AMHERST COLLEGE

Amherst, Massachusetts 01002

MAR12AC43

Stormwater Pollution Prevention Plan (SWPPP)

for Construction Projects

Amherst College

Amherst, Massachusetts 01002

Storm Water Pollution Prevention Plan

For Construction Projects

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Site Description

Project Name and Location: (Latitude, Longitude, or Address)	**Amherst College Amherst, MA 01002 (42 22.15N, 72 31.08W)**	**Owner Name and Address:**	**Trustees of Amherst College 6 East Drive Amherst College Amherst, MA 01002**
Description: (Purpose and Types of Soil Disturbing Activities)	Amherst College is a four-year liberal arts college that is located in the center of the Town of Amherst, Massachusetts, in Hampshire County at the intersection of Route 9 and 116. The college has approximately 180 buildings on site, including academic facilities, dormitories and private residences that are rented or owned by college faculty and staff. Most of Amherst College sits on a hill that peaks at the intersection of Northampton Road (Route 9) and South Pleasant Street (Route 116). Amherst College is 327 feet above sea level. Water and other material have the potential to flow downhill in all four directions from this point.		

This project will consist of several changes around the Amherst College campus over the next 4 years. The construction plan includes the renovation of residence halls and academic buildings, the replacement of the football field with 2 new facilities buildings and the construction of the new Science Center. New sewer, electrical, chilled water, fire protection systems, and telecommunication lines will all be installed on campus.
Soil disturbing activities will include: excavation of new foundations, excavation for waterlines, sewer lines, storm water lines, electrical lines, and drainage.

Runoff Coeffient:	The final coefficient of runoff for the site will be c=0.40.
Site Area:	The entire Amherst College property is approximately 1440 acres: however, the main campus in Amherst, Massachusetts consists of approximately 135 acres of land, of which 50 acres will be disturbed by construction activities.

Sequence of Major Activities

2013– 2020

- Seligman House – Renovation
- 79 South Pleasant St. – Renovation
- Keefe Campus Center - Renovation
- Pratt Football Field – Replacement
- Pratt Field – New Facilities
- New Science Center - Construction

Name of Receiving Waters:	The immediate receiving waters of the main campus area are as follows: the Fearing Brook receiving water from the northern 45 acres of campus, and the Fort River receiving water from the southern 70 acres of the campus. The Fort River water passes through the nearby Conservation Area prior to contribution into the river. The Connecticut River is the ultimate receiving body of water of the Fearing Brook and Fort River.

Controls

Erosion and Sediment Controls

Stability Practices

Temporary Stabilization – Different stabilization practices will be in use throughout the sites. In general, any disturbed soil from excavations shall be collected in one common area per construction site, all soil shall be compacted to prevent wind erosion, and piles shall be covered with plastic, or canvas tarps, etcetera, when applicable. Location, time of year, weather conditions, etcetera, will dictate how erosion and runoff will be managed. On some appropriate sites, geotextiles are used for sediment and erosion control. For this control measure, polypropylene, polyester, polyethylene, nylon, polyvinyl chloride, or similar will be used for stabilization of the soil. On the construction site. Also, the preservation of natural vegetation will be a priority on all sites, with fences placed around trees, etcetera, to protect from damage or soil disturbance. As soon as possible, disturbed soil will be replaced, compacted, and vegetation of different types will be reestablished. Hydro-seeding is the preferred practice to expedite the process of growth. (See pages 9 -25 for discussion and design of control measures.)

Permanent Stabilization – Disturbed portions of the site where construction activities permanently cease shall be stabilized with permanent seeding as soon as is practical, or once the weather allows if during the off-growing season. Trap rock, wood driveways, and use of sidewalks shall be place to prevent the removal of soil from the site on construction vehicles (See pages 9 -25 for discussion and design of control measures.)

Structural Practices

Sediment Barrier – When required to prevent runoff, hay bales and plastic tarps line the entire construction site as a straw bale barrier, which serves to contain the soil on the construction site, and minimize and filter runoff from the disturbed area and direct it towards the existing storm sewers, as free from sediment as possible. Jersey barriers may also be used to contain sedimentation on a construction site as needed. Retention or detention basins will be installed when needed on construction sites depending on flow pattern potential for heavy accumulation. The basin will be constructed at the common drainage location, on the downhill side of the site. Once the construction activity is nearly complete, the accumulated sediment will be removed from the barrier with inspection, a possible removal from the basin included. (See pages 9 -25 for discussion and design of control measures.)

Storm Water Management

Storm water drainage will be provided by both existing and new storm water drainage swales. Due to the construction, some storm water drains may be added or altered to reflect the new drainage patterns, if any, of the sites, in accordance with requests set up by the Town of Amherst. Newly constructed parking lots may have oil water separators as is necessary, when required by the Town of Amherst.

Other Controls

Waste Disposal

Waste Materials

All waste materials will be collected and stored in appropriate waste containers. Solid waste will be placed in securely lidded metal dumpsters or other suitable containers, which meet all state and local solid waste management regulations. All trash and construction debris from the site will be deposited in appropriate waste material specific dumpsters, such as for brick, sheet rock, or asbestos in accordance with EPA, DEP, and OSHA requirements. The dumpsters will be emptied when full, and the trash will be hauled to the appropriate waste collector or approved construction landfill. No waste debris, construction or associated materials will be buried onsite. All personnel will be instructed, by contract regarding the correct procedure for waste disposal. Notices stating these practices will be posted in the office trailer or construction office of the general contractor. The individual who manages the day to day site operations as well as the Amherst college Project Manger and the Amherst College Environmental Health and Safety Manager will be responsible for seeing that these procedures are followed.

Hazardous Materials

All hazardous waste materials will be disposed of in the manner specified by the Amherst College Plans, Policies and Standard Operating Guidelines, which reflect the applicable local, state and federal regulations. In case of a release of hazardous materials, accidental or otherwise, including asbestos and/or lead, the Amherst College Spill Prevention, Control and Countermeasures Plan, Hazardous Material Spill Control Policy, Asbestos Operations and Maintenance and Lead Paint Practices, will be used to minimize the impact and control the hazardous material. Site personnel will be instructed in the above mentioned procedures, and the site manager will be responsible for seeing that these practices are followed.

Sanitary Waste

Sanitary waste is handled in accordance with the requirements of the Town of Amherst POTW/ Sanitary Sewer/Water Department. Sani-cans used by contractors and their subcontractors are placed and maintained on site by an approved contractor. The waste is taken by approved removal company, as required based on the number of units and the size of the construction job.

Offsite Vehicle Tracking:

Several measures will be provided to help reduce the impact of vehicle tracking sediments. A stabilized construction entrance with trap rock and wood siding will be constructed at the entrance of each construction site to help reduce vehicle tracking of sediments, and maintained as necessary. The paved street adjacent to the construction site will be maintained as needed to prevent runoff of dirt and debris from the construction site. Additionally, the individual who manages the day to day operations will be responsible for overseeing the vehicles leaving the site, and in assuring that the minimum amount of soil is tracked off the construction site.

Timing of Controls / Measures

The storm water pollution prevention plan reflects the local, state and federal requirements for storm water management and erosion and sediment control. To ensure compliance, this plan was prepared in accordance with the Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices, a handbook prepared by the EPA. There are no other applicable local, State or Federal requirements for sediment and erosion site plans (or permits), or storm water management site plans (or permits).

Maintenance / Inspection Procedures

Erosion and Sediment Control Inspection and Maintenance Practices

These are the inspection and maintenance practices that will be used to maintain erosion and sediment controls:

- All control measures will be inspected daily by the general contractor and supervisor, and at least weekly by the Amherst College Project Manager, and Environmental Health and Safety Manager.
- Inspection frequency may be reduced to once per week if the site activity has been temporarily suspended and temporarily stabilized, or if run off is unlikely due to winter conditions (i.e. the site is covered in snow, ice, and the ground is frozen).
- All measures will be maintained in good working order; if repair is necessary, it will be initiated within 24 hours of report.
- Temporary and permanent seeding and planting will be inspected for bare spots, washouts, and healthy growth.
- A maintenance inspection report will be made after each inspection for bare spots, washouts, and healthy growth.
- It shall be the responsibility of the general contractor and Amherst College Project Manager to inspect, maintain, and repair construction activity to prevent runoff from the project.
- The general contractor shall inspect and maintain the site daily and will take corrective action immediately after identification of a problem. The general contractor shall report their finding and corrective action to the Amherst College Project Manager as stipulated with contract.
- At least weekly, the Amherst College Environmental Health and Safety Manager will perform an on-site

inspection of the construction site, and will if necessary, cease any and all construction activity until soil stabilization and runoff deficiencies have been corrected. The formal inspection report shall be made available to the general contractor and the Amherst College Project Manager in order to assist with the comprehensive daily inspection.

- The construction foreperson, working for the general contractor, shall hold weekly toolbox health and safety meetings that will include training on storm water and other environmental management techniques.
- It shall be the responsibility of the general contractor and Amherst College Project Manager to post the NOI permit and the viewing location of the SWPPP near the main entrance of the construction site.

Non Storm Water Discharges

It is expected that the only non-storm water discharges that will occur from the construction site will be within the regulations of the EPA NPDES Storm Water Permit. This permit has posted several allowable non-storm water discharges, including:

1. Discharges from firefighting activities
2. Fire hydrant flushing
3. Vehicle wash water, provided it does not contain any detergents
4. Water used to control dust, in accordance with other applicable regulations
5. Portable water, including uncontaminated water line flushing's
6. Routine external building wash down, provided:
    - No chemicals or detergents are used
    - Asbestos is not present
    - Lead paint if not disturbed
    - No hazardous or potentially hazardous materials are being utilized
7. Pavement wash waters provided there are no spills of oil, antifreeze, or other hazardous material present
    - These hazardous materials must be absorbed prior to wash down
8. Uncontaminated air conditioning or compressor condensate
9. Uncontaminated groundwater or spring water
10. Foundation or footing drains where flows are not contaminated with other hazardous or potentially hazardous materials from roofs, etc.
11. Uncontaminated ground or spring water
12. Uncontaminated excavation dewatering

Inventory for Pollution Prevention Plan

The materials or substances listed below are expected to be present onsite during construction:

1. Bituminous Concrete
2. Brick
3. Carpet
4. Concrete
5. Concrete Block
6. Epoxy flooring
7. Fertilizers
8. Fiberglass
9. Gravel
10. Metal Studs
11. Paints (latex and oil / enamel)
12. Petroleum products (including gasoline, oil, hydraulic fluid, and transmission fluid)
13. Piece Stone
14. Pipe Adhesive
15. Plaster

16. Propane (LPG)
17. Sand
18. Shingles (asphalt and slate)
19. Steel
20. Tile (ceramic)
21. Trap Rock
22. Waterproofing
23. Wood (including Oak, Pine, Pressure Treated, and Douglas Fir)

Spill Prevention

Material Management Practices

The following are the material management practices that will be used to reduce the risk of spills or other accidental exposure of materials and substances to storm water runoff.

Good Housekeeping:

The following good housekeeping practices will be followed onsite during the construction project.

- An effort will be made to store only enough product required to do the job.
- All materials stored onsite will be stored in a neat, orderly manner in their appropriate areas or containers and, when possible, under a roof or other enclosure.
- Products will be maintained as long as possible in their original with the original manufacturer's label. If transfer is made to another container, then the name of the material and hazard class, or a copy of the manufacturer's label will be transferred as well.
- Substances will not be mixed with one another unless recommended by the manufacturer.
- Whenever possible, all of a product will be used up before disposing of the container.
- Manufacturers' recommendations for proper use and disposal will be followed.
- The site superintendent will inspect daily to ensure proper use and disposal of materials onsite.
- Vehicles belonging to contractors and their subcontractors, including cement trucks/mixers and dump trucks, shall not be permitted to wash their vehicles or any part thereof at Amherst College, unless runoff can be controlled and recycled.

Hazardous Products:

The following practices are used to reduce the risks associated with hazardous materials:

- Material safety data sheets will be retained on the construction site or in the project trailer, as required by OSHA.
- Surplus product/chemicals shall be disposed of, in accordance with local, state, and federal requirements
- Inspected weekly for: tight fitting covers, proper labeling, hazard cross (ignitable, corrosive, toxic, reactive) and good housekeeping
- Disposed of by Amherst College Environmental Health and Safety Manager, when the container is full
- Labeled with: name of contractor, exact name of material/chemical, and hazard class

Improper hazardous material and waste disposal and management by the contractor (General Contractor and/or subcontractor) will result in a notice of non-compliance from the college and/or a fine, payable to a non-profit organization.

Product Specific Practices

The following product specific practices will be followed onsite:

Petroleum Products:

The following practices are used to reduce the risk associated with petroleum products:

- All onsite vehicles will be monitored for leaks and receive regular preventative maintenance to reduce the chance of leakage.
- Any petroleum product on site will be stored in tightly sealed containers, which are clearly labeled.
- Any asphalt substance used onsite will be applied according to the manufacturer's recommendations.

Any leakages will be controlled according to the Amherst College Storm Water Management Plan. This plan states that if any hazardous leakage occurs, the Amherst College Environmental Health and Safety Manager, Amherst College Project Manager, or the Amherst College Campus Police will be immediately contacted and the following action will be taken: the spill will be appropriately cleaned up using absorbent material, including, but not limited to absorbent pulp, pillows, socks, pads, etc., all contaminated materials will be double bagged (6ml plastic) and placed into an appropriately labeled drum (plastic or metal) in accordance with local, state, and federal regulations. The drum will be stored within the hazardous waste shed to await proper disposal, through our hazardous waste hauler, Triumvirate Environmental Inc.

Fertilizers:

Fertilizers used will be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer will be worked into the soil to limit exposure to storm water. Storage will be covered. The contents of any partially sued gag of fertilizer will be transferred to a sealable plastic bin to avoid spills.

Paints and Thinners:

All paint containers, including enamel latex and oil, will be tightly sealed and stored at all times, unless actually being used. Open cans of paint or thinners, not in use at the time of inspection will warrant a note of non-compliance and possible fine from the College. Excess paint will not be discharged to the storm water or sanitary sewer system, but will be collected in the Amherst College hazardous waste storage building to be disposed of by an outside contractor.

Concrete Trucks:

Concrete trucks, dump trucks and other construction equipment, shall not be allowed to wash out or discharge surplus concrete, dirt, debris, etc. while on Amherst College property, unless approved by the Department of Environmental Health and Safety in advance.

Contaminated Soils:

The following practices are used to reduce the risks associated with contaminated soils:

- Any soils to contain any contamination will be reported to the office of Environmental Health and Safety for inspection, collection and disposal.
- Disposal shall be performed in accordance with local, state and federal regulations, the Amherst College Policies and Procedures through our approved hazardous waste hauler, Triumvirate Environmental.
- Soil brought to campus as replacement or fill shall be checked for contaminants such as lead and petroleum based products to prevent contamination of a site that might fall under future regulatory requirements for that building or site.

Sandblasting Grits:

Sandblasting will only be allowed within the regulation stated in the Amherst College Painting Policy. This policy states that only approved sandblasters, which minimize the spread of paint chips to the surrounding area, can be used. If being used on a building that contained lead, cadmium or chrome based paints, the sandblasting grit and paint chips shall be collected in plastic bags and stored in Amherst College's Hazardous Waste Storage Building,

and disposed of by a licensed, approved waste management or transport and disposal contractor. Sand grits must not be washed into the storm or sanitary sewer.

Spill Control Practices

In addition to the good housekeeping and material management practices discussed in the previous sections of this plan, the following practices will be followed for spill prevention and cleanup:

- Manufacturer's recommended methods for spill cleanup will be clearly posted and site personnel will be made aware of the procedures and the location of the information and cleanup supplies.

- Materials and equipment necessary for spill cleanup will be kept in the Amherst College emergency response vehicle and the Hazardous Material Storage facility located at 2 East Drive onsite. Equipment and materials will include but not be limited to brooms, dustpans, mops, rags, gloves, goggles, absorbent pads, pulp, socks, pillows, sand, sawdust, plastic bags and metal trash containers specifically for this purpose.

- All spills of hazardous materials and wastes, regardless of the size, will be reported immediately to the site manager, Amherst College Campus Police and the Environmental Health and Safety Manager.

- Hazardous material incidents, other than incidental non-hazardous releases, will require immediate evacuation by onsite personnel, reporting of that incident to the Amherst College Campus Police from a safe location and all other applicable protocols found in the Contractor Health and Safety Guidelines, and Amherst College Emergency Action Plan.

Pollution Prevention Plan Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violation.

Date: _____ / _____ /20_____

Signed
Richard Mears
Amherst College
Environmental Health and Safety Director

Contractor's Certification

I certify under penalty of law that I understand the terms and conditions of the General National Pollution Discharge Elimination System (NPDES) permit that authorizes the storm water discharges associated with industrial activity on the construction site identified as part of this certification.

Date: _____ / _____ /20_____

Signed
Responsible for General Contractor

_____
(Company and Address)

Date: _____ / _____ /20_____

Signed
Responsible for Temporary and Permanent Stabilization

_____
(Company and Address)

Date: _____ / _____ /20_____

Signed
Responsible for Storm Water Control Measures

_____
(Company and Address)

Best Management Practices Control Design Criteria

Control of Sedimentation and Erosion:

The following practices may be used to divert upstream flows away from the construction site and to prevent uncontrolled runoff from the construction site:

Drainage Swale
Earth Dike
Silt Fence

The controlling design criteria are:

Drainage Swale

- Must have a slope grade of less than 10%
- May need regular reseeding / stabilization
- Channel width is about 24”

Earth Dike

- Must have a slope grade between 0.5 – 10%
- May need regular reseeding / stabilization
- Channel width is about 4’ – 6’

Silt Fence

- Effective for about 6 months
- Maximum of 100’ fence per 0.25 acre
- Surrounding slope must be altered to 1:1 slope

The following practice may be used to control vehicle tracking of sedimentation off the construction site:
Stabilized Construction Entrance (refer to pg 24)

- Width is 10’ – 12’
- Length is 50’ – 75’

The following practice may be used to reduce the velocity of runoff on a construction site:
Check Dam (refer to pg 14)

- Maximum coverage is 1 dam per 2 – 10 acres drainage area
- May be constructed of rocks, logs, or sand bags

The following practices may be used to protect drainage inlets:

- Block and Gravel Inlet Protection (refer to pg 13)
- Excavated Gravel Inlet Protection (refer to pg 18)
- Filter Fabric Inlet Protection (refer to pg 19)

<u>The design criteria for all of the above mentioned control practices:</u>
Maximum drainage area is 1 acre
Maximum drainage slope is 5%

<u>The controlling design criteria are:</u>

Block and Gravel Inlet Protection

- Ideal for heavy flows of 0.5 cfs or greater
- Ideal if ponding around the inlet structure is not a concern for onsite traffic

Excavate Gravel Inlet Protection

- Ideal for heavy flows of 0.5 cfs or greater
- Ideal if ponding around the inlet structure is a concern of onsite traffic

Filter Fabric Inlet Protection

- Maximum surrounding drainage slope is 1%
- Maximum overland flow is 0.5 cfs

Dewatering – Massachusetts General Permit

In accordance with the requirements of the Federal and Massachusetts Clean Waters Act, Amherst College and contractors working on property belonging to or adjoining the campus will follow all applicable stormwater requirements, inclusive of dewatering regulations and best management practices (BMP's).

- Uncontaminated discharges from Amherst College are permitted to stormwater systems, as Amherst is not located within a coastal, marine or inland receieving waterway, as designated in the Massachusetts Water Quality Standards, 314 CMR 4.00 et seq., unless otherwise restricted, in accordance with effluent limitations, monitoring requirements and other conditions set forth herein.

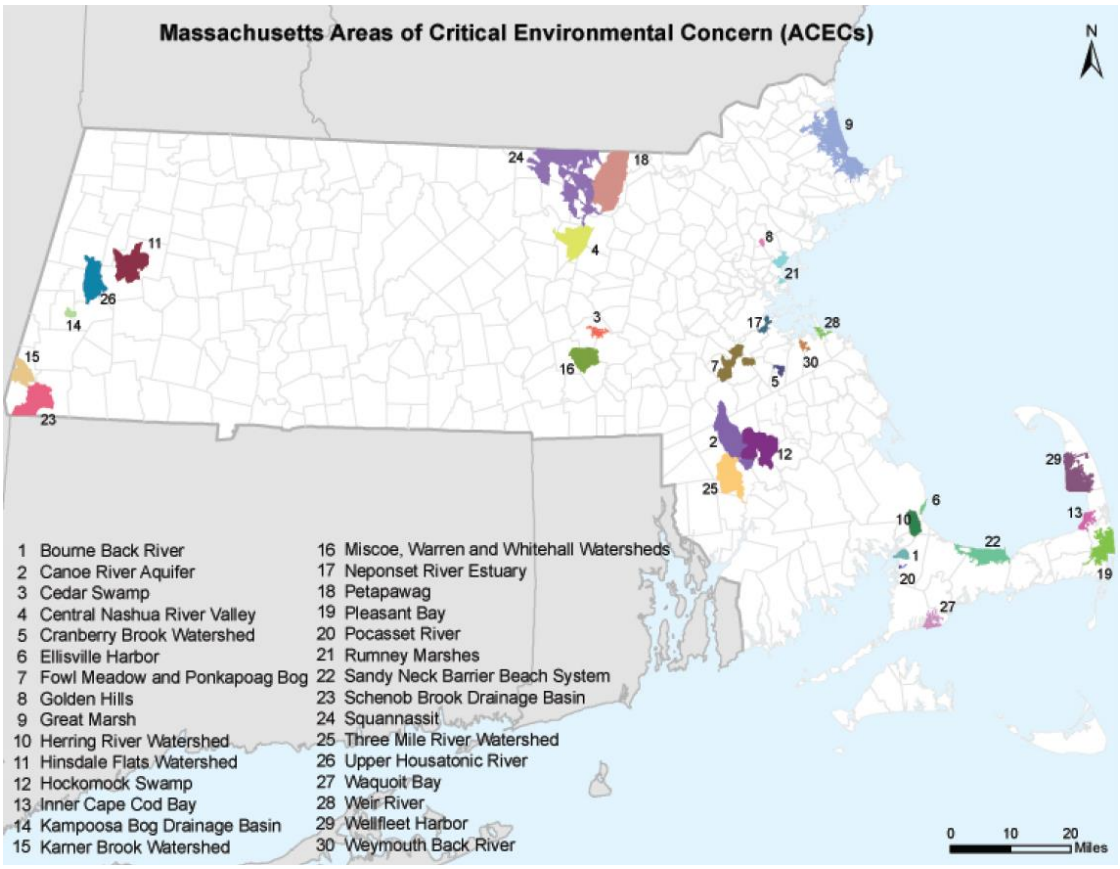
Any discharges authorized by the General Permit can be commingled with other discharges as long as the authorized discharge(s) are monitored separately (prior to commingling) for compliance with the requirements of this General Permit and any non-authorized discharge is either covered by another NPDES permit or excluded from requiring an NPDES permit by EPA regulation and/or by the Commonwealth.

Discharge Limits and Monitoring Requirements

During the period beginning on the effective date and lasting through expiration, tAmherst College is authorized to discharge uncontaminated water from construction dewatering intrusion and/or storm water processes.

As indicated below, the Amherst area does not fall into the category of Areas of Critical Environmental Concern (ACEC's), and as such would not require additional notification of other regulatory agencies, unless the dewatering was determined to be "contaminated." As defined here-in.

- Inland Class A and Class B Receiving Waterways are <u>not</u> located within the Amherst Area of Hampshire County.
- Coastal and Marine Class SA and SB Receiving Waterways are <u>not</u> located within the Amherst Area of Hampshire County.



Footnotes:

The following practice may be used to temporarily divert flow off construction site:

Pipe Slope Drain

- Will require inlet and outlet control measures
- Maximum drainage area is 10 acres, recommended maximum is 5 acres

Control Measures – Dewatering

- **Construction Dewatering**
  Construction dewatering may be pumped from below grade and has the potential to contain sediment. This sediment and other known contaminants shall be filtered before discharge of effluent to the Amherst College storm drain system.
- **Compliance and Monitoring of Discharge**
  Initial testing of the discharge shall be performed weekly to determine a baseline for pH and Total Suspended Solids (TSS). From that point forward, pH tests will be performed weekly with TSS samples taken monthly. In addition, any and all appropriate testing will be performed immediately when an unanticipated (potentially contaminated) release is identified.
  - pH - Weekly Samples
  - Total Suspended Solids (TSS) - Monthly, or at the point of an unanticipated release.
    - Daily Maximum – 100mg/L
    - Monthly Average – 50mg/L
  - Hydrocarbons (15mg/L) - at the point of an unanticipated release
  - Total Residual Chlorine (TRC) - if the discharge(s) contain water from the municipal source

  Sample requirements
  1. Samples shall be taken only when discharging and should be taken at a location that provides a representative analysis of the effluent just prior to discharge to the receiving water or if the effluent is commingled with another permitted discharge, prior to such commingling.
  2. Sample numbers for length of flow duration shall not exceed BMP
  3. The flow rate shall not exceed the maximum capacity of any treatment device
  4. Samples shall be tested by a Massachusetts accredited water testing laboratory
     - Documentation of all tests shall be maintained by the Stormwater Manager and placed into a binder/folder for inspection and regulatory purposes.
     - All samples shall be tested using the analytical methods found in 40 CFR § 136 or alternative methods approved by EPA in accordance with the procedures in 40 CFR §136.
  5. If the discharge(s) contain water from the municipal source, sampling for total residual chlorine (TRC) is required.
  6. Sampling for any hydrocarbon is required only if during a periodic inspection or at any other observation, the discharge or standing water contained at the facility prior to discharge indicates the presence of a visible sheen as defined in 40 CFR Part 110.
     - Where a leak, spill, or other release containing a hazardous substance or oil has been identified, it shaqll be immediately reported to the office of Environmental Health and Safety at Amherst College, as required.
  7. Excepting non-toxic chemicals used for pH neutralization and/or dechlorination, this General Permit prohibits the addition of toxic materials or chemicals to the discharge

- **Groundwater**
  - As a result of past projects, both small and large, and all previous ground, soil and water testing conducted on campus, there is no evidence of any known groundwater contamination at Amherst College.
    - As indicated above, if any discharge from the college is determined to be tainted, the discharge will immediately stop, Environmental Health & Safety will be notified and all appropriate testing and mitigation controls shall be conducted.

Requirements- Additional

1. The discharge shall not cause a violation of the water quality standards of the receiving water.
2. The discharge shall not cause an objectionable discoloration of the receiving water.
3. There shall be no discharge of visible foam or floating, suspended and/or settle able solids in concentrations or combinations that would impair any use assigned to the receiving water class.
4. The permittee shall use any one or a combination of the following BMPs for construction dewatering discharges to ensure that the numeric and non-numeric effluent limits in Part 1 are met:

Runoff Control

- ☐ Check Dams
- ☐ Grass-Lined Channels
- ☐ Permanent Slope Diversions
- ☐ Temporary Diversion Dikes

Erosion Control

- ☐ Compost blankets
- ☐ Dust control
- ☐ Geotextiles
- ☐ Gradient terraces
- ☐ Mulching
- ☐ Riprap
- ☐ Seeding
- ☐ Sodding
- ☐ Soil Retention
- ☐ Soil Roughening
- ☐ Temporary Slope Drain
- ☐ Temporary Stream Crossings
- ☐ Wind Fences and Sand Fences

Sediment Control

- ☐ Bag and/or Sand Filters
- ☐ Brush Barrier
- ☐ Compost Filter Berms and/or Socks
- ☐ Construction Entrances
- ☐ Dewatering Tanks
- ☐ Fiber Rolls
- ☐ Filter Berms
- ☐ Sediment Basins and/or Traps
- ☐ Sediment Filters and/or Chambers
- ☐ Rock Dams
- ☐ Silt Fences
- ☐ Storm Drain Inlet Protection
- ☐ Straw or Hay Bales
- ☐ Vegetated Buffers
- ☐ Weir Tanks

Permit Conditions – Massachusetts

1. This NPDES permit is issued jointly by the U. S. Environmental Protection Agency (EPA) and the MassDEP under federal and state law, respectively. As such, all the terms and conditions of this permit are hereby incorporated into and constitute a discharge permit issued by the Commissioner of the MassDEP pursuant to M.G.L. Chap. 21, Section 43. Each agency shall have the independent right to enforce the terms and conditions of this permit.

2. An authorization to discharge under this General Permit, where the activity discharges to a municipal or private sanitary sewer system owned by another party, does not convey any rights or authorization to connect to that drain.
    - If the sanitary sewer system within the Town of Amherst has to be used for a "special" release, Amherst College shall notify the Amherst DPW Stormwater Treatment Plant operator of the proposed discharge.
3. At any time MassDEP determines that additional water quality certification requirements are necessary to protect water quality and in lieu of requiring a discharger covered under a general permit to obtain an individual permit (314 CMR 3.06(8)), MassDEP may require an individual discharger to undertake additional control measures, BMPs, or other actions. MassDEP may exercise its authority to require the discharger to take these actions by imposing a condition in the general permit to that effect, or by taking an enforcement action against the discharger, or by any other means. Any such conditions shall be supplied to the permittee in writing.

Responsibilty – Stormwater Manager

- In addition to the above, it shall be the responsibility of the Stormwater Manager to inspect, monitor and record all data for stormwater related to the project.

- If any unanticipated contaminant, discharge, odor or sedimentation is identified in the process, or if the dewatering discharge exceeds permissible flow levels, the Stormwater Manager or their designee shall notify the office of Environmental Health & Safety at Amherst College for immediate corrective action(s).

Responsibility – Dewatering Contractor

- In addition to the above requirements, it shall be the responsibility of the Dewatering contractor or their designee to identify the flow rate from the construction site, and utilize the appropriate calculations, equipment, flow meters and other appropriate monitors to maintain a discharge below the maximum calculated design flow.
- The dewatering contractor, in cooperation with the General Contractor (GC) shall determine in advance if the discharge flow can/will be exceeded for unexpected reasons, such as, but not limited to weather, and shall immediately discontinue discharge from the site until appropriate conditions can be maintained.

The following practice may be used to protect drainage outlets:

Temporary Sediment Trap (refer to pg 25)

- Maximum drainage area is 5 acres
- Effective for about 18 – 24 months
- Width is 2' – 5'
- Length is 3' – 4'

Block and Gravel Inlet Protection

How to Build Them

Design Criteria:

Inlet protection is appropriate in the following locations:

- In drainage areas (less than 1 acre) where the storm drain inlet is functional before the drainage area has been permanently stabilized.
- Where there is danger of sediment silting in an inlet which is in place prior to permanent stabilization.

Block and gravel inlet protection may be used with most types of inlets where overflow capability is needed and in areas of heavy flows 0.5 cfs or greater.

- The drainage areas should not exceed 1 acre
- The drainage area should be fairly flat with slopes of 5% or less.
- To achieve maximum trapping efficiency, the longest dimension of the basin should be orientated toward the longest inflow area.

- Where possible the trap should have sediment trapping sump of 1 or 2 feet in depth with side slopes of 2:1.

There are several other types of inlet protection also used to prevent situation of storm drainage systems and structures during construction, they are:

- Filter Fabric Inlet Protection
- Excavated Gravel Inlet Protection

Materials:

1. Hardware cloth of wire mesh with ½ inch openings
2. Filter fabric (see fabric specifications for silt fence)
3. Concrete block 4 inches to 12 inches wide.
4. Washed gravel ¾ inches to 4 inches in diameter.

Construction Specification:

1. The inlet grate should be secured to prevent seepage of sediment-laden water.
2. Place wire mesh over the drop inlet, so that the wire extends a minimum of 12 to 18 inches beyond each side of the inlet structure. Overlap the strips of mesh if more than one is necessary.
3. Place filter fabric (optional) over the mesh and extend it at least 18 inches beyond the inlet structure.
4. Place concrete blocks over the filter fabric in a single row lengthwise on their sides along the sides of the inlet. The foundation should be excavated a minimum of 2 inches below the crest of the inlet and the bottom row of blocks should be against the edge of the structure for lateral support.
5. The open ends of the block should have outward not upward and the ends of adjacent blocks should abut. Lay one block on each side of the structure on its side to allow for dewatering of the pool.
6. The barrier should be at least 12 inches high and may be up to a maximum of 24 inches high and may be from 4 inches to 12 inches in depth, depending on the size of block used.
7. Prior to backfilling, place wire mesh over the outside vertical end of the blocks so that stone does not wash down the inlet.
8. Place gravel against the wire mesh to the top of the blocks.

Maintenance:

Inspect regularly and after every storm. Make any repairs necessary to ensure the measure is in good working order. Sediment should be removed and the trap resorted to its original dimensions when sediment has accumulated to ½ the design depth of the trap.

- All sediments removed should be properly disposed of.
- Inlet protection should remain in place and operational until the drainage area is completely stabilized, or up to 30 days after the permanent site stabilization is achieved.

Check Dams

What are they?

A check dam is a small, temporary or permanent dam constructed across a drainage ditch, swale, or channel to lower the speed of concentrated flows. Reduced runoff speed reduces erosion and gullying in the channel and allows sediments to settle out.

When and Where to Use Them

A check dam should be installed in steeply sloped swales, or in swales where adequate vegetation cannot be established. A check dam may be build from logs, stone, or pea gravel-filled sandbags.

How to Build Them

Design Criteria:

Check Dams are appropriate for use in the following locations:

- Across swales or drainage ditches to reduce the velocity of flow.
- Where velocity must be reduced because of vegetated channel lining has not yet been established.
- Check Dams may never be used in a live stream unless approved by the appropriated government agency.
- The drainage area above the Check Dam should be between 2 and 10 acres.
- The dams must be spaced so that the toe of the upstream dam is never any higher than the top of the downstream dam.
- The center of the dam must be 6 to 9 inches lower than the edge and the maximum height of the dam should be 24 inches.
- The Check Dam should be as much as 18 inches wider than the banks of the channel to prevent undercutting as overflow water reenters the channel.
- Excavating a sump immediately upstream from the check dam improves its effectiveness.
- Provide outlet stabilization below the lowest Check Dam where the risk of erosion is greatest.
- Consider the used of channel linings or protection such as plastic sheeting or riprap where there may be significant erosion or prolonged submergence.

Materials

1. Stone 2” to 15” in diameter
2. Logs 6” to 8” in diameter
3. Sandbags filled with pea gravel
4. Filter fabric (see fabric specifications for silt fence)

Construction Specifications:

Rock Check Dams

Place the stones on the filter fabric either by hand or using appropriate machinery; do not simply dump them in place.

Extend the stone 18” beyond the banks and keep the side slopes 2:1 or flatter.

Lining the upstream side of the dam with ¾” to 1¼ “gravel 1 ft depth is a suggested option.

Log Check Dams

Logs must be firmly embedded in the ground; 18” is the recommended minimum depth.

Sand Bag Check Dams

Be sure that bags are securely sealed.

Place bags by hand or use appropriate machinery.

Maintenance

- Inspect regularly and after every storm. Make any repairs necessary to ensure the measure is in good working order. Accumulated sediment and leaves should be removed from behind the dams and erosive damage to the channel restored after each storm or when ½ the original height of the dam is reached.
- All accumulated material removed from the dams shall be properly disposed.
- Replace stone as necessary for the dams to maintain their correct height.
- If sandbags are used, the fabric of the bags should be inspected for signs of deterioration.
- Remove stone or riprap if grass lined channel requires mowing.
- Check Dams should remain in place and operational until the drainage area and channel are completely stabilized or up to 30 days after the permanent site stabilization is achieved.
- Restore the channel lining or establish vegetation when each dam is removed.

Drainage Swale

A drainage swale is a channel with a lining of vegetation, riprock, asphalt, concrete, or other material. It is constructed by excavating a channel and applying the appropriate stabilization.

When and Where to Use It

A drainage swale applies when runoff is to be conveyed without causing erosion. Drainage swales can be used to convey runoff from the bottom or top of a slope. Drainage swales accomplish this by intercepting and diverting the flow to a suitable outlet. For swales draining in disturbed area, the outlet can be to a sediment trapping device prior to its release.

How to Build Them

Design Criteria:

Temporary drainage swales are appropriate in the following situations:

- To divert upslope flows away from disturbed areas such as cut or fill slopes and to divert runoff to a stabilized outlet.
- To reduce the length of the slope runoff will cross.
- To direct sediment-laden runoff to a sediment trapping device.

When the drainage area is greater than 10 acres of the United Sates Department of Agriculture – Soil Conservation Services (USDA-SCS) standards and specifications for diversions should be consulted.

- The minimum channel depth should be between 12" and 18".
- The minimum width at the bottom of the channel should be 24" and the bottom should be level.
- The channel should have a uniform positive grade between 2% and 5%, with no sudden decreases where sediments may accumulate and cause overtopping.
- The channel should be stabilized with temporary or permanent stabilization measures.
- Grades over 10% may require an engineering design.
- Construct the swale away from areas of major construction traffic.
- Runoff must discharge to a stabilized outlet.

Materials:

1. Grass seed for temporary or permanent stabilization.
2. Sod
3. Coarse aggregate or riprap

Construction Specifications:

- Clear the area of all tress, bush, stumps or other obstructions.
- Construct the swale to the designed cross-section, line and grade making sure that there are no irregularities or bank projections to impede the flow.
- The lining should be well compacted using earth moving equipment and stabilization initiated as soon as possible.
- Stabilize lining with grass seed, sod, or riprap.
- Surplus material should be properly distributed or disposed of so that it does not interfere with the functioning of the swale
- Outlet dissipation measures should be used to avoid the risk of erosion.

Maintenance:

Inspect regularly and after every storm, make any repairs necessary to ensure the measure is in good working order.

Inspect the flow channel and outlet for deficiencies or signs of erosion.

If surface of the channel requires material to be added be sure it is properly compacted.

Reseed or stabilize the channel as needed to prevent erosion during a storm event.

Earth Dike

What is It?

An earth dike is a ridge or ridge and channel combination used to protect work areas from upslope runoff and to divert sediment laden water to appropriate traps or stable outlets. The dike consists of compacted soil and stone, riprap, or vegetation to stabilize the channel.

When and Where to Use It

Earth Dikes are used in construction areas to control erosion, sedimentation, or flood damage. Earth dikes can be used in the following situations:

- Above disturbed existing slopes and above cut or fill slopes to prevent runoff over the slope
- Across unprotected slopes, as slope breaks, to reduce slope length.
- Below slopes to divert excess runoff to stabilized outlets.
- To divert sediment laden water to sediment traps.
- At or near the perimeter of the construction area to keep sediment from leaving the site.
- Above disturbed areas before stabilization to prevent erosion and maintain acceptable working conditions.
- Temporary diversions may also serve as sediment traps when the site has been over excavated on flat grade or in conjunction with sediment fence.

How to Build Them

Design Criteria:

Earth dikes are appropriate in the following situations;

- To divert upslope flows away from disturbed areas such as cut or fill slopes and to divert runoff to a stabilized outlet.
- To reduce the length of a slope runoff will cross.
- At the perimeter of the construction site to prevent sediment-laden runoff from leaving the site.
- To direct sediment-laden runoff to a sediment trapping device.

When the drainage area to the earth dike is greater than 10 acres, the United States Department of Agriculture- Soil Conservation Service (USDA-SCS) standards and specification of diversions should be consulted. Table 1 contains suggested dike design criteria.

Table 1: Suggested Dike Design Criteria

Drainage Area	Under 5 Acres	Between 5 – 10 Acres
Dike Height	18 inches	30 inches
Dike Width	24 inches	36 inches
Flow Width	4 feet	6 feet
Flow Depth	12 inches	24 inches
Side Slopes	2:1 or less	2:1 or less
Grade	0.5% - 10%	0.5% - 10%

1. The base for a dike 18” high and 24” wide at the top should be between 6’ and 8’. The height of the dike is measured the upslope side.
2. If the dike is constructed using coarse aggregate the side slopes should be 3:1 or flatter.
3. The channel formed behind the dike should have a positive grade to a stabilized outlet. The channel should be stabilized with vegetative or other stabilization measures.
4. Grades over 10% may require an engineering design.
5. Construct the dike where it will not interfere with major areas of construction traffic so that vehicle damage to the dike will be kept to a minimum.
6. Diversion dikes should be installed prior to the majority of soil disturbing activity, and may be removed when stabilization of the drainage area and outlet are complete.

Materials:

1. Compacted Soil
2. Coarse Aggregate

Construction Specifications:

- Clear the area of all trees, brush, stumps or other obstructions.
- Construct the dike to the design cross-section, line and grade making sure that there are no irregularities or bank projections to impede the flow.
- The dike should be compacted using earth moving equipment to prevent failure of the dike.
- The dike must be stabilized as soon as possible after the installation.

Maintenance:

- Inspect regularly and after every storm, make any repairs necessary to ensure the measure is in good working order.
- Inspect the dike, flow channel and outlet for deficiencies or signs of erosion.
- If material must be added to the dike, be sure it's properly compacted.
- Reseed or stabilize the dike as needed to maintain its stability regardless if there has been a storm event or not.

Excavated Gravel Inlet Protection

How to Build Them

Design Criteria:

Inlet protection is appropriate in the following locations:

1. In small drainage areas (less than 1 acre) where the storm drain inlet is functional before the drainage area has been permanently stabilized.
2. Where there is danger of sediment silting in an inlet, which is in place prior to permanent stabilization.
3. Where ponding around the inlet structure could be a problem to traffic on site.

Excavated gravel and mesh inlet protection may be used with most inlets where overflow capability is needed and in areas of heavy flows, 0.5 cfs or greater.

1. The drainage area should not exceed 1 acre.
2. The drainage area should be fairly flat with slopes of 5% or less.
3. The trap should have a sediment trapping sump of 1 to 2 feet measured from the crest of the inlet. Side slopes should be 2:1.
4. The recommended volume of excavation is 35yd3/acre disturbed.
5. To achieve maximum trapping efficiency the longest dimension of the basin should be orientated toward the longest inflow area.

Material:

Hardware cloth or wire-mesh with ½ inch openings.
Filter fabric (see the fabric specifications for silt fence).
Washed gravel ¾ inches to 4 inches in diameter.

Constructed Specifications:

- Remove any obstructions to excavating and grading. Excavate sump area, grade slopes and properly dispose of soil.
- The inlet grate should be secured to prevent seepage of sediment laden water.

- Place filter fabric over the mesh extending it at least 18" beyond the inlet opeing on all sides. Ensure that weep holes in the inlet structure are protected by filter fabric and gravel.
- Place stone/gravel over the fabric/wire mesh to a depth of at least 1 foot.

Maintenance:

- Inspect regularly and after every storm. Make any repairs necessary to ensure the measure is in good working order.
- Sediments should be removed and the trap restored to its original dimensions when sediment has accumulated to ½ the design depth of the trap.
- Clean or remove and replace the stone or filter fabric if they become clogged.
- Inlet protection should remain in place and operational until the drainage area is completely stabilized, or up to 30 days after the permanent site stabilization is achieved.

Filter Fabric Inlet Protection

How to Build Them

Design Criteria:

Inlet protection is appropriate in the following locations:

In small drainage areas (less than 1 acre) where the storm drain inlet is functional before the drainage area has been permanently stabilized.

Where there is danger of sediment silting in an inlet, which is in place prior to permanent stabilization.

Filter fabric inlet protection is appropriate for most types of inlets where the drainage area is one acre or less.

1. The drainage area should be fairly flat with slopes 5% or less and the area immediately surrounding the inlet should not exceed a slope of 1%.
2. Overland flow to the inlet should be no greater than 0.5 cfs.
3. This type of inlet protection is not appropriate for use in paved areas because the filter fabric required staking.
4. To avoid failure caused by pressure against the fabric when overtopping occurs, it is recommended that the height of the filter fabric be limited to 1 ½ feet above the crest of the drop inlet.
5. It is recommended that a sediment trapping sump of 1 to 2 feet in depth with side slopes of 2:1 be provided.

Materials:

1. Filter fabric (see fabric specifications for silt fence).
2. Wooden stakes 2" x 2" or 2" x 4" with a minimum length of 3 feet.
3. Heavy duty wire staples at least ½ inch in length.
4. Washed gravel ¾ inches in diameter.

Construction Specifications:

- Place a stake at each corner of the inlet and around the edges at no more than 3 feet apart. Stakes should be driven into the ground 18 inches or at a minimum of 8 inches.
- For stability a framework of wood strips should be installed around the stakes at the crest of the overflow area 1 ½ feet above the crest of the drop inlet.
- Excavate a trench of 8 to 12 inches in depth around the outside perimeter of the stakes. If a sediment trapping sump is being provided then the excavation may be as deep as 2 feet.
- Staple the filter fabric to the wooden with heavy-duty staples, overlapping the joints to the next stakes. Ensure that between 12 to 32 inches of filter fabric in the trench and backfill the trench all the way around using washed gravel to a minimum depth of 4 inches.

Maintenance:

Inspect regularly and after every storm. Make any repairs necessary to ensure the measure is in good working order. Sediment should be removed and the trap restored to its original dimensions when sediment has accumulated to ½ the design depth of the trap.

- If the filter fabric becomes clogged, it should be replaced immediately.
- Make sure that the stakes are firmly in the ground and that the filter fabric continues to be anchored.

- All sediments removed should be properly disposed.
- Inlet protection should remain in place and operational until the drainage area is completely stabilized or up to 30 days after the permanent site stabilization is achieved.

Pipe Slope Drains

What are They?

Pipe slope drains reduce the risk of erosion by discharging runoff to stabilized areas. Made of flexible or rigid pipe, they carry concentrated runoff from the top to bottom of a slope that has already been damaged by erosion or is at high risk for erosion. They are also used to drain saturated slopes that have the potential for soil slides. Pipe slope drains can be either temporary or permanent depending on the method of installation and material used.

When and Where to Use Them

Pipe slope drains are used whenever it is necessary to convey water down a slope without causing erosion. They are especially effective before a slope has been stabilized or before permanent drainage structures are ready for use. Pipe slopes drain may be used with other devices, including diversions dikes or swales, sediment traps, and lever spreaders (used to spread out storm water runoff uniformly over the surface of the ground). Temporary pipe slope drains, usually flexible tubing or conduit, may be installed prior to the construction of permanent drainage structures. Permanent slope drains may be placed on or beneath ground surface; pipes, sectional down drains, paved chutes, or clay tiles may be used. Paved chutes may be covered with a surface of concrete or other impenetrable material. Subsurface drains can be constructed of concrete, PVC, clay tile, corrugated-metal, or other permanent material.

How to Build Them

Design Criteria:

Pipe Slope Drains (PSD) are appropriate in the following general locations:

- On cut or fill slopes before permanent storm water drainage structures have installed.
- Where earth dikes or other diversion measures have been used to concentrate flows.
- On any slope where concentrated runoff crossing the face of the slope may cause gullies, channel erosion, or saturation of slide prone soils.
- As an outlet for natural drainage way.
- The drainage area may be up to 10 acres; however, many jurisdictions consider 5 acres the recommended maximum.
- The PSD design should handle the peak runoff for the 10-yr storm. Typical relationships between area and pipe diameter are shown in Table 2 below.

Table 2: Relationship between Area and Pipe Diameter

Maximum Drainage Area (Acres)	Pipe Diameter (D) (Inches)
0.5	**12**
0.075	**15**
1.0	**18**

Materials:

Pipe may be heavy-duty flexible tubing designed for this purpose, e.g. , non perforated, corrugated plastic, corrugated metal pipe, bituminous filter pipe, or specially designed flexible tubing.

- Extension collars should be 12” long sections of corrugated pipe. All fittings must be watertight.

Construction Specifications:

- Place the pipe slope drain on undisturbed or well compacted soil.

- Soil around and under the entrance section must be hand tamped in 4” to 8” lifts to the top of the dike to prevent piping failure around the inlet.
- Place filter cloth under the inlet and extend 5’ in from of the inlet and be keyed in 6” on all sides to prevent erosion. A 6” metal toe plate may also be used for this purpose.
- Ensure firm contact between the pipe and the soil at all pints by backfilling around and under the pipe with stable soil material hand compacted in lifts of 4” to 8”.
- Securely stake the PSD to the slope using grommets provided for this purpose at intervals of 10’ or less.
- Ensure that all slope drain sections are securely fastened together and have watertight fittings.
- Extend the pipe beyond the toe of the slope and discharge at a non-erosive velocity into a stabilized are (e.g., rock outlet protection may be use) or to a sedimentation trap or pond.
- The PSD should have a minimum slope of 3% or steeper.
- The height at the centerline of the earth dike should range from minimum of 1.0 foot over the pipe to twice the diameter of the pipe measured from the invert of the pipe. It should be at least 6” higher than the adjoining ridge on either side.
- At no point along the dike will the elevation of the top of the dike be less than 6” higher than the top of the pipe. Immediately stabilize all areas disturbed by installation or removal of the PSD.

Maintenance:
Inspect regularly and after every storm. Make any necessary repairs.

- Check to see that water is not bypassing the inlet and undercutting the inlet or pipe. If necessary, install headwall or sandbags.
- Check for erosion at the outlet point and the pipe for breaks or clogs. Install additional outlet protection if needed and immediately repair the breaks and clean any clogs.
- Don not allow construction traffic to cross the PSD and do not place any material on it.
- If a sediment trap has been provided, clean it out when the sediment level reaches 1/3 to ½ the design volume.
- The PSD should remain in place until the slope has been completely stabilized or up to 30 days after permanent slopes stabilization.

Silt Fence

What is It?
A silt fence, also called a “filter fence”, is a temporary measure for sedimentation control. It usually consists of posts with filter fabric stretched across the posts and sometimes with a wire support fence. The lower edge of the fence is vertically trenched and covered by backfill. A silt fence is used in small drainage areas to detain sediment. The fences are most effective where there is overland flow (runoff that flows over the surface the ground as a thin, even layer) or in minor swales or drainage ways. They prevent sediment from entering receiving waters. Silt fences are also used to catch wind blown sand and to create an anchor for sand dune creation. Aside from the traditional wooden post and filter fabric method, there are several variations of silt fence installation including silt fence which can be purchased with pockets pre-sewn to accept use of steel fence posts.

When and Where to Use It
A silt fence should be installed prior to major soil disturbance in the drainage area. The fence should be placed across the bottom of a slope along a line of uniform elevation (perpendicular to the direction of flow). It can be used at the outer boundary of the work area. However, the fence does not have to surround the work area completely. In addition, a silt fence is effective where sheet and rill erosion may be a problem. Silt fences should not be constructed in streams of swales.

How to Build Them
Design Criteria:
Silt fences are appropriate at the following general locations:

- Immediately upstream of the point(s) of runoff discharge from a site before flows becomes concentrated (maximum design flow rate should not exceed 0.5 cubic feet per second).
- Below disturbed areas where runoff may occur in the form of overland flow.
- Ponding should not be allowed behind silt fences since they will collapse under high pressure; the design should provide sufficient outlets to prevent overtopping.
- The drainage area should not exceed 0.25 acre per 100 feet of fence length.
- For slopes between 50:1 and 5:1, the maximum allowable upstream flow path length to the fence is 100 feet; for slopes 2:1 and steeper, the maximum is 20 feet.
- The maximum upslope grade perpendicular to the fence line should not exceed 1:1.
- Synthetic silt fences should be designed for 6 months of service; burlap is acceptable for periods of up to 60 days.

Materials:

Synthetic filter fabric should be pervious sheet of polypropylene, nylon, polyester, or polyethylene yarn conforming to the requirements in Table 3 below.

Table 3: Synthetic Filter Fabric Requirements

Physical Property	Requirements
Filtering Efficiency	75% - 85%
Tensile Strength at 20% (max) Elongation	Standard Strength – 30 lb/linear inch (minimum) Extra Strength – 50 lb/linear inch (minimum)
Slurry Flow Rate	0.3 gal/ft^2/min (minimum)

- Synthetic filter fabric should contain ultraviolet ray inhibitors and stabilizers to provide minimum of 6 months of expected usable construction life at a temperature range of 0 to 120 ºF.
- Burlap of 10 ounces per square yard of fabric can also be used.
- The filter fabric should be purchased in a continuous roll to avoid joints.
- While not required, wire fencing may be used as a backing to reinforce standard strength filter fabric. The wire fence (14 gauge minimum) should be at 22 – 48 inches wide and should have a maximum mesh spacing of 6 inches.
- Post should be 2 – 4 feet long and should be composed of either 2” x 2-4” pine (or equivalent) or 1.00 to 1.33 lb/linear ft steel.
- Steel posts should have projections for fastening wire and fabric to them.

Construction Specifications:

- The maximum height of the filter fence should range between 18 and 36 inches above the ground surface (depending on the amount of upslope ponding expected).
- Post should be spaced 8 to 10 feet apart when a wire mesh fence is used and no more than 6 feet apart when extra strength filter fabric without a wire fence) is used. The posts should extend 12 to 30 inches into the ground.
- A trench should be excavated 4 to 8 inches wide and 4 to 12 inches deep along the upslope side of the line of posts.

If standard strength filter fabric is to be used, the optional wire mesh support fence may be fastened to the upslope side of the post using 1 inch heavy duty wire staples, tie wires, or hog rings. Extend the wire mesh support to the bottom of the trench. The filter fabric should then be stapled or wired to the fence, and 8 to 20 inches of the fabric into the trench.

- Where joints in the fabric are required, the filter cloth should be spliced together only at a support post, with a minimum 6 inch overlap, and securely sealed.

- Do not attach filter fabric to trees.
- Backfill the trench with compacted soil or 0.75 inch minimum diameter gravel placed over the filter fabric.

Maintenance:
Inspect filter fences daily during periods of prolonged rainfall, immediately after each rainfall event, and weekly during periods of no rainfall. Make any required repairs immediately.

- Sediments must be removed when it reached 1/3 to ½ the height of the filter fence. Take care to avoid damaging the fence during cleanout.
- Filter fences should not be removed until the upslope area has been permanently stabilized. Any sediment deposits remaining in place after the filter fence has been removed should be dressed to conform with the existing grade, prepared, and seeded.

Soiling Retaining Measures

What are They?

Soil retaining measures refer to structures or vegetative stabilization practices used to hold the soil firmly to its original place or to confine as much as possible within the site boundary. There are many different methods for retaining soil; some are used to control erosion while others are used to protect the safety of the workers (i.e. during excavation). Examples of soil retaining measures include reinforced soil retaining systems, wind breaks, and stream bank protection using shrubs and reads.

Reinforced soil retaining measures refer to using structural measures to hold in place loose or unstable soil. During excavation, for example, soil tiebacks and retaining walls are used to prevent cave-ins and accidents. But these same methods can be used to retain soil and prevent them from moving. While detailed discussion of soil retaining methods is beyond the scope of this manual, several are briefly described.

- **Skeleton Sheeting** – Skeleton sheeting, the least expensive soil bracing system, requires the soil to be cohesive (i.e. like clay). Construction grade lumber is used to brace the excavated face of the slope.
- **Continuous Sheeting** – Continuous sheeting involves using a material that covers the face of the slope in a continuous manner. Struts and boards are placed along the slope, which provide continuous support to the slope face. The material used can be steel, concrete, or wood.
- **Permanent Retaining Walls** – Permanent construction walls may be necessary to provide support to the slope well after the construction is complete. In this instance, concrete masonry or wood (railroad tie) retaining walls can be constructed and left in place.

When and Where to Use Them

Use reinforced retaining methods where using other methods of soil retention (e.g., vegetation) is not practical. Some sites may have slopes or soils that do not lend themselves to ordinary practices of soil retention. In these instances, a reinforced soil retaining measures should be considered.

Stabilizing Construction Entrance

How to Build Them

Design Criteria:

A Stabilized Construction Entrance (SCE) is appropriate in the following locations:

- Wherever vehicles are leaving a construction site and enter onto a public road.
- At any unpaved entrance/exit location where there is risk of transporting mud or sediment onto paved roads.

The width should be at least 10 feet to 12 feet or as wide as the entire width of the access. At sites where traffic volume is high the entrance should be wide enough for two vehicles to pass safely.

- The length should be between 50 and 75 feet in length.

- Flare the entrance where it meets the existing road to provide a turning radius.
- Runoff from a stabilized construction entrance should drain to a sediment trap [or sediment basin].
- Pipe placed under the entrance to hand runoff should be protected with a mountable berm.
- Dust control should be provided in accordance.

Materials:
Crushed stone 2 inches - 4 inches in diameter.
Geo-textile (filter fabric) with the properties listed in Table 4 below.

Table 4: GEOTEXTILE REQUIREMENTS

Physical Property	Requirements
Grab Tensile Strength	220 lbs. (ASTM D1682)
Elongation Failure	60 % (ASTM D1682)
Mullen Burst Strength	430 lbs. (ASTM D3768)
Puncture Strength	125 lbs. (ASTM D751) (modified)
Equivalent Opening	Size 40-80 (US std Sieve) (CW-02215)

Construction Specifications:
- Clear all vegetation, roots, and all other obstructions in preparation for grading.
- Prior to placing getotextile (filter fabric) make sure that the entrance is properly grades and compacted.
- To reduce maintenance and loss of aggregate place geotextile fabric (fabric cloth) over the existing ground before placing the stone of the entrance.
- Stone should be placed to a depth of 6 inches or greater for the entire width and length of the SCE.

Maintenance:
- Inspect the measure on a regular basis and after there has been a high volume of traffic or storm event.
- Apply additional stone periodically and when repair is required.
- Immediately remove sediments or any other materials tracked onto the public roadway.
- Ensure that associated sediment measures are in good working condition.

Temporary Sediment Trap

How to Build Them
Design Criteria:
Temporary sediment traps are appropriate in the following locations:
- At the outlet of the perimeter controls installed during the first stage of constructions.
- At the outlet of any structure with concentrates sediment-laden runoff, e.g. at the discharge point of diversions, channels slope drains, or other runoff conveyances.
- Above a storm water inlet that is in line to receive sediment-laden runoff.
- Temporary sediment traps may be constructed by excavation alone or by excavation combination with an embankment.
- Temporary sediment traps are often used in conjunction with a diversion dike or swale.
- The drainage area for the sediment trap should not exceed 5 disturbed areas.
- The trap must be accessible for ease of regular maintenance which is critical to its functioning properly.
- Sediment traps are temporary measures and should not be planned to remain in place longer than between 18 and 24 months.
- The capacity of the sedimentation pool should provide storage volume for 3,6000 cubic feet/acre drainage area.
- The outlet should be designed to provide a 2 foot settling depth and an additional sediment storage area 1 ½ feet deep at the bottom of the trap.

- The embankment may not exceed 5 feet in height.
- The recommended minimum width at the top of the embankment is between 2 and 5 feet.
- The minimum recommended length of the weir is between 3 feet and 4 feet, and the maximum is 12 feet in length.
- Table 5 illustrates the typical relationship between the embankment height, the height of the outlet (Ho), and the width (W) at the top of the embankment.

Table 5: EMBANKMENT HEIGHT vs. OUTLET HEIGHT AND WIDTH

H	Ho	W
1.5	**0.5**	**2.0**
2.0	**1.0**	**2.0**
2.5	**1.5**	**2.5**
3.0	**2.0**	**2.5**
3.5	**2.5**	**3.2**
4.0	**3.0**	**3.2**
4.5	**3.5**	**4.0**
5.0	**4.0**	**4.5**

Materials:

1. Filter fabric (see fabric requirements for silt fence)
2. Coarse aggregate or riprap 2 inches to 14 inches in diameter.
3. Washed gravel ¾ to 1 ½ inches in diameter.
4. Seed and mulch for stabilization.

Construction Specifications:

- Clear the area of all trees, bush, stumps or other obstructions.
- Construct the embankment in 8 inch lifts, compacting each lift with the appropriate earth moving equipment. Fill material must be free of woody vegetation, roots, or large stones.
- Keep cut and fill slopes between 3:1 and 2:1 or flatter.
- Line the outlet area with filter fabric prior to placing stone or gravel.
- Construct the gravel outlet using heavy stones between 6 inches and 14 inches in diameter and face the upstream side with a 12 inch layer of 3/4 inch to1 ½ inch washed gravel on the upstream side.
- Seed and mulch the embankment as soon as possible to ensure stabilization.

Maintenance:

- Inspect regularly and after every storm. Make any necessary to ensure the measure is in good working order.
- Frequent removal of sediment is critical to the functioning of this measure. At a minimum, sediment should be removed and the trap restored to its original volume when sediment reaches 1/3 of the original volume.
- Sediment removed from the trap must be properly disposed.
- Check the embankment regularly to make sure it is structurally sound.

Appendix A

AMHERST COLLEGE

AMHERST, MASSACHUSETTS 01002

STORM WATER POLLUTION PREVENTION PLAN
INSPECTION AND MAINTENANCE REPORT FORM

Changes Required to the Pollution Prevention Plan:

_____

_____

_____

_____

_____

_____

Reason for Changes:

_____

_____

_____

_____

_____

_____

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

SIGNATURE: _____ DATE: _____

Appendix B

AMHERST COLLEGE

AMHERST, MASSACHUSETTS 01002

STORM WATER POLLUTION PREVENTION PLAN
ENVIRONMENTAL HEALTH AND SAFETY
INSPECTION AND MAINTENANCE REPORT FORM

TO BE COMPLETED EVERY 7 DAYS AND WITHIN 24 HOURS OF A RAINFALL EVENT OF 0.5 INCHES OR MORE

Stormwater Manager:_____ Date:___/___/_____

Qualifications / Job Title:

_____
_____
_____
_____

Days since last rainfall: _____

Duration of last rainfall: _____ hours

Amount of last rainfall: _____ inches

Is there any evidence of washout or overcollection? *(please note location)*

_____
_____
_____
_____

Stabilization Required:

_____
_____
_____
_____

To be performed by:_____ on or before: ___/___/_____