly) few weeds	0.026
	3	In gravelly soil, uniform section, clean	0.024
B		Earth, fairly uniform section:	
	1	No vegetation	0.024
	2	Grass, some weeds	0.028

	3	Dense weeds or aquatic plants in deep channels	0.033
	4	Sides clean, gravel bottom	0.028
	5	Sides clean, cobble bottom	0.037
C		Dragline excavated or dredged:	
	1	No vegetation	0.031
	2	Light brush on banks	0.045
D		Rock:	
	1	Based on design section (to be utilized for preliminary design calculations only)	0.035
	2	Based on actual mean section (smooth and uniform)	0.037
	3	Based on actual mean section (jagged and irregular)	0.043
E		Channels not maintained, weeds and brush uncut:	
	1	Dense weeds, high as flow depth	0.110
	2	Clean bottom, brush on sides	0.070
	3	Clean bottom, brush on sides, highest stage of flow	0.090
	4	Dense brush, high stage	0.130
IV.		**HIGHWAY CHANNELS AND SWALES – MAINTAINED VEGETATION**	
A		Depth of flow up to 0.7 foot:	
	1	Regularly mowed to a height of 2 inches	0.060
	2	Occasionally mowed, average height 4 to 6 inches	0.070
	3	Good grass cover, length about 12 inches	0.100
	4	Good grass cover, length about 24 inches	0.190
	5	Fair grass cover, length about 12 inches	0.090
	6	Fair grass cover, length about 24 inches	0.190
B		Depth of flow 0.7 to 1.5 feet:	
	1	Regularly mowed to a height of 2 inches	0.050
	2	Occasionally mowed, average height 4 to 6 inches	0.055
	3	Good grass cover, length about 12 inches	0.090
	4	Good grass cover, length about 24 inches	0.160

	5	Fair grass cover, length about 12 inches	0.080
	6	Fair grass cover, length about 24 inches	0.150
V.		**STREET AND HIGHWAY GUTTERS***	
A		Concrete gutter, troweled finish*	0.012
B		Asphalt pavement:	
	1	Smooth texture*	0.013
	2	Rough texture*	0.016
C		Concrete gutter with asphalt pavement:	
	1	Smooth texture*	0.013
	2	Rough texture*	0.015
*		For slopes less than 1.5%, add 0.01 to each of the Manning's numbers contained in Section V. This is to account for the higher potential of sediment accumulation.	
VI.		**NATURAL STREAM CHANNELS****	
A		Minor Streams (surface width at flood stage less than 100') Mother Brook, East Brook Wigwam Brook, and Little Wigwam Brook do not fall under this classification:	
	1	Fairly regular section, some grass and weeds, little or no brush**	0.040
	2	Fairly regular section, dense growth of weeds, less than 50% flow depth**	0.045
	3	Fairly regular section, some weeds, light brush on banks**	0.040
	4	Fairly regular section, some weeds, heavy brush on banks**	0.060
	5	Fairly regular section, some weeds, dense vegetation on banks**	0.070
**		For trees within flood area where branches will be submerged during high flood stage, add 0.015 to the Manning's values in items 1-5 above.	
**		For minor streams with irregular channel sections, pooling, and slight meandering, add 0.010 to the Manning's values in items 1-5 above.	
	6	Woodlands streams, with steep banks (such as upper reaches of Lowder Brook), with gravel streambed with cobbles and few boulders	0.045
	7	Woodlands streams, with steep banks (such as upper reaches of Lowder Brook), with gravel streambed with cobbles with large boulders	0.055
B		Floodplains adjacent to natural streams, including East Brook, Wigwam Brook, Little Wigwam Brook, Neponset River and Charles River ***:	
	1	Open field, no brush, mowed regularly***	0.030
	2	Open field, no brush, not mowed***	0.045
	3	Bare soil, recently graded or cleared***	0.045
	4	Heavy weeds and scattered brush***	0.060
	5	Light brush and trees, winter***	0.055

APPENDIX 2
MANNING COEFFICIENTS TO BE UTILIZED FOR DRAINAGE DESIGN

	6	Light brush and trees, summer***	0.070
	7	Medium to dense brush, winter***	0.090
	8	Medium to dense brush, summer***	0.130
	9	Wooded areas with typical underbrush (such as portions of East Brook)***	0.012
***		For the Charles River, Neponset River, Wigwam Brook, Little Wigwam Brook and East Brook, it is important to take into account the available floodplain studies and flood elevation data to determine how the waterway will function under the storm event being analyzed.	

The Manning's roughness coefficients contained in this Appendix are based on the values published by the U.S. Department of Transportation in 1980. The values contained in this Appendix have been modified to affect the prevailing conditions found in Dedham. In the case of culverts and swales, the Manning's coefficients contained in this table are from the higher end of acceptable values to reflect "in use" conditions of drainage systems.

The TOWN OF DEDHAM
COMMONWEALTH OF MASSACHUSETTS
CONSERVATION COMMISSION

APPENDIX 3

BMP SYSTEM, TSS REMOVAL WORKSHEET

26 Bryant Street, P.O. Box 306, Dedham, MA 02027-0306 • Phone (781) 461-5980 • Fax (781) 461-5992

SWP File Number

BSWP-

Watershed _____

Town **DEDHAM**

Applicant _____

TOWN OF DEDHAM

COMMONWEALTH OF MASSACHUSETTS

BMP SYSTEM, TSS REMOVAL WORKSHEET

THIS FORM TO BE COMPLETED AND STAMPED BY THE PROJECT ENGINEER

A BMP TYPE	B TSS REMOVAL RATE	C STARTING TSS LOAD	D TSS LOAD REMOVED (BxC)	E TSS LOAD REMAINING (C-D)
BMP 1		1.00		
BMP 2				
BMP 3				
BMP 4				
BMP 5				
TOTAL SUSPENDED SOLIDS (TSS) REMOVED =				

Project Address _____

Assessors Map No. _____ Parcel No. _____

Affix P.E. Stamp here

Engineer _____

Address _____

Town _____ State _____ Zip _____

Phone # _____ Fax # _____

E-Mail Address _____

_____

Engineer Signature Date

SWP File Number

BSWP-

Watershed_____

Town **DEDHAM**

Applicant_____

TOWN OF DEDHAM

COMMONWEALTH OF MASSACHUSETTS

BMP SYSTEM, TSS REMOVAL WORKSHEET

INSTRUCTIONS HOW TO UTILIZE AND COMPLETE THIS FORM

A BMP TYPE	B TSS REMOVAL RATE	C STARTING TSS LOAD	D TSS LOAD REMOVED (BxC)	E TSS LOAD REMAINING (C-D)
BMP 1 *Deep Sump & Hooded Catch Basin*	*0.25*	**1.00**	*0.25*	*0.75*
BMP 2 *Extended Detention Pond*	*0.70*	*0.75*	*0.525*	*0.225*
BMP 3 *Drainage Channel*	*0.25*	*0.225*	*0.05625*	*0.169*
BMP 4				
BMP 5				
TOTAL SUSPENDED SOLIDS (TSS) REMOVED =			*0.831*	

1. One of these forms shall be completed for each individual stormwater conveyance system associated with the project.

2. In this example, the TSS removal form is filled out for a TSS removal system which consists of a Deep Sump & Hooded Catch Basin which flows to an Extended Detention Pond and discharges to a Drainage Channel.

3. The table must be filled out in the order in which the devices appear in the drainage/BMP system.

4. Please note that the effective TSS removal rate of the BMPs have a diminishing rate of efficiency with the more BMPs placed in front of them. In this example, the Extended Detention Pond has only a 52.5% effective TSS removal rate and the Drainage Channel has only a 5.6 % effective TSS removal rate.

The TOWN OF DEDHAM
COMMONWEALTH OF MASSACHUSETTS
CONSERVATION COMMISSION

APPENDIX 4

OPERATION & MAINTENANCE PLAN SCHEDULE TABLE

26 Bryant Street, P.O. Box 306, Dedham, MA 02027-0306 • Phone (781) 461-5980 • Fax (781) 461-5992

OPERATION AND MAINTENANCE PLAN

PROJECT LOCATION_____ DATE _____

Extent of Service	FREQUENCY OF SERVICE								
	DAILY (MON-FRI)	WEEKLY	MONTHLY	QUARTERLY	SEMIANNUALLY	ANNUALLY	TIMES PER WEEK	TIMES PER MONTH	TIMES PER YEAR
1. Trash & Debris Collection & Removal from									
a. parking areas									
b. walkways									
c. driveways									
d. landscape islands									
e.									
f.									
g.									
2. Empty Covered Trash Receptacles									
3. Empty Lined Trash Receptacles									
4. Weed Removal From									
a. parking areas									
b. light pole base areas									
c. curbings									
d. landscape islands									
e. building fronts									
f. sidewalks									
g. garden beds									
h.									
i.									
j.									
5. Mowing & Raking all Grass Areas									
6. Sweeping									
a. parking areas									
b. sidewalks									
c. parking islands									
d.									
e.									
7. Catch Basins									
a. inspection									
b. cleaning of basin sump									
8. Drainage Ponds									
a. inspection									
b. removal of sediments from forebay									
c. removal of sediments from main pond area									
d. cleaning of outlet structure(s)									

OPERATION AND MAINTENANCE PLAN

PROJECT LOCATION_____ DATE _____

Extent of Service	FREQUENCY OF SERVICE								
	DAILY (MON-FRI)	WEEKLY	MONTHLY	QUARTERLY	SEMIANNUALLY	ANNUALLY	TIMES PER WEEK	TIMES PER MONTH	TIMES PER YEAR
9. Drainage Swales									
a. inspection									
b. cleaning									
c.									
d.									
10. Roof Drain System									
a. inspection									
b. cleaning of roof gutters									
11. Infiltration System(s)									
a. inspection									
b. cleaning									
c.									
d.									
12. Spring Clean Up									
a. remove all branches, leaves & sand from lawn									
b. remove all branches, leaves & sand from gardens									
c. loam and seed plow damaged areas									
d. thatch and cut all lawn areas									
e. edge all garden beds									
f. install mulch on garden beds									
h. trim shrubbery as needed									
g. prune shrubbery									
h. fertilization of trees, shrub and lawn areas									
i. aeration of lawn areas									
j. repair of broken curbing									
k.									
l.									
m.									
n.									
13. Fall Clean Up									
a. remove all branches, leaves & debris from lawn									
b. remove all branches, leaves & debris from garden									
c.									
d.									
e.									
f.									
g.									

OPERATION AND MAINTENANCE PLAN

PROJECT LOCATION_____ DATE _____

Extent of Service	FREQUENCY OF SERVICE								
	DAILY (MON-FRI)	WEEKLY	MONTHLY	QUARTERLY	SEMIANNUALLY	ANNUALLY	TIMES PER WEEK	TIMES PER MONTH	TIMES PER YEAR
14. Irrigation System Maintenance									
a. spring start up of system									
b. test and adjust all zones									
c. make repairs, as needed									
d. fall winterization of system									
15. Snow Plowing									
a.									
b.									
c.									
d.									