SECTION 2200

EROSION CONTROL AND WATER POLLUTION CONTROL

1.0 Description

This work shall consist of furnishing, installing, maintaining, removing and disposing of water pollution and erosion control items in accordance with TDEC, WPC, these specifications and as shown in the Plans or as designated by the Town Engineer.

2.0 Maintenance and Removal

Erosion control devices shall be maintained so they properly perform their function until the Town Engineer determines they are no longer needed. The devices shall be inspected for damage and sediment deposits as per TDEC requirements. Damages to or undercutting of the device shall be repaired immediately. Debris or contaminated sediment shall be disposed of in accordance with BMP'S. Clean sediments may be stabilized on site using approved best management practices when the Town Engineer approves.

3.0 Removal

When the Town Engineer determines that an erosion control device is no longer required, the Contractor shall remove the device and all associated hardware from the project limits. When the materials are biodegradable, the Town Engineer may approve leaving the temporary device in place. The Contractor shall stabilize all bare and disturbed soil after removal of erosion control devices using best management practices. If the installation and use of the erosion control devices have compacted or otherwise rendered the soil inhospitable to plant growth, such as construction entrances, the Contractor shall take the measures to rehabilitate the soil to facilitate plant growth. This may include, but is not limited to, ripping the soil, incorporating soil amendments, or other horticultural practices.

SECTION 02200

SOIL EROSION AND SEDIMENTATION CONTROL

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4.0 SOIL EROSION AND SEDIMENTATIONS CONTROL

4.01 GENERAL

This chapter contains standards and specifications for various techniques and devices used in temporary and permanent erosion control, for the purpose of insuring compliance with the Town's Sedimentation & Erosion Control ordinance (i.e. to prevent soil erosion and sedimentation to offsite property or protected areas). These techniques and devices are the minimal acceptable for use in the Town of Collierville. The use of other techniques and devices is acceptable if adequate control is provided by the alternative and prior approval is given based on a review of specifications for the measure.

The techniques and devices in this chapter should generally be used in the locations and under the conditions specified in the standards for the particular measure. No temporary or permanent erosion control devices are allowed to be placed in riparian buffers, unless approved by the Director of Engineering (or designee).

4.02 APPLICABILITY

Temporary and permanent erosion control measures shall be provided for all land disturbing work in accordance with the Town's Sedimentation and Erosion Control Ordinance. While all land disturbing work, regardless of the amount of disturbed area, shall require the installation of temporary and permanent measures to prevent erosion and sedimentation to offsite properties or protected areas, certain categories of land-disturbing work shall be required by the Town to meet additional requirements:

1. Land disturbance exceeding 20,000 sq. ft. – requires erosion control plan approval, a payment of related fees, and a preconstruction meeting before clearing & grubbing and construction may begin.

2. Land disturbance exceeding one acre for a publicly funded project (i.e. a public agency as financially responsible party) – requires plan approval by the Tennessee Department of Environment and Conservation. Copies of approved plans & permits should also be submitted to the Town for record.

3. Land disturbance for the construction of individual residential buildings – requires installation of certain site-specific erosion and control measures prior to specific building inspections. If the amount of disturbed area is 20,000 square feet or greater, an Erosion Control Plan approval is required by the Town. The amount of disturbed area for residential lot construction is determined by the lot or lots that are to be constructed in a subdivision or phase of a subdivision. These lots do not have to be contiguous or being disturbed at the same time.

   For most development-related land disturbance activities, the following shall apply. An erosion control plan must be submitted to and approved by the Town. A land disturbance (grading) permit shall be obtained from the Town, with erosion control plan approval, a preconstruction meeting, and all applicable fees paid prior to issuance of a

Land Disturbance permit. Temporary measures shall be installed and inspected by the Town for compliance. All permanent erosion control measures shall be incorporated into the work at the earliest practical time. All temporary measures shall be maintained until the permanent measures have taken effect or approval to remove such measures has been granted by the Director of Engineering. Temporary and permanent measures shall be coordinated to provide effective and continuous erosion control throughout the construction and post-construction period to minimize siltation of streams, lakes, reservoirs, and other impoundments, ground surfaces and other property. These measures shall remain in effect until the Town gives final approval. Refer directly to the Town's Sedimentation and Erosion Control Ordinance for more detailed specific jurisdictional information.

4.03 TEMPORARY MEASURES

A. Temporary Silt Fence Installation

Silt fence is a temporary sediment filter of geotextile fabrics stretched between and attached to supporting posts (at maximum 6 feet spacing) and a wire fence, with the bottom of the fabric and wire buried in the ground. Silt fence shall be used below small disturbed areas less than ¼ acre per 100 feet of fence, where runoff can be stored behind the silt fence without damaging the fence or submerged area behind the fence. Silt fence is not intended for installation across areas of concentrated flow (i.e. streams, ditches, or waterways).

Silt fence shall consist of metal fence posts, wire fence, filter fabric, staples and wire. The wire fence shall be "hog wire", minimum 14 gauge, with maximum mesh of 6 inches. The wire is used to attach the wire fence to the posts. The filter fabric shall be a synthetic geotextile stapled to the top of the wire fence.

Use/Design: Silt fence must be stable for the 10-year peak storm runoff. Silt fence shall be used where the drainage area is no great than ¼ acre per 100 ft. of fence. The depth of impounded water adjacent to silt fence in the design storm shall not exceed 1.5 ft at any point along the fence. The design life of a synthetic silt fence should be 6 months.

Installation: Refer to the approved erosion control plan for location, extent, and specifications. If silt fence is not installed correctly the first time, it will have to be re-installed.

1. Determine the location on the ground taking into consideration:

   a. Sufficient spacing between the silt fence and the construction site for maintenance, grading, filling, and other construction activity.

   b. Installation of the silt fence on the contour so that runoff goes through the silt fence and does not flow along the silt fence to pond at the lowest point. Where ponding does occur, silt fence outlets may be necessary so that the fence does not collapse.

2. Clear the location of the silt fence, clearing only what is needed to provide access by personnel and equipment for installation.

3. Excavate a 4-inch wide x 8-inch deep trench along the location of the fence.

4. Along the lower side of the trench, place steel fence posts no more than 6 feet apart and drive them 18 inches into the ground.

5. Attach wire fence ("hog wire" or min. 14 gauge with max. mesh of 6 inches) to the uphill side of the posts, placing 12 inches of the bottom of the fence into the trench. Use wire to fasten fence to the posts. Completed fence must be at least 2 feet high and no more than 3 feet high.

6. Attach synthetic filter fabric to the uphill side of the wire fence with staples a maximum of 12 inches apart, placing 12 inches of the fabric into the trench with the wife fence. Use rolls of fabric and cut to necessary length in order to minimize the number of joints.

7. Backfill the trench and tamp the fill to firmly anchor the bottom of the filter fabric and wire fence.

8. Where it is impossible to install the silt fence on the contour, runoff will flow along the fence and pond at the lowest point. Where the total drainage area to the point is greater than 5,000 ft^2, a silt fence outlet is required. Where the drainage area is greater than 10,000 ft^2, a sediment trap shall be used in lieu of a silt fence outlet. The location of silt fence outlets should be shown on the plan, with installation checked in the field to determine if additional outlets are needed.

9. Where all runoff is to be stored behind the fence, ensure that the maximum slope length behind a sediment fence does not exceed the specifications shown in Table 4.1 The shorter slope length that is allowed for steeper slopes will greatly reduce the maximum drainage area.

Table 4.1 Maximum Slope Length and Slope for which Sediment Fence is Applicable

Slope	Slope length (ft)	Maximum Area (ft^2)
< 2 %	100	10,000
2 to 5 %	75	7,500
5 to 10 %	50	5,000
10 to 20 %	25	2,500
> 20 %	15	1,500

10. Silt fence shall be installed in accordance with the standard detail, this specification, and the approved erosion control plan.

11. Access to silt fence must be provided in all phases of construction for maintenance and removal purposes. Following are some guidelines for minimum clearance required for silt fence:

a. Allow 15 to 25 feet of space between the fence and any structure for equipment to maneuver for site construction and silt fence maintenance.

b. Allow 15 feet at the bottom of fill slopes over 5 feet high for sediment storage and silt fence maintenance.

B. Silt Fence Outlet

A silt fence outlet is a low point placed (where necessary) along the length of a silt fence to allow water trapped behind the silt fence to drain out, thus minimizing failure of the silt fence. A silt fence outlet consists of a segment of hardware cloth and washed stone placed in the low point of a length of a silt fence. The outlet may not be used in a place of a sediment trap or basin. Provisions shall be made to provide such outlets where necessary to prevent damage and to ensure the maximum filtering efficiency of silt fence.

Use/Design: Obvious points of ponding shall be identified on the erosion control plan and silt fence outlets designated where the drainage area to the point of ponding exceeds 5,000 ft^2. Because it is difficult to predict these locations using a topographic map, points of ponding must be exactly located during installation of the silt fence. Silt fence outlets should NOT be located where the outflow will erode the soil below. A location should be selected that is protected with adequate vegetation, or protection should be provided via stone or layers of filter fabric. Silt fence outlets have the same requirements for access as a silt fence, outlined above.

Installation: Refer to the approved erosion control plan for location, extent, and specifications. If silt fence is not installed correctly the first time, it will have to be reconstructed. Determine the exact location of the outlet before completing installation of the silt fence, taking into consideration:

1. Installation at the lowers point(s) in the fence where water will pond.

2. Maximum allowable drainage area restriction for silt fence.

3. Installation where the outlet is accessible for installation, maintenance and removal.

4. Placement of the outlet so that water flowing through it will not create an erosion hazard below – avoid steep slopes below the outlet and areas without protective vegetation. Use slope drains if necessary.

The silt fence outlet shall be installed in accordance with the standard detail, and the approved erosion control plan.

C. Gravel and Rip Rap Filter Basin (Sediment Trap)

A sediment trap is a small, temporary ponding area formed by an embankment or excavation to detain sediment-laden runoff and trip the sediment. The erosion control

plan should show the sediment trap drawn to scale with adequate room around it for machinery to construct and maintain it during all phases of construction.

Use/Design: Use the following criteria to evaluate the location and to design all types of sediment traps. Sediment traps may be used for ***maximum drainage areas that are 5 acres or less*** and where access can be maintained for sediment removal and proper disposal. Investigate and evaluate the specific conditions on the site, determine if the location is suitable, and design the trap to fit the conditions.

1. Storage Capacity – The minimum volume of the sediment trap shall be 3600 ft^2/acre based on area draining into the basin. Measure volume below the crest elevation of the outlet.

2. Surface Area – The minimum surface area of the trap must be 436 square feet per cfs of Q_{10} peak inflow.

3. Weir Length and Depth – The spillway weir must be designed at least 4 feet long and sized to pass the peak discharge of the 10-yr storm or may be selected from table 4.2. A maximum flow depth of 0.5 feet, a minimum freeboard of 1 foot, and maximum side slopes of 2:1 are recommended. Weir length is to be designed based on the following criteria by using the weir equations $Q = CLH^{3/2}$; H, not to exceed .5' and C=3

Table 4.2 Minimum Weir Length for Sediment Traps

Drainage (Acres)	Minimum Length of Weir (Feet)
1	4.0
2	6.0
3	8.0
4	10.0
5	12.0

4. Total Depth – The minimum depth below the crest of the outlet is 3.5 feet. The maximum depth is 6.5 feet. Depth may vary in different parts of a trap due to topography. Excavate 1.5 feet of the depth of the basin below grade, and provide minimum storage depth of 2 feet above grade.

Installation:

1. **Embankment** – Ensure that embankments for temporary sediments traps do not exceed 5 feet in height measured at the center line from the original ground surface to the top of the embankment. Additional freeboard may be added to the embankment height to allow flow through a designated bypass location. Construct embankments with a minimum top width of 5 feet and side slopes of 2:1 or flatter. Machine compact embankments.

2. **Diversions and Slope Drains** – Runoff must be conveyed into the basin through stable diversions or temporary slope drains. Locate sediment inflow to the basin away from the dam to prevent short circuits from inlets to the outlet.

3. **Outlet Section** – The outlet area of a sediment trap consists of an earthen embankment with filter fabric separating the riprap and wash stone weir. Baffles to lengthen the distance water travels through the sediment trap should be incorporated in the sediment basin. Installation of porous baffles shall be as described in the silt fence specifications outlined in Section 4.03C. Construct the sediment trap outlet with a minimum of 4 feet in length of the embankment made of stone (located at the low point). The stone section serves two purposes: 1) the top section serves as a non-erosive spillway outlet for flood flows, and 2) the bottom section provides a means of dewatering the basin between runoff events.

4. **Stone Size** – Construct the outlet using well-graded stones with a size of 9 inches and a maximum stone size of 14 inches. A 1-ft thick layer of ½ - ¾ inch aggregate (*#57* washed stone is recommended) should be placed on the inside face to reduce drainage flow rate.

5. **Side Slopes** – Keep the side slopes of the spillway section at 2:1 or flatter. To protect the embankment, keep the sides of the spillway at least 21 inches thick.

6. **Depth of Spillway** – Keep the crest of the spillway outlet a minimum of 1.5 feet below the settled top of the embankment.

7. **Protection from Piping** – Place filter cloth on the foundation below the riprap to prevent piping. An alternative would be to excavate a keyway trench across the riprap foundation and up the sides to the height of the dam.

8. **Weir Length and Depth** – Keep the spillway weir at least 4 feet long and sized to pass the peak discharge of the 10-yr storm. A maximum flow depth of 1 foot, a minimum freeboard of 0.5 feet, and maximum side slopes of 2:1 are recommended. Weir length may be selected from Table 4.2.

9. **Stabilization** – Within 5 working days after completion, all areas disturbed for the trap construction must be provided with ground cover sufficient to restrain erosion. Vegetation (either temporary or permanent) should be used on the top, slopes, and perimeter when the season allows it. When the season is not suitable for establishing vegetation, use a heavy layer of mulch.

10. **Baffles** – Porous baffles shall be required in all sediment traps. Baffles normally split the sediment traps into four cells where the percentage of surface area for each section of the baffle are as follows: a) Inlet zone: 35%, b) First cell 25%, c) Second cell: 25%, d) Outlet zone: 15%. Basins less than 20 feet in length may use 2 baffles that divide the basin into thirds. The installation should be similar to a sediment fence. Materials such as 700 g/m^2 coir erosion blanket mesh, or other similar materials may be used. The fabric should have 5 to 10 percent openings in the weave. Silt fence fabric in front of a wire fence (hog wire) backing may also be used. The silt fence fabric should be slit alternating squares; this permits flow through

the silt fence similar to more porous materials. Do not splice the fabric, but use a continuous piece across the basin. Make sure that the end of each section is keyed into the sidewall of the trap to prevent water from washing out the porous material. The metal posts should be driven to a depth of 24 inches and spacing between the metal posts shall be a maximum of 4' apart. When using posts, add a support wire across the top of the measure to prevent sagging and the bottom and sides of the fabric should be anchored in a trench or pinned with 8 inch erosion control matting staples. The top of the fabric should be 6 inches higher than the invert of the spillway. Tops of the baffles should be 2 inches lower than the top of the berm.

11. **Trap Cleanout and Maintenance** – Inspect temporary sediment traps at least twice weekly and after each significant (1/2 inch or greater) rainfall event and repair immediately. Remove sediment and restore trap to its original dimensions when sediment has accumulated to one-half the design depth of the trap. Place the sediment that is removed in the designated disposal area, and replace the part of gravel facing that is impaired by the sediment. Any damage to the sediment trap should be repaired at this time. Check the structure for damage or erosion form piping. Periodically check the depth of the spillway to ensure it is a minimum of 1.5 feet below the low point of the embankment. Immediately fill any settlement of the embankment to slightly above design grade. Any riprap displaced form the spillway must be replaced immediately.

12. **Trap Removal** – After all sediment-producing areas have been permanently stabilized, contact project's development inspector to gain approval to remove the device and unstable sediment. Smooth area to blend with the adjoining areas and stabilize properly.

    Sediment traps shall be installed according to the preceding criteria, the standard details and the approved erosion control plan.

D. Custom Basin

A Custom Basin is a small sediment riser basin that can be used in place of sediment traps. The erosion control plan must show the custom basin drawn to scale with adequate room around it for machinery to construct and maintain it during all phases of construction. The Custom Basin outlet consists of an earthen embankment and a tarp installed to secure into the earthen weir. The riser pipe shall be 8" SCH. 40 PVC and must have a cone of #57 washed stone around the slotted riser section of the pipe. Baffles should be included in the basin to provide even flow of the water through the Basin. Porous baffles shall be used in all sediment traps and be designed in accordance with the silt fence specifications outlined in Section 4.03C.

Use/Design: Use the following criteria to evaluate the location and to design all types of Custom Basins. Custom Basins shall be used in areas with a ***maximum drainage area of 5 acres***, and located where access can be maintained for sediment removal and proper disposal. Custom Basins shall be placed in a suitable location which is the result of investigating and evaluation the specific conditions on the site and designing the basin to fit the conditions.

1. Storage Capacity – The minimum volume of the sediment basin shall be 3600 ft^3/acre based on the area draining into the basin. The volume shall be measured below the crest elevation of the outlet. One way to calculate the total required volume is to use the disturbed area (in acres) and multiply it by 3600ft^3/acre. To get the area, divide the total required volume by the length of the basin. Subsequently divide that area by the width of the basin. This will give the required basin depth of the basin. However, the Town has a ***minimum*** depth of 3.5 feet with 1.5 feet being excavated below-grade.

2. Surface Area – The minimum surface area of the basin must be 435 square feet per cfs of Q 1.0 peak inflow.

3. Weir Length and Depth – The spillway weir must be designed at least 10 feet long and sized to pass the peak discharge of the 10-yr storm or may be selected from Table 4.3. A maximum flow depth of 1 foot, a minimum freeboard of 0.5 feet, and maximum side slopes of 2:1 are recommended. Weir length is to be designed based on the following criteria by using the weir equations $Q=CLH^{3/2}$, H, not to exceed .5' and C=3.

Table 4.3 Minimum Weir Length for Custom Basins

Drainage (Acres)	Minimum Length of Weir (Feet)
1 – 4	10.0
5	12.0

4. Total Depth – The minimum depth below the crest of the outlet is 3.5 feet. The maximum depth is 6.5 feet. Depth may vary in different parts of a trap due to topography. Excavate 1.5 feet of the depth of the basin below grade, and provide minimum storage depth of 2 feet above grade.

Installation:

1. **Embankment** – Ensure that embankments for temporary Custom Basins do not exceed 5 feet in height measured at the center line from the original ground surface to the top of the embankment. Additional freeboard may be added to the embankment height to allow flow through a designated bypass location. Construct embankments with a minimum to width of 5 feet and side slopes of 2:1 or flatter. Machine compact embankments.

2. **Diversions and Slope Drains** – Runoff must be conveyed into the basin through stable diversions or temporary slope drains per Town specifications. Locate sediment inflow to the basin away from the daw to prevent short circuits from inlets to the outlets.

3. **Outlet Section** – Construct the custom basin outlet with a minimum of 10 feet in length of the embankment made of compacted soil with a tarp keyed into the weir (located at the low point). The tarp used to protect the weir shall be the width specified, the length of the tarp shall be in accordance to the available supply. If multiple tarps are to be used then the tarps shall be overlapped at least 12". The upstream 12"

tarp shall overlap the downstream tarp. The tarp shall be 50 MIL. Heavy Duty Silver Tarpaulins for U.V. resistance. The draw-down riser structure shall be 8" SCH. 40 PVC with clean-out cap and slots. A smaller diameter may be approved by the Director of Engineering based on the submittal of design calculations. The sots shall be placed 1/8" wide, 1" on center radial around the pipe, vertical saw cuts of 24" long.

4. **Stone Size** – Construct the riser structure and then install a cone of 1-ft thick layer of ½ to 1 inch aggregate (#57 washed stone is recommended) around the riser structure.

5. **Side Slopes** – Keep the side slopes of the spillway section at 2:1 or flatter. To protect the embankment, keep top of the spillway at least 5 feet thick.

6. **Depth of Spillway** – Keep the crest of the spillway outlet a minimum of 1'6" below the settled top of the embankment.

7. **Stabilization** – Within 5 working days after completion, all areas disturbed for the trap construction must be provided with ground cover sufficient to restrain erosion. Vegetation (either temporary or permanent) should be used on the top, slopes, and perimeter when the season allows it. When the season is not suitable for establishing vegetation, use a heavy layer of mulch.

8. **Basin Cleanout and Maintenance** – Inspect temporary sediment traps at least twice weekly and after each significant (1/2 inch or greater) rainfall event and repair immediately. Remove sediment and restore trap to its original dimensions when sediment has accumulated to one-half the design depth of the trap. Place the sediment that is removed in the designated disposal area, and replace the part of the gravel facing that is impaired by the sediment. Any damage to the sediment trap should be repaired at this time. Check the structure for damage or erosion from piping. Periodically check the depth of the spillway to ensure it is a minimum of 1.5 feet below the low point of the embankment. Immediately fill any settlement of the embankment to slightly above design grade. Any riprap displaced from the spillway must be replaced immediately.

9. **Basin Removal** – after all sediment-producing areas have been permanently stabilized, contact project's development inspector to gain approval to remove the device and unstable sediment. Smooth area to blend with the adjoining areas and stabilize properly.

   Custom Basins shall be installed according to the preceding criteria, the standard details and the approved erosion control plan.

E. Gravel and Riprap Horseshoe Inlet Basin

A Gravel and Riprap Horseshoe Inlet Protection Basin is one variation of a sediment trap. It is a "horse-shoe shaped" temporary impoundment used on an existing pipe invert. It may be used for drainage areas that are 5 acres or less. Design criteria shall be consistent with the sediment trap designed specified in section 4.03C of this design

manual. These devices shall be installed according to standard detail and the approved erosion control plan.

F. Catch Basin Riser/Filter

A Catch Basin Riser/Filter Basin is one variation of a sediment trap. It is a "Horse-shoe shaped" temporary impoundment used on an existing pipe invert and catch basin. It may be used for drainage areas that are 5 acres or less. Design criteria shall be consistent with the sediment trap design specified in section 4.03C of this design manual. These devices shall be installed according to standard detail and the approved erosion control plan.

G. Skimmer Basin

A skimmer basin is a temporary impoundment formed by an embankment to capture runoff and trap the sediment. This device is equipped with a floating skimmer for dewatering. The erosion control plan should show the skimmer basin drawn to scale with adequate room around it for machinery to construct and maintain it during all phases of construction.

Use/Design: Use the following criteria to evaluate the location and to design all skimmer basins. Skimmer basins may be used for ***maximum drainage areas that are 10 acres or less*** and where access can be maintained for sediment removal and proper disposal. Investigate and evaluate the specific conditions on the site, determine if the location is suitable, and design the basin to fit the conditions.

1. **Storage Capacity** – The minimum volume of the skimmer basin shall be 1800 ft^3/acre based on area draining into the basin. Measure volume below the crest elevation of the outlet.

2. **Drainage Area** – Limit drainage areas to 10 acres.

3. **Design Basin Life** – Ensure a design basin life of 3 years or less.

4. **Surface Area** – The minimum surface area of the basin must be 325 square feet per cfs on Q10 peak inflow.

5. **Basin Shape** – Ensure that the flow length to basin width ratio is greater than 2:1 to improve trapping efficiency and does not exceed a maximum length to width ratio of 6:1 – attempt to maximize the length – to – width ratio of the basin as much as possible. This basin shape may be attained by site selection, excavation, or installing baffles. Length is measured at the elevation of the principal spillway.

6. **Spillway Capacity** – The spillway system must carry the peak runoff from the 10-yr storm with a minimum of 1-foot freeboard in the emergency spillway. Runoff computations should be based on the disturbed soil cover conditions expected during the effective life of the structure.

7. **Basin Spillway** – Construct the entire flow area of the spillway in undisturbed soil (not fill). Make the cross section trapezoidal with side slopes of 3:1 or flatter.

    - ***Capacity*** – The minimum design capacity of the spillway must be the peak rate of runoff from the 10-yr storm, maximum depth of flow during the peak runoff should be 6 inches. In no case should freeboard of the emergency spillway be less than 1 foot above the design depth of flow.
    - ***Velocity*** – Ensure that the velocity of flow discharged from the basin is non-erosive for the existing conditions. When velocities exceed that allowable for the receiving areas, provide outlet protection.

8. **Sediment Cleanout Elevation –** Show the distance from the top of the riser to the pool level when the basin is 50% full. This elevation should also be marked in the field with a permanent stake set at this ground elevation or some other acceptable means of marking.

9. **Basin Dewatering** – The skimmer basin de waters from the top of the water surface. The dewatering rate must be controlled and meet a dewatering time of 24 to 72 hours (1-3 days). Any skimmer design that dewaters from the surface at a controlled rate is acceptable. – Manufactures recommendations should also be followed to make this determination.

10. **Outlet Protection** – Protect the outlet of the barrel against erosion.

11. **Embankment** – Ensure that embankments for temporary Custom basins do not exceed 5 feet in height measured at the centerline from the original ground surface to the top of the embankment. Additional freeboard may be added to the embankment height to allow flow through a designated bypass location. Construct embankment with a minimum top width of 5 feet and side slopes of 2:1 or flatter. Machine compact embankments.

12. **Basin Efficiency** – Locate the sediment inlets to the basin the greatest distance from the principal spillway. Allow the maximum reasonable detention period before the basin is completely dewatered – at least 24 hours. Reduce the inflow velocity and divert sediment–free runoff.

13. **Stabilization** – Within 5 working days after completion, all areas disturbed for the trap construction must be provided with ground cover sufficient to restrain erosion. Vegetation (either temporary or permanent) should be used on the top, slopes, at least the top half of the interior slopes and perimeter when the season allows it – when the season is not suitable for establishing vegetation, use a heavy layer of mulch.

14. **Baffles** – Porous baffles shall be used in all skimmer basins and be designed in accordance with the Porous Baffles specifications outlined in Section 4.03C.

15. **Diversions and Slope Drains** – Runoff must be conveyed into the basin through stable diversions or temporary slope drains. Locate sediment inflow to the basin away from the dam to prevent short circuits from inlets to the outlet.

16. **Basin Cleanout and Maintenance** – Inspect skimmer basins at least twice weekly and after each significant (1/2 inch or greater) rainfall event and repair immediately. Remove sediment and restore trap to its original dimensions when sediment has accumulated to one-half the design depth of the trap. Place the sediment that is removed in the designated disposal area, and replace the part of gravel facing that is impaired by the sediment. Any damage to the sediment trap should be repaired at this time. Check the structure for damage or erosion from piping. Periodically check the depth of the spillway to ensure it is a minimum of 1.5 feet fellow the low point of the embankment. Immediately fill any settlement of the embankment to slightly above design grade. Any riprap displaced from the spillway must be replaced immediately.

17. Basin Removal – After all sediment-producing areas have been permanently stabilized, contact projects development inspector to gain approval to remove the device and unstable sediment Smooth area to blend with the adjoining areas and stabilize properly.

    Skimmer Basins shall be installed according to the preceding criteria, the standard detail and the approved erosion control plan.

H. **Standard Riser-Barrel Sediment Basin (Sediment Pond)**

A sediment basin is a temporary impoundment for use below larger areas of land disturbance with a Stormwater release structure, formed by constructing an earthen embankment to create a natural or excavated basin across a drainage way.

Materials: Sediment ponds shall be used for ***drainage areas less than or equal to 100 acres.*** In addition, the basin life should be limited to 3 years unless it is designed as a permanent structure.

Use/Design:

Special limitation – This specification applies only to the design and installation of sediment basins where failure of the structure would not result in the loss of life, damage to homes or buildings, or interruption of use of public roads or utilities. Regardless of classification, structures 11-15 feet or higher, and having a maximum storage capacity of 10 acre-ft or more are subject to the Dam Safety Act.

Planning Considerations – Basin sites should be selected to capture sediment from all areas that are not treated adequately by other sediment traps, considering access for cleanout and disposal of trapped sediment. Locations where a pond can be formed by constructing a low dam across a natural swale are generally preferred to sites that require excavation (unless the structure will be permanent). If practical, divert sediment-free runoff away from the basin.

Design Criteria – The design and construction of a sediment pond involves much more thought and planning than most other sediment trapping devices. A more precise design is required because of the volume of the sediment to be trapped, the large flow of runoff through the pond, and the hazard created. Adequate precautions should be taken to design the sediment basin properly and to prevent its failure.

1. **Drainage Area** – Limit drainage areas to 100 acres.

2. **Design Basin Life** – Ensure a design basin life of 3 years or less.

3. **Dam Height** – Limit dam height to 15 feet (see special Limitation statement above). Height of a dam is measured from the top of the dam to the lowest point at the downstream toe.

4. **Storage Capacity** – Ensure that the sediment storage volume of the basin, as measured to the elevation of the crest of the principal spillway, is at least 1800 ft^3/acre volume for the disturbed area draining into the basin (1800 ft^3/acre volume is equivalent to ½ inch of sediment per acre of basin drainage area). Where possible the entire drainage area is used for this computation, rather than the disturbed area alone, to help ensure adequate trapping efficiency. For purposes of measuring volume to determine whether or not the special limitation statement above applies, measure volume to the top of the dam.

5. **Minimum Surface Area –** The surface area of the basin must be 435 square feet per cfs of Q10 peak inflow.

6. **Basin Shape** – Ensure that the flow length to basin width ratio is greater than 2:1 to improve trapping efficiency and does not exceed a maximum length to width ratio of 6:1 – attempt to maximize the length-to-width ratio of the basin as much as possible. This basin shape may be attained by site selection, excavation, or installing baffles. Length is measured at the elevation of the principal spillway.

7. **Spillway Capacity** – The spillway system must carry the peak runoff from the 10-yr storm with a minimum of 1-foot freeboard in the emergency spillway. Runoff computations should be based on the disturbed soil cover conditions expected during the effective life of the structure.

8. **Principal Spillway** – Construct the principal spillway with a vertical riser connected to a horizontal barrel that extends through the embankment and outlets beyond the downstream toe of the dam, or an equivalent design.

    - ***Capacity*** – Ensure that the primary spillway must carry the peak runoff from the 2-year storm, with the water surface at the emergency spillway crest elevation.
    - ***Sediment clean out elevation*** – Show the distance from the top of the riser to the pool level when the basin is 50% full. This elevation should also be marked in the field with a permanent stake set as this ground elevation or some other acceptable means of marking.
    - ***Crest elevation*** – Keep the crest elevation of the riser a minimum of 1 foot below the crest elevation of the emergency spillway.
    - ***Riser and barrel*** – Keep the minimum barrel size at 15 inches for corrugated metal pipe or 12 inches for smooth wall pipe to facilitate installation and reduce potential for failure from blockage. Limit the barrel to a maximum diameter of 30 inches. Ensure that the pipe is capable of withstanding them maximum

external loading without yielding, buckling, or cracking. To improve the efficiency of the principal spillway system, make the cross-sectional area of the riser at least 1.5 times that of the barrel. The riser and barrel must be assembled with watertight connections.

- ***Anchoring the Riser*** – The base of the riser must be firmly anchored to prevent floating or dislocation, which could result in breaking of the watertight connections and failure of the structure when the water level rises. Secure the riser by an anchor with a buoyant weight greater than 1.1 times the water displaced by the riser.
- ***Basin dewatering*** – The basin should be provided with a mechanism to dewater the basin from the water surface. A skimmer and a flashboard riser are the two methods that may be used to dewater the basin. Skimmers should be attached to the base of the riser, the orifice in the skimmer will control the rate of dewatering which should be sized to dewater the basin in 24 – 72 hours (1-3 days). A flashboard riser forces the basin to fill to a given level before the water tops the riser, it is similar to a solid riser but with the option to lower the water level in the basin when accumulated sediment must be removed. Flashboard risers are usually fabricated as a box or as a riser pipe cut in half. The open face has slots on each side into which boards of "stop logs" are placed, forcing the water up and over them. This device should be sized the same way as a typical riser. In large basins or sites with erosive soils, the Engineering Department may require an additional rock doughnut around the outlet structure to provide additional protection.
- ***Anti-seep Collars*** – These are used to prevent water from seeping between the outside of the barrel and the fill material. Install at least one watertight anti-seep collar with a minimum projection of 1.5 feet around the barrel of the principal spillway conduits, 8 inches or later in diameter. Locate the anti-seep collar slightly downstream from the dam centerline.
- ***Anti-vortex Devices & Trash Guard*** – An anti-vortex device and trash guard must be provided for the inlet of the principal spillway. The anti-vortex device prevents the formation of a whirlpool within the riser inlet, which would restrict flow into the riser and reduce its capacity. The trash guard traps floating debris, preventing it from entering the riser and possibly blocking the pipe. Trash guards are required on all risers. Anti-vortex devices are required on risers with diameters of 10 inches or more.
- ***Outlet Protection*** – Protect the outlet of the barrel against erosion.

9. **Emergency Spillway** – Construct the entire flow area of the emergency spillway in undisturbed soil (not fill). Make the cross section trapezoidal with side slopes of 3:1 or flatter. Make the control section of the spillway straight and at least 20 feet long. The inlet portion of the spillway may be curved to improve alignment, but ensure that the outlet section is straight due to supercritical flow in this portion.

    - ***Capacity –*** The minimum design capacity of the emergency spillway must be the peak rate of runoff from the 10-yr storm, less any reduction due to flow in the principal spillway. In no case should freeboard of the emergency spillway be less than 1 foot above the design depth of flow.

- ***Velocity –*** Ensure that the velocity of flow discharged from the basin is non-erosive for the existing conditions. When velocities exceed that allowable for the receiving areas, provide outlet protection.

10. **Embankment** –
    - ***Cut-off Trench*** – Excavate a trench at the centerline of the embankment. Ensure that the trench is in undisturbed soil and extends the length of the embankment to the elevation of the riser crest at each end. A minimum of 2 feet depth is recommended.
    - ***Top Width*** – The minimum top width of the dam shall be 8 feet for dams less than 10 feet in height and 10 feet wide for dams between 10 and 15 feet in height.
    - ***Freeboard*** – Ensure that the minimum difference between the design water elevation in the emergency spillway and the top of the settled embankment is 1 foot.
    - ***Side Slopes*** – Make the side slopes of the impoundment structure 2.5:1 or flatter.
    - ***Allowance for Settlement*** – Increase the constructed height of the fill at least 10% above the design height to allow for settlement.

11. **Basin Efficiency** – Locate the sediment inlets to the basin the greatest distance from the principal spillway. Allow the maximum reasonable detention period before the basin is completely dewatered – at least 24 hours. Reduce the inflow velocity and divert sediment-free runoff.

12. **Stabilization** – Within 5 working days after completion, all areas disturbed for the trap construction must be provided with ground cover sufficient to restrain erosion. Vegetation (either temporary or permanent) should be used on the slopes, at least the top half of the interior slopes and perimeter when the season allows it – when the season is not suitable for establishing vegetation, use a heavy layer of mulch.

13. **Baffles** – Porous baffles shall be used in all sediment traps and be designed in accordance with the silt fence specifications outlined in Section 4.03C.

14. **Diversions and Slope Drains** – Runoff must be conveyed into the basin through stable diversions or temporary slope drain. Locate sediment inflow to the basin away from the dam to prevent short circuits from inlets to the outlets.

15. **Basin Cleanout and Maintenance** – Inspect temporary sediment traps at least twice weekly and after each significant (1/2 inch or greater) rainfall event and repair immediately. Remove sediment and restore trap to its original dimensions when sediment has accumulated to one-half the design depth of the trap. Place the sediment that is removed in the designated disposal area, and replace the part of gravel facing that is impaired by the sediment. Any damage to the sediment trap should be repaired at this time. Check the structure for damage or erosion from piping. Periodically check the depth of the spillway to ensure it is a minimum of 1.5 feet below the low point of the embankment. Immediately fill any settlement of the embankment to slightly above the design grade. Any riprap displaced from the spillway must be replace immediately.

16. **Basin Removal** – After all sediment-producing areas have been permanently stabilized, contact project's development inspector to gain approval to remove the device and unstable sediment. Smooth area to blend with the adjoining areas and stabilize properly.

    Sediment basins shall be installed according to the preceding criteria, the sealed Engineer's detail, and the approved erosion control plan.

Sediment basins shall be installed according to the preceding criteria, the standard details and the approved erosion control plan.

1. Check Dam

   Check dams are small, temporary stone dams constructed across a drainage way to reduce erosion by restricting the velocity of flow in the channel. Limit drainage areas to one-half acre or less. Do not use check dams in live streams.

   Use/Design: Keep the maximum height to 2 feet at the center of the dam. Keep the center of the check dam at least 9 inches lower than the outer edges at natural ground elevation. Keep the side slopes at 2:1 or flatter. Ensure that the maximum spacing between dams places the toe of the upstream dam at the same elevation as the top of the downstream dam. Stabilize overflow areas along the channel to resist erosion caused by check dams.

   Stone Size – Construct the check dam using well-graded stones with a size of 9 inches and a maximum stone size of 14 inches. A ½ - ¾ inch aggregate (#57 washed stone is recommended) should be placed on the upstream face to reduce drainage flow rate.

   Installation – Check dams shall be installed according to the standard detail and the approved erosion control plan.

I. **Construction Entrance**

Construction entrances shall be installed at all points of access to construction sites (both residential and nonresidential) in accordance with the standard details and the approved erosion control plan. Any access point that does not have a construction entrance shall be barricaded to prevent its use.

Nonresidential Construction Entrance – Place fabric from the roadway into the site a minimum of 50 feet and allow for a minimum of 25-foot width along the roadway. Once the fabric is down, place 2 inch to 3-inch railroad ballast or surge stone on the fabric. The first 35 feet of the stone shall be at a minimum depth of 6 inches and the remaining 15 feet of the entrance shall be a minimum depth of 12 inches.

Residential Construction Entrance – Install stone from the roadway into the site a minimum of 20 feet and allow for a minimum of 12-foot width along the roadway. Stone shall be clean #57 washed stone and be at a minimum of 6 inches in depth. It is

recommended to use fabric under the stone to add to the total life of the construction entrance.

Washing – If conditions at the site are such that most of the mud and sediment are not removed by vehicles traveling over the gravel, tires of vehicles exiting the site should be washed. Washing should be done on an area stabilized with crushed stone that drains into a sediment trap or other suitable disposal area. A wash rack may also be used to make washing more convenient and effective.

Street Cleaning – The Town may require the Financially Responsible Party of any project regardless of the size to clean any sediment (mud) that has been tracked or has left the site and is left on a roadway, sidewalk, or right–of–way. Failure to respond to directives by the Town to complete the street or sidewalk cleaning and/or any other measure to remove sediment from the street, the Town may have such work performed and charged to the Financially Responsible Party in an amount to cover all manual and administrative costs of such work. This shall not create an obligation of the Town to undertake such work or to be liable in any way for failure to undertake such work.

J. **Diversion Ditch**

A diversion ditch is a temporary ridge or excavated channel or combination ridge and channel constructed across sloping land on a predetermined grade. The purpose is to protect work areas from up-slope runoff and to divert sediment-laden water to appropriate traps or stable outlets. ***Diversion ditches shall be used for drainage areas less than or equal to 5 acres.***

Diversion ditches shall be sized to handle the peak runoff from the 1 a-year storm. Where design velocities exceed 2ft/second, a channel liner is usually necessary to prevent erosion. Diversions that are to serve longer than 30 working days should be seeded and mulched as soon as they are constructed to preserve dike height and reduce maintenance. Wherever feasible, build and stabilize diversions and outlets before initializing other land-disturbing activities.

Diversion ditches shall be installed in accordance with the standard detail and the approved erosion control plan.

K. **Temporary Stream Crossing**

A temporary stream crossing is a bridge, ford, or temporary structure installed across a stream or watercourse for short-term use by construction vehicles or heavy equipment. Stream crossings are of three general types: bridges, culverts and fords. Temporary stream crossings shall be installed in accordance with the standard detail, DTEC, WPC and USCOE.

L. **Storm Drain Inlet Protection**

Storm drain inlet protection is a sediment filter or trap around or across the inlet to a storm drain. The different types of storm drain inlet protection consists of 1) block and gravel filter, 2) hardware cloths and gravel filter, 3) excavated pit, and 4) plywood and

stone, pipe inlet protection, 5) gravel and riprap horseshoe inlet. The purpose of inlet protection is to detain and filter sediment-laden runoff before it enters a storm drain. Storm drain inlet protection is necessary where a sediment-trapping device is not at the outlet and the runoff will enter the drainage system before the land disturbance is completed. Inlet protection may not be necessary where an adequate sediment-trapping device, such as a sediment trap or sediment pond, is located below the storm drain outlet. Other prefabricated methods of inlet protection may be used on a case by case basis and will require approval from the engineering department prior to installation of the erosion control device.

Erosion control plans that propose to use inlet protection must include detailed instructions and illustrations of how inlet protection will be implemented around each inlet. The plan must also include details of how diversions will be used to capture and direct runoff to the inlet and how berms will be build below the inlet to force runoff through the filter and into the inlet.

1. **Sediment Bags** are useful to protect catch basin inlets that have been installed in the road right-of-way that has already been paved. The bags must be maintained on a weekly basis or after every ½ inch of rain. The Engineering Department may require a street cleaning and inlet protection maintenance plan for areas where storm drain outlet protection devices have been removed.

2. **Block and Gravel Filters** are particularly useful at storm drain inlets. By varying the number of courses of block, the height of the filter can be varied to fit the particular location. The drainage area to the inlet must be 14 acres or less. Where the drainage area is greater, an excavated pit or other device must be used at the inlet. The filter is built of washed stone, hardware cloth, concrete blocks, and 2 x 4's. For yard inlets and junction boxes, the concrete blocks are placed around the perimeter of the inlet with the holes parallel to the ground to allow water to flow through them. The 2 x 4's are placed behind the blocks as reinforcement. Hardware cloth is placed on the ground around the outside of the blocks and up over the holes in the block to prevent the stone from washing through. The washed stone is then placed on top of the hardware cloth up to the top of the blocks to form the filter. For curb inlets, the block and gravel filter is ½ of the filter for yard inlets and junctions boxes. The end of the line of blocks is placed up against the curb to form a C-shaped filter around the opening. Block and gravel filter inlet protection shall be installed according to the standard detail and the approved erosion control plan. The barrier should be inspected twice weekly and after rainfall of one half inch or greater. Sediment shall be removed as necessary to provide adequate storage for subsequent rains.

3. **Hardware Cloth and Gravel Filters** are useful at yard inlets and inlets to junction boxes. The height of the filter can be varied to fit the particular location. The shore height of the filter and open top allows runoff to overflow into the inlet instead of bypassing it when runoff ponds at the filter. The drainage area to the inlet must be ¼ acre or less. Where the drainage area is built of steel fence posts, hardware cloth, wire, and washed stone. Hardware cloth and gravel filter inlet protection shall be installed according to the standard detail and the approved erosion control plan. No silt fence may be used. The fabric barrier should be inspected twice weekly and after rainfall of one-half inch or greater. Repairs should be made as needed.

Sediment shall be removed form the pool area as necessary to provide adequate storage volume for the next rain. The fabric should not be damaged during sediment removal.

4. An **Excavated Pit** around a storm drain inlet is essentially a sediment trap with the inlet structure serving as the outlet for the sediment trap. Around a storm drain inlet is essentially a sediment trap with the inlet structure serving as the outlet for the sediment trap. For small drainage areas (less than ¼ acre), other types of inlet protection are recommended. Where the drainage area exceeds that for inlet protection devices and an excavated pit is desirable, use the sediment trap design criteria. An excavated pit inlet protection shall be installed according to the standard detail and the approved erosion control plan. The excavated pit should be inspected twice weekly and after rainfall of one-half inch or greater. Sediment shall be removed when the volume of the trap has been reduced by one-half.

5. Plywood and Stone Pipe Inlet Protection Storm drain inlets must be protected during all phases of construction, even while the pipe is being laid and before the junction boxes and inlet structures are in place. These devices shall be installed across the upstream pipe opening at the end of each work session and removed at the beginning of the next. If the pipe will not be extended for a prolonged time period gravel and riprap horseshoe inlet protection with appropriate storage shall be installed to replace the plywood and stone structure. These devices are to be used on the pipe in small storm drain systems that are not located in live streams with large watersheds or watercourses where their use could cause upstream flooding. These devices are made of plywood or steel fence posts, hardware cloth, and washed stone. Protection for the open end of storm drains shall be installed according to the standard detail and the approved erosion control plan.

M. **Slope Drains**

Slope drains consist of flexible tubing or conduit extending temporarily from the top to the bottom of a cut or fill slope. The slope drains convey concentrated runoff down the face of the slope without causing erosion. Slope drains are needed where grading or placement of a sediment-trapping device will result in concentrated runoff flowing over an erodible slope. Slope drains are usually used in conjunction with diversions at the top of the slope and some type of sediment-trapping device at the outlet. However, in some instances they may be used below a sediment-trapping device to carry outflow over a steep undisturbed slope.

Slope drains must be designed to carry the peak runoff from a 10-year storm. The drainage area to any single slope drain must not exceed one acre. Larger drainage areas should be divided into several smaller ones to limit the damage if the slope drain should fail. Size the slope drain according to Table 4.2 to size the slope drains.

Table 4.2 Size of Slope Drain

Maximum Drainage Area per Pipe (acres)	Pipe Diameter (Inches)
0.3	8
0.5	12
0.75	15
1.0	18

Where the drainage area exceeds those in the table, use multiple pipes or, preferable, divide the area into two or more parts. In no instance can the watershed exceed one acre to any point where one or more slopes drain is located.

Slope drains shall be installed in accordance with the details and the approved erosion control plan.

Maintenance: Slope drains must be inspected and maintained so that they continue to perform properly and contribute to erosion control rather than becoming a liability. Failure usually results from improper installation or maintenance of the inlet; runoff flowing between the pipe and the fill creates a weak point, and runoff flows on the slope instead of in the pipe. Other failures result from faulty pipe connections or an improperly constructed diversion directing runoff to the inlet.

4.03 PERMANENT MEASURES

A. **Lined Stormwater Channels**

Lined Stormwater channels are open constructed or improved drainage ways to convey runoff through and away from developed areas. The Stormwater channel must carry the expected volume and velocity of runoff without damage to the channel lining or erosion' of the soil beneath. Stormwater channels may be grass-lined channels, riprap channels or paved channels. Riprap and paved linings are used where velocities are too high for grass-lined channels. Permanent erosion control matting can be used in conjunction with grass-lined swales to increase the velocity of water in the channel. In addition, there are several acceptable shapes for Stormwater channels: V-shaped channels, parabolic channels, and trapezoidal channels. V-shaped channels generally apply where the quantity of water is small such as in short reaches along roadsides. The V-shaped channel is least desirable because it is difficult to stabilize the bottom where velocities may be high. Parabolic channels are often used where larger flows are expected and space is available. The swale-like shape is pleasing and may best fit site conditions. Trapezoidal channels are used where runoff volumes are large.

Use/Design: Channels must be designed to carry peak runoff from at least a 10-year storm without eroding. Where flood hazard exists, increase the capacity according to the potential damage. Channel dimensions may be determined by using design table with appropriate retardance factors or by Manning's formula using an appropriate "n" value. The design velocity in the channels determines what type of lining will be required. Stormwater channels shall be designed in accordance with his section, the standard detail and TDEC Erosion and Sediment Control Handbook.

B. **Storm Drain Outlet Protection**

All Stormwater release points (downstream of both stream crossing culverts and storm drainage flared end sections) shall be protected by riprap dissipation pads designed to reduce discharge velocities to non-erosive levels. Alternate measures will be evaluated on a case-by-case basis by the Director of Engineering. Dissipation pads shall be designed and constructed with either an engineering fabric or washed stone barrier between the pad and the natural ground. Calculations shall be provided to indicate the sufficiency of the dissipation pads specified. Storm drain protection shall be installed in accordance with the standard detail and the approved erosion control plan.

4.05 STABILIZATION MEASURES

A. **Temporary Stabilization**

Temporary seeding is the use of rapid growing annual grasses, small grains or legumes to provide initial, temporary cover for erosion control on disturbed areas for less than 12 months. Mulch is used to provide an immediate ground cover to protect disturbed soil from erosion during the completion of construction until the disturbance is permanently stabilized. Seeding and mulching shall be done immediately following construction. All disturbed areas shall be dressed to a depth of 8 inches (soil loosened using a ripper, harrow, or chisel plow). The top 3 inches shall be pulverized to provide a uniform seedbed.

Agricultural Lime – Shall be applied at the rate of 95-lbs/1000 ft^2 or 2-tons/ac. immediately before plowing (soils with a pH of 7 or higher need not be limed).

Grass Seed – Shall be applied at the rates outlined in Table 4.3 10-10-10 shall be applied to all disturbed areas at a rate of 23-lbs/1000 ft^2 or 1000-lbs/acre.

Surface Roughening – If recent tillage operations have resulted in a loose surface, additional roughening may not be required except to break up large clods. If rainfall causes the surface to become sealed or crusted, loosen it just prior to seeding by disking, raking, harrowing, or other suitable methods. Groove or furrow slopes steeper than 3:1 on the contour before seeding.

Mulching – The use of appropriate mulch will help ensure establishment under normal conditions and is essential to the success under harsh site conditions. Mulching shall consist of small grain straw applied at a rate of 95-lbs/1000 ft^2 or 2-tons/ac. Mulched areas shall be tacked with asphalt at a rate of 200 to 400 gallons per acre, or other approved method sufficient to hold the straw in place.

If active construction ceases, meaning no substantial or significant progress is made in any area for more than 30 days, all disturbed areas must be seeded, mulched, and tacked unless written approval is granted by the Environmental Engineer. ***Incidental grading shall not constitute substantial or significant progress in construction activity.***

Table 4. Temporary Seeding Recommendations

Date	Type	Planning Rate
Jan 1 – May 1	Rye and Annual lespedeza (Kobe)	120 lb/acre 50 lb/acre
May 1 – Aug 15	German millet	40 lb/acre
Aug 15 – Dec 31	Rye (grain)	120 lb/acre

1. Omit annual lespedeza when duration of temporary cover is not to extend beyond June. Note on maintenance: re-fertilize if growth is not fully adequate. Reseed, re-fertilize and mulch immediately following erosion or other damage.

B. **Permanent Stabilization**

Permanent stabilization consists of a permanent ground cover to protect the disturbed soil and prevent erosion after completion of the disturbance. The different types of permanent stabilization are: 1) vegetation, 2) mulch, 3) stone, and 4) sod. The Towns' Erosion Control Ordinance requires that a permanent ground cover sufficient to restrain erosion be provided on slopes within 21 days after completion of construction or development. Provision must be made in the erosion control plan to stabilize all disturbed areas.

Vegetation – Seedbed preparation is very important in establishing good vegetative cover. All disturbed areas shall be dressed to a depth of 8 inches (soil loosened using a ripper, harrow, or chisel plow). The top 3 inches shall be pulverized to proved a uniform seedbed.

Agricultural Lime – Shall be applied at the rate of 95-lbs/1000 ft^2 or 2 tons/acre immediately before plowing (soils with a pH or 7 or higher need not be limed).
Grass Seed – Shall be applied at the rate outlined in Tables 4.4 and 4.5. 10-10-10 shall be applied to all disturbed areas at a rate of 23-lbs/1000 ft^2 or 1000-lbs/ac.

Surface Roughening – If recent tillage operations have resulted in a loose surface, additional roughening may not be required except to break up large clods. If rainfall causes the surface to become sealed or crusted, loosed it just prior to seeding by disking, raking, harrowing, or other suitable methods. Groove or furrow slopes steeper than 3:1 on the contour before seeding.

Table 4.4 – Permanent Seeding Recommendations
Shoulders, Side Ditches, Slopes *(Maximum slope 3:1)*

Date[2]	Type	Planting Rate
Aug 15 – Nov 1	Tall Fescue or Hard Fescue	300 lb/acre
Nov 1 – Mar 1	Tall Fescue & Abruzzi Rye or Annual Rye	300 lb/acre
Mar 1 – Apr 15	Tall Fescue or Hard Fescue	300 lb/acre
Mar 1 – Jul 15	Hulled Common Bermuda grass OR Hybrid Bermuda grass OR Centipede grass OR Zoysia grass OR St. Augustine grass	200 lb/acre
Apr 15 – Jun 30	Weeping Love Grass OR Bahia grass	25 lb/acre
Jul 15 – Aug 15	Tall Fescue and Browntop Millet or Sorghum – Sudan Hybrid	35 lb/acre

1. Temporary – Reseed according to optimum season for desired vegetation. Do not allow temporary cover to grow over 12 inches in height before moving to keep fescue from being shaded out.
2. Seeding dates will vary depending on weather conditions (e.g. temperature, rainfall, etc.)

Note on maintenance: refertilize if growth is not fully adequate. Reseed, refertilize and mulch immediately following erosion or other damage.

Table 4.5 – Permanent Seeding Recommendations Shoulders,
Side Ditches, Slopes, (*Slopes 3:1 and 2:1 – not mowed*)

Date	Type	Planting Rate
Mar 1 – Jun 1	Sericea Lespedeza (scarified), AND Add Tall Fescue, OR Add Weeping Love grass, OR Add Hulled Common Bermuda Grass	50 lb/acre 120 lb/acre 10 lb/acre 25 lb/acre
June 1 – Sep 1	Tall Fescue, AND Add Browntop Miller, OR Add Sorgum-Sudan Hybrids	120 lb/acre 35 lb/acre 30 lb/acre
Sep 1 – Mar 1	Sericea Lespedeza (unhulled/unscarified), AND Add Tall Fescue, AND Add Abruzzi Rye and Annual Rye	70 lb/acre 120 lb/acre 25 lb/acre

1. For temporary seeding purposes.

   Note on maintenance: refertilize if growth is not fully adequate. Reseed, refertilize and mulch immediately following erosion or other damage.

   When seeding is finished, apply a layer of mulch, usually small grain straw, to encourage seed germination and to protect bare soil until the vegetation is established. It is advisable to anchor the mulch with either asphalt or netting to prevent the mulch being blown away. Where possible, irrigate the seeded areas to promote germination and growth.

As a part of permanent vegetation, maintenance may be required to maintain vegetation for 12 months. This maintenance shall be considered a part of establishing permanent ground cover.

Permanent vegetation shall be installed according to this section and the approved erosion control plan.

Mulch – Mulching is defined as the application of a protective blanket of straw of other plant residue, or synthetic material to the soil surface. Mulching is an acceptable alternative to vegetation, except in locations where slopes are too great for the mulch to remain in place for long periods of time or where concentrations of runoff require a more durable type of stabilization. Table 4.6 is a list of recommended mulches – this list is not exhaustive and other types of mulch are acceptable when used in the appropriate location, at a rate that will restrain erosion, and in a manner that will keep the material in place.

Table 4.6 – Mulching Material and Application Rates

Material	Rate per 1000 ft^2	Notes
Wood Chips	250 lbs	Require the addition of nitrogen while decaying
Bark Chips	2 cubic yards	Apply w/chip handler by hand. Do not use asphalt track.
Shredded Bark	2 cubic yards	Apply w/mulch blower
Pine Straw	90 lbs	Avoid weeds
Compost or Manure	400 lbs	May contain objectionable weeds

C. Use of Drought Tolerant Plants

All sedimentation and erosion control plans shall be designed to incorporate water conservation materials and techniques through application of landscaping principals, including but not limited to: 1) use of low water demanding plants and turf; 2) use of re-use water supplies for irrigation; 3) minimizing the use of high irrigation turf; 4) use of mulches to reduce the evaporation rates.

4.06 SLOPES

Cuts, fills and graded areas shall not exceed 2:1 in slope. Slopes which are designed to be stabilized with vegetation, which requires mowing, shall not exceed 3:1. Slope breaks shall be implemented on long and steep slopes to prevent erosion and gullying. The Director of Engineering may require more restrictive measures for site-specific slope and stabilization. Engineered slope design may be required in areas where there is erosive soil or slopes exceed 3:1.

4.07 CALCULATIONS

The Town shall generally review calculations and assumptions used to formulate an erosion control plan. All calculations shall be submitted in a bound sealed engineers report accompanying drawings. Erosion and sedimentation control measures, structures, and devices shall be planned, designed, and constructed to control the calculated peak runoff from a 10-year frequency storm, unless otherwise indicated. Runoff rates shall be calculated using the Rational Method, the Natural Resources Conservation Service (formerly Soil Conservation Service) Method, or other acceptable calculation procedures. Runoff computations shall be based on rainfall data published by the National Weather Service for this area.

4.08 CONSTRUCTION SEQUENCE

The basic construction sequence on projects shall be as follows:

1. Attend pre-construction conference.

2. Obtain Land Disturbance (grading) Permit.

3. Install tree protection on site.

4. Install all erosion control measures as shown on the approved plan.

5. Call for on-site inspection by Engineering department personnel.

6. Proceed with grading.

7. Clean sediment traps and basins when one-half full and check for maintenance of all erosion control devices twice weekly or after every ½ inch of rain. Prepare written report and furnish copy to Town's Engineering Inspector.

8. Seed and mulch denuded area within 21 Days.

9. Maintain soil erosion and sedimentation control measures until permanent ground cover is established.

10. Call for on-site meeting to obtain approval for removal temporary erosion control measures, stabilize these areas and install applicable permanent measures and Stormwater BMP's.

11. Request final approval by Engineering Department.

    On complex projects, this basic construction sequence shall be expanded to show the order of devices installed, necessary phasing, special circumstances, etc.

4.09 MINIMUM STANDARDS FOR RESIDENTIAL LOTS

Erosion and Sedimentation Control measures shall be installed on all lots under construction regardless of the amount of disturbed area and must meet the following minimum criteria for erosion and sedimentation control measures: residential construction entrance and silt fence on the low side of the lot. Additional erosion control may be required for site-specific areas of concern, which will be identified by the Director of Engineering prior to issuance of a building permit or throughout the construction process. Residential lot construction of 20,000 square feet or greater of disturbed area requires an Erosion Control Plan approval. The amount of disturbed area for residential lot construction is determined by the lot or lots that are to be constructed on/in a subdivision. These lots do not have to be contiguous or being disturbed at the same time.

END OF SECTION