

COASTAL WATER QUALITY PROTECTION

A GUIDE FOR LOCAL OFFICIALS



- **BEST MANAGEMENT PRACTICES**
- **MODEL LAND USE REGULATIONS**
- **WHERE TO FIND HELP**

**DEVELOPED BY THE CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION
SIDNEY J. HOLBROOK, COMMISSIONER**

DO YOU KNOW THE LAW?

CONNECTICUT:

PUBLIC ACT 91-170 requires zoning regulations in municipalities contiguous to Long Island Sound be adopted "with reasonable consideration for restoration and protection of the ecosystem and habitat of Long Island Sound." Such regulations must be "designed to reduce hypoxia, pathogens, toxic contaminants and floatable debris in Long Island Sound."

CGS SEC. 22a-93(15) and 22a-106 A coastal site plan review cannot be approved unless all adverse impacts on water quality have been mitigated.

CGS SEC. 22a-104 requires that zoning regulation changes affecting the coastal area be referred to OLISP at least 35 days prior to the public hearing.

FEDERAL REQUIREMENTS:

SECTION 319 of the 1987 Federal Clean Water Act requires each state to develop a program that identifies best management practices to reduce nonpoint source (NPS) pollution. State programs must include regulatory and non-regulatory measures for enforcement, technical assistance, education, training, technology transfer and demonstrations. The DEP Bureau of Water Management administers the 319 Program. A portion of the state program is directed toward assisting local communities in understanding and implementing NPS measures.

SECTION 6217 of the Coastal Zone Management Act Reauthorization Amendments provides for the development of state programs of land use measures to control nonpoint source pollution of coastal waters. As part of this effort, the OLISP staff is developing model regulations and workshops for coastal communities on the use of best management practices (BMPs).

SOME BASIC STEPS YOU CAN TAKE -

To comply with 91-170 [CGS 8-2 (b)] and to get a head start on other program requirements -

1. Don't reinvent the wheel. Learn what other commissions and staff people in your town and in your region are doing, including the sanitarian and town engineer.
2. Include basic language in your zoning and subdivision regulations citing the requirements of CGS 8-2 (b) as a standard for new development. Require developers to demonstrate that best management practices have been utilized for new development. See model regulations in Coastal Water Quality Protection - A Guide for Local Officials.
3. Become familiar with current best management practices through one or more of the many available handbooks and manuals.
4. Attend OLISP and NEMO workshops on coastal water quality protection.

WHERE TO FIND HELP -

CT DEP, Office of Long Island Sound Programs
79 Elm Street, Hartford, CT 06106
203-424-3034

CT DEP, Bureau of Water Management
79 Elm Street, Hartford, CT 06106
203-424-3810

UCONN COOPERATIVE EXTENSION SERVICE
Nonpoint Education for Municipal Officials -(NEMO)
1066 Saybrook Road, P.O. Box 70, Haddam, CT 06438
203-345-4511

SOIL AND WATER CONSERVATION DISTRICTS

REGIONAL PLANNING AGENCIES

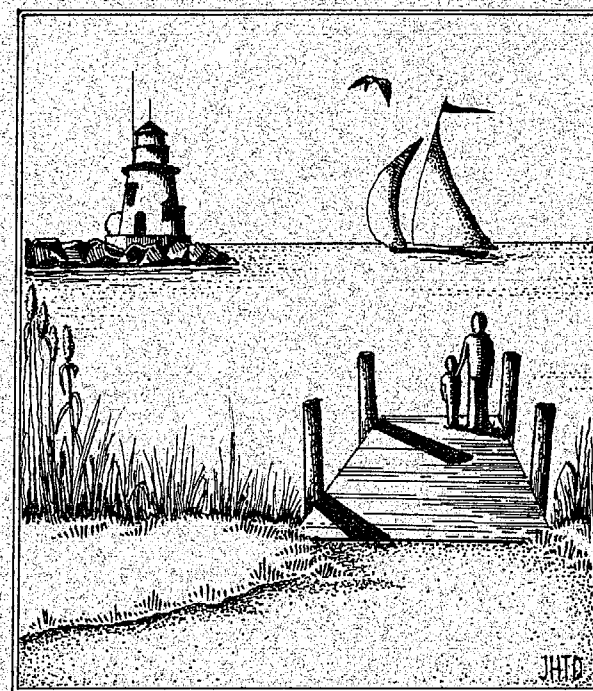
EPA NONPOINT SOURCE BULLETIN BOARD
ONLINE: 301-589-0205

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COASTAL WATER QUALITY PROTECTION

CONTROLLING NONPOINT SOURCES OF POLLUTION

A GUIDE FOR LOCAL OFFICIALS



Prepared Cooperatively By The
**CONNECTICUT RIVER ESTUARY
REGIONAL PLANNING AGENCY**
And
**CONNECTICUT DEPARTMENT OF
ENVIRONMENTAL PROTECTION
OFFICE OF LONG ISLAND SOUND
PROGRAMS**
1995

UNDERSTANDING THE LANGUAGE

Point Sources of pollution, including discharge pipes from municipal sewage treatment plants and other wastewater discharges, have been the primary focus for past water quality protection measures.

NONPOINT SOURCE pollution has no well-defined point of origination. NPS pollution includes street and parking lot runoff, agricultural and lawn runoff, leachate from landfills, and effluent and nutrients from septic systems.

HYPOXIA, the condition of a low dissolved oxygen level in the water, adversely affects marine life. Excessive nitrogen, found in nonpoint sources such as stormwater runoff from pavement, lawns and agriculture, and from poorly functioning septic systems, promotes algae blooms.

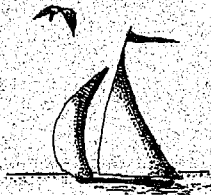
PATHOGENS are disease-causing bacteria, viruses and protozoa. Pathogens are found in untreated or improperly treated sewage from sewers and septic systems, and in pet and animal wastes carried in stormwater runoff. The presence of pathogens can result in contaminated shellfish beds and closed swimming areas.

TOXIC CONTAMINANTS are health-threatening substances, including heavy metals, pesticides, and hydrocarbons that are transported by groundwater or surface water, and find their way to the Sound. Toxic contaminants can kill aquatic plants and animals and may be harmful to humans.

FLOATABLE DEBRIS is litter and trash which often washes from the streets into storm drainage systems. Illegal offshore dumping by commercial and recreational boaters is a source of floatable debris. Floatable debris is ugly, may be hazardous, and can harm aquatic animals.

WHAT MUNICIPALITIES CAN DO -

REGULATORY AND NON-REGULATORY APPROACHES Local officials can use a combination of regulatory and non-regulatory measures to address coastal water quality protection issues.



Regulations can establish use restrictions, require buffers and setbacks, limit lot coverage, and link development to soil capacity. Other regulations may deal with standards for specific land use applications. Non-regulatory measures include education, financial incentives, technical assistance, waste collection and recycling, and even land acquisition.

CONSIDER THE FOLLOWING MEASURES:

SEPTIC SYSTEMS

- * Require septic tank pumping every three years
- * Prohibit chemical additives to septic tanks
- * Prohibit garbage disposals in new structures
- * Limit density in shore areas served by septic systems
- * Limit impervious coverage of leach fields
- * Keep gutters and downspouts away from leach fields

UNDERGROUND FUEL STORAGE TANKS

- * As required by state statute:
 - Restrict underground tanks in sensitive areas
 - Establish installation standards for underground tanks
 - Require registration of tanks to document locations
- * Start a tank installation permit program
- * Require inspection /replacement of tanks based on age
- * Require removal of abandoned tanks

HAZARDOUS MATERIALS HANDLING AND STORAGE

- * Require safe storage in facilities with containment dikes, impervious floors, and roofs
- * Require monitoring and reporting on stored materials
- * Exclude hazardous materials and fuels from coastal flood hazard areas where possible

ROAD SALT STORAGE

- * Store and handle salt piles on impervious curbed surface and collect runoff from surface
- * Completely cover storage areas
- * Sweep loading areas after salt handling

STORMWATER MANAGEMENT



Rain and melting snow pick up pollutants and carry them from the land to coastal waters. Petroleum products, road salt, fertilizers, pesticides, heavy metals, bacteria and viruses, excess nitrogen, litter and other pollutants may all be swept along by stormwater. New development typically results in an increase in both the rate and volume of stormwater runoff, and often has an adverse impact on water quality.

- * Work with other commissions and staff to develop a single set of townwide drainage requirements addressing both water quantity and quality. Reference the standards in each commission's regulations.
- * Through regulation, require a detailed stormwater management plan for new development. The plan should include a mapped and written description of best management practices to be used for control of stormwater quantity and quality.
- * Require the management plan to include an operation and maintenance schedule.
- * Establish a groundwater protection overlay zone for areas with high water yield potential.
- * Encourage use of infiltration measures in suitable soils in areas where groundwater quality would not be threatened.
- * Through regulations and plan review, minimize the percentage of impervious surfaces in new development.
- * Eliminate curbing where appropriate to allow runoff to be diffused.
- * Filter runoff through grass or vegetative buffers where possible.
- * Require collection and treatment of the first inch of rainfall. The "first flush", which washes dry weather deposits from paved surfaces, has the highest concentration of pollutants.
- * Establish a goal of removal of 80% of the total suspended solids (TSS) in stormwater runoff.
- * Require measures to reduce the velocity of runoff as much as possible.



**GENERAL PERMIT FOR THE DISCHARGE OF STORMWATER
ASSOCIATED WITH INDUSTRIAL ACTIVITY**

**October 1, 1992
Modified October 1, 1995**

State of Connecticut
Department of Environmental Protection
Bureau of Water Management

Printed on Recycled Paper

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GENERAL PERMIT FOR THE DISCHARGE OF STORMWATER ASSOCIATED WITH INDUSTRIAL ACTIVITY

PART I. AUTHORITY

This general permit is issued under the authority of Section 22a-430b of the Connecticut General Statutes, as amended by Public Act 91-263.

PART II. DEFINITIONS

The definitions of terms used in this general permit shall be the same as the definitions contained in Sections 22a-423 and 22a-207 of the Connecticut General Statutes and Section 22a-430-3(a) of the Regulations of Connecticut State Agencies. The definition of the term "coastal area" shall be the same as the definition contained in section 22a-94. The definition of the term "high tide line" shall be the same as that contained in section 22a-359 of the Connecticut General Statutes. The definition of the term "coastal tidal waters" shall be the same as the definition contained in section 22a-29 of the Connecticut General Statutes. In addition, the following definitions shall apply:

"Industrial activity" means:

- (1) An activity subject to stormwater effluent limitation guidelines, new source performance standards, or toxic pollutant effluent standards under 40 CFR Subchapter N (except facilities with toxic pollutant effluent standards which are exempt under category (10) of this paragraph);
- (2) An activity classified as Standard Industrial Classifications "Standard Industrial Classification Manual, Executive Office of the President, Office of Management and Budget 1987" 24 (except 2434), 26 (except 265 and 267), 28 (except 283 and 285), 29, 311, 32 (except 323), 33, 3441, 373;
- (3) An activity classified as Standard Industrial Classifications 10 through 14 (mineral industry) including active or inactive mining operations (except for areas of coal mining operations meeting the definition of a reclamation area under 40 Code of Federal Register 434.11(1)) and oil and gas exploration, production, processing, or treatment operations, or transmission facilities that discharge stormwater contaminated by contact with or that has come into contact with, any overburden, raw material, intermediate products, finished products, by-products or waste products;
- (4) Hazardous waste treatment, storage, or disposal facilities, including those facilities operating under interim status or a permit pursuant to section 22a-449(c) or 22a-454 of the Connecticut General Statutes.
- (5) Facilities classified as Standard Industrial Classification 4953 including, but not limited to, solid waste facilities (i.e. landfills, land application sites, transfer stations, woodburning facilities, biomedical waste treatment facilities, volume reduction plants and open dumps) which have received any industrial wastes (waste that is received from any of the facilities described under this subsection) including but not limited to those facilities that are subject to regulation under Subtitle D of the Resource Conservation and Recovery Act, 42 U.S.C. sections 6901, et seq., recycling centers and resource recovery facilities, all such facilities and centers as defined in Section 22a-207 of the Connecticut General Statutes;
- (6) The recycling of materials including metal scrap yards, battery reclaimers, salvage yards, and automobile junk yards, including but not limited to those classified as Standard Industrial Classification 5015 and 5093;
- (7) Steam electric power generating facilities, including coal handling sites;

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- (8) Transportation facilities classified as Standard Industrial Classifications 40, 41, 42 (except 4221-25), 44, 45, and vehicle service and storage facilities (including, but not limited to, public works garages) operated by federal, state or municipal government which have vehicle (including watercraft) maintenance shops, equipment cleaning or maintenance operations, or airport deicing operations. Only those portions of the facility that are either involved in vehicle or equipment maintenance (including rehabilitation, mechanical repairs, painting, fueling, and lubrication), vehicle or equipment cleaning operations, road salt storage, airport deicing operations, or which are otherwise identified under paragraphs (1) through (7) or (9) through (11) of this subsection are included in this definition;
- (9) Treatment works treating domestic sewage or any other sewage sludge or wastewater treatment device or system, used in the storage, treatment, recycling, and reclamation of municipal or domestic sewage, including land dedicated to the disposal of sewage sludge that are located within the confines of the facility, but not including farm lands, domestic gardens or lands used for sludge management where sludge is beneficially reused and which are not physically located in the confines of the facility, or areas that are in compliance with 40 CFR 503;
- (10) Facilities under Standard Industrial Classifications 20, 21, 22, 23, 2434, 25, 265, 267, 27, 283, 285, 30, 31 (except 311), 323, 34 (except 3441), 35, 36, 37 (except 373), 38, 39, 4221 - 25, (and which are not otherwise included within categories (2) through (9), (11) or (12)), including only those areas where material handling equipment or activities, raw materials, intermediate products, final products, waste materials, by products or industrial machinery are exposed to stormwater.
- (11) Facilities classified as Standard Industrial Classification 5171 (Petroleum Bulk Stations and Terminals).
- (12) Road salt storage facilities (including facilities storing pure salt or salt mixed with other materials) as regulated pursuant to Section 22a-474 of the Connecticut General Statutes.

"Fresh-tidal wetland" means a tidal wetland with an average salinity of less than 0.5 parts per thousand.

"Inland wetland" means a wetland as that term is defined in section 22a-38 of the Connecticut General Statutes.

"Intermediate processing facility" means a facility where glass, metals, paper products, batteries, household hazardous waste, fertilizers and other items are removed from the waste stream for recycling or reuse.

"Municipal separate storm sewer" means conveyances for stormwater (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels or storm drains) owned or operated by any municipality and discharging directly to surface waters of the state.

"Permittee" means any person who or municipality which initiates, creates, originates or maintains a discharge to the waters of the state; which discharge is covered under this general permit in accordance with Part IV of this general permit.

"Point Source" means any discernible, confined and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel or other floating craft from which pollutants are or may be discharged.

"Recycling facility" or "recycling center" means land and appurtenances thereon and structures where recycling is conducted, including but not limited to, an intermediate processing facility as defined above.

"Registrant" means a person who or municipality which submits a complete registration in accordance with Part V of this general permit.

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"Site" means on the same or geographically contiguous property which may be divided by public or private right(s)-of-way.

"Stormwater" means waters consisting of precipitation runoff.

"Stormwater discharge associated with industrial activity" means the discharge from any conveyance which is used for collecting and conveying stormwater and which is directly related to manufacturing, processing or material storage areas at an industrial activity.

"Tidal wetland" means a wetland as that term is defined in section 22a-29 of the Connecticut General Statutes.

"Transfer station" means any location or structure, whether located on land or water, where more than ten cubic yards of solid waste, generated elsewhere, may be stored for transfer or transferred from transportation units for movement to another location, whether or not such waste is stored at the location prior to transfer.

PART III. FEES

A fee of \$250.00 for any person shall be paid with the registration required by Part V of this general permit except that any municipality shall not be required to pay a registration fee for any industrial activity which was not regulated by this general permit prior to its modification. On and after January 1, 1993, registration and annual fees, if applicable, shall be paid in accordance with applicable regulations, including but not limited to Sections 22a-430-6 and 22a-430-7 of the Regulations of Connecticut State Agencies.

PART IV. COVERAGE UNDER THIS GENERAL PERMIT

- A. CONDITIONS FOR ELIGIBILITY.** This general permit covers only discharges comprised solely of stormwater associated with industrial activity, provided that the following conditions are met prior to coverage under this general permit.
1. The discharge is not covered by a permit issued under Section 22a-430 of the Connecticut General Statutes;
 2. The stormwater is not discharged to a Publicly Owned Treatment Works (POTW) or to ground water;
 3. No effluent limitations, standard or guideline adopted by the U. S. Environmental Protection Agency under the Federal Clean Water Act is applicable to the discharge;
 4. The stormwater is discharged from a point source which is directly related to manufacturing, processing or material storage areas at an industrial activity, including but not limited to stormwater discharged from ground surfaces immediately adjacent to manufacturing areas, processing or material storage areas; immediate access roads and rail lines used or traveled by carriers of raw materials, manufactured products, waste materials, or by-products used or created by the facility; material handling sites; refuse sites; sites used for the application or disposal of process waste waters (as defined at 40 CFR 401); sites used for the storage and maintenance of material handling equipment; sites used for residual treatment, storage, or disposal; shipping and receiving areas; manufacturing buildings; storage areas (including tank farms) for raw materials, and intermediate and finished products; and areas where industrial activity has taken place in the past and materials remain and are exposed to stormwater;
 5. The stormwater is not discharged from an industrial activity owned by a municipality with a 1990 census population of less than 100,000, unless the stormwater discharge is from municipally-owned airports, power

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plants, facilities identified in paragraph 5 of the definition of industrial activity in Part II including uncontrolled landfills (e.g., landfills which do not meet the requirements of run-on and run-off controls established pursuant to subtitle D of the Solid Waste Disposal Act.) and facilities identified in paragraphs 8 and 12 of the definition of industrial activity in Part II.

- B. GEOGRAPHIC AREA.** This general permit covers all areas of the State of Connecticut.
- C. EFFECTIVE DATE AND EXPIRATION DATE.** This general permit was issued on October 1, 1992. The modification to this general permit is effective October 1, 1995. This general permit, as modified, expires on October 1, 1997 for all industrial activities.
- D. EFFECTIVE DATE OF COVERAGE.** The effective date of coverage under this general permit is the effective date of this permit listed in Part IV Paragraph C above, or the date the industrial activity is initiated, whichever is later.
- E. ISSUANCE OF AN INDIVIDUAL PERMIT.** Under Section 22a-430b of the General Statutes, when an individual permit is issued to a person or municipality for stormwater discharges at the site otherwise covered by this permit, the applicability of this general permit to the individually permitted discharge is automatically terminated on the effective date of the individual permit.

PART V. REGISTRATION REQUIREMENTS

- A. DUTY TO REGISTER.** Any person who or municipality which initiates, creates, originates or maintains a discharge described in Part IV Paragraph A of this general permit shall submit to the Commissioner a registration which satisfies the requirements of this part either (1) 60 days after the date of issuance of this permit for any discharge initiated, created, originated or maintained on or before the date of issuance of this permit, or (2) 60 days after the effective date of the modification of this general permit for any discharge not regulated by this general permit prior to its modification, or (3) for any other discharge, no later than the date the industrial activity is initiated. If the facility or activity for which a registration is submitted under this permit is owned by one person or municipality but is leased or, in some other way, the legal responsibility of another person or municipality (the operator), the operator is responsible for submitting the registration required by this general permit. The permittee is responsible for compliance with all conditions of this general permit.
- B. SCOPE OF REGISTRATION.** A registrant may only include on a registration those discharges which are operated by such registrant on one site. A registrant may not submit more than one registration per site under this permit.
- C. CONTENTS OF REGISTRATION.** The registration shall be submitted on forms prescribed by the Commissioner and shall include but not necessarily be limited to the following information:
 - 1. Facilities Information
 - a. Name, Address of owner and operator and status as federal, state, private, public or other entity
 - b. Site address if different from a. above
 - c. Site contact person and phone number
 - d. Primary activity; up to four four-digit Standard Industrial Classification (SIC) codes.
 - e. A list of other DEP permits currently in force for the site, including discharges of non-stormwater to the stormwater outlets
 - f. An original 8½" x 11" copy of the applicable section of a United States Geological Survey Quadrangle Map or other location map showing the site boundaries and a radius of at least ½ mile.

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2. Stormwater Discharge Information

- a. Number, type (e.g. swale or pipe) and size of conveyances, outfalls or channelized flows that run off the site;
- b. Location and material of construction (if applicable) of the conveyances, outfalls, channelized stormwater flows discharging from the site shall be shown on the map required in paragraph C.1. above;
- c. Confirmation of the existence of any analytical laboratory stormwater quality data associated with the site
- d. The name of the receiving water(s), or if the discharge is through a municipal separate storm sewer, the name of the operator of the storm sewer, and the ultimate receiving water(s).
- e. The name of the watershed in which the site is located.

3. Any additional information requested by the Commissioner

- D. **SIGNATURE OF REGISTRANT.** Any person who or municipality which submits a registration under this general permit shall sign the registration and shall make the following certification:

"I certify under penalty of law that I have read and understand all conditions of the General Permit for the Discharge of Stormwater Associated with Industrial Activity issued on October 1, 1992 (as modified on October 1, 1995), and that all conditions for eligibility for coverage under this general permit are met. This document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate 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 contained in this registration is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are penalties for submitting false information, including the possibility of fine and imprisonment for knowingly making false statements."

- E. **WHERE TO SUBMIT A REGISTRATION.** Persons who or municipalities which submit a registration under this general permit shall submit such registration to the Department of Environmental Protection at the following address:

Central Permit Processing Unit
Department of Environmental Protection
79 Elm Street
Hartford, CT 06106-5127

- F. **TRANSFER OF COVERAGE.** Any coverage under this general permit shall be non-transferable. However, any person registering a discharge which has previously been registered under this permit may adopt by reference the stormwater pollution prevention plan developed by the previous permittee. The new registrant shall amend the Plan as required by Part VI, B. 4. prior to submitting a registration.
- G. **FAILURE TO REGISTER.** Any person or municipality who fails to submit a registration, and who initiates, creates, originates or maintains a stormwater discharge to the waters of the State without coverage under a general permit issued under Section 22a-430b of the Connecticut General Statutes or an individual permit issued under Section 22a-430 of the Connecticut General Statutes, is in violation of the Connecticut General Statutes, and is subject to injunction and penalties of up to \$25,000 per day per violation under Chapter 446k of the Connecticut General Statutes.
- H. **ADDITIONAL NOTIFICATION.** Facilities that discharge stormwater associated with industrial activity through a municipal separate storm sewer system shall also submit a copy of the registration to the owner and operator of that system.

PART VI. PERMIT CONDITIONS FOR STORMWATER ACTIVITIES ASSOCIATED WITH INDUSTRIAL ACTIVITIES

A. CONDITIONS APPLICABLE TO CERTAIN DISCHARGES

1. Any person who or municipality which initiates, creates, or originates a discharge of stormwater associated with industrial activity after the date of issuance of this general permit or after the effective date of modification for those industrial activities only covered by this general permit as of that effective date pursuant to Part IV.C., which discharge is located less than 100 feet from a tidal wetlands which is not a fresh-tidal wetland, shall discharge such stormwater through a system designed to store the volume of stormwater runoff generated by 1 inch of rainfall on the site.
2. Any person who or municipality which discharges stormwater into coastal tidal waters for which a permit is required under either the Structures and Dredging Act in accordance with Section 22a-361 of the Connecticut General Statutes or the Tidal Wetlands Act in accordance with Section 22a-32 of the Connecticut General Statutes, shall obtain such permit(s) from the Commissioner.

B. STORMWATER POLLUTION PREVENTION PLANS.

1. Development of Plan

The permittee shall develop a stormwater pollution prevention plan ("Plan") for each site. The Plan shall be prepared in accordance with sound engineering practices. The permittee shall perform all actions required by the Plan in accordance with the schedule set forth in Part VI Paragraph B.2 below. Permittee shall maintain compliance with the Plan thereafter.

2. Deadlines for Plan Preparation and Compliance.

- a. For a discharge that is initiated, created, originated or maintained on or before the date of issuance of this general permit, the Plan shall be completed on or before 180 days after the date of issuance of this general permit. For industrial activities only covered by this general permit as of the effective date of modification pursuant to Part IV.C., the Plan shall be completed on or before 180 days after that date. The permittee shall perform all actions required by such Plan as soon as possible, but in no event later than three hundred and sixty-five days after the date of issuance of this general permit or three hundred sixty-five days after the effective date of modification pursuant to Part IV.C. for those industrial activities only covered by this general permit as of that date, and shall maintain compliance with such Plan thereafter.
- b. For any stormwater discharges associated with industrial activity which activity is initiated after the date of issuance of this general permit or after the effective date of modification for those industrial activities only covered by this general permit as of that effective date pursuant to Part IV.C., the Plan shall be prepared on or before the date such activity is initiated. The permittee shall perform all actions required by such Plan as soon as possible, but in no event later than 60 days after the date the industrial activity is initiated, and shall maintain compliance with such Plan thereafter.

3. Signature and Plan Review

- a. The Plan shall be signed as follows: for a corporation, by a responsible corporate officer or a duly authorized representative thereof, as those terms are defined in RCSA 22a-430-3(b)(2); for a municipality, state, Federal, or other public agency, by either a principal executive officer or a ranking elected official, as those terms are

STORMWATER GENERAL PERMIT FOR INDUSTRIAL ACTIVITY, 10/1/92, MODIFIED 10/1/95

defined in RCSA 22a-430-3(b)(2); for a partnership or a sole proprietorship, by a general partner or the proprietor, respectively. The Plan shall be certified in accordance with Part VI Paragraph B.6 by a professional engineer licensed in the State of Connecticut. The Plan shall be retained on site at the facility which generates the stormwater discharge.

- b. The permittee shall make a copy of the Plan available to the Commissioner immediately upon request, and, in the case of a stormwater discharge associated with industrial activity which discharges through a municipal separate storm sewer system, to the operator of the municipal system upon request. In the case of a stormwater discharge associated with industrial activity which discharges to a water supply watershed, make copies of the plan available upon request to the public water supply company.
 - c. The Commissioner may notify the permittee at any time that the plan does not meet one or more of the requirements of this Part. Unless otherwise notified by the Commissioner in writing, within 30 days of such notification from the Commissioner the permittee shall revise the plan, perform all actions required by the revised plan, and shall submit to the Commissioner in writing that the requested changes have been made and implemented, and such other information as the Commissioner requires.
4. **Keeping Plans Current.** The permittee shall amend the plan whenever; (1) there is a change at the site which has an effect on the potential to cause pollution of the waters of the state; or (2) the actions required by the Plan fail to ensure or adequately protect against pollution of the waters of the state; or (3) the Commissioner requests modification of the plan. The permittee shall amend the plan as necessary to address any sources or potential sources of pollution identified as a result of a Comprehensive Site Compliance Evaluation conducted pursuant to Part VI.B.5.d. of this general permit. The amended plan shall be completed and all actions required by the plan shall be completed within 60 days of the date the Permittee becomes aware or should have become aware that either condition above has occurred.
5. **Contents of Plan.** The plan shall include, at a minimum, the following items:
- a. Pollution Prevention Team. Each plan shall identify a specific individual or individuals for the site who shall serve as members of a stormwater Pollution Prevention Team ("team"). The team shall be responsible for developing the stormwater pollution prevention plan and assisting the permittee in the implementation, maintenance, and revision of the plan. The plan shall clearly identify the responsibilities of each team member. The activities and responsibilities of the team shall address all aspects of the plan.
 - b. Description of Potential Pollutant Sources. Each plan shall describe the potential sources of pollutants which may reasonably be expected to affect stormwater quality at the site or which may result in the discharge of pollutants during dry weather from the site. Each plan shall identify all activities and materials which may be a source of stormwater pollution at the site. In addition, each plan shall include, but not be limited to the following:
 - (i) Drainage.
 - (a) A site map (at a defined or approximate scale) showing an outline of the drainage area of each stormwater outfall, existing structural control measure installed to reduce pollutants in stormwater runoff, receiving surface water body, location where materials are exposed to precipitation, location where major spills or leaks identified under Part VI Paragraph B.5.b.(iii) of this permit have occurred, and each location of the following activities where such activities are exposed to precipitation: fueling stations, vehicle and equipment maintenance and/or cleaning areas,

STORMWATER GENERAL PERMIT FOR INDUSTRIAL ACTIVITY, 10/1/92, MODIFIED 10/1/95

loading/unloading areas, locations used for the treatment, storage or disposal of wastes, liquid storage tanks, processing areas and storage areas.

- (b) For each area of the site that generates stormwater discharges associated with industrial activity, the direction of flow, and the types of pollutants which are present or likely to be present in the discharge, including but not limited to discharges with a potential for causing erosion in the area of the receiving water.
- (ii) Inventory of Exposed Materials. An inventory of the types of materials handled at the site that may be exposed to precipitation. Such inventory shall include a list of materials that have been handled, treated, stored or disposed in a manner to allow exposure to stormwater between the time of three years prior to the date of the issuance of this permit and the present; method and location of on-site storage or disposal; materials management practices employed to minimize contact of materials with stormwater runoff between the time of three years prior to the date of the issuance of this permit and the present; the location and a description of existing structural and non-structural control measures to reduce pollutants in stormwater runoff; and a description of any treatment the stormwater receives.
- (iii) Spills and Leaks. A list of spills and leaks of five gallons or more of toxic or hazardous substances which could affect stormwater, as those terms are defined in section 22a-430-4 Appendix B Tables II, III and V, and Appendix D of the Regulations of Connecticut State Agencies, and 40 CFR 116.4, that occurred at the facility after the date of three years prior to the effective date of this permit.
- (iv) Monitoring Program. A description of the monitoring program and sampling data for stormwater discharges at the site, in accordance with Part VI. C. 1. of this general permit.
- (v) Summary of Potential Pollutant Sources. A narrative description of the potential pollutant sources at the following areas: loading and unloading operations; roof areas; outdoor storage activities; outdoor manufacturing or processing activities; dust or particulate generating processes; and on-site waste disposal practices. The description shall specifically list any potential source of pollutants at the site and, for each potential source, any pollutants associated with the potential source.
- c. Measures and Controls. Each plan shall describe the stormwater management controls appropriate for the facility. The permittee shall implement such controls. The appropriateness and priorities of controls in a plan shall reflect identified potential sources of pollutants at the site. The plan shall include but not be limited to a schedule for implementing such controls and the following components:
 - (i) Good Housekeeping - The plan shall provide for the maintenance of a clean, orderly facility. The plan shall provide at a minimum that no washing of equipment or vehicles shall be allowed at the site which would allow wash waters to enter any storm drainage system or receiving water.
 - (ii) Preventive Maintenance - The plan shall include a preventive maintenance program, which shall include but not be limited to the inspection and maintenance of stormwater management devices (e.g., cleaning oil/water separators, catch basins); the inspection and testing of equipment and systems on the site to identify conditions that could cause breakdowns or failures resulting in discharges of pollutants to surface waters, and the appropriate maintenance of such equipment and systems.
 - (iii) Spill Prevention and Response Procedures - Areas where potential spills can occur, and their accompanying drainage points shall be identified clearly in the plan. Procedures for cleaning up spills

STORMWATER GENERAL PERMIT FOR INDUSTRIAL ACTIVITY, 10/1/92, MODIFIED 10/1/95

shall be identified in the plan and made available to the appropriate personnel. The necessary equipment to implement a cleanup shall be available to personnel.

The plan shall provide that all areas in which chemicals are stored are provided with impermeable containment which will hold at least the volume of the largest chemical container, or 10% of the total volume of all containers in the area, whichever is larger, without overflow from the containment area. For industrial activities initiated after the date of this general permit, all chemicals and their containers shall be stored under a roof which minimizes stormwater entry to the containment area, except for those chemicals stored in containers of 100 gallon capacity or more, in which case a roof is not required.

The plan shall also provide that all dumpsters used to store waste materials are supplied with attached covers with drain plugs intact, or are in roofed areas which will not allow dumpster leakage to enter any stormwater drainage system.

- (iv) Inspections - In addition to or as part of the Comprehensive Site Evaluation required under Part VI Paragraph B.5.d. of this permit, qualified personnel shall be identified to inspect designated equipment and areas of the site at appropriate intervals specified in the plan, but at an interval no greater than once every six months. A set of tracking or follow up procedures shall be used to ensure that appropriate actions are taken in response to the inspections. Records of inspections shall be maintained.
- (v) Employee Training - The plan shall provide for employee training programs designed to inform all appropriate personnel of the components and goals of the stormwater pollution prevention plan. Training shall address topics such as spill response, good housekeeping and material management practices. The plan shall identify periodic dates for such training, but at intervals no greater than once per year.
- (vi) Non-Stormwater Discharges - The plan shall include the following certification, signed by a professional engineer, licensed to practice in Connecticut.

"I certify that in my professional judgement, the discharge from the site consists only of stormwater, or of stormwater combined only with groundwater seepage and/or wastewater covered by an effective permit issued under Section 22a-430 or Section 22a-430b of the Connecticut General Statutes. This certification is based on testing and evaluation of the stormwater discharge from the site. I further certify that all potential sources of non-stormwater at the site, a description of the results of any test and/or evaluation for the presence of non-stormwater discharges, the evaluation criteria or testing method used, the date of any testing and/or evaluation, and the on-site drainage points that were directly observed during the test have been described in detail in the stormwater pollution prevention plan prepared for the site. I further certify that no interior building floor drains exist which are connected to any storm drainage system or which may otherwise direct interior floor drainage to exterior surfaces, unless such floor drain connection has been approved and permitted by the Commissioner. I am aware that there may be significant penalties for false statements in this certification, including the possibility of fine and imprisonment for knowingly making false statements."

- (vii) Sediment and Erosion Control - The plan shall identify areas which, due to topography, activities, or other factors, have a potential for soil erosion, and shall identify measures to limit erosion.
- (viii) Management of Runoff - The plan shall contain a discussion of the need for stormwater management or treatment practices other than those which control the source of pollutants which practices shall be used to divert, infiltrate, reuse, or treat stormwater runoff in a manner that reduces pollutants in stormwater discharges from the site. The plan shall provide that management or treatment measures determined to

STORMWATER GENERAL PERMIT FOR INDUSTRIAL ACTIVITY, 10/1/92, MODIFIED 10/1/95

be reasonable and appropriate to prevent pollution of the waters of the state shall be implemented and maintained at the site. The permittee shall consider the potential of various sources at the facility to contribute pollutants to stormwater discharges associated with industrial activity when determining reasonable and appropriate measures. Appropriate measures may include: vegetative swales or buffer strips, reuse of collected stormwater (such as for a process or as an irrigation source), oil/water separators, snow management activities, infiltration devices, and wet detention/retention basins.

- (ix) The plan shall identify roof areas which may be subject to drippage from exhausts or vents or other sources of pollution, shall include an inspection program of such areas to determine if any potential sources of stormwater pollution are present, and shall contain steps to be taken to eliminate such sources or potential sources of pollution, and a schedule for performing such steps.
- d. Comprehensive Site Compliance Evaluation. The plan shall provide that qualified personnel shall conduct site compliance evaluations at appropriate intervals specified in the plan, but in no event less frequently than twice a year. Such evaluations shall include:
 - (i) Visual inspection of material handling areas and other potential sources of pollution identified in the plan for evidence of, or the potential for, pollutants entering the stormwater drainage system. Structural stormwater management measures, erosion control measures, and other structural pollution prevention measures identified in the plan shall be observed to ensure that they are operating correctly. A visual inspection of equipment needed to implement the plan, such as spill response equipment, shall be made. Inspections should be made during rainfall events if possible.
 - (ii) Preparation of a report summarizing the scope of the inspection, personnel making the inspection, the date(s) of the inspection, major observations relating to the plan, and actions taken shall be made and retained as part of the stormwater pollution prevention plan for at least five years. The report shall be signed by the permittee.
- e. Additional requirements for stormwater discharges associated with industrial activity through municipal separate storm sewer systems serving a population of 100,000 or more. In addition to the applicable requirements of this general permit, sites covered by this permit shall comply with applicable requirements in municipal stormwater management programs developed under NPDES permits issued for the discharge of the municipal separate storm sewer system that receives the facility's discharge, provided the discharger has been notified of such conditions.
- f. Consistency with other plans. Stormwater pollution prevention plans may reference requirements contained in Spill Prevention Control and Countermeasure (SPCC) plans and other plans required by state, federal or local law for the prevention or control of spillage.
- g. Additional Requirements for Salt Storage. The plan shall provide that within one year of the date of issuance of this permit or one hundred eighty days after the effective date of modification established in Part IV.C. for those industrial activities only covered by this general permit as of that date, storage piles of salt (including pure salt or salt mixed with other materials) used for deicing or other commercial or industrial purposes and which generate a stormwater discharge associated with industrial activity which is discharged to waters of the state, shall be enclosed or covered by structural means or by waterproof canvas, polyethylene cover or other waterproof material to prevent exposure to precipitation, except for exposure resulting from adding or removing materials from the pile. In addition, on or after October 1, 1995 no new road salt storage facilities shall be located within a 100-year floodplain as defined and mapped for each municipality under 44 CFR 59

STORMWATER GENERAL PERMIT FOR INDUSTRIAL ACTIVITY, 10/1/92, MODIFIED 10/1/95

et seq. or within 250 feet of a well utilized for potable drinking water supply or within a Level A aquifer protection area as defined by mapping pursuant to Section 22a-354c of the Connecticut General Statutes.

6. Professional Engineer Certification

The plan shall contain the following certification, signed by a professional engineer, licensed in the State of Connecticut.

"I certify that, in my professional judgement, the stormwater pollution prevention plan prepared for this site meets the criteria set forth in the General Permit for the Discharge of Stormwater Associated With Industrial Activity issued on October 1, 1992 (as modified October 1, 1995). This certification is based on my review of the stormwater pollution prevention plan for the site and an inspection of the site. I am aware that there are significant penalties for false statements in this certification, including the possibility of fine and imprisonment for knowingly making false statements."

C. MONITORING AND REPORTING REQUIREMENTS

1. PARAMETERS TO BE MONITORED

- a. Annual stormwater monitoring shall be conducted by all industrial activities as defined in Part II (except road salt storage facilities as defined in Part II, category 12) no later than 365 days after their date of coverage under Part IV.C of this permit, and annually thereafter (except as provided in Part VI.C.1.d. and e. below) for the parameters listed below:

Total Oil and Grease (mg/l)
pH (S.U.)
Chemical Oxygen Demand (mg/l)
Total Suspended Solids (mg/l)
Total Phosphorous (mg/l)
Total Kjeldahl Nitrogen (mg/l)
Nitrate as Nitrogen (mg/l)
Fecal Coliforms (#/100 ml)
Total Copper (mg/l)
Total Zinc (mg/l)
Total Lead (mg/l)
Aquatic Toxicity (LC50)

Pollutants limited or required to be monitored under a discharge permit issued by the Commissioner to the site for process water.

Pollutants limited in an EPA effluent guideline to which the permittee is subject.

- b. In addition to the list of parameters in Paragraph C.1.a. of this Part, uncontaminated rainfall pH shall be measured at the time the runoff sample is taken.
- c. In addition to the list of parameters in Paragraph C.1.a. of this Part, for airports with stormwater discharges associated with industrial activities from areas where aircraft or airport deicing operations occur (including runways, taxiways, ramps and dedicated aircraft deicing stations), monitoring shall be conducted no later than 365 days after the date of issuance of this permit, and annually thereafter for the primary ingredient used in

STORMWATER GENERAL PERMIT FOR INDUSTRIAL ACTIVITY, 10/1/92, MODIFIED 10/1/95

the deicing materials used at the site (e.g., ethylene glycol, urea, etc.). All monitoring shall be performed immediately following deicing operations during a storm event and samples shall be collected in such a manner that they are representative of stormwater quality resulting from deicing operations.

- d. For industrial activities that employ twenty-five (25) employees or less and for federal, state or municipally operated industrial activities, monitoring shall not be required after the first year unless required in writing by the Commissioner.
- e. For any discharge monitored by an industrial activity which does not exceed the levels listed in subparagraph (i) of this paragraph for a period of two consecutive years commencing on October 1, 1995, sampling may be suspended for one year following this period. This provision shall apply only to those discharge points at the industrial activity which remain below these levels. Pollutants limited in an EPA effluent guideline to which the permittee is subject and pollutants limited or required to be monitored under a discharge permit issued by the Commissioner to the site for process water must be monitored for the entire term of the permit.

(i) Total Oil and Grease (mg/l)	20
Chemical Oxygen Demand (mg/l)	50
Total Suspended Solids (mg/l)	50
Total Phosphorous (mg/l)	0.5
Total Kjeldahl Nitrogen (mg/l)	3.0
Nitrate as Nitrogen (mg/l)	3.0
Fecal Coliforms (#/100 ml)	2,000
Total Copper (mg/l)	0.200
Total Lead (mg/l)	0.050
Total Zinc (mg/l)	0.500
Aquatic Toxicity	LC50 > 50%

Stormwater discharges associated with industrial activities include areas where aircraft or airport deicing operations exist as specified in Part VI Paragraph C.1.c. above.

- f. Representative Discharge. When a facility has two or more outfalls that, based on a consideration of features, (e.g. grass vs. pavement, slopes, catch basins vs. swales), and activities within the area drained by the outfall, the permittee reasonably believes discharge substantially identical effluents, the permittee may test the effluent of one of such outfalls and report that the quantitative data also applies to the substantially identical outfalls. In addition, for each outfall that the permittee believes is representative, an estimate of the size of the drainage area (in square feet) and an estimate of the runoff coefficient of the drainage area shall be provided in the Plan. In no case shall one outfall test be substituted for more than 5 outfalls.

2. STORMWATER MONITORING PROCEDURES

- a. Annual samples shall be collected from discharges resulting from a storm event that is greater than 0.1 inch in magnitude and that occurs at least 72 hours after any previous storm event of 0.1 inch or greater. Where feasible, the rainfall during the first 30 minutes of the storm event monitored shall be between 0.1 and 0.75 inches. Runoff events resulting from snow or ice melt cannot be used to meet the minimum annual monitoring requirements. Grab samples shall be used for all monitoring. Grab samples shall be collected during the first 30 minutes of a storm event discharge. The uncontaminated rainfall pH measurement shall also be taken at this time.

STORMWATER GENERAL PERMIT FOR INDUSTRIAL ACTIVITY, 10/1/92, MODIFIED 10/1/95

b. Storm Event Information

The following information shall be collected for the storm events monitored:

- (1) The date, temperature, time of the start of the discharge, time of sampling, and magnitude (in inches) of the storm event sampled.
- (2) The duration between the storm event sampled and the end of the previous measurable (greater than 0.1 inch rainfall) storm event.

c. Test Procedures

- (1) Unless otherwise specified in this permit, all pollutant parameters shall be determined according to methods prescribed in Title 40, CFR, Part 136 (1990), promulgated pursuant to Section 304(h) of the Federal Water Pollution Control Act.
- (2) Acute toxicity biomonitoring tests shall be conducted according to the procedures specified in Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, 4th edition, EPA 600/4-90/027. The following specific conditions apply:
 - Tests shall employ neonatal (less than 24 hour old) *Daphnia pulex* as test organisms.
 - Tests shall be conducted at 20 +/- 1 degrees Centigrade.
 - Tests shall be 48 hours in duration.
 - Synthetic freshwater prepared as described in EPA 600/4-90/027 and adjusted to an approximate hardness of 50 mg/l as CaCO₃ shall be used as dilution water in all tests.
 - The following test dilution series shall be utilized, expressed as percent stormwater sample: 100%, 50%, 25%, 12.5%, 6.25% and 0%.
 - A minimum of twenty test organisms shall be exposed to each stormwater concentration, with each test chamber containing no more than ten test organisms.
 - Test organisms shall not be fed during the test period.
 - Test results shall be reported as the LC50 value determined by the computational method (Binomial Distribution, Probit Analysis, Moving Average Angle, Spearman Karber) which yields the smallest 95% confidence interval and LC50 value which is consistent with the dose-response data.
 - Toxicity tests shall be initiated within 36 hours of stormwater sample collection.
 - Any test in which the survival of test organisms is less than 90% in the combined control test vessels or failure to achieve test conditions as specified, such as maintenance of environmental controls, shall constitute an invalid test and will require stormwater resampling and retesting as soon as practicable.

STORMWATER GENERAL PERMIT FOR INDUSTRIAL ACTIVITY, 10/1/92, MODIFIED 10/1/95

(3) Recording of Results

For each measurement or sample taken pursuant to the requirements of this permit, the discharger shall record the following information:

- (a) the place, date, and time of sampling
- (b) the person(s) collecting samples
- (c) the dates and times the analyses were initiated
- (d) the person(s) or laboratory who performed the analyses
- (e) the analytical techniques or methods used
- (f) the results of all required analyses

d. Records Retention

All records and information resulting from the monitoring activities required by this general permit including all records of analyses performed and calibration and maintenance of instrumentation shall be retained for a minimum of five (5) years following the expiration of this general permit, or longer if required by the Commissioner.

3. REPORTING REQUIREMENTS

- a. All results of monitoring conducted pursuant to this general permit shall be submitted on the Stormwater Monitoring Report (SMR) attached hereto, including all supporting chemical/physical measurements performed in association with the toxicity tests as well as dose-response data. A separate SMR form shall be used for each discharge monitored. All SMR forms shall be submitted within 90 days of the date of sampling to :

Department of Environmental Protection
Bureau of Water Management
79 Elm Street
Hartford, CT 06106-5127
Attention: Water Toxics Program Coordinator

In the case of stormwater discharges through a municipal separate stormwater system, these results shall also be made available to the operator of that system upon request.

b. Additional Monitoring by Permittee

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of such monitoring shall meet the reporting requirements of Part VI Paragraph C.3.a. above.

4. STORMWATER DATA PREVIOUSLY COLLECTED

Data collected for the purpose of completing the Environmental Protection Agency Form 2F prior to adoption of this general permit may serve to meet the first year of monitoring required by this permit (Part VI Paragraph C.1).

D. OTHER REQUIREMENTS

1. There shall be no distinctly visible floating scum, oil or other matter contained in the stormwater discharge. Excluded from this are naturally occurring substances such as leaves and twigs provided no person has placed such substances in or near the discharge.
2. The stormwater discharge shall not result in pollution due to acute or chronic toxicity to aquatic and marine life, impair the biological integrity of aquatic or marine ecosystems, or result in an unacceptable risk to human health.

PART VII. GENERAL CONDITIONS

- A. The permittee shall comply with the following Regulations of Connecticut State Agencies which are hereby incorporated into this general permit, as if fully set forth herein:

1. Section 22a-430-3:

Subsection (b) General - subparagraph (1)(D) and subdivision (2), (3), (4) and (5)

Subsection (c) Inspection and Entry

Subsection (d) Effect of a Permit - subdivisions (1) and (4)

Subsection (e) Duty to Comply

Subsection (f) Proper Operation and Maintenance

Subsection (g) Sludge Disposal

Subsection (h) Duty to Mitigate

Subsection (i) Facility Modifications, Notification - subdivisions (1) and (4)

Subsection (j) Monitoring, Records and Report Requirements - subdivisions (1), (6), (7), (8), (9) and (11) (except subparagraphs (9) (A) (2) and (9) (C))

Subsection (k) Bypass

Subsection (m) Effluent Limitation Violations

Subsection (n) Enforcement

Subsection (p) Spill Prevention and Control

Subsection (q) Instrumentation, Alarms, Flow Recorders

Subsection (r) Equalization

2. Section 22a-430-4

Subsection (t) Prohibitions

Subsection (p) Revocation, Denial, Modification

Appendices

- B. The permittee shall comply with the following additional terms and conditions:

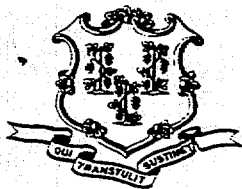
1. Discharge of any substance which is not from the activities described in this general permit shall be considered a violation of this general permit unless it is authorized by an individual permit issued under Section 22a-430 of the General Statutes.

STORMWATER GENERAL PERMIT FOR INDUSTRIAL ACTIVITY, 10/1/92, MODIFIED 10/1/95

- C. The permittee shall at all times continue to meet the conditions for eligibility set forth in Part IV of this general permit.
- D. Within fifteen days after the date the registrant or permittee becomes aware of a change in any information submitted to the Commissioner in a registration or pursuant to this general permit, or that any such information was inaccurate or misleading or that any relevant information was omitted, the registrant or permittee shall submit the correct or omitted information in writing to the Commissioner.
- E. Nothing in this general permit shall relieve the registrant or permittee of other obligations under applicable federal, state and local law.
- F. Any document, including but not limited to any notice, which is required to be submitted to the Commissioner under this general permit by the permittee shall be signed by the permittee and by the individual or individuals responsible for actually preparing such document, each of who shall certify in writing as follows: "I have personally examined and am familiar with the information submitted in this document and all attachments and certify that based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information, the submitted information is true, accurate and complete to the best of my knowledge and belief, and I understand that any false statement made in this document or its attachments may be punishable as a criminal offense."
- G. Any false statement in any information submitted pursuant to this general permit may be punishable as a criminal offense under Section 22a-438 of the General Statutes or, in accordance with Section 22a-6, under Section 53a-157 of the General Statutes.


SIDNEY J. HOLBROOK
COMMISSIONER

28 Aug 95
Date



STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION



STORMWATER MONITORING REPORT

FACILITY INFORMATION

Name, Address (owner, operator) _____

Site Address _____

Contact Person _____ Phone: _____

Receiving Water (name, basin) _____

Stormwater G.P. Registration # _____ SIC Code _____

Check this box if number of employees is 25 or less, or if operated by a municipality: ☐

SAMPLING INFORMATION

Sample Location _____

Date/Time Collected _____

Person Collecting Sample _____

Storm Magnitude (inches) _____ Storm Duration (hours) _____

Date of Previous Storm Event _____ Rainfall pH _____

MONITORING RESULTS

<u>Parameter</u>	<u>Method</u>	<u>Results (units)</u>	<u>Laboratory</u>
Oil & Grease	_____	_____	_____
pH	_____	_____	_____
COD	_____	_____	_____
TSS	_____	_____	_____
TP	_____	_____	_____
TKN	_____	_____	_____
NO3-N	_____	_____	_____
Fecal Coliform	_____	_____	_____
Total Copper	_____	_____	_____
Total Zinc	_____	_____	_____
Total Lead	_____	_____	_____
24 Hr. LC50	_____	_____	_____
48 Hr. LC50	_____	_____	_____

Attach separate page(s) to report additional parameters monitored pursuant to Part VI.C.1.a of the General Permit.

STATEMENT OF ACKNOWLEDGMENT

I certify that the data reported on this document were prepared under my direction or supervision in accordance with the General Stormwater Permit. The information submitted is, to the best of my knowledge and belief, true, accurate and complete.

Authorized Official: _____

Signature: _____ Date: _____

STORMWATER ACUTE TOXICITY TEST DATA SHEET

Source: _____

Date Begin: _____ Date End: _____

Technician: _____ Starting Hour: _____

Dilution Water: Synthetic Freshwater 50 ±5 mg/L as CaCO₃

Test Species: Daphnia pulex < 24 hours old

Individuals/Concentration: _____ Temp. Range: 20 ±1°C

Start Time: _____

DILUTION%	0 A	0 B	6¼ A	6¼ B	12½ A	12½ B	25A	25B	50A	50B	100A	100B
D.O.												
pH												
TEMP.												
COND.												

24 Hours

%SURVIVAL												
D.O.												
pH												
TEMP.												
COND.												

48 Hours

%SURVIVAL												
D.O.												
pH												
TEMP.												
COND.												

REFERENCE TOXICANT RESULTS

Test Species	Date	Referance Toxicant	Source	LC50
<i>Daphnia pulex</i>				

COMMENTS

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER MANAGEMENT

REGISTRATION UNDER A GENERAL PERMIT
CGS SECTION 22a-430b

for

STORMWATER DISCHARGE ASSOCIATED WITH
INDUSTRIAL ACTIVITY

DEP USE ONLY

REG.#

PERMIT #

FAC. ID.

type or print neatly

I. Facility Information

A. Name and address of owner

B. Name and address of operator

Ownership status: Federal____, State____, Public____, Private____, Other_____

C. Site address _____

D. Site contact person _____ Phone: () _____

E. Standard Industrial Classification (SIC) Code for industrial activities, up to four four-digit numbers
(primary # first): _____ (secondary #s if applicable) _____ / _____ / _____ and primary SIC description

F. Other DEP Permits currently in force for the site: NPDES # _____, Air Yes: _____ No: _____,
RCRA # _____, Number and type of other general permit discharges to stormwater system

G. Attach 8 1/2" x 11" copy of the applicable section of a USGS quadrangle map or other location map
showing site boundaries and location of all conveyances, outfalls, or channelized flows on the site.

II. Stormwater discharge information

A. Number, type (e.g. swale or pipe) and size of conveyances, outfalls, or channelized flows that run
off the site: _____

B. Material of construction, if applicable, of the conveyances, outfalls, or channelized flows:

C. Where does stormwater discharge to?

- Municipal Separate Storm Sewer System? No:____ Yes:____ (Name):_____
- Surface water body or wetlands? No:____ Yes:____ (Name):_____
- Is discharge located less than 100 feet from a tidal wetland which is not a fresh-tidal wetland?
No _____ Yes _____ (Only for discharges initiated after October 1, 1992.)
- Seeps into ground? No:____ Yes:____ (If yes, Well:____ Seepage Pit:____ Detention Pond:____
Other:_____

D. Name of the watershed where the site is located or nearest waterbody to which it discharges:

E. Have any stormwater quality analytical data been previously collected? No:____ Yes:____ (If yes, maintain data from past three (3) years on site.)

F. Has this site been previously registered by a different permittee? No:____ Yes:____ If yes, name of previous permittee:_____

III. Certification

I certify under penalty of law that I have read and understand all conditions of the general permit for the discharge of stormwater associated with industrial activity issued on October 1, 1992 (as modified on October 1, 1995), and that all conditions for eligibility for coverage under this general permit are met. This document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate 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 contained in this registration is, to the best of my knowledge and belief; true, accurate, and complete. I am aware that there are penalties for submitting false information, including the possibility of fine and imprisonment for knowingly making false statements.

Name of Registrant (please print)

Title

Signature

Date

Fee attached \$_____. A fee of \$250.00 for any facility shall be paid with the registration. (Make your check payable to the Department of Environmental Protection and annotate check: Water Management Permit fee.) State and Town owned facilities are not required to pay a registration fee.

Mail registration, location map, and fee to:

Central Permit Processing Unit
Department of Environmental Protection
79 Elm Street
Hartford, CT 06106-5127



**GENERAL PERMIT FOR THE DISCHARGE OF STORMWATER AND
DEWATERING WASTEWATERS FROM CONSTRUCTION ACTIVITIES**

October 1, 1992

State of Connecticut
Department of Environmental Protection
Bureau of Water Management

Printed on Recycled Paper

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GENERAL PERMIT FOR THE DISCHARGE OF STORMWATER AND DEWATERING WASTEWATERS FROM CONSTRUCTION ACTIVITIES

PART I. AUTHORITY

This general permit is issued under the authority of Section 22a-430b of the Connecticut General Statutes, as amended by Public Act 91-263.

PART II. DEFINITIONS

The definitions of terms used in this general permit shall be the same as the definitions contained in Section 22a-423 of the Connecticut General Statutes and Section 22a-430-3(a) of the Regulations of Connecticut State Agencies. The definition of the term "coastal area" shall be the same as the definition contained in section 22a-94. The definition of the term "high tide line" shall be the same as that contained in section 22a-359 of the Connecticut General Statutes. The definition of the term "coastal tidal waters" shall be the same as the definition contained in section 22a-29 of the Connecticut General Statutes. In addition, the following definitions shall apply:

"Construction activities" means activities including but not limited to clearing, grading, excavation, and dewatering.

"Dewatering wastewater" means wastewater with water generated from the lowering of the groundwater table, the pumping of accumulated stormwater from an excavation, or the pumping of surface water from a coffer dam, or pumping of other surface water which has been diverted into a construction site.

"Fresh-tidal wetland" means a tidal wetland with an average salinity level of less than 0.5 parts per thousand.

"Guidelines" means the Connecticut Guidelines for Soil Erosion and Sediment Control, as amended, established pursuant to section 22a-328 of the Connecticut General Statutes.

"Inland wetland" means a wetland as that term is defined in section 22a-38 of the Connecticut General Statutes.

"Municipal separate storm sewer" means conveyances for stormwater(including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels or storm drains) owned or operated by any municipality and discharging directly to surface waters of the state.

"Permittee" means any person who or municipality which initiates, creates, originates or maintains a discharge to the waters of the state; which discharge is covered under this general permit in accordance with Part IV of this general permit.

"Registrant" means a person who or municipality which submits a complete registration in accordance with Part V of this general permit."

"Site" means on the same or geographically contiguous property associated with one project which may be divided by public or private right(s)-of-way.

"Stormwater" means waters consisting of precipitation runoff.

"Tidal wetland" means a wetland as that term is defined in section 22a-29 of the Connecticut General Statutes.

"Upland soils" means soils which are not designated as poorly drained, very poorly drained, alluvial, or flood plain by the National Cooperative Soils Survey, as may be amended from time to time, of the Soil Conservation Service of the United States Department of Agriculture and/or the Inland Wetlands Commission of the Community in which the project will take place.

STORMWATER GENERAL PERMIT FOR CONSTRUCTION, 10/1/92

PART III. FEES

A fee of \$250.00 for any person and \$125.00 for any municipality shall be paid with the registration required by Part V of this general permit. On and after January 1, 1993, registration and annual fees, if applicable shall be paid in accordance with applicable regulations, including but not limited to Sections 22a-430-6 and 22a-430-7 of the Regulations of Connecticut State Agencies.

PART IV. COVERAGE UNDER THIS GENERAL PERMIT

A. CONDITIONS FOR ELIGIBILITY. This general permit covers only discharges comprised solely of stormwater and dewatering wastewater from construction activities which result in the disturbance of five or more total acres land area on a site, provided that the following conditions are met prior to coverage under this general permit.

1. The discharge is not covered by an individual permit issued under Section 22a-430 of the Connecticut General Statutes;
2. The stormwater is not discharged to a Publicly Owned Treatment Works or to ground water;
3. No effluent limitations, standard or guidelines adopted by the U.S. Environmental Protection Agency under the Federal Clean Water Act are applicable to the discharge;
4. The discharge shall not cause pollution due to acute or chronic toxicity to aquatic and marine life, impair the biological integrity of aquatic or marine ecosystems, or result in an unacceptable risk to human health.

B. GEOGRAPHIC AREA. This general permit covers all areas of the State of Connecticut.

C. EFFECTIVE DATE AND EXPIRATION DATE. This general permit is effective on October 1, 1992 and expires on October 1, 1997.

D. EFFECTIVE DATE OF COVERAGE. The effective date of coverage under this general permit is the same as the effective date of the permit listed in Part IV Paragraph C above, or the date construction activities are initiated, whichever is later.

E. ISSUANCE OF AN INDIVIDUAL PERMIT. Under Section 22a-430b of the General Statutes, when an individual permit is issued to a person or municipality otherwise covered by this general permit, the applicability of this general permit to the individually permitted discharge is automatically terminated on the effective date of the individual permit.

PART V. REGISTRATION REQUIREMENTS

A. DUTY TO REGISTER. Any person who or municipality which initiates, creates, originates or maintains a discharge described in Part IV Paragraph A of this general permit shall submit to the Commissioner a registration which satisfies the requirements of this part either 30 days after the date of issuance of this permit if the discharge was initiated, created, originated or maintained on or before the date of issuance of this permit, or at least fifteen days before the initiation of construction activities for any other discharge. If the site for which a registration is submitted under this permit is owned by one person or municipality but is leased or, in some other way, the legal responsibility of another person or municipality (the operator), the operator is responsible for submitting the registration required by this permit. The permittee is

STORMWATER GENERAL PERMIT FOR CONSTRUCTION, 10/1/92

responsible for compliance with all conditions of this permit.

B. SCOPE OF REGISTRATION. A registrant may only include on a registration those discharges which are operated by such registrant on one site. A registrant may not submit more than one registration per site under this general permit.

C. CONTENTS OF REGISTRATION. The registration shall be submitted on forms prescribed by the Commissioner and shall include but not be limited to the following information.

1. The location of the construction activity for which the registration is submitted. An 8 1/2"x 11" copy of the applicable section of a United States Geological Survey Quadrangle Map showing the boundaries of the construction activity.
2. The landowner's name, address, telephone number and status as federal, state, private, public or other entity.
3. The registrant's name, address, telephone number and status as federal, state, private, public or other entity.
4. The name, address, and telephone number of the general contractor(s) that have been identified at the time of the registration submittal if known. Name and telephone number of the on-site contact person. If unknown at the time of registration, the name and telephone number of the general contractor(s) shall be provided at least 48 hours prior to the start of construction.
5. Stormwater Discharge Information
 - a. Number of existing or proposed outfalls or channelized flows of stormwater from the site;
 - b. Location or proposed location of the outfalls, or channelized stormwater flows discharging from the site shall be shown on the map required in paragraph C.1. above;
 - c. Confirmation of whether any analytical laboratory data exist on stormwater quality for the site.
6. A brief description of the project; estimated timetable including date when contractor began or will begin site disturbance; estimates of the number of acres of the site on which soil have been or will be disturbed; statement that a site-specific erosion control plan has been or will be prepared for the project; and
7. The following certification, signed by an independent professional engineer licensed to practice in Connecticut and not in the regular employ of the registrant or permittee:

"I certify that, in my professional judgement, a stormwater pollution control plan has been prepared for the site in accordance with the Guidelines, and the conditions of the General Permit for the discharge of stormwater and dewatering wastewaters from construction activities issued on October 1, 1992, and the controls required by such plan are appropriate for the site. This certification is based on my review of the stormwater pollution control plan for the site and an inspection of the site. I am aware that there are significant penalties for false statements in this certification, including the possibility of fine and imprisonment for knowingly making false statements."
8. Any additional information requested by the Commissioner.

STORMWATER GENERAL PERMIT FOR CONSTRUCTION, 10/1/92

D. SIGNATURE OF REGISTRANT

Any person who or municipality which submits a registration under this general permit shall sign the registration and shall make the following certification:

"I certify under penalty of law that I have read and understand all conditions of the general permit for the discharge of stormwater and dewatering wastewaters from construction activities issued on October 1, 1992, that all conditions for eligibility for coverage under the general permit are met, all terms and conditions of the general permit are being met for all discharges which have been initiated and are the subject of this Registration, and that a system is in place to ensure that all terms and conditions of this general permit will continue to be met for all discharges covered by this general permit at the site. This document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate 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 contained in this registration 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 knowingly making false statements."

- E. WHERE TO SUBMIT A REGISTRATION.** Persons who or municipalities which submit a registration under this general permit shall submit such registration to the Department of Environmental Protection at the following address:

Department of Environmental Protection
Bureau of Water Management
Engineering & Enforcement Division
165 Capitol Avenue, Hartford, CT 06106
Attention: General Permit Coordinator

- F. TRANSFER OF COVERAGE.** Any coverage under this general permit shall be non-transferable. However, any person registering a discharge which has previously been registered under this permit may adopt by reference the stormwater pollution control plan developed by the previous permittee. The new registrant shall amend the Plan as required by part VI B. 2.
- G. FAILURE TO REGISTER.** Any person or municipality who fails to submit a registration, and who initiates, creates, originates or maintains a stormwater discharge to the waters of the State without coverage under this general permit, or who is determined by Commissioner to be discharging without a permit as described in Part V Paragraph C. 6 above, except those covered by an individual permit issued under Section 22a-430 of the Connecticut General Statutes, is in violation of the Connecticut General Statutes, and is subject to injunction and penalties of up to \$25,000 per day per violation under Chapter 446k of the Connecticut General Statutes.
- H. ADDITIONAL NOTIFICATION.** For sites covered by this general permit that discharge stormwater associated with construction activity through a municipal separate storm sewer system, a copy of the registration shall also be submitted to the owner and operator of that system.

PART VI PERMIT CONDITIONS FOR STORMWATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITY

A. SPECIAL CONDITION FOR CERTAIN DISCHARGES

Any person who or municipality which discharges stormwater or dewatering wastewaters from construction activity into coastal tidal waters for which a permit is required under either the Structures and Dredging Act or the Tidal Wetlands Act shall obtain such permit(s).

B. CONSTRUCTION ACTIVITY STORMWATER POLLUTION CONTROL PLAN.

The permittee shall develop a stormwater pollution control plan ("plan") for each site covered by this general permit and shall perform all actions required by such plan and shall maintain compliance with the plan thereafter. The stormwater pollution control plan shall be designed to address two components of stormwater pollution: (1) pollution caused by soil erosion and sedimentation during and after construction; and (2) stormwater pollution caused by use of the site after construction is completed, including but not limited to parking lots, roadways and the maintenance of grassed areas. Stormwater pollution control plans shall be prepared in accordance with good engineering practices. The plan shall ensure and demonstrate compliance with the guidelines.

1. General

- a. For construction activities covered by this general permit which are initiated on or before the date of issuance of this general permit, the permittee shall prepare the stormwater pollution control plan no later than thirty days after the date of issuance of this general permit.
- b. For construction activities covered by this general permit which are initiated after the date of issuance of this general permit, the permittee shall prepare the stormwater pollution control plan no later than fifteen days before the date of initiation of the construction activity.
- c. The permittee shall provide a copy of the stormwater pollution control plan, and the registration set forth in Part V of this general permit immediately upon request to: the Commissioner; the local agency approving sediment and erosion plans, grading plans, or stormwater management plans; or in the case of a stormwater discharge through a municipal separate storm sewer system, the municipal operator of the system.
- d. The Commissioner may notify the permittee at any time that the plan does not meet one or more of the minimum requirements of this permit. Within 7 days of such notice the permittee shall make the required changes to the plan, perform all actions required by such revised plan, and submit to the Commissioner a written certification that the requested changes have been made and implemented, and such other information as the Commissioner requires.

2. **Keeping Plans Current.** The permittee shall amend the plan whenever there is a change in contractor or subcontractor at the site, or a change in design, construction, operation, or maintenance at the site, which has the potential for the discharge of pollutants to the waters of the state and which has not otherwise been addressed in the plan or if the actions required by the stormwater control plan fail to prevent pollution.

3. **Contents of the Plan.** The plan shall include the following items:

STORMWATER GENERAL PERMIT FOR CONSTRUCTION, 10/1/92

a. Site Description.

- (i) A description of the nature of the construction activity;
- (ii) A description of the intended sequence of major activities which disturb soils for major portions of the site (e.g., grubbing, excavation, grading);
- (iii) Estimates of the total area of the site and the total area of the site that is expected to be disturbed by construction activities;
- (iv) An estimate, including calculations if any, of the average runoff coefficient of the site after construction activities are completed and existing data describing the soil or the quality of any discharge from the site;
- (v) A site map indicating drainage patterns and approximate slopes anticipated after major grading activities, areas of soil disturbance, the location of major structural and non-structural controls identified in the plan, the location of areas where stabilization practices are expected to occur, areas which will be vegetated following construction, surface waters (including inland wetlands, tidal wetlands, and fresh-tidal wetlands), and locations where stormwater is discharged to a surface water; and
- (vi) The name of the immediate receiving water(s) and the ultimate receiving water(s), and areal extent of wetland acreage on the site.

b. **Controls.** Each plan shall include a description of appropriate controls and measures that will be performed at the site to prevent pollution of the waters of the state. The plan shall clearly describe for each major activity identified in the registration submitted under this general permit, the appropriate control measures and the timing during the construction process that the measures will be implemented. (For example, perimeter controls for one portion of the site will be installed after the clearing and grubbing necessary for installation of the measure, but before the clearing and grubbing for the remaining portions of the site. Perimeter controls will be actively maintained until final stabilization of those portions of the site upgradient of the perimeter control. Temporary perimeter controls will be removed after final stabilization.) The description of controls shall address the following minimum components:

(i) Erosion and Sediment Controls.

- (a) Stabilization Practices. A description of interim and permanent stabilization practices, including a schedule for implementing the practices. Site plans shall ensure that existing vegetation is preserved where attainable and that disturbed portions of the site are stabilized. Stabilization practices may include but not be limited to: temporary seeding, permanent seeding, mulching, geotextiles, sod stabilization, vegetative buffer strips, protection of trees, preservation of mature vegetation, and other vegetative and non-structural measures as may be identified by the guidelines. Where construction activities have permanently ceased or have temporarily been suspended for more than thirty days, or when final grades are reached in any portion of the site, stabilization practices shall be implemented within seven days.
- (b) Structural Practices. A description of structural practices to divert flows away from exposed soils, store flows or otherwise limit runoff and the discharge of pollutants from

STORMWATER GENERAL PERMIT FOR CONSTRUCTION, 10/1/92

the site. Such practices include but may not be limited to silt fences, earth dikes, drainage swales, sediment traps, check dams, subsurface drains, pipe slope drains, level spreaders, storm drain inlet protection, rock outlet protection, reinforced soil retained systems, gabions, and temporary or permanent sediment basins. Unless otherwise specifically approved in writing, structural measures shall be installed on upland soils.

For common drainage locations that serve an area with more than 5 disturbed acres at one time, a temporary or permanent sediment basin designed in accordance with the guidelines, shall be designed and installed, which basin shall provide a minimum of 134 cubic yards of water storage per acre drained and which basin shall be maintained until final stabilization of the site. This requirement shall not apply to flows from off-site areas and flows from the site that are either undisturbed or have undergone final stabilization where such flows are diverted around the sediment basin.

- (c) **Maintenance.** Maintenance shall be performed in accordance with the guidelines, provided that if additional maintenance is required to protect the waters of the state from pollution, the plan shall include a description of the procedures to maintain in good and effective operating conditions all erosion and sediment control measures, including vegetation, and all other protective measures identified in the site plan.
- (ii) **Dewatering Wastewaters.** A description of the operational and structural practices which will be used to ensure that all dewatering wastewaters will not contain suspended solids in amounts which could reasonably be expected to cause pollution of waters of the State. Dewatering wastewaters shall be discharged in a manner which minimizes the discoloration of the receiving waters.
- (iii) **Post Construction Stormwater Management.** A description of measures that will be installed during the construction process to control pollutants in stormwater discharges that will occur after construction operations have been completed. Unless otherwise specifically provided by the Commissioner in writing, structural measures shall be placed on upland soils. This general permit only addresses the installation of stormwater management measures, and not the ultimate operation and maintenance of such structures included in such measures after the construction activities have been completed and the site has undergone final stabilization.
- (a) For construction activities initiated after the issuance date of this general permit, the permittee shall install post-construction stormwater management measures designed to remove suspended solids from stormwater. A goal of 80 percent removal of total suspended solids from the stormwater discharge shall be used in designing and installing stormwater management measures. Such measures may include but are not limited to: stormwater detention structures (including wet ponds); stormwater retention structures; flow attenuation by use of open vegetated swales and natural depressions; infiltration of runoff on-site; vegetated buffer strips; and sequential systems (which combine several practices).
- (b) Velocity dissipation devices shall be placed at discharge locations and along the length of any outfall channel as necessary to provide a non-erosive velocity flow from the structure to a water course so that the natural physical and biological characteristics and functions are maintained and protected (e.g., maintenance of hydrologic conditions, such as the hydrodynamics present prior to the initiation of construction activities).

STORMWATER GENERAL PERMIT FOR CONSTRUCTION, 10/1/92

(iv) **Other Controls.**

(a) Waste Disposal. A description of best management practices to be performed at the site, which practices shall ensure that no litter, debris, building materials, or similar materials are discharged to waters of the State.

(b) Off-site vehicle tracking of sediments and the generation of dust shall be minimized.

c. **Inspection.** Qualified personnel (provided by the permittee) shall inspect disturbed areas of the construction activity that have not been finally stabilized, structural control measures, and locations where vehicles enter or exit the site at least once every seven calendar days and within 24 hours of the end of a storm that is 0.5 inches or greater. Where sites have been temporarily or finally stabilized, such inspection shall be conducted at least once every month for three months.

(i) Disturbed areas and areas used for storage of materials that are exposed to precipitation shall be inspected for evidence of, or the potential for, pollutants entering the drainage system. Erosion and sediment control measures identified in the plan shall be observed to ensure that they are operating correctly. Where discharge locations or points are assessable, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Locations where vehicles enter or exit the site shall be inspected for evidence of off-site sediment tracking.

(ii) Based on the results of the inspection, the description of potential sources and pollution prevention measures identified in the plan shall be revised as appropriate as soon as practicable after such inspection. Such modifications shall provide for timely implementation of any changes to the plan within 7 calendar days following the inspection.

(iii) A report summarizing the scope of the inspection, name(s) and qualifications of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the stormwater control plan, and actions taken shall be made and retained as part of the stormwater control plan for at least three years after the date of inspection. The report shall be signed by the permittee.

d. **Contractors**

(i) The stormwater pollution control plan shall clearly identify each contractor and subcontractor which will perform on the site actions which may reasonably be expected to cause or have the potential to cause pollution of the waters of the State, and shall include a copy of the certification statement shown below signed by each such contractor and subcontractor. All certifications shall be included in the stormwater control plan.

(ii) Certification Statement. The stormwater pollution control plan shall include the following certification signed by each contractor and subcontractor identified in a stormwater pollution control plan as described above:

"I certify under penalty of the law that I have read and understand the terms and conditions of the general permit for the discharge of stormwater associated with construction activity. I understand that as a contractor or subcontractor at the site, I am covered by this general permit, and must comply with the terms and conditions of this permit, including but not

STORMWATER GENERAL PERMIT FOR CONSTRUCTION, 10/1/92

limited to the requirements of the stormwater pollution control plan prepared for the site."

The certification shall include the name and title of the person providing the signature; the name, address and telephone number of the contracting firm; the address (or other identifying description) of the site; and the date the certification is made.

C. RETENTION OF RECORDS

1. The permittee shall retain copies of stormwater pollution control plans and all reports required by this general permit, and records of all data used to complete the registration to be covered by this general permit, for a period of at least three years from the date that construction at the site is completed unless the Commissioner specifies another time period in writing.
2. The permittee shall retain a copy of the stormwater pollution control plan required by this general permit at the construction site from the date construction is initiated at the site until the date construction at the site is completed.

PART VII. GENERAL CONDITIONS

- A. The permittee shall comply with the following Regulations of Connecticut State Agencies which are hereby incorporated into this general permit, as if fully set forth herein:

1. Section 22a-430-3

Subsection (b) General - subparagraph (1)(D) and subdivision (2), (3), (4) and (5)

Subsection (c) Inspection and Entry

Subsection (d) Effect of a Permit - subdivisions (1) and (4)

Subsection (e) Duty to Comply

Subsection (f) Proper Operation and Maintenance

Subsection (g) Sludge Disposal

Subsection (h) Duty to Mitigate

Subsection (i) Facility Modifications, Notification - subdivisions (1) and (4)

Subsection (j) Monitoring, Records and Report Requirements - subdivisions (1), (6), (7), (8), (9) and (11) (except subparagraphs (9) (A) (2) and (9) (C))

Subsection (k) Bypass

Subsection (m) Effluent Limitation Violations

Subsection (n) Enforcement

Subsection (p) Spill Prevention and Control

Subsection (q) Instrumentation, Alarms, Flow Recorders

Subsection (r) Equalization

2. Section 22a-430-4

Subsection (t) Prohibitions

Subsection (p) Revocation, Denial, Modification

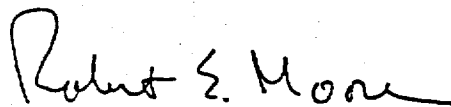
Appendices

STORMWATER GENERAL PERMIT FOR CONSTRUCTION, 10/1/92

B. The permittee shall comply with the following additional terms and conditions:

Discharge of any substance which is not from the activities described in this general permit shall be considered a violation of this general permit unless it is authorized by an individual permit issued under Section 22a-430 of the General Statutes or another general permit issued under Section 22a-430b of the General Statutes.

- C. The permittee shall at all times continue to meet the conditions for eligibility set forth in Part IV of this general permit.
- D. Within fifteen days after the date the registrant or permittee becomes aware of a change in any information submitted to the Commissioner in a registration or pursuant to this general permit, or that any such information was inaccurate or misleading or that any relevant information was omitted, the registrant or permittee shall submit the correct or omitted information in writing to the Commissioner.
- E. Nothing in this general permit shall relieve the registrant or permittee of other obligations under applicable federal, state and local law.
- F. Any document, including but not limited to any notice, which is required to be submitted to the Commissioner under this general permit by the permittee shall be signed by the permittee and by the individual or individuals responsible for actually preparing such document, each of whom shall certify in writing as follows: "I have personally examined and am familiar with the information submitted in this document and all attachments and certify that based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information, the submitted information is true, accurate and complete to the best of my knowledge and believe, and I understand that any false statement made in this document or its attachments may be punishable as a criminal offense."
- G. Any false statement in any information submitted pursuant to this general permit may be punishable as a criminal offense under Section 22a-438 of the General Statutes or, in accordance with Section 22a-6, under Section 53a-157 of the General Statutes.



ROBERT E. MOORE
DEPUTY COMMISSIONER

9/30/92

Date

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER MANAGEMENT

REGISTRATION UNDER A GENERAL PERMIT
CGS SECTION 22a-430b

for
STORMWATER AND DEWATERING WASTEWATER FROM
CONSTRUCTION ACTIVITIES

DEP USE ONLY

REG.#

PERMIT #

FAC. ID.

type or print neatly

I. Facility Information

A. Location of construction site

C. Name and address of registrant

B. Name and address of land owner

Telephone no. ()

D. Name and address of general contractor

Telephone no. ()

Telephone no. ()

Ownership status: Federal _____, State _____, Public _____, Private _____, Other _____

Registrant status: Federal _____, State _____, Public _____, Private _____, Other _____

E. Site contact person _____ Phone: () _____

F. Attach 8 1/2" x 11" copy of the applicable section of a USGS quadrangle map showing site boundaries and location of all stormwater conveyances, outfalls, and channelized flows that run off the site.

II. Stormwater discharge information

A. Number of existing or proposed outfalls or channelized flows from the site (as shown on attached map): _____

B. Where does stormwater discharge to?

- Municipal Separate Storm Sewer System? No: _____ Yes: _____ (Name): _____
- Surface water body or wetlands? No: _____ Yes: _____ (Name): _____
- Seeps into ground? No: _____ Yes: _____ (If yes, Well: _____ Seepage Pit: _____ Infiltration Pond: _____ Other: _____)

E. Have any stormwater quality analytical data been previously collected? No: _____ Yes: _____ (If yes, maintain data from past three (3) years on site.)

F. Has this discharge been previously registered by a different permittee? No: _____ Yes: _____ If yes, name of previous permittee: _____

(over)

E. Nature of Construction Activity:

Brief description: _____

Start date: _____, Anticipated completion date: _____, Major milestone date: _____

Estimate number of acres to be disturbed: _____

Has a site specific erosion control plan been prepared? Yes: ____ No: ____

Is construction in accordance with guidelines established under Section 22a-329 of Soil Erosion and Sedimentation Act: Yes: ____ No: ____

Is construction in accordance with local soil erosion and sediment ordinances? Yes: ____ No: ____

III. Certification

I certify that, in my professional judgment, a stormwater pollution control plan has been prepared for the site in accordance with the Guidelines, and the conditions of the General Permit for the discharge of stormwater and dewatering wastewaters from construction activities issued on October 1, 1992, and the controls required by such plan are appropriate for the site. This certification is based on my review of the stormwater pollution control plan for the site and an inspection of the site. I am aware that there are significant penalties for false statements in this certification, including the possibility of fine and imprisonment for knowingly making false statements.

Name of professional engineer (please print)

Company

Signature

Date

P.E. #

I certify under penalty of law that I have read and understand all conditions of the general permit for the discharge of stormwater and dewatering wastewaters from construction activities issued on October 1, 1992, that all conditions for eligibility for coverage under this general permit are met, all terms and conditions of the general permit are being met for all discharges which have been initiated and are the subject of this Registration, and that a system is in place to ensure that all terms and conditions of this general permit will continue to be met for all discharges covered by this general permit at the site. This document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate 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 contained in this registration is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are penalties for submitting false information, including the possibility of fine and imprisonment for knowingly making false statements.

Name of Registrant (please print)

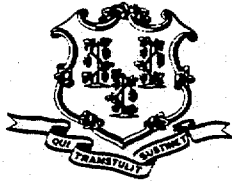
Title

Signature

Date

Fee attached \$_____. A fee of \$250.00 for any person and \$125.00 for any municipality shall be paid with the registration. (Make your check payable to the Department of Environmental Protection and annotate check: Water Management Permit fee.) State owned facilities are not required to pay a registration fee.

Mail application to: Department of Environmental Protection
Bureau of Water Management
165 Capitol Avenue
Hartford, CT 06106
Attention: General Permit Coordinator



**GENERAL PERMIT FOR THE DISCHARGE OF STORMWATER
ASSOCIATED WITH COMMERCIAL ACTIVITY**

AUGUST 1, 1995

State of Connecticut
Department of Environmental Protection
Bureau of Water Management

Printed on Recycled Paper

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**GENERAL PERMIT FOR THE DISCHARGE OF STORMWATER
ASSOCIATED WITH COMMERCIAL ACTIVITY**

PART I. AUTHORITY

This general permit is issued under the authority of Section 22a-430b of the Connecticut General Statutes, as amended by Public Act 91-263.

PART II. DEFINITIONS

The definitions of terms used in this general permit shall be the same as the definitions contained in Section 22a-423 of the Connecticut General Statutes and Section 22a-430-3(a) of the Regulations of Connecticut State Agencies. The definition of the term "coastal area" shall be the same as the definition contained in section 22a-94. The definition of the term "high tide line" shall be the same as that contained in section 22a-359 of the Connecticut General Statutes. The definition of the term "coastal tidal waters" shall be the same as the definition contained in section 22a-29 of the Connecticut General Statutes. In addition, the following definitions shall apply:

"Commercial activity" means:

Any activity or facility under Standard Industrial Classifications (SIC) (as defined in "Standard Industrial Classification Manual, Executive Office of the President, Office of Management and Budget 1987") 50-59 and 70-79, with five (5) acres or more of contiguous impervious surface. Impervious surface means roof area, paved walk, paved parking area, paved driveway, paved roadway and any other paved surface. An activity or facility with an SIC code already covered by the General Permit for the Discharge of Stormwater Associated with Industrial Activity is not included in this definition. See Appendix A for SIC code descriptions.

"Fresh-tidal wetland" means a tidal wetland with an average salinity of less than 0.5 parts per thousand.

"Inland wetland" means a wetland as that term is defined in section 22a-38 of the Connecticut General Statutes.

"Municipal separate storm sewer" means conveyances for stormwater (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels or storm drains) owned or operated by any municipality and discharging directly to surface waters of the state.

"Permittee" means any person who or municipality which initiates, creates, originates or maintains a discharge to the waters of the state, which discharge is covered under this general permit in accordance with Part III of this general permit.

"Point Source" means any discernible, confined and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel or other floating craft from which pollutants are or may be discharged.

"Registrant" means a person who or municipality that submits a complete registration in accordance with Part IV of this general permit.

"Site" means on the same or geographically contiguous property that may be divided by public or private right(s)-of-way.

"Stormwater" means waters consisting of precipitation runoff.

"Stormwater discharge associated with commercial activity" means the stormwater discharge from a point source, which discharge is directly related to the commercial activity, access thereto or parking therefor, including but not limited to stormwater discharged from: ground surfaces within or immediately adjacent to said activity and its access

and parking areas; material handling areas; refuse storage or disposal areas; areas used for the storage and maintenance of material handling equipment; shipping and receiving areas; manufacturing buildings; storage areas for raw materials, intermediate products and finished products; and areas where industrial or commercial activity has taken place in the past and where materials remain and are exposed to stormwater.

"Tidal wetland" means a wetland as that term is defined in section 22a-29 of the Connecticut General Statutes.

PART III. AUTHORIZATION UNDER THIS GENERAL PERMIT

- A. REQUIREMENTS FOR AUTHORIZATION.** This general permit authorizes only discharges comprised solely of stormwater associated with commercial activity, provided that the following conditions are met prior to coverage under this general permit.
1. The discharge is not covered by a permit issued under Section 22a-430 or 22a-430b of the Connecticut General Statutes;
 2. The stormwater is not discharged to a Publicly Owned Treatment Works (POTW) unless such discharge consists only of runoff from areas associated with gardening or nursery materials and such discharge has been approved by the POTW. Portions of the site associated with commercial activity discharging to surface waters or a municipal separate storm sewer are still covered by this general permit.
 3. The stormwater is not discharged to ground water. Portions of the site associated with commercial activity discharging to surface waters or a municipal separate storm sewer are still covered by this general permit.
- B. GEOGRAPHIC AREA.** This general permit covers all areas of the State of Connecticut.
- C. EFFECTIVE DATE AND EXPIRATION DATE.** This general permit is effective on August 1, 1995 and expires on August 1, 2000.
- D. EFFECTIVE DATE OF AUTHORIZATION.** The effective date of coverage under this general permit is the effective date of this general permit listed in Part III Paragraph C above, or the date the commercial activity is initiated, whichever is later.
- E. ISSUANCE OF AN INDIVIDUAL PERMIT.** Under Section 22a-430b of the General Statutes, when an individual permit is issued to a person or municipality for stormwater discharges at the site otherwise covered by this permit, the applicability of this general permit to the individual permittee is automatically terminated on the effective date of the individual permit.

PART IV. REGISTRATION REQUIREMENTS

- A. WHO MUST SUBMIT A REGISTRATION.** Any person who or municipality which initiates, creates, originates or maintains a discharge described in Part III Paragraph A of this general permit shall submit to the Commissioner a registration which satisfies the requirements of this part either (1) within 180 days after the date of issuance of this permit for any discharge initiated, created, originated or maintained on or before the date of issuance of this permit, or (2) for any other discharge, no later than the date the commercial activity is initiated. If an individual facility or activity for which a registration is submitted under this permit is owned by one person or municipality but is leased or, in some other way, the legal responsibility of another person or municipality (the operator), the operator is responsible for submitting the registration required by this general permit. If the facility or activity for which a registration is submitted under this permit is owned by one person or municipality but is leased or, in some other way, the legal responsibility of more than one other person or municipality, the owner is responsible for submitting the registration required by this general permit. The permittee is responsible for compliance with all conditions of this general permit.

B. SCOPE OF REGISTRATION. A registrant may only include on a registration those discharges that are operated by such registrant on one site. A registrant may not submit more than one registration per site under this permit.

C. CONTENTS OF REGISTRATION.

1. Fees

- a. A fee of \$250.00 for any facility shall be paid with the registration required by Part IV.A. of this general permit. On and after August 1, 1995, registration fees shall be paid in accordance with applicable regulations, including but not limited to Sections 22a-430-6 and 22a-430-7 of the Regulations of Connecticut State Agencies. A registration shall not be deemed complete and no activity shall be authorized by this general permit unless the registration fee has been paid in full.
- b. The registration fee shall be paid by check or money order payable to the Department of Environmental Protection.
- c. The registration fee is nonrefundable.

2. Registration Form: The registration shall be submitted on forms prescribed by the Commissioner and shall include but need not be limited to the following information:

a. Facility Information

- i. Name, address of owner and operator of the commercial facility;
- ii. Site address if different from i. above;
- iii. Site contact person and phone number at the site;
- iv. Primary activity; up to four four-digit Standard Industrial Classification (SIC) codes;
- v. A list of other permits issued by the DEP currently in force for the site, including discharges other than stormwater to the stormwater outlets;
- vi. An 8-1/2 x 11" copy of the applicable section of a United States Geological Survey Quadrangle Map or other location map showing the location of site boundaries, stormwater conveyances, outfalls or channelized flows and latitude and longitude, if known.

b. Stormwater Discharge Information

- i. Number, type (e.g. swale or pipe), material (e.g. concrete or metal pipe, grass swale) and size of conveyances, outfalls or channelized flows that conduct runoff from the site;
- ii. Location of the conveyances, outfalls, channelized stormwater flows discharging from the site shall be shown on the map required in paragraph C.2.a.vi. above;
- iii. If stormwater quality data associated with the site has been collected, a summary of such data;
- iv. The name of the immediate receiving water(s), or if the discharge is through a municipal separate storm sewer, the name of the operator of the storm sewer, and the ultimate receiving water(s);
- v. The name of the watershed in which the site is located or the nearest waterbody to which it discharges.

c. Signature Of Registrant. Any person who or municipality that submits a registration under this general permit shall sign the registration and shall make the following certification:

"I certify under penalty of law that I have read and understand all conditions of the General Permit for the Discharge of Stormwater Associated with Commercial Activity issued on August 1, 1995, and that all conditions for eligibility for authorization under this general permit are met. This document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that the information submitted has been properly gathered and evaluated. The Stormwater

Management Plan has been prepared and implemented in accordance with the requirements of this general permit. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information contained in this registration is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are penalties for submitting false information, including the possibility of fine and imprisonment for knowingly making false statements."

The registration shall be signed as follows: for a corporation, by a responsible corporate officer or a duly authorized representative thereof, as those terms are defined in RCSA 22a-430-3(b)(2); for a municipality, state, Federal, or other public agency, by either a principal executive officer or a ranking elected official, as those terms are defined in RCSA 22a-430-3(b)(2); for a partnership or a sole proprietorship, by a general partner or the proprietor, respectively.

d. Any additional information requested by the Commissioner

- D. WHERE TO SUBMIT A REGISTRATION.** Persons who or municipalities that submit a registration under this general permit shall submit such registration to the Department of Environmental Protection at the following address:

Central Permit Processing Unit
Department of Environmental Protection
79 Elm Street
Hartford, CT 06106-5127

- E. CORRECTION OF INACCURACIES.** Within fifteen days after the date the registrant or permittee becomes aware of a change in any information submitted to the Commissioner in a registration or pursuant to this general permit, or that any such information was inaccurate or misleading or that any relevant information was omitted, the registrant or permittee shall submit the correct or omitted information in writing to the Commissioner.
- F. FALSE STATEMENTS.** Any false statement in any information submitted pursuant to this general permit may be punishable as a criminal offense under Section 22a-438 of the General Statutes or, in accordance with Section 22a-6, under Section 53a-157 of the General Statutes.
- G. ADDITIONAL INFORMATION.** The Commissioner may require a registrant to submit additional information which the Commissioner deems necessary to evaluate the consistency of the commercial activity with the requirements for authorization under this general permit.
- H. DISAPPROVAL AND REJECTION OF A REGISTRATION.** The Commissioner may disapprove a registration (a) for the same reasons for which he may, under section 22a-430 of the General Statutes, require an individual permit, including without limitation, if he finds that the commercial activity is inconsistent with the requirements for authorization under this general permit, (b) if he finds that the commercial activity is inconsistent with any of the applicable standards and criteria of section 22a-430 of the General Statutes, or (c) for any other reason provided by law.
- I. TRANSFER OF AUTHORIZATION.** Authorization under this general permit shall be non-transferable. However, any person registering a discharge that has previously been registered under this permit may use as part of such registration any pertinent information including the Stormwater Management Plan prepared by the previous permittee. The new registrant shall amend the Plan as required by Part V. B. 3. prior to submitting a registration.

PART V. PERMIT CONDITIONS FOR STORMWATER ACTIVITIES ASSOCIATED WITH COMMERCIAL ACTIVITIES

A. CONDITIONS APPLICABLE TO CERTAIN DISCHARGES

1. Any person who or municipality which initiates, creates, or originates a discharge of stormwater associated with commercial activity after the date of issuance of this general permit, which discharge is located less than 100 feet from a tidal wetland which is not a fresh-tidal wetland, shall discharge such stormwater through a system designed to store the volume of stormwater runoff generated by 1 inch of rainfall on the site.
2. Any person who or municipality which discharges stormwater into coastal tidal waters for which a permit is required under either the Structures and Dredging Act in accordance with Section 22a-361 of the Connecticut General Statutes or the Tidal Wetlands Act in accordance with Section 22a-32 of the Connecticut General Statutes, shall obtain such permit(s) from the Commissioner.

B. STORMWATER MANAGEMENT PLAN. The permittee shall prepare, implement and maintain a Stormwater Management Plan (the "Plan") which shall consist of all records, schedules, narrative, instructions or other materials kept on file at the registrant's facility in accordance with the Stormwater Management Measures and other provisions of Part V of this general permit.

1. Deadlines for Plan Preparation and Implementation.

- a. For a stormwater discharge associated with commercial activity that is initiated, created, originated or maintained on or before the date of issuance of this general permit, the permittee shall prepare and implement the Stormwater Management Measures as defined below in Part V.B.2. on or before 180 days after the date of issuance of this general permit and shall maintain this Plan thereafter.
- b. For stormwater discharges associated with commercial activity which activity is initiated after the date of issuance of this general permit, the Stormwater Management Measures as defined below in Part V.B.2. shall be implemented on or before the date such activity is initiated and shall be maintained thereafter.

2. Stormwater Management Measures

The Stormwater Management Plan shall be maintained on a form prescribed and provided by the Commissioner and shall, at a minimum, contain the following:

a. Pollution Prevention Team

The permittee shall designate a pollution prevention team consisting of personnel, at least one of whom must be working at the site, to carry out the provisions of these Stormwater Management Measures.

b. Sweeping

All parking areas, sidewalks, driveways and other impervious surfaces (except roofs) shall be swept clean of sand, litter and any other possible pollutants at least twice a year, once between November 15 and December 15 (after leaf fall) and once during the month of April (after snow melt) and at other times as may be necessary.

c. Outside Storage

Any raw materials, intermediate products, by-products, final products, waste materials, accessories or equipment stored outside shall be covered or moved inside, if possible, or maintained in such as manner

as to avoid, if at all possible, the risk of any of these materials or their residue passing to a stormwater discharge.

d. Washing

No water resulting from washing of any raw materials, intermediate products, by-products, final products, waste materials, accessories, equipment, storage areas, outside sales/garden areas, loading docks, parking areas or vehicles shall be discharged to a stormwater collection system or waters of the state (including, but not limited to, surface waters or wetlands) except in accordance with a permit issued by the DEP pursuant to Section 22a-430 or 22a-430b of the Connecticut General Statutes.

e. Spill Control

The permittee shall prepare and implement a Spill Control and Response Plan ("Spill Plan") for any raw materials, intermediate products, by-products, final products, waste materials, accessories or equipment present at the facility which could possibly discharge to the stormwater collection system or waters of the state. The Spill Plan shall include measures to avoid spills in areas exposed to rainfall or from reaching areas exposed to rainfall. The Spill Plan shall also include response measures to best prevent a spill from being exposed to stormwater or entering a stormwater collection system or waters of the state once it has occurred.

The Spill Plan shall identify areas where potential spills can occur and the location of associated collection and discharge points. The Spill Plan shall include procedures for cleaning up spills including, without limitation, procedures for insuring that appropriate personnel are trained or otherwise notified of measures to take in the event of a spill. The necessary equipment to implement a cleanup shall be listed in the Spill Plan and locations designated such that this equipment shall be available to personnel in all areas where spills may occur.

The Spill Plan shall provide that all areas in which a spill could potentially discharge to stormwater and where liquid chemicals are stored are provided with impermeable containment which will hold at least the volume of the largest chemical container, or 10% of the total volume of all containers in the area, whichever is larger, without overflow from the containment area. For commercial activities initiated after the date of this general permit, the Spill Plan shall provide that all chemicals in containers of 100 gallons or less shall be stored under a roof that minimizes stormwater entry to the containment area.

The Spill Plan shall also provide that all dumpsters used to store waste or recyclable materials are supplied with attached covers and have drain-plugs intact, or are in roofed areas that will keep rain out of the dumpster and will not allow dumpster leakage to enter any stormwater drainage system.

f. Maintenance and Inspection

The permittee shall prepare and implement a facility maintenance plan. The facility maintenance plan shall include good housekeeping measures to ensure that all areas exposed to stormwater are kept in such a condition as to minimize the possibility of discharging pollutants into a stormwater collection system or waters of the state. The plan shall include provisions for a monthly inspection by a member of the Pollution Prevention Team of all areas covered by the plan, a weekly inspection of the site for surface debris and the monthly inspection of all stormwater structures and outfalls on the site for floating or surface debris and sediment. Structures and outfalls shall be cleaned of sediment and debris at least once a year during the month of April and at other times as necessary to prevent the discharge of pollutants from structures or outfalls.

g. Employee Training

The permittee shall ensure that all employees whose activities may affect stormwater quality receive training upon employment and at least once a year thereafter to make them familiar with these stormwater management measures. Training shall be conducted by a member of the Pollution Prevention Team.

h. Comprehensive Annual Stormwater Evaluation and Inspection

Once a year, a member of the Pollution Prevention Team shall conduct a Comprehensive Annual Stormwater Evaluation and Inspection. All aspects of the stormwater collection and/or treatment system shall be inspected for consistency with the Stormwater Management Plan. A report of the results of this inspection shall be prepared and a copy maintained on site. This report shall also be reviewed and signed by the permittee as specified in Part IV.C.2.c. above. Based on this report, the permittee shall revise the Plan as necessary to maintain consistency with this general permit.

i. Record Keeping

The permittee shall keep at the site a record of all weekly and monthly inspections, the facility spill control and response plan, sweeping schedule, stormwater structure cleaning schedule, employee training schedule, annual stormwater evaluation and inspection reports and a list of designated Pollution Prevention Team members. This record shall be made available to the Commissioner for inspection immediately upon request.

j. Future Construction

The permittee shall ensure that oil and sediment control structures or devices are used within the drainage system for all construction which i) may impact the drainage system and ii) occurs on site on or after the effective date of this general permit. Note that any construction activity that disturbs greater than 5 acres must be registered and conducted in accordance with the General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities. In addition, the permittee shall avoid, wherever possible, the use of copper or galvanized roofing or building materials for any new construction where these materials will be exposed to stormwater.

3. Keeping Plan Current

The permittee shall update the Plan annually and shall amend the Plan whenever; (1) there is a change at the site which may affect the potential of stormwater discharges from the site to cause pollution of the waters of the state; (2) there is a change in the Pollution Prevention Team; (3) the actions required by the Stormwater Management Measures fail to ensure or adequately protect against pollution of the waters of the state; or (4) the Commissioner requests modification of the Plan. The permittee shall amend the Plan as necessary to address any sources or potential sources of pollution identified as a result of a Comprehensive Annual Stormwater Evaluation and Inspection conducted pursuant to Part V.B.2.h. of this general permit. The amended Plan and all actions required by the Plan shall be completed within 60 days of the date the permittee becomes aware or should have become aware that any condition identified in this paragraph has occurred.

C. REPORTING REQUIREMENTS

1. The permittee shall keep a copy of the Stormwater Management Plan onsite at all times. The permittee shall make a copy of the Plan available to the Commissioner immediately upon request, and, in the case of a stormwater discharge associated with commercial activity that discharges through a municipal separate storm sewer system, to the operator of the municipal system upon request. In the case of a stormwater

discharge associated with commercial activity that discharges to a water supply watershed, copies of the Plan shall be made available upon request to the public water supply company.

2. The Commissioner may notify the permittee at any time that the Plan does not meet one or more of the requirements of this Part. Unless otherwise notified by the Commissioner in writing, within 30 days of the date of such notification from the Commissioner, the permittee shall revise the Plan, perform all actions required by the revised Plan, and shall submit to the Commissioner, in writing, certification that the requested changes have been made and implemented and such other information as the Commissioner may require.

D. OTHER REQUIREMENTS

1. The stormwater discharge shall contain no distinctly visible floating scum, oil or other matter except naturally occurring substances such as leaves and twigs provided no person has placed such substances in or near the discharge.
2. The stormwater discharge shall not impair the biological integrity of aquatic or marine ecosystems or result in an unacceptable risk to human health.

PART VI. GENERAL CONDITIONS

- A. The permittee shall comply with the following Regulations of Connecticut State Agencies which are hereby incorporated into this general permit, as if fully set forth herein:

1. Section 22a-430-3:

Subsection (b) General - subparagraph (1)(D) and subdivision (2), (3), (4) and (5)

Subsection (c) Inspection and Entry

Subsection (d) Effect of a Permit - subdivisions (1) and (4)

Subsection (e) Duty to Comply

Subsection (f) Proper Operation and Maintenance

Subsection (g) Sludge Disposal

Subsection (h) Duty to Mitigate

Subsection (i) Facility Modifications, Notification - subdivisions (1) and (4)

Subsection (k) Bypass

Subsection (n) Enforcement

Subsection (p) Spill Prevention and Control

Subsection (q) Instrumentation, Alarms, Flow Recorders

Subsection (r) Equalization

2. Section 22a-430-4

Subsection (t) Prohibitions

Subsection (p) Revocation, Denial, Modification

Appendices

- B. The permittee shall comply with the following additional terms and conditions:

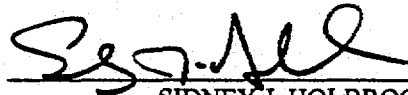
Discharge of any substance that is not from the activities described in this general permit shall be considered a violation of this general permit unless it is authorized by an individual permit issued under Section 22a-430 of the General Statutes.

- C. The permittee shall at all times continue to meet the conditions for eligibility set forth in Part III of this general permit.

- D. Nothing in this general permit shall relieve the registrant or permittee of other obligations under applicable federal, state and local law.
- E. Any document, including but not limited to any notice, which is required to be submitted to the Commissioner under this general permit by the permittee shall be signed by the permittee and by the individual or individuals responsible for actually preparing such document, each of who shall certify in writing as follows: "I have personally examined and am familiar with the information submitted in this document and all attachments and certify that based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information, the submitted information is true, accurate and complete to the best of my knowledge and belief, and I understand that any false statement made in this document or its attachments may be punishable as a criminal offense."

PART VII. UNAUTHORIZED ACTIVITIES

Any person or municipality who fails to submit a registration, and who initiates, creates, originates or maintains a discharge to the waters of the State without coverage under a general permit issued under Section 22a-430b of the Connecticut General Statutes or an individual permit issued under Section 22a-430 of the Connecticut General Statutes, is in violation of the Connecticut General Statutes, and is subject to injunction and penalties of up to \$25,000 per day per violation under Chapter 446k of the Connecticut General Statutes.



SIDNEY J. HOLBROOK
COMMISSIONER
2 Aug 95
Date

APPENDIX A

LIST OF STANDARD INDUSTRIAL CLASSIFICATION (SIC) CODE GROUPS COVERED BY THE GENERAL PERMIT FOR THE DISCHARGE OF STORMWATER ASSOCIATED WITH COMMERCIAL ACTIVITY

If you are unsure of which SIC group you may fall under or require a more detailed description of specific SIC codes within these groups, please contact the Stormwater Permit Coordinator for the DEP at 424-3018. Descriptions are as indicated in the Standard Industrial Classification Manual, 1987, Executive Office of the President, Office of Management and Budget.

- Group 50: Wholesale Trade - Durable Goods
- Group 51: Wholesale Trade - Nondurable Goods
- Group 52: Building Materials, Hardware, Garden Supply, and Mobile Home Dealers
- Group 53: General Merchandise Stores
- Group 54: Food Stores
- Group 55: Automotive Dealers and Gasoline Service Stations
- Group 56: Apparel and Accessory Stores
- Group 57: Home Furniture, Furnishings, and Equipment Stores
- Group 58: Eating and Drinking Establishments
- Group 59: Miscellaneous Retail

- Group 70: Hotels, Rooming Houses, Camps, and Other Lodging Places
- Group 71: *Not assigned*
- Group 72: Personal Services
- Group 73: Business Services
- Group 74: *Not assigned*
- Group 75: Automotive Repair, Services, and Parking
- Group 76: Miscellaneous Repair Services
- Group 77: *Not assigned*
- Group 78: Motion Pictures
- Group 79: Amusement and Recreation Services

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER MANAGEMENT

REGISTRATION UNDER A GENERAL PERMIT
CGS SECTION 22a-430b

for

STORMWATER DISCHARGE ASSOCIATED WITH
COMMERCIAL ACTIVITY

DEP USE ONLY

REG.#

PERMIT #

FAC. ID.

type or print neatly

I. Facility Information

A. Name and address of owner

B. Name and address of operator

C. Site address

D. Site contact person _____ Phone: () _____

E. Standard Industrial Classification (SIC) Code for commercial activities, up to four four-digit numbers (primary # first): _____ (secondary #s if applicable) ____/____/____ and primary SIC description _____

F. Other DEP Permits currently in force for the site: NPDES # _____, Air Yes: ____ No: _____, RCRA # _____, Number and type of other general permit discharges to stormwater system _____

G. Attach 8 1/2" x 11" copy of the applicable section of a USGS quadrangle map or other location map showing site boundaries and location of all conveyances, outfalls, or channelized flows on the site.

II. Stormwater discharge information

A. Number, type (e.g. swale or pipe) and size of conveyances, outfalls, or channelized flows that run off the site: _____

B. Material of construction, if applicable, of the conveyances, outfalls, or channelized flows: _____

(over)

C. Where does stormwater discharge to?

- Municipal Separate Storm Sewer System? No:____ Yes:____ (Name):_____
- Surface water body or wetlands? No:____ Yes:____ (Name):_____
- Is discharge located less than 100 feet from a tidal wetland which is not a fresh-tidal wetland?
No _____ Yes _____ (Only for discharges initiated after August 1, 1995.)
- Seeps into ground? No:____ Yes:____ (If yes, Well:____ Seepage Pit:____ Detention Pond:____
Other:_____

D. Name of the watershed where the site is located or nearest waterbody to which it discharges:

E. Have any stormwater quality analytical data been previously collected? No:____ Yes:____ (If yes, maintain data from past three (3) years on site.)

F. Has this site been previously registered by a different permittee? No:____ Yes:____ If yes, name of previous permittee:_____

III. Certification

I certify under penalty of law that I have read and understand all conditions of the general permit for the discharge of stormwater associated with commercial activity issued on August 1, 1995, and that all conditions for eligibility for coverage under this general permit are met. This document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate 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 contained in this registration is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are penalties for submitting false information, including the possibility of fine and imprisonment for knowingly making false statements.

Name of Registrant (please print)

Title

Signature

Date

Fee attached \$_____. A fee of \$250.00 for any facility shall be paid with the registration. (Make your check payable to the Department of Environmental Protection and annotate check: Water Management Permit fee.) State and Town owned facilities are not required to pay a registration fee.

Mail registration, location map, and fee to:

Central Permit Processing Unit
Department of Environmental Protection
79 Elm Street
Hartford, CT 06106-5127

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U. S. DEPARTMENT OF COMMERCE NOAA
COASTAL SERVICES CENTER
2234 SOUTH HOBSON AVENUE
CHARLESTON, SC 29405-2413
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Glossary

INTRODUCTION

Nationwide, great strides have been made in controlling point sources of water pollution, being pollution emanating from discreet points such as discharge pipes. As a result, federal attention has turned to the problem of nonpoint source (NPS) pollution which results from more diffuse sources such as stormwater runoff. As part of federal efforts to address this water quality issue, the federal Environmental Protection Agency (EPA) was given the role of establishing a national NPS program in 1987 through Section 319 of the Clean Water Act. Further, during reauthorization of the Coastal Zone Management Act in 1990, Congress added Section 6217 which requires states with federally approved coastal management programs to develop Coastal Nonpoint Pollution Control Programs (CNPCP) or permanently lose Coastal Zone Management and Clean Water Act funding.

Development of a CNPCP in Connecticut has been a joint effort by the DEP's Office of Long Island Sound Programs, which administers the state's coastal management program, and Water Management Bureau which is the state's water quality agency and administers the Section 319 NPS program. The state's CNPCP must comply with specific management measures to address significant sources of coastal nonpoint pollution or identify alternative measures to ensure comparable pollution control. Program requirements were jointly developed by the National Oceanic and Atmospheric Administration and the U.S. EPA, and specific guidance in developing state programs and management measures were published in January 1993.

One of Connecticut's major efforts in the area of water quality protection has been the Long Island Sound Study which was sponsored in part by the EPA. Connecticut, New York and the EPA established a Management Conference involving federal, state, interstate and local agencies, universities, environmental groups, industry and the public which developed a Comprehensive Conservation and Management Plan (CCMP) for protecting and improving the health of Long Island Sound. In response to some of the interim findings of the CCMP, the Connecticut General Assembly passed Public Acts 91-170 and 91-389 (codified in Connecticut General Statutes Sections 8-2, 8-3b, 8-23 and 8-35a) which require reasonable consideration for the restoration and protection of Long Island Sound. While this legislation specifically identified the reduction of hypoxia, pathogens, toxic contaminants and floatable debris, it also highlighted the need to provide municipalities with assistance regarding not only these Acts (in particular, what they mean and how to comply with them) but also water quality protection in general.

In response to all these initiatives, the Office of Long Island Sound Programs developed this manual to provide municipal land use officials with some basic approaches to coastal water quality protection. It consists of four chapters which address stormwater, soil erosion and sedimentation control, on-site disposal systems, and marina development and operation. It also includes listings of best management practices (BMPs), their applications, and a glossary of terms.

These four chapters and their accompanying BMP listings are not meant to comprehensively cover the subject of nonpoint source pollution. Rather, they are intended to provide the basics for nonpoint source pollution control in those areas where land use officials can make a difference. The manual was developed in loose-leaf form to allow for the inclusion of additional and/or updated chapters and other relevant information. It is our hope that readers will find this manual informative, easy to use, and applicable to their day-to-day tasks and decisions.

ACKNOWLEDGEMENTS

This document *Coastal Water Quality Protection: A Guide for Local Officials* was prepared by the Connecticut Department of Environmental Protection's Office of Long Island Sound Programs. The office appreciates the contributions of staff within the Department's Bureau of Water Management as well as staff from the Connecticut River Estuary Regional Planning Agency, the University of Connecticut's Cooperative Extension Service, Middlesex County Soil and Water Conservation District, and the towns of Groton and Waterford.



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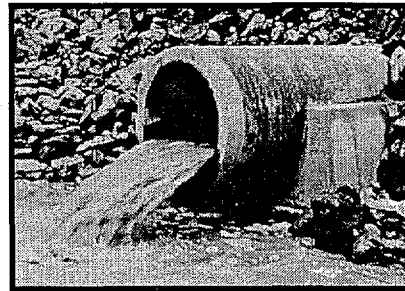
CHAPTER 1 - STORMWATER

STORMWATER AS A NONPOINT SOURCE OF POLLUTION

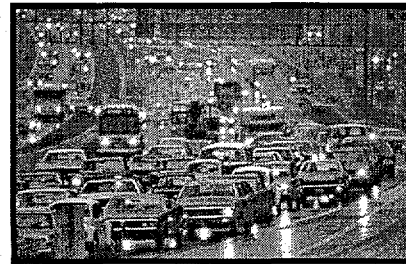
HOW IS STORMWATER NONPOINT SOURCE POLLUTION?

Pollution can originate in one of two ways:

“point” sources of pollution - pollution which originates from well-defined, usually manufactured “points” or locations such as municipal and industrial sewage treatment plants, combined sewer overflows and other wastewater discharge pipes; and



“nonpoint” sources of pollution - pollution originating from land use and man’s activities, having no well-defined point of entry, such as urban stormwater runoff including street and parking runoff, agricultural and lawn runoff, soil erosion and leachate from landfills and failing septic systems.



Stormwater runoff is the major contributor of nonpoint source pollution. As stormwater runs over and off of land and manmade structures, working its way into the ground and brooks, streams, and coastal waters, it picks up a wide variety of substances, many which serve to pollute surface and ground waters. These pollutants include oil, grease, gasoline and sand from roadways, litter, decaying vegetation and fertilizer, herbicides and pesticides from lawns and agricultural areas.

WHY IS IT IMPORTANT?

Pollution of our surface and ground waters has been a recognized problem for many years. While great strides have been made in controlling point sources of pollution primarily through the National Pollution Discharge Elimination System (NPDES) permitting program and corresponding state regulatory programs, there is a new awareness of the importance of controlling nonpoint sources of pollution. Since water quality is strongly linked to land use, local planners and decision makers play a vital role in controlling this source of pollution and in

restoring and protecting our coastal and inland ground and surface waters. The manner in which land is developed and used is a major determinant as to whether stormwater adversely impacts the quality of these water bodies. Therefore, it is essential that individuals working in all different aspects of municipal land use understand this source of pollution and how to control it.

WHAT HARM DOES IT POSE?

Nonpoint source pollution results from clean runoff becoming polluted and transporting various contaminants to ground and surface waters.

Runoff is the portion of precipitation, snow melt or irrigation that flows over the ground (instead of being absorbed into the ground or retained on the surface) which eventually makes its way to surface waters.

Polluted runoff is rainwater and snowmelt which has become contaminated after picking up pollutants and sediment as it runs off streets, lawns, parking lots, agricultural lands, marinas, landfills and any other sites being used for activities which can generate pollutants.

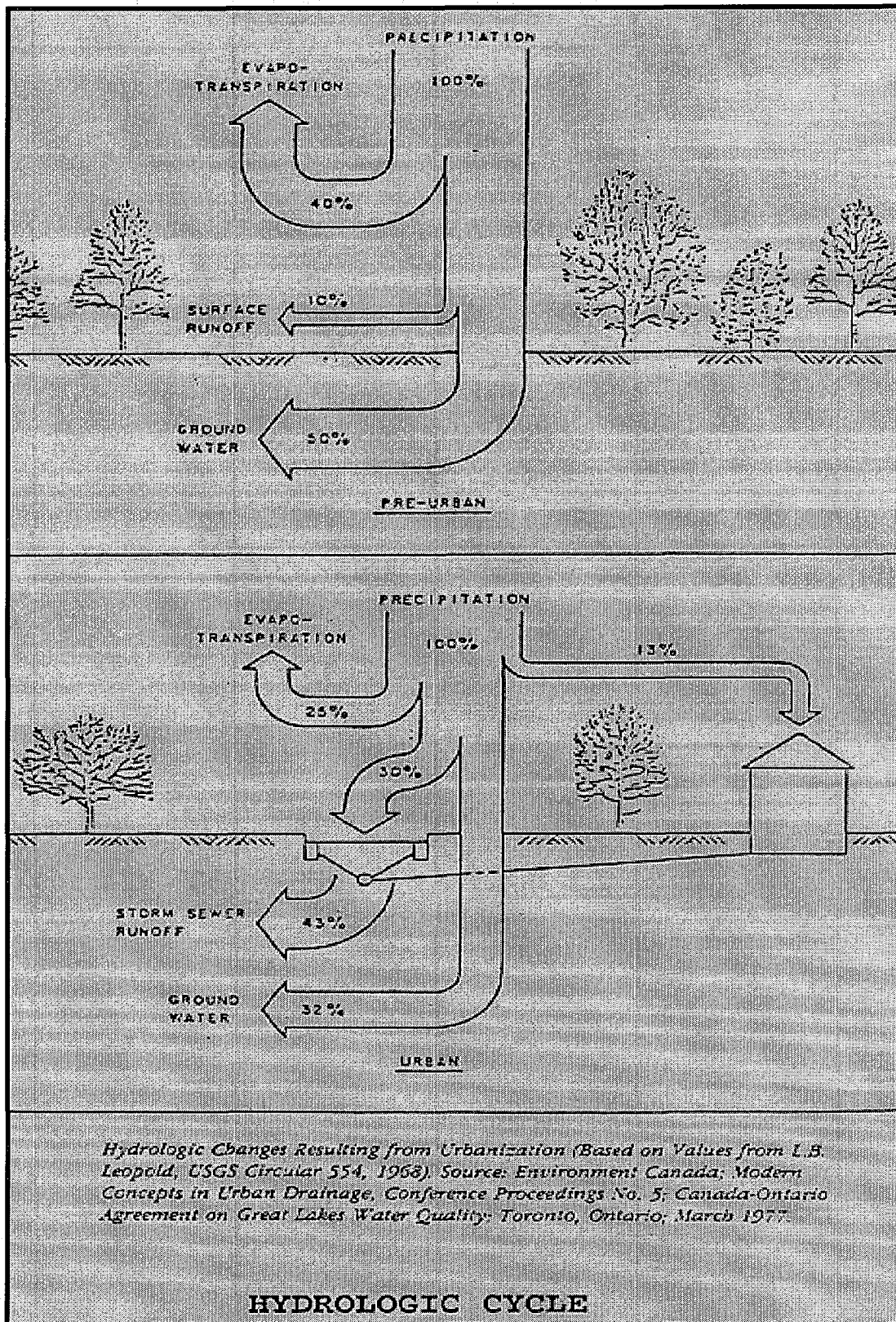
Land development or urbanization has an effect on both the **quantity** and **quality** of stormwater runoff. In terms of **quantity**, the placement of buildings and associated structures results in:

- decreased vegetation
- increased impervious land cover
- decreased infiltration into the soil
- reduction in wetland and depression storage
- engineered conveyance systems designed to move water quickly to receiving waters

In turn, these changes in the land result in:

- increased volume of runoff
- higher runoff flow velocities
- higher peak flow rates
- increased channel erosion
- increases in flood hazards and resultant damage
- water quality degradation

The impact of development on stormwater flows is best understood in the context of the hydrologic cycle:



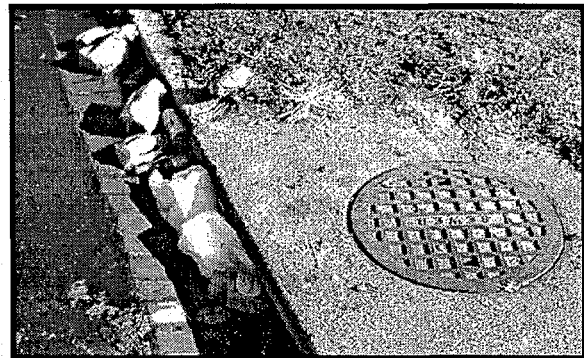
In addition to increased volume and velocity of runoff, water quality is also affected by a variety of pollutants associated with the urban environment, such as oil-based contaminants, heavy metals (copper, lead, zinc), nutrients and bacteria, which are carried in runoff in increasing amounts.

Pollutants picked up in stormwater include:

- road sand
- road salt
- petroleum products from vehicles (oil, gas, grease)
- fertilizer-based nitrogen and phosphorus
- pesticides, domestic and agricultural
- herbicides, domestic and agricultural
- heavy metals (lead, cadmium, copper)
- eroded soil and sediment
- leachate from sanitary landfills
- bacteria
- viruses
- rubber
- litter (paper, plastic, foam products, cans, bottles)
- asbestos
- road pavement
- decaying vegetation (leaves, grass clippings)
- accidentally spilled products
- manure and pet waste
- decaying animal carcasses
- atmospheric deposition
- chemicals from agricultural use

In terms of land use, these pollutants can be grouped as follows:

Urban stormwater pollutants - consist largely of materials which accumulate on paved surfaces such as automobile products (fuel, exhaust byproducts, rubber, brake linings, oil lubricants), deicing and traction control materials, asphalt products, airborne materials, animal wastes, spilled materials and litter



Litter collecting at catch basin

Residential pollutants - pollutants from lawns, gardens, improper disposal of waste, pet wastes, impervious surfaces; lawns and gardens contribute fertilizers, herbicides, insecticides and leaf decay

Rural pollutants - natural pollutants from soil and vegetation (eroded sediment, nitrogen, and phosphorus from vegetative decay) and animal wastes

Agricultural pollutants - runoff which includes fertilizers, herbicides, insecticides, manure, eroded sediment, bacteria and viruses

Transport of Pollutants

Understanding the transport of pollutants is important in controlling them:

Dissolved pollutants are soluble and mixed in with stormwater. As a result, they are difficult to remove. Dissolved pollutants include salts, phosphorus, and nitrogen.

Suspended pollutants are particulate materials that float on the water surface or are held within the water by flow. Suspended pollutants are usually removed through the use of sedimentation basins and vegetated buffer zone filters. Suspended pollutants include lighter soil particles and vegetative debris.

Bedload sediments are particulate materials that are pushed, rolled, dragged, or bounced along the stream or pipe by the flowing water. These sediments are usually heavier soil particles such as sand and gravel.

Therefore, the choice of a method to trap these pollutants and prevent them from reaching ground and surface waters depends upon the type of pollutants present and how they are transported.

Treating Pollutants

In terms of treating pollutants in stormwater, one of the key factors is the collection and treatment of the first half inch to inch of rainfall, also known as the first flush, which has been shown to have the highest concentration of pollutants.

First flush - feature where the initial stormwater runoff has higher pollutant concentrations than subsequent runoff. Rain rapidly "washes" dry weather deposits off of paved surfaces with a high initial concentration level and a subsequently declining concentration later in the storm. This effect is more pronounced when precipitation begins with intense rainfall.

Therefore, land use officials should ensure that at least the first half inch of runoff is properly treated.

In sum, the replacement of undeveloped vegetated areas with impervious surfaces in the form of buildings, driveways, roads, sidewalks, and parking lots causes changes in runoff quantity, quality and rate. This results in decreased infiltration (and subsequent decreases in the filtering of pollutants) and an increase in the volume and rate of water running off a site into adjacent water bodies and ultimately to Long Island Sound. Therefore, land use commissions must be aware that these changes in land cover are a source of pollution and must act to minimize and mitigate them as much as possible.

ARE MUNICIPALITIES REQUIRED TO ADDRESS NONPOINT SOURCES OF POLLUTION?

Yes. The Connecticut legislature recognized the impact of nonpoint sources of pollution to Long Island Sound when it passed Public Act (P.A.) 91-170 and P.A. 91-398 (codified in Connecticut General Statutes (C.G.S.) Sections 8-2, 8-3b, 8-23 and 8-35a) which require reasonable consideration for the restoration and protection of Long Island Sound in zoning regulations, plans of conservation and development, and regional plans. While this legislation is directed toward coastal municipalities, *all* towns should be working to better control nonpoint sources of pollution in order to restore, protect and enhance their own ground and surface water resources. Ultimately, many of these resources connect to Long Island Sound or downstream neighbors who will share the benefit of your local improvements. C.G.S. Section 8-2(b) which is a subsection of the state's planning and zoning statutes dealing with municipal zoning regulations specifically requires the following:

In any municipality that is contiguous to Long Island Sound the regulations adopted under this section shall be made with reasonable consideration for restoration and protection of the ecosystem and habitat of Long Island Sound and shall be designed to reduce hypoxia, pathogens, toxic contaminants and floatable debris in Long Island Sound. Such regulations shall provide that the commission consider the environmental impact on Long Island Sound of any proposal for development.

What are hypoxia, pathogens, toxic contaminants and floatable debris?

Hypoxia is the condition of low dissolved oxygen that negatively affects fish and other aquatic life. It is caused by excess nutrients, in particular, nitrogen in coastal waters. Nutrients in large concentrations act like aquatic fertilizers and result in excess growth of algae which, upon decay, use up life-sustaining dissolved oxygen, thereby endangering oxygen-dependent aquatic life. Sources include sewage treatment plants, on-site septic systems, and runoff containing fertilizers.

Pathogens are disease-causing microorganisms such as bacteria and viruses which come from the fecal wastes of humans and animals. These microorganisms can result in illnesses such as cholera, hepatitis, gastroenteritis and typhoid. Sources include faulty sewage treatment plants, improperly functioning septic systems, and runoff containing animal wastes.

Toxic contaminants are substances that can harm the health of aquatic life and/or human beings. They include heavy metals (e.g. copper, zinc, lead), pesticides and organic compounds like PCBs. Sources include oil, grease and gasoline spilled or leaked on roadways and driveways, improper disposal practices, atmospheric fallout and chemicals used in the home, garden and on farm crops.

Floatable Debris is waste material which, upon entering surface and coastal waters, causes aesthetic problems and can pose a threat to aquatic organisms through ingestion or entanglement. Debris often takes the form of street litter which is carried in runoff to waterways but also originates from shore areas and boats.

As an additional consideration, basic water quality parameters are important to all water courses and can be disturbed by changes in runoff volume or quality or poor land practices. Such disturbance is yet another form of pollution. These parameters are:

dissolved oxygen - The measure of the water's oxygen content which is important for supporting aquatic life. Excessive levels of oxygen consumption by decaying organic material and algae can deplete oxygen levels leading to fish kills, habitat loss and odor.

temperature - Fish and other aquatic species have distinct temperature range preferences, generally preferring cooler water which holds more oxygen. Removal of trees and buffer zones will raise water temperature by exposing water bodies to prolonged sunlight and cause fish to relocate or to die.

algal blooms - Excess levels of nutrients lead to nuisance algae blooms, reduced clarity, odor and low oxygen levels.

turbidity - A way of defining the clarity of surface waters, specifically the ability of light to penetrate through the water. High turbidity deters recreational use, is less attractive and inhibits aquatic life. Turbidity levels are easily affected by soil erosion and urban runoff when fine sediments remain suspended in the water column rather than settling to the bottom or through algal blooms.

Therefore, in light of this new legislation and its purpose, not only should all municipal officials be working to protect their water resources by controlling nonpoint sources of pollution, but officials in municipalities contiguous to Long Island Sound are required to consider water quality in their land use regulations and plans of conservation and development.

WHAT IS THE GOAL IN MANAGING STORMWATER?

When controlling any type of pollution, the general objectives are:

- First:** Prevent pollution at its **source**, primarily through preconstruction planning.
Second: Control unavoidable pollution as close to the source as possible through best management practice (BMP) selection and associated maintenance plans.
Third: Mitigate for existing sources of pollution, often through retrofitting in already developed areas.

Steps to Better Stormwater Management

- Provide reasonable drainage facilities for local upland areas: protect streets and property from overland flooding, direct runoff away from buildings, prevent nuisance problems at neighborhood level.
- Minimize adverse changes (increased flooding) in downstream runoff due to upstream development.
- Minimize adverse environmental impact on water bodies.

Urban Runoff Quality Control Concepts

1. Control pollutants at their source
2. Design for frequent runoff events
3. Minimize impervious cover
4. Maintain/reduce runoff rates and volumes where appropriate
5. Use multiple best management practices
6. Emphasize total suspended solids removal
7. Trap floating materials, oil and litter
8. Encourage infiltration into suitable soils where water supplies are not at risk
9. Use long duration detention
10. Wet detention basins are preferred over dry basins
11. Use grass and vegetative filter zones

Typical Stormwater Management Guidelines

Preconstruction Planning

- **Limit disturbance of natural drainage features and vegetation**

- ▶ **Limit land disturbance activities such as clearing and grading**

- ▶ **Minimize the amount of paved or impervious surfaces on the site to the maximum extent practicable**

Cluster development helps reduce the amount of pavement and provides large open space and retention areas. On a larger scale, municipalities should review regulations and ordinances regarding requirements for road width, curbing, paving and walks.

- ▶ **Coordinate erosion control measures with longer-term stormwater management measures**

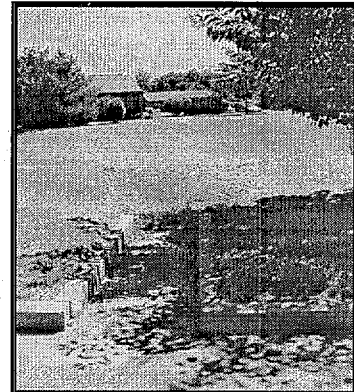
For example, a sediment basin may sometimes be converted to a detention or retention basin for use after the completion of construction.

- ▶ **Identify and assess stormwater runoff flows from drainage areas above the site, including the potential runoff effects downstream**

A general assessment can be made during initial development plan reviews and detailed engineering calculations and considerations can be made at a later stage in the approval process.

- ▶ **Coordinate stormwater management plans with open space plans for the site, encouraging the multiple use of drainage courses and stormwater management areas whenever possible**

**Leakoff into a spreader mechanism with ultimate discharge to a large open space recreation/detention area
Groton, CT**



- ▶ **Delineate stormwater easements on development plans which will be used for maintenance purposes**

The relationship of stormwater easements to utility easements should be shown on the development plan.

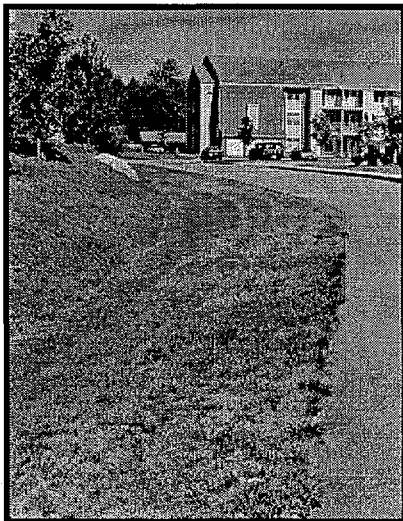
Volume and Quantity Control

► **Consider water quality as well as the quantity of water**

Consideration of quantity is particularly important in coastal areas. Discharges into tidal wetlands should generally be prohibited due to the resultant dilution of the high marsh salinity and encouragement of the invasion of brackish or upland species, specifically Phragmites. Stormwater drainage systems should distribute the runoff over a broad area and avoid point discharges.

► **Encourage infiltration of stormwater: Use depressions, swales, and other natural drainage areas to hold stormwater and provide for a slow release to groundwaters, where soils permit**

The use of natural drainage concepts can save storm drain construction costs while adding recreational and open space amenities. However, special care must be taken in areas of sensitive groundwater resources such as public water supply areas, individual well areas and sources of public water in order to prevent their contamination.



Use of stormwater infiltration systems is generally appropriate in coastal areas where suitable pervious soils exist. Such systems help to renovate water quality, recharge groundwater and reduces peak discharges. However, infiltration systems should not be used in areas with on-site sewage disposal problems.

**Vegetated swale adjacent to curbless road
Groton, CT**

► **Encourage groundwater recharge of clean runoff, where soil conditions permit and aquifers are not at risk**

For example, roof runoff can be separated from other types of runoff and directed into the ground where soils allow for infiltration.

- ▶ **Retain on-site the first 0.5 to 1.0 inches of rainfall, with 1.0 inch retained adjacent to tidal salt marshes and estuarine waters**

While urban flood control systems are planned and designed for large, infrequent rainfall events, urban runoff quality control measures are proportioned for the smaller and more frequent runoff events. This is because most urban runoff pollutants are generated on a continuous basis and are conveyed into water bodies by smaller routine rain events. Stormwater drainage systems should include pretreatment for sediment, toxic contaminants, floatables and pathogens, distribute the runoff over a broad area and avoid point discharges.

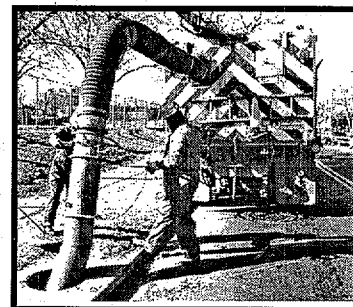
*Discharges into tidal saltwater wetlands should **not** be allowed due to the resultant dilution of the high marsh salinity and encouragement of the invasion of brackish or upland species, specifically Phragmites.*

- ▶ **Manage stormwater so that both the volume and rate of the outflow from the site after development does not exceed the outflow from the site prior to the development**
- ▶ **Strive to remove 80% of annual total suspended solids (TSS) loadings or reduce post-development loadings of TSS so that average annual loadings are no greater than pre-development levels**
- ▶ **Coordinate the timing of detention basin outflows to avoid the peak runoff periods of other watercourses**
- ▶ **Identify stormwater routing and storage for the 2 and 10 year storm events, as well as the 100 year storm event**

Long-term Maintenance

- ▶ **Assign and require clear responsibilities for long-term maintenance of catch basins, sediment traps and retention and detention basins including periodic cleaning of filters, removal of debris and sediment, and weed cutting**

Pumping of catch basin to remove accumulated sediments



Consider the use of a performance bond if facility maintenance is assigned to a homeowners' association. Restrictive deed covenants should be used to assure that maintenance responsibilities are legally binding.

- ▶ **Institute pollution prevention measures such as providing trash cans and requiring sweeping of parking lots and roads**

WHAT IS THE IMPLEMENTATION MECHANISM?

Best Management Practices (BMPs) - practices that reduce or prevent the discharge of pollutants to ground and surface waters and have been determined to be acceptable based upon technology and economic and institutional feasibility.

Selection of Best Management Practices

Proper selection of BMPs depends upon the anticipated pollutants, site conditions and characteristics of the receiving water body. This is particularly true for stormwater management BMPs. Ground and surface water classifications should be identified along with specific factors which may include identification of existing problems in receiving waters such as flow rates, sedimentation, erosion, eutrophication, bacterial or contaminant-related problems of receiving surface waters and bacterial, contaminant, or water table level related problems of groundwaters. Also, all uses involving or affecting the water resources of the area should be investigated. Once these data are assembled, BMP selection can begin.

Special Note on the Selection of Stormwater Runoff Collection BMPs

Stormwater BMPs which direct runoff into the soil and/or vegetative areas should be utilized. In contrast, low maintenance artificial drainage systems which provide little opportunity for settlement or infiltration of pollutants have become increasingly popular. Unfortunately, these systems are designed to collect and convey surface runoff from developed areas to discharge points as quickly as possible and to be self-cleaning. The result has been that these systems collect and concentrate pollutants in runoff, augmenting their transport to watercourses. Therefore, to allow for maximum treatment of pollutants, BMPs which allow for infiltration should be selected while BMPs which convey runoff quickly with little opportunity for pollutant removal should be avoided.

Priorities of Pollution Control:

- First:** Prevent pollution at its source, primarily through preconstruction planning
- Second:** Control unavoidable pollution as close to the source as possible through BMP selection and associated maintenance plans
- Third:** Mitigate for existing sources of pollution, often through retrofitting in already developed areas

These priorities should be applied to each site, undeveloped or developed, through application of the following principles:

1. Design the development of a site for minimum disturbance. This can be done for undeveloped or developed sites.
2. Install state-of-the-art BMPs to address unavoidable disturbances and potential pollution sources. These BMPs should deal with both the quantity and quality of stormwater runoff.
3. Once BMPs are selected, maintenance schedules should be developed and instituted, and compliance and adherence with maintenance schedules should be assured. These BMPs should include housekeeping-type pollution prevention practices such as street sweeping, collection of pet wastes and fertilizer and pesticide application plans.
4. For existing sources of pollution, retrofit facilities where possible to minimize or eliminate these sources.

First: Pollution Prevention at the Source through Primary and Secondary Stormwater Runoff Control

Stormwater runoff quality control measures are designed to prevent or mitigate nonpoint source pollution on a per site basis. Primary and secondary runoff quality control measures begin with proper site design within the bounds of topography, surficial geology and infrastructure and extends to the use of Best Management Practices.

Intent:

Primary measures - to keep pollutants from entering stormwater conveyance systems comprised of pipes and channels; applicable to virtually all sites.

Secondary measures - to provide conventional low maintenance treatment for stormwater at local and regional scales.

Primary measures

- ▶ minimal site disturbance
- ▶ pervious surfaces
- ▶ hooded outlets
- ▶ grass swales
- ▶ no curbs
- ▶ sheet flow
- ▶ vegetative filters

Parking area with individual curb stops to encourage runoff. Vegetative filter strip and natural vegetation allows for maximum infiltration of stormwater.

Groton, CT



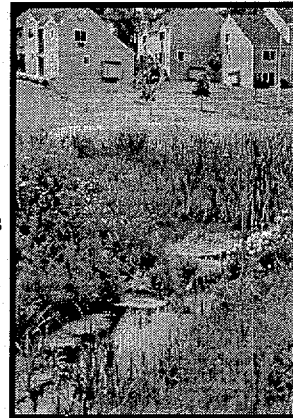
Secondary measures

- ▶ sediment chambers
- ▶ infiltration systems
- ▶ sediment basins
- ▶ detention basins
- ▶ vegetative filters
- ▶ extended duration ponds

Wet basin with wetland habitat; provides habitat value, landscape amenity and high removal of sediment, metals and nutrients

Stoneheights, Waterford, CT

Photo courtesy of Pat Snarski

Second: Control of Unavoidable Pollutants through Source Control Measures

These measures or BMPs are intended to limit the concentration of unavoidable urban pollutants and minimize their entry into urban drainage systems. The control of urban runoff pollutants at their source is also effective in reducing the accumulation of erosion-borne material.

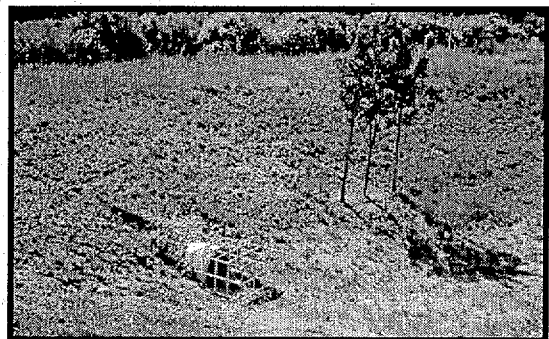
Intent:

To minimize pollutant generation and to keep potential pollutants at their source.

Typical Source Control Best Management Practices

These measures are fairly self-explanatory:

- ▶ street and parking lot sweeping
- ▶ collection of waste oils and other hazardous wastes
- ▶ reduction of lawn fertilization
- ▶ leaf collection
- ▶ recycling of cans, bottles, tires, plastics
- ▶ erosion control
- ▶ trash racks on catch basins, pipe outlets
- ▶ elimination of combined sewer overflows
- ▶ prevention of illegal dumping
- ▶ proper automobile maintenance
- ▶ accident and spillage clean ups
- ▶ limited usage of deicing chemicals
- ▶ oil traps
- ▶ public education



Trash rack cover for outlet pipe into basin

Waterford Landing, Waterford, CT

Photo courtesy of Pat Snarski

Third: Mitigate for Existing Sources of Pollution, Often through Retrofitting

These measures are used to capture existing nonpoint sources of pollution in areas which have already been developed without such pollution controls. These measures are often implemented during redevelopment or expansion or where serious problems exist that require more immediate attention.

Intent:

To treat existing sources of pollution in developed areas where pollution control is lacking.

Typical Measures

- ▶ retrofit catch basins with sumps and hooded outlets
- ▶ install gross particle/floatables removal chambers in existing systems

Retrofitting of existing stormwater system through the installation of a swirl-type gross particle separator/sediment chamber

Middletown, CT



- ▶ replace impervious surfaces with pervious surfaces
- ▶ install vegetative islands and buffer areas
- ▶ install swales with riprap check dams
- ▶ remove curbing, add slotted curb stops if appropriate

The BMP Selection Chart and individual BMP sheets found in the appendices of this chapter can be used to aid in the selection of appropriate BMPs.

The most effective BMPs are those which allow for pretreatment and infiltration of stormwater. Therefore, in most cases, such BMPs should be selected over those that do not provide these functions. Some general characteristics can be assigned to these two types of BMPs as follows:

Preferred stormwater BMPs which allow for infiltration:

- discontinuous pavements, using grass shoulders and vegetative islands to break up sheet flow and allow for infiltration;

- no curbs, encourage overland flow to buffer areas;
- grass swales to encourage settlement and filtration of pollutants;
- sediment traps; and
- infiltration devices.

Less desirable stormwater management practices with little pretreatment:

- curbed pavement surfaces that trap and channel runoff on the pavement, minimizing soil infiltration;
- paved channels;
- catch basin inlets that drain surface runoff into underground pipes;
- storm drain pipes that carry all roadway and parking lot runoff and pollutants to watercourses; and
- direct discharges.

The BMPs listed in the appendices fall into the first category and, therefore, should be selected over less desirable management practices.

WHAT IS THE ENFORCEMENT MECHANISM?

Municipal Enforcement

Municipalities should adopt a stormwater ordinance or regulations to provide additional authority to enforce stormwater management standards over and above those already provided for in zoning regulations. Following adoption, enforcement can be achieved through the site plan review process. Further, bonding can be required as part of the site plan approval process to assure compliance with a municipal stormwater management ordinance, regulations or conditions of site plan approval.

State Enforcement

Water Pollution Control Statutes

C.G.S. Section 22a-427 disallows the pollution of any of the waters of the state or the maintenance of a discharge of any treated or untreated wastes by any person or municipality.

If the DEP Commissioner finds that any person or municipality has initiated, created, originated, or is maintaining any discharge, point or nonpoint, into the waters of the state without a permit as required or in violation of such permit, he may issue an order to abate pollution, or he may request the attorney general to bring an action in superior court to enjoin such discharge until a permit is received or compliance with an issued permit is achieved. In addition, any activity which would result in a discharge to the waters of the state which violates the state's water quality standards cannot be permitted. Any noncompliance with an issued water quality certificate is also enforceable pursuant to the state's water pollution control statutes.

C.G.S. Section 22a-432 allows the DEP commissioner to issue an order to correct a **potential** source of pollution where it is found that a person has established a facility, created a condition, or is maintaining any facility or condition which reasonably can be expected to create a source of pollution to the waters of the state. Thus, the commissioner is authorized to take a proactive role in protecting against sources of pollution in addition to correcting existing pollution problems.

If the Commissioner finds that any person has established a facility or created a condition before or after June 25, 1985, or is maintaining any facility or condition which reasonably can be expected to create a source of pollution to the waters of the state, he may issue an order to such person to take the necessary steps to correct such potential source of pollution. If the Commissioner finds that the recipient of any such order fails to comply therewith, he may request the attorney general to bring an action in superior court to

enjoin such person from maintaining such potential source of pollution to the waters of the state or to take the necessary steps to correct such potential source of pollution.

In addition, any activity which would result in a discharge to the waters of the state which violates the state's water quality standards cannot be permitted.

Stormwater General Permit

In accordance with C.G.S. Section 22a-430b, the Department administers a stormwater general permit program for all construction activities with land disturbance of five acres or more, commercial activities with five acres or more of contiguous impervious surface, industrial activities, and for municipalities in excess of 100,000 population with separate sanitary and storm sewers. Municipal garages are included as well. Eligible applicants must register with the DEP, and a stormwater pollution control plan must be developed and kept at the site.

For construction activities, each pollution control plan must include soil erosion and sedimentation controls, effective both during and after construction, and long-term water quality controls. For industrial activities, each plan must include measures and controls appropriate for potential pollutants as identified by the permittee, based on a required inventory of exposed materials. Permittees for industrial activities are also responsible for annual stormwater monitoring and recording of analyses results. For commercial activities, each pollution control plan must provide for regular sweeping of parking areas, sidewalks and driveways, and for the proper storage of potential pollutants such as raw materials, intermediate and final products, by-products and waste materials. The DEP has oversight responsibilities and enforcement authority.

C.G.S. Section 22a-430b(c) authorizes the DEP to require individual permits if the Commissioner of the DEP determines that an individual permit would better protect the waters of the state from pollution than the general permit.

MODEL ORDINANCE

Background

In 1991, the Connecticut General Assembly passed Public Acts 91-170 [amending C.G.S. Sections 8-2(b), 8-3b and 8-35a] and 91-398 [amending C.G.S. Section 8-23(a)]. These Acts require, in part, that zoning regulations and plans of conservation and development adopted by coastal municipalities be made with reasonable consideration for greater protection of Long Island Sound water quality. In particular, the Acts required municipalities to adopt regulations and plans with reasonable consideration and protection of the ecosystem and habitat of Long Island Sound and to design them to reduce hypoxia, pathogens, toxic contaminants and floatable debris in Long Island Sound. It is well documented that improperly managed stormwater flows do make significant contributions to coastal pollution, resulting in hypoxic (low dissolved oxygen) conditions and increases in pathogens, toxic contaminants and floatable debris. Therefore, improved stormwater management and treatment will result in decreases in these pollutants.

In order to assist municipalities in meeting the substantive as well as legal requirements of this legislation, we are providing the enclosed Model Stormwater Ordinance for your use. The approach of providing a model ordinance as opposed to zoning regulations was selected due to the need for consistent approaches to stormwater management in various municipal regulations such as zoning regulations including coastal site plan reviews, wetland regulations, sedimentation and erosion controls and aquifer protection regulations. Thus, rather than provide model site plan regulations which may conflict with existing municipal regulations, we have suggested an ordinance as a means of ensuring consistency among the various municipal regulations.

Depending upon the current format of your regulations, portions of this ordinance can be inserted where appropriate. Therefore, the first task is to identify appropriate sections. For example, should your regulations have an environmental section, this may be the most appropriate place for incorporation; however, you may have a drainage section which would be more appropriate. Since the system of regulations varies from town to town, this model may have to be significantly reorganized in order to match an existing format. Thus, prior to adopting any stormwater regulations, the municipality's legal counsel should be consulted.

As the following model regulations were being developed, workshops were held to solicit input from municipal officials on the most effective ways to incorporate a stormwater ordinance. Comments received at the workshops suggested that modification of municipal coastal site plan regulations would be an effective method. While this approach was seriously considered, pollution of Long Island Sound caused by stormwater runoff is not a problem isolated to the coastal boundary (though proximity to the Sound plays a role in the degree of pollution reaching the Sound). Therefore, stormwater management regulations should not only be applied within

the coastal boundary, but throughout coastal municipalities and in inland municipalities throughout the state as well. In reviewing the model ordinance, please note that suggested ordinance language is in normal type; *explanations or commentary are in italics.*

MODEL ORDINANCE FOR STORMWATER MANAGEMENT

Purpose and Authority

In accordance with the provisions of Chapters 98, 124, 126, 440, 444, and 446h of the General Statutes of the State of Connecticut, as amended, the Town of _____ hereby adopts the following Stormwater Management Ordinance for the following purposes:

Increased development without proper consideration of stormwater impacts can be a significant source of pollution to Long Island Sound, its tributaries, and other waters of the state. The state's water resources are valuable natural, economic, recreational, cultural and aesthetic resources. The protection and preservation of these waters is in the public interest and is essential to the health, welfare and safety of the citizens of the state. It is, therefore, the purpose of this ordinance to protect and preserve the waters within (town name) from nonpoint sources of pollution through the proper management of stormwater flows and minimization of inputs of suspended solids, pathogens, toxic contaminants, nitrogen and floatable debris to these flows.

Definitions

aquifer - a geologic formation, group of formations or part of a formation that contains sufficient saturated, permeable materials to yield significant quantities of water to wells and springs

BMPs - best management practices - techniques or structural devices that are effective practical ways of preventing or reducing pollution, including but not limited to those techniques and devices described in the DEP document entitled COASTAL WATER QUALITY PROTECTION: A Guide for Local Officials.

"first flush of rain" - the initial runoff, usually the first inch, of rainfall during a single event.
The initial runoff from the first inch of rain contains higher pollutant concentrations than the subsequent runoff, due to initial washing off of dry weather deposits in significantly higher concentrations than those washed off later in a storm. This effect is particularly pronounced with initial heavy rainfalls.

groundwater - water found beneath the ground surface that completely fills the open spaces between particles of sediment and within rock formations

impervious surface - material or structure on, above or below the ground that does not allow precipitation or surface water to penetrate directly into the soil

site - a single parcel, together with any adjacent waters, which is the subject of an application for zoning approval, subdivision approval, coastal site plan review, or an inland wetlands permit

sediment - solid material, either mineral or organic, that is in suspension, is transported, or has been moved from its site of origin by erosion

trash hood - feature in a catch basin which traps debris such as litter and keeps it from being discharged from the catch basin

urban stormwater runoff - precipitation that falls onto the surfaces of roofs, streets, parking lots, roads and the grounds of developed areas. *Urban precipitation is not absorbed by the ground or retained in its surface, but collects and runs off, carrying a wide variety of pollutants such as oil-based contaminants, heavy metals (copper and lead), nutrients and bacteria*

Application Requirements

Stormwater management plans should be strongly encouraged for all land use and development projects, even where they are not required. A stormwater management plan shall be included as a part of any application for zoning approval, subdivision approval, coastal site plan review, or an inland wetlands permit where:

1. the application pertains to a development or construction project disturbing five or more acres of total land area on a site; *Applicants should be made aware that any development which calls for a total disturbance of over 5 acres also requires the submission of registration to the Connecticut DEP under the General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities.*
2. the application pertains to any site with one acre or more of impervious cover;
3. the application proposes new residential development of three or more units;
4. the application pertains to any new industrial or commercial project; *Applicants should be made aware that a commercial project with five or more acres of contiguous impervious surface or an industrial project may require the submission of registration to the Connecticut DEP under the General Permit for the Discharge of Stormwater Associated with Commercial Activity or the General Permit for the Discharge of Stormwater Associated with Industrial Activity, respectively. or*

5. the commission which has jurisdiction over the application has required submission of a stormwater management plan pursuant to written findings that the activity proposed in the application has the potential to cause significant nonpoint source pollution to ground or surface water drinking supplies, or to Long Island Sound or any other waters of the state. Such findings may be based upon a written request by the Commissioner of Environmental Protection.

If the commission determines that the activity proposed in an application may result in significant nonpoint source pollution to ground or surface water drinking supplies, or to Long Island Sound or any other waters of the state, it may refer the application, including the stormwater management plan, to the Commissioner of Environmental Protection for a determination as to whether a discharge permit under section 22a-430 of the General Statutes, or other state authorization, is required.

Contents of stormwater management plan:

Where a stormwater management plan is required, such plan shall provide, at a minimum, the following information:

1. Soil characteristics of the site.
2. DEP ground and surface water quality classification of the site.
3. Location of the closest surface water bodies and wetlands to the site, and the depth to any groundwater or aquifer areas on or adjacent to the site. In the case of tidal waters, provide the mean high water and high tide elevations.
4. Location and description of all proposed stormwater control BMPs for both construction activities and post-construction long-term stormwater control.
5. Proposed maintenance and operation manual or schedule for any trash hoods, catch basins, or other BMP devices used to prevent or treat stormwater.

For applications which the commission finds will not have the potential to cause significant nonpoint source pollution to groundwater or surface water drinking supplies, or to Long Island Sound or any other waters of the state, the commission may waive submission of the following information:

6. Calculations of stormwater runoff rates, suspended solids removal rates, and soil infiltration rates before and after completion of the activity proposed in the application.

7. A hydrologic study of pre-development site conditions. Hydrology studies shall be conducted at a level of detail commensurate with the probable impact of the proposed activity and should extend downstream to the point where the proposed activity causes less than a five percent change in the peak flow rates.

Standards and Criteria for Decision

In order to approve any application for which a stormwater management plan is required, the commission shall find the stormwater management plan consistent with the following criteria. If such application is also subject to the requirements of an aquifer protection overlay zone or any other requirements for nonpoint source pollution control, the more stringent requirements shall control.

1. Direct channeling of surface water runoff into adjacent ground and surface waters and tidal wetlands shall be prohibited.
2. No net increase in urban stormwater runoff from the site shall result from the proposed activity.
3. Design and planning for site development shall provide for minimal disturbance of pre-development natural hydrologic conditions, and shall reproduce such conditions after completion of the proposed activity, to the maximum extent feasible.
4. Pollutants shall be controlled at their source to the maximum extent feasible in order to contain and minimize contamination. *Such an approach is not only cost-effective but more efficient, by reducing the need for extensive restoration efforts. Methods include but are not limited to sweeping of streets and parking lots, especially in the early spring, the use of oil traps and sediment basins prior to infiltration, the use of pervious surfaces and encouragement of sheet flow to filter strips.*
5. Stormwater management systems shall be designed and maintained to manage site runoff in order to eliminate surface and groundwater pollution, prevent flooding and, where required, control peak discharges and provide pollution treatment.
6. Stormwater management systems shall be designed to collect, retain and treat the first inch of rain on-site, so as to trap floating material, oil and litter. *BMP techniques to achieve treatment of the first inch of rainfall include oil and grit separators, and trash hoods.*

7. On-site storage of stormwater shall be employed to the maximum extent feasible. *On-site storage methods include but are not limited to landscaped depressions, grass swales, infiltration trenches and retention or detention basins.*
8. Stormwater runoff rates and volumes shall be controlled by slowing runoff velocities and encouraging infiltration. Post-development runoff rates and volumes shall not exceed pre-development rates and volumes. *BMP methods for controlling runoff and encouraging infiltration include the minimization of impervious surfaces, minimization of curbing and collection, the use of grass or vegetative filter zones, landscape depressions, slotted curb spacers, perforated pipes for conveying stormwater, establishment of buffers from streams, wetlands and waterbodies, and any combination of methods, where appropriate.*
9. Stormwater treatment systems shall be employed where necessary to ensure that the average annual loadings of total suspended solids (TSS) following the completion of the proposed activity at the site are no greater than such loadings prior to the proposed activity. Alternatively, stormwater treatment systems shall remove 80% of TSS from the site on an average annual basis. *BMP methods for stormwater treatment include infiltration through vegetative strips, grass swales and detention basins.*

WHERE CAN I TURN FOR HELP AND ADDITIONAL INFORMATION?

AVAILABLE INFORMATION

PUBLICATIONS

- Upstream Solutions to Downstream Pollution - A Citizens' Guide to Protecting Seacoasts and the Great Lakes by Cleaning Up Polluted Runoff, 1993. Sarah Chasis, Jessica Landman, Beth Lillemann, Diane Cameron and Ann Notthoff, principal authors.
Good overview of nonpoint source pollution, not too technical
Available through the Natural Resources Defense Council and Coastal Alliance (send \$7.50 plus \$1.45 shipping and handling to: NRDC Publications Department, 40 West 20th Street, New York, NY 10011)
- Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters - EPA, January, 1993.
Contains guidance developed in accordance with Section 6217 of the 1990 federal Coastal Zone Act Reauthorization Amendments specifying management measures to control sources of nonpoint pollution in coastal waters
Contact EPA Office of Water, Washington, D.C. by calling (202)260-7100.
- Guidelines for Soil Erosion and Sedimentation Control - CT DEP/CT Council on Soil and Water, 1988.
Contains methods and techniques for minimizing soil erosion and sedimentation
Available from CT DEP, Map and Publication Sales, 79 Elm Street, Store Level, Hartford, CT 06106-5127, (860)424-3555.
- Stormwater Management Quantity and Quality (prepared for the CT DEP by Milone & MacBroom, Inc.), February, 1992.
Provides information to help evaluate the need for and use of stormwater management systems
Draft document available from Milone & MacBroom, Inc., (203)271-1773.
- Connecticut Nonpoint Source Material Summary - Bibliography of Publications available through the DEP including the following:

- Assessment of Nonpoint Sources of Pollution in Urbanized Watersheds: A Guidance Document for Municipal Officials - (Shreve-Gibb, B. and W. Boucher, Metcalf & Eddy, Inc.), CT DEP Bulletin #22, April 1995.
Provides information on stormwater and nonpoint source pollution prevention and control; provides a process to follow for evaluating and improving existing regulations and practices
Available from CT DEP, Map and Publication Sales, 79 Elm Street, Store Level, Hartford, CT 06106-5127, (860)424-3555.
- Nonpoint Source Pollution: An Assessment and Management Plan - CT DEP, February 28, 1989.
An assessment of the state's nonpoint source problem, providing a management strategy to address Connecticut's nonpoint source concerns
Available from CT DEP, Map and Publication Sales, 79 Elm Street, Store Level, Hartford, CT 06106-5127, (860)424-3555.
- Best Management Practices for Coastal Marinas, Final Report (prepared for the CT DEP by Fugro McClellan), August, 1992.
A program of BMPs to minimize the adverse impacts of marina construction, expansion and operations on Connecticut's coastal water quality
Available through the DEP Office of Long Island Sound Programs - (860)424-3034.
- Protecting Connecticut's Water-Supply Watersheds: A Guide for Local Officials - Doenges, J.M., C.P. Allan, J. Benson, and R.J. Jontos, Jr. (Eds.), 1993.
Provides municipalities with guidance and information on existing and recommended programs for protection of public surface water supplies
Available from CT DEP, Map and Publication Sales, 79 Elm Street, Store Level, Hartford, CT 06106-5127, (860)424-3555.
- Best Management Practices for the Protection of Groundwater, A Local Official's Guide to Managing Class V Underground Injection Control Wells - Inglese, O., Jr. 1992.
Discusses the operations commonly associated with many types of facilities, the materials used and the wastes generated; describes shops and services such as printing, dry cleaners, auto service and repair, beauticians and non-agricultural pesticide application
Available from the DEP Map and Publication Sales, 79 Elm Street, Store Level, Hartford, CT 06106-5127, (860)424-3555.

STAFF

DEP Office of Long Island Sound Programs staff

79 Elm Street
Hartford, CT 06106-5127
(860)424-3034

DEP Water Bureau Staff:

Long Island Sound water quality: 860-424-3020
Stormwater management and water quality enforcement: (860)424-3018
79 Elm Street
Hartford, CT 06106-5127

UConn Cooperative Extension Service

Nonpoint Education for Municipal Officials - (NEMO)
1066 Saybrook Road, P.O. Box 70
Haddam, CT 06438
(860)345-4511

Soil and Water Conservation Districts/County Offices:

Fairfield (203)743-5453
Hartford (860)688-7725
Litchfield (203)567-8288
Middlesex (860)345-3219
New Haven (203)269-7509
New London (860)887-3604
Tolland (860)875-3881
Windham (860)774-0224

Regional Planning Agencies

EPA Nonpoint Source Bulletin Board Online - (301)589-0205

APPENDIX

BMP TABLES AND DESCRIPTIONS

The following BMP tables and descriptions are meant to provide a quick reference to various stormwater BMPs and their functions. The first page consists of a table of comparative BMP pollutant removal and beneficial effects followed by Stormwater BMP Application/Advantage/Limitations Tables providing quick reference to various BMPs. The following BMP Diagram and Descriptions section provides larger and more legible diagrams and includes design criteria for each BMP.

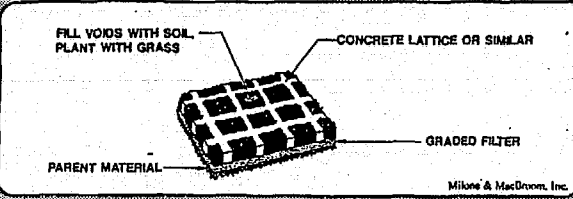
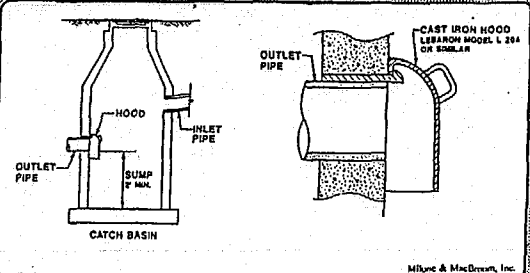
Comparative Pollutant Removal and Beneficial Effects of Different Stormwater BMPs	A-1-1
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Stormwater BMP diagrams and Descriptions (cont.)

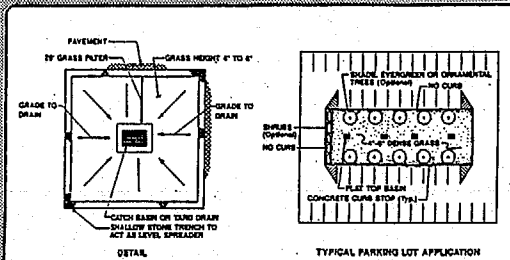
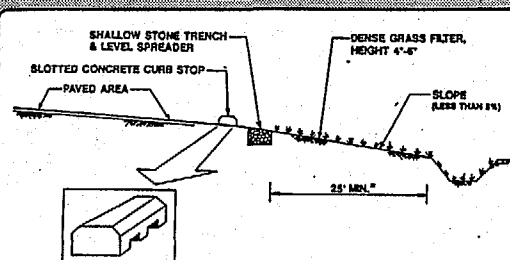
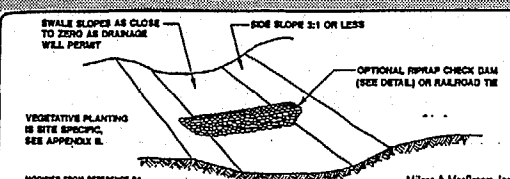
Vegetative Filter	A-1-13
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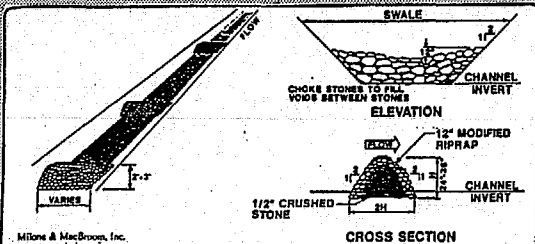
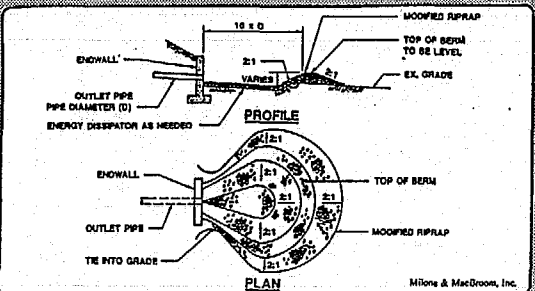
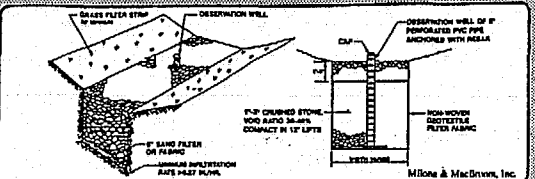
COMPARATIVE POLLUTANT REMOVAL AND BENEFICIAL EFFECTS OF DIFFERENT BMPs

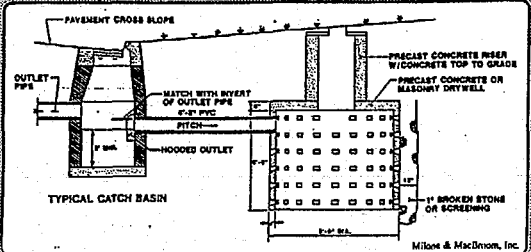
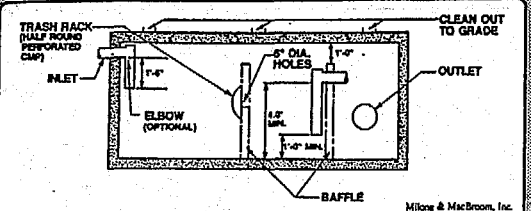
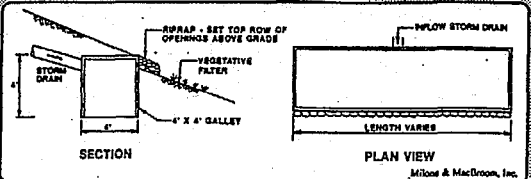
	POLLUTANT REMOVAL/BENEFICIAL EFFECTS												
	Encourages Infiltration	Filters Particulate Pollutants	Captures Sediment	Captures Hydrocarbons	Captures Floatables	Nutrient and BOD Removal	Bacteria Removal	Trace Metals Removal	Slows Runoff	Reduces Erosion	Recharges Groundwater	Maintains Baseflows	Landscape/Aesthetic Feature
TYPICAL STORMWATER BMPs													
Gravel Road Surface	X	X							X				X
Modular Paving	X	X							X				X
Catch Basin with Sump and Hood			X	X	X								
Catch Basin Perimeter Filter	X	X											X
Vegetative Filter	X	X	X						X	X			X
Swale	X	X							X				
Riprap Check Dam	X		X						X				
Level Spreader	X		X						X	X			
Infiltration Trench	X	X	X									X	
Sand Filter	X	X	X			X	X	X					
Catch Basin with Dry Well	X	X	X	X	X						X	X	
Sediment Chamber			X	X	X								
Infilt. Gallery w/ Level Side Overflow	X												
Rooftop Infiltration Via Drywell	X										X	X	
Sediment Basin	X	X	X		X						X		
Sediment Basin Outlet					X				X				
Sediment Forebay/Riprap Filter Berm			X		X								
Infiltration Basin	X	X	X								X		X
Wet Pond/Basin	X	X	X			X							X
Extended Duration Detention Basin	X	X	X										X
Underground Exfiltration Storage	X	X									X		
Wetland Treatment System	X	X	X			X	X	X	X		X		X

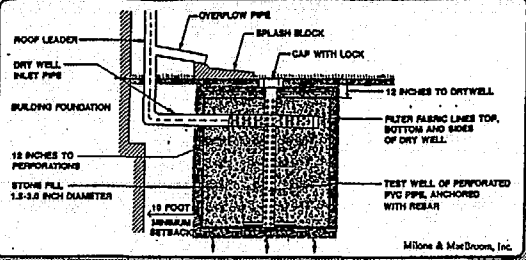
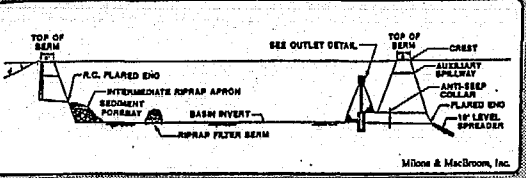
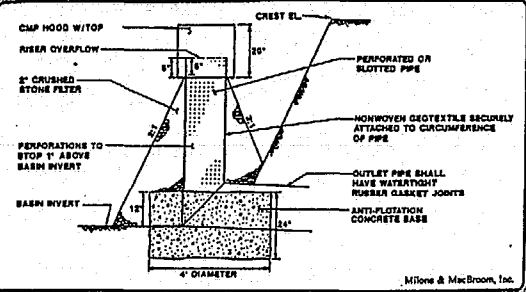
BMPs	APPLICATION	ADVANTAGES	LIMITATIONS
Gravel Road Surface	Driveways Rural roads Emergency access Overflow parking	Encourages infiltration Filters particulate pollutants Reduces impervious surface Delays runoff Reduces runoff volume Reduces need for downstream drainage facilities	Low traffic volume required Occasional maintenance required
Modular Paving 	Emergency access Landscaped areas Overflow parking	Encourages infiltration Renovates pollutants Maintains natural look Reduces impervious cover Reduces need for downstream drainage facilities Delays runoff Reduces runoff volume	Mowing maintenance Low traffic volumes necessary Possible frost action in clayey soils Labor intensive installation Permeability may be reduced over time due to traffic load
Catch Basin with Sump and Hooded Outlet 	Large commercial/industrial parking areas Systems having direct discharge to waterways, water bodies and wetlands Areas with potential petroleum inputs	Floating hydrocarbons captured Adsorbed hydrocarbons settle with particulates Sump traps coarse sediments Floatables prevented from exiting Simple to retrofit head Low cost	Emulsified and dissolved hydrocarbons difficult to trap mechanically Maintenance, sump cleaning 3 times a year to maintain effectiveness Organics and stagnant water may be flushed out upon subsequent flow without routine cleaning

Note: Information in tables based upon Milone & MacBroom, Stormwater Management Quantity and Quality, Draft, February, 1992

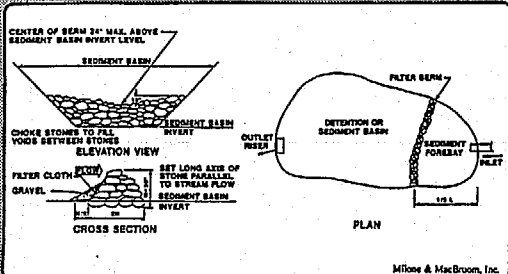
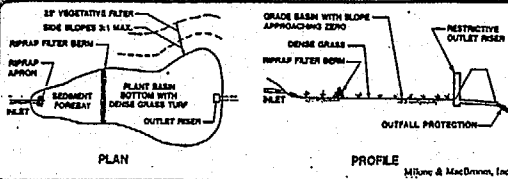
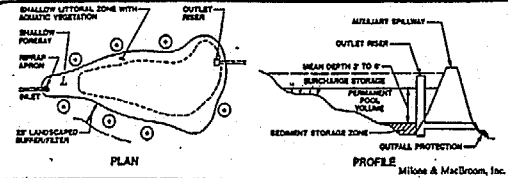
BMPs	APPLICATION	ADVANTAGES	LIMITATIONS
Catch Basin Perimeter Filter  Milone & MacBroom, Inc.	Highway medians Parking lots Parks	Filters particulate pollutants Islands may be a landscaped feature	Large area required Maintenance
Vegetative Filter  Milone & MacBroom, Inc.	Immediately abutting impervious surfaces Downstream of level spreaders Place in areas of high particulate loads, organics and metals Pretreatment step for infiltration systems	Reduces pollutant loads Increases time of concentration Protects soil from erosion May double for aesthetic/recreation use Can provide wildlife habitat Relatively inexpensive to establish	Mowing maintenance Channels formed from non-sheet flow may short-circuit filter Periodic sediment accumulation at top of strip Should be used on slopes of 5% or less
Vegetative or Grassed Swale  Milone & MacBroom, Inc.	Single family residential developments Highway medians Alternate to curb and gutter systems Slopes less than or equal to 5% Can be used with infiltration trench at base	Promotes infiltration Attenuates small flows Filters particulate pollutants Usually less expensive than curb and gutter systems Keeps water away from street surface	Mostly used with other BMPs to achieve stormwater management goals Maintenance required more than curbed systems Less compatible with sidewalks

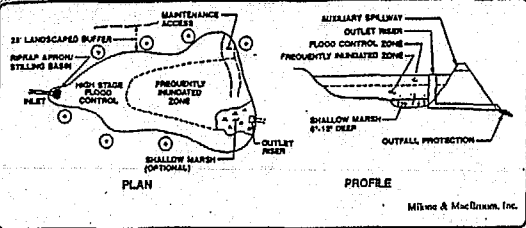
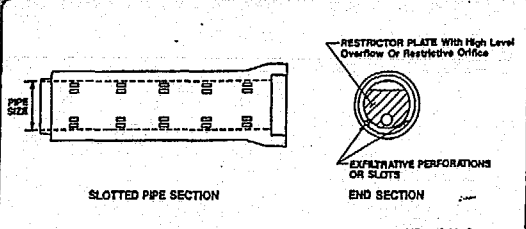
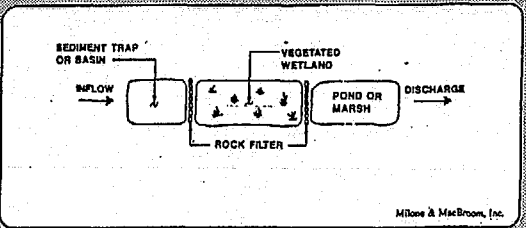
BMPs	APPLICATION	ADVANTAGES	LIMITATIONS
Riprap Check Dam (Used with Vegetative or Grassed Swale)  Milone & MacBroom, Inc.	Temporary or permanent measure for existing channels Useful in new temporary or permanent drainage swales Used to reduce velocity in grass swales	Acts to settle out coarse material Delays runoff timing for small storms Reduces velocity Distributes water over channel Increases infiltration in swales	Maintenance/stone replacement Must periodically remove accumulated sediments from behind dam
Level Spreader  Milone & MacBroom, Inc.	Discharge to filter strips or vegetated swales Construct preferably on undisturbed soils discharging to stabilized downstream areas with moderate slopes	Slows erosive velocities Converts concentrated flow to sheet flow Settles coarse sediment Encourages infiltration	Periodic maintenance after large rainfall events
Infiltration Trench  Milone & MacBroom, Inc.	Residential lots and small commercial areas Rooftop runoff Adjacent to parking areas with grass filter strips receiving sheet flow Highway medians Below swales	Easy to fit into site Reduces runoff Encourages infiltration Filters pollutants, metals proven to bind to soils Can nearly reproduce natural hydrological conditions Maintains baseflow	Periodic inspection required to monitor function Can clog with sediment - grass buffers must be installed in association to capture sediment Possible risk of groundwater contamination from spills Regular maintenance required Rarely achieves peak runoff control

BMPs	APPLICATIONS	ADVANTAGES	LIMITATIONS
Catch Basin with Dry Well  TYPICAL CATCH BASIN Milone & MacBroom, Inc.	Areas with moderate pollutant and hydrocarbon loads Should be used in areas with well-drained soils to take advantage of infiltration Suitable for minor residential roads and small parking lots	Maintains groundwater table and base flows Renovates pollutants in first flush and frequent small storms Reduces peak flows	Inspect yearly for ponding Cannot clean infiltration surface Signs of contamination are out of view
Sediment Chamber  Milone & MacBroom, Inc.	Parking lot systems Temporary measure during construction Permanent measure on large developments with high anticipated sediment load	Traps floatables Traps coarse sediment Groundwater recharge Pollutant filtering	Sediment removal required Periodic inspection and maintenance required
Infiltration Gallery with Level Side Overflow  Milone & MacBroom, Inc.	Serves as an outlet for small drainage systems May be used for rooftop drainage Parking lots, driveways, recreation areas	Infiltrates runoff from small storms Excess overflows similar to level spreader and vegetative filter	Runoff must be pretreated to prevent clogging of soil

BMPs	APPLICATIONS	ADVANTAGES	LIMITATIONS
Rooftop Infiltration Via Dry Well  Milone & MacBroom, Inc.	Rooftop runoff from residential and commercial buildings Locate away from building underdrains to prevent infiltration short-circuit	Reduces runoff volume Provides clean water infiltration to enhance groundwater supply Reduces size of storm drains required downstream Helps maintain base flow	Clogging possible Periodic rejuvenation may be required
Sediment Basin  Milone & MacBroom, Inc.	Parking lot systems Temporary measure during construction Permanent measure on large developments with high anticipated sediment loads	Traps floatables Traps coarse sediment Groundwater recharge Pollutant filtering	Sediment removal required Periodic inspection and maintenance required
Sediment Basin Outlet (Used with Sediment Basin)  Milone & MacBroom, Inc.	Sediment basins (temporary and permanent) Infiltration basins Ideal for off-line systems that capture small frequent storms	Hood traps floatables Slow metered discharge encourages settling	Does not accommodate high flows Periodic cleaning of stone filter required

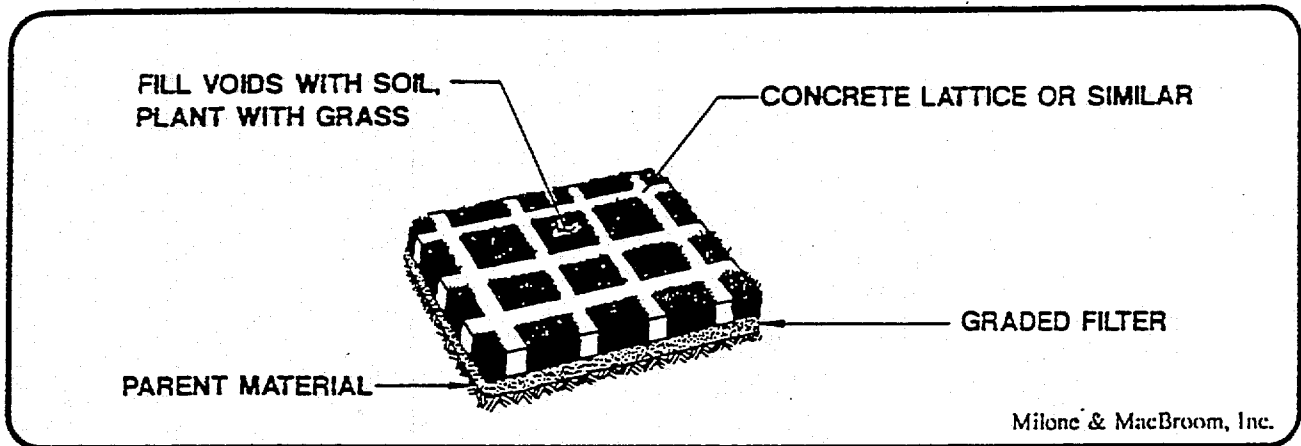
Note: Information in tables based upon Milone & MacBroom, Stormwater Management Quantity and Quality, Draft, February, 1992

BMPs	APPLICATIONS	ADVANTAGES	LIMITATIONS
Sediment Forebay/Riprap Filter Berm (For Use in Sediment, Infiltration or Detention Basins)  Milone & MacBroom, Inc.	Sediment basins Infiltration basins Dry detention basins Shallow wet basins Extended Detention basins	Prolongs life of basins Provides zone to trap coarse sediment before it fills entire basin Traps floatables	Maintenance required Filter fabric may clog and have to be replaced
Infiltration Basin  Milone & MacBroom, Inc.	Commercial and large residential developments Drainage areas of 5 to 50 acres During construction, bottom should be left at 2 feet above final grade and used as a temporary sediment basin Any site with well drained soils should not be used in areas where contaminant spills are likely (industrial)	Removes soluble and particulate pollutants Can control peak discharges Can serve large drainage areas Groundwater recharge Preserves natural water balance May be used as recreational space	Fairly frequent maintenance High failure rate due to poor soils and poor design Infiltration rate may ultimately be determined by accumulated sediments Requires relatively large area Possible risk of groundwater contamination from very soluble pollutants such as nitrates, chlorides and gasoline
Wet Basin  Milone & MacBroom, Inc.	Use where high nutrient control is required including discharges to reservoirs and lakes Watersheds of tidal embayments and estuaries Larger developments greater than 20 acres in size with base flow runoff	Downstream eutrophication management Aesthetic and habitat value Wetlands creation Less maintenance than dry basins High removal of sediment, metals, BOD, and nutrients Recreation and landscape amenity Can provide runoff peak control	Large land area required Potential for thermal discharges Possible difficulty permitting in existing wetlands Occasional nuisance problems (odor, debris, algae) Periodic sediment removal Possible safety problem

BMPs	APPLICATIONS	ADVANTAGES	LIMITATIONS
Extended Duration Detention Basin 	Retrofit for existing dry basins Large residential developments, commercial and industrial complexes Regional control measure	Flood control Particulate removal Soluble pollutants removal with wet pond Possible recreational use and habitat Easy to retrofit old installations	Occasional nuisance in wet portion Moderate maintenance Sediment removal Unattractive Liability concerns Questionable impacts on wildlife
Underground Exfiltration Storage 	Under parking lots due to space considerations Applicable where basins may be unsightly Can be oversized to control peak discharges by storing runoff	Commercially available Takes little area Out of sight Groundwater recharge Pollutant filtering Reduces peak flows	Cost Difficult to restore infiltrative capacity if it fails Difficult to monitor Frequent cleaning of sediment traps required Requires pretreatment of runoff
Wetland Treatment Systems 	Sites with large pollution and runoff loads Helps mitigate the loss of natural wetlands	Multiple treatment systems Nutrient and sediment reductions Helps wildlife and groundwater recharge	Requires mild slopes Requires larger land area Biologically sensitive Nutrient removal varies Organic soils necessary

BMPs	APPLICATIONS	ADVANTAGES	LIMITATIONS
Sand Filters	Adaptable to most development sites Where poor soil infiltration exists Where groundwater concerns restrict use of most infiltration techniques Appropriate for ¼ to 10 acre watersheds with maximum watershed size for effective treatment no more than 50 acres	Removes sediment Removes trace metals Removes nutrients, BOD and coliform bacteria moderately well Useful for groundwater protection Can enhance effectiveness with layers of peat, limestone and/or topsoil and may be overplanted with grass	May not be applicable in colder climates Requires frequent maintenance Does not control water quantity Can produce odor problems Costly but long lived

MODULAR PAVING



DESIGN CRITERIA

- Place in areas of well drained soils (Hydrologic Groups A & B)
- Place in low traffic areas, such as driveways
- Design for maximum anticipated vehicle load
- Tamp soil into voids
- Seed with grass

APPLICATIONS

- Emergency accessways
- Landscaped areas
- Overflow parking areas

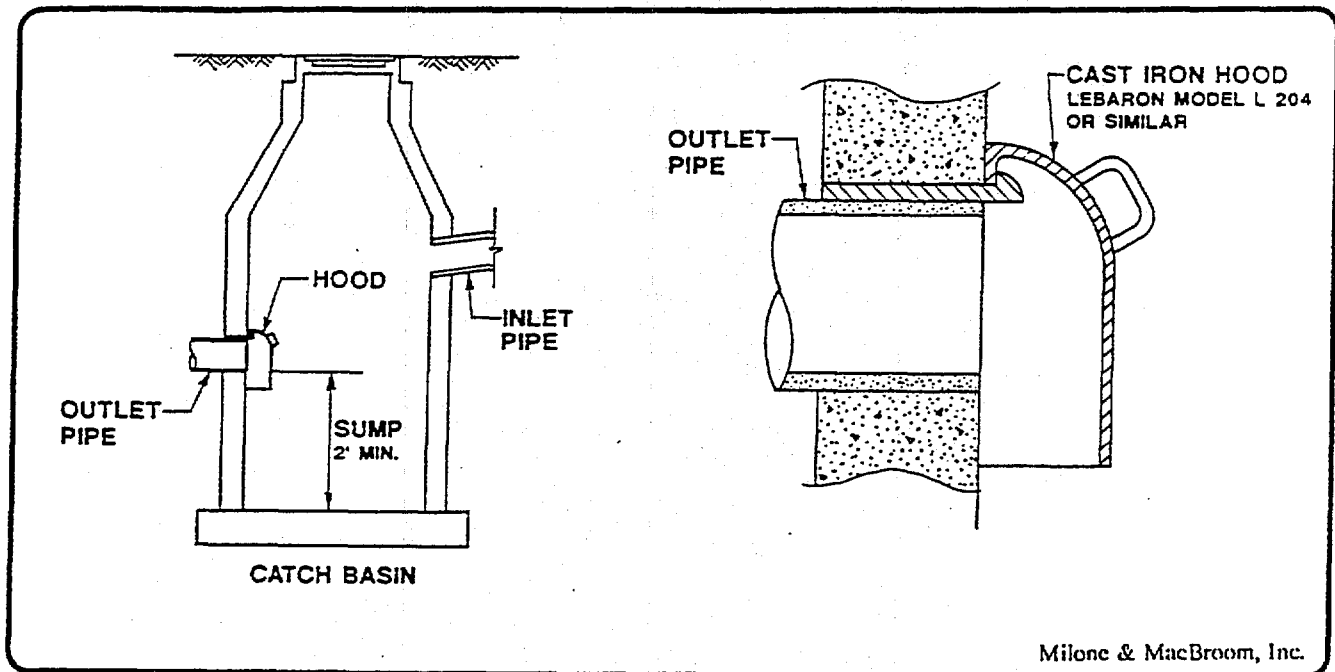
ADVANTAGES

- Encourages infiltration
- Renovates pollutants
- Maintains natural look and reduces impervious cover
- Reduces need for downstream drainage facilities
- Delays runoff
- Reduces runoff volume

LIMITATIONS

- Mowing maintenance
- Must be placed in areas of low traffic volumes
- Possible frost action in clayey soils
- Labor intensive installation

CATCH BASIN SUMP & HOODED OUTLET



DESIGN CRITERIA

None

APPLICATIONS

Large commercial/industrial parking areas
 Systems having direct discharge to waterways, water bodies and wetlands
 Areas with potential petroleum inputs

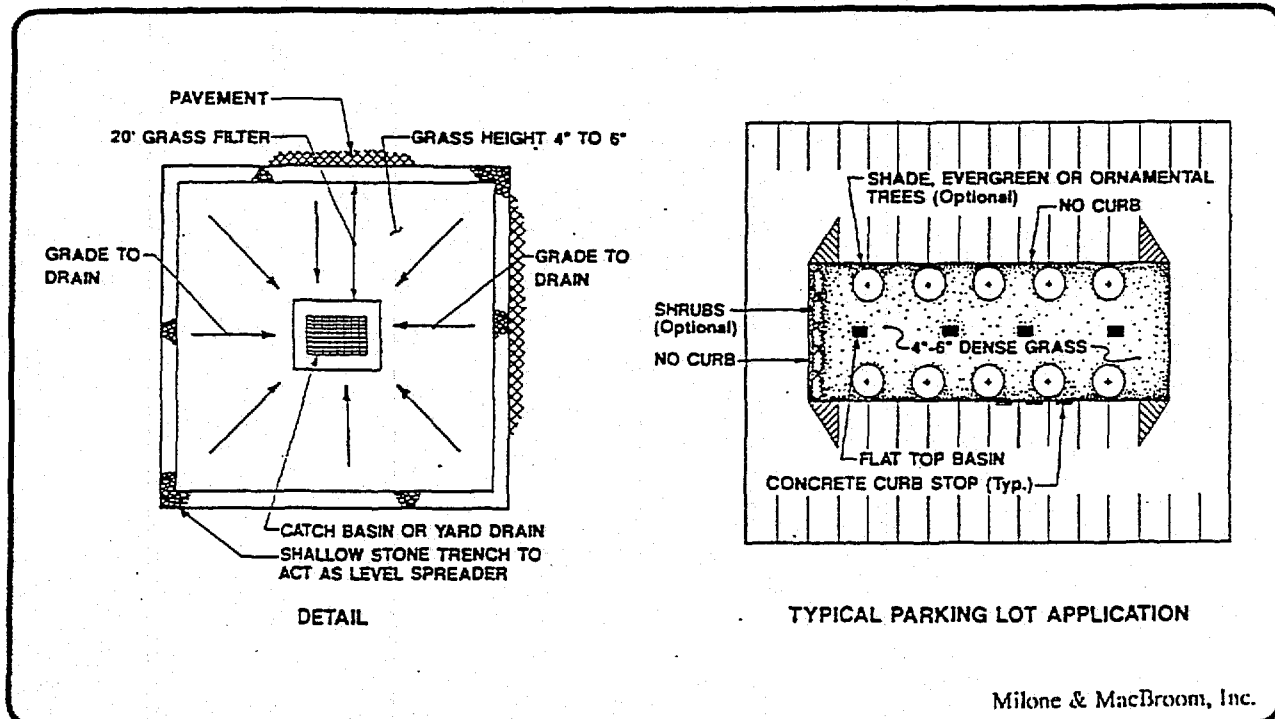
ADVANTAGES

Floating hydrocarbons captured
 Adsorbed hydrocarbons settle with particles
 2 foot sump traps coarse sediments
 Floatables prevented from exiting
 Simple to retrofit hood
 Low cost

LIMITATIONS

Emulsified and dissolved hydrocarbons difficult to trap mechanically
 Maintenance - sump cleaning 3 times yearly to maintain effectiveness
 Organics and stagnant water may be flushed out upon subsequent flow without routine cleaning

CATCH BASIN PERIMETER FILTER



DESIGN CRITERIA

- Grade filter uniformly to avoid concentrated flow
- Grade paved areas to drain to low area with basin and filter
- Sheet flow only, avoid concentrated flows
- Determine grate capacity as usual
- Provide sandy subsoil below grass
- Place on flat grade
- Provide shallow stone trench on perimeter as a level spreader

APPLICATIONS

- Highway medians
- Parking lots
- Parks

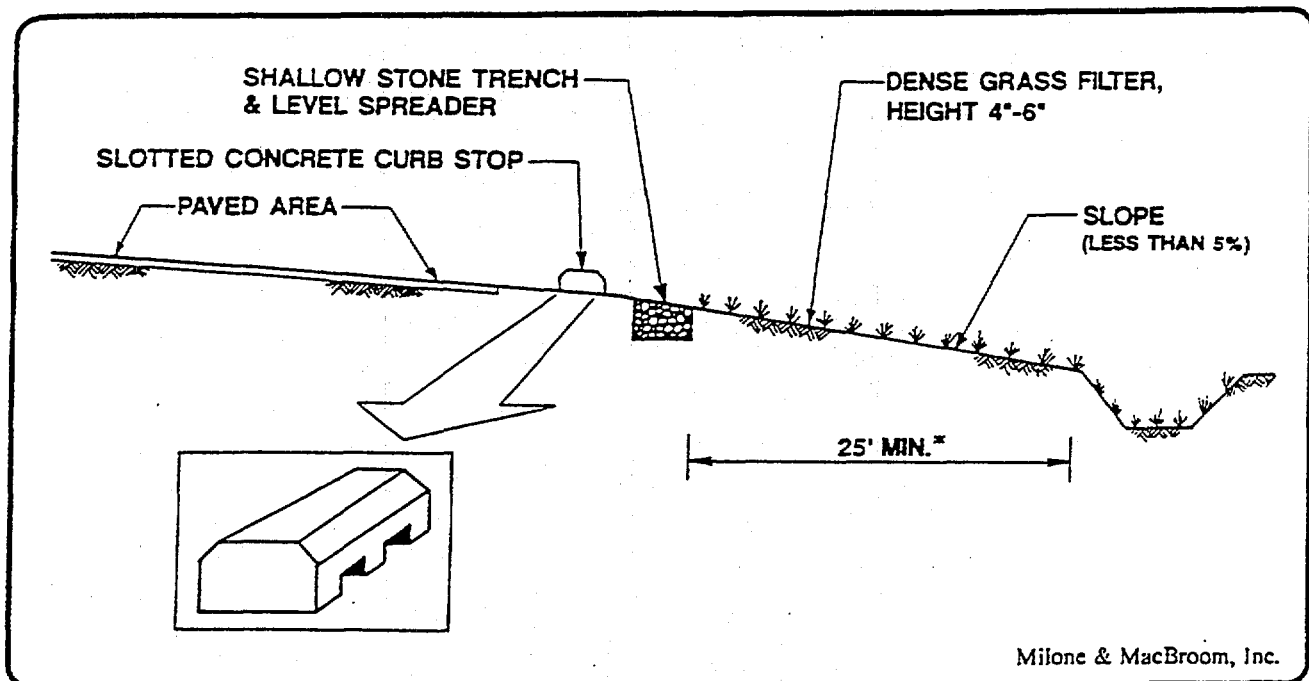
ADVANTAGES

- Filters particulate pollutants
- Islands may be a landscape feature

LIMITATIONS

- Large area required
- Maintenance

VEGETATIVE FILTER



DESIGN CRITERIA

- Depth of water should not exceed grass height
- Select vegetation via use of CT Guidelines for Sediment and Erosion Control and Appendix B
- Serve a contributing area of 5 acres or less
- Uniformly grade to avoid depressions or swales
- Grass height should be 4" to 6"
- Performance best on slopes less than 5%
- Filters should receive only sheet flow
- Minimum length of 25', 50' to 75' optimal plus 4' for each additional percent slope
- Recommended in topsoils of loamy sand to silt loam
- Combine with forested strips where possible
- A longer strip length provides more filtration

APPLICATIONS

- Immediately abutting impervious surfaces
- Downstream of level spreaders
- Place in areas with high particulate loads, organics and metals
- Pre-treatment step for infiltrative systems

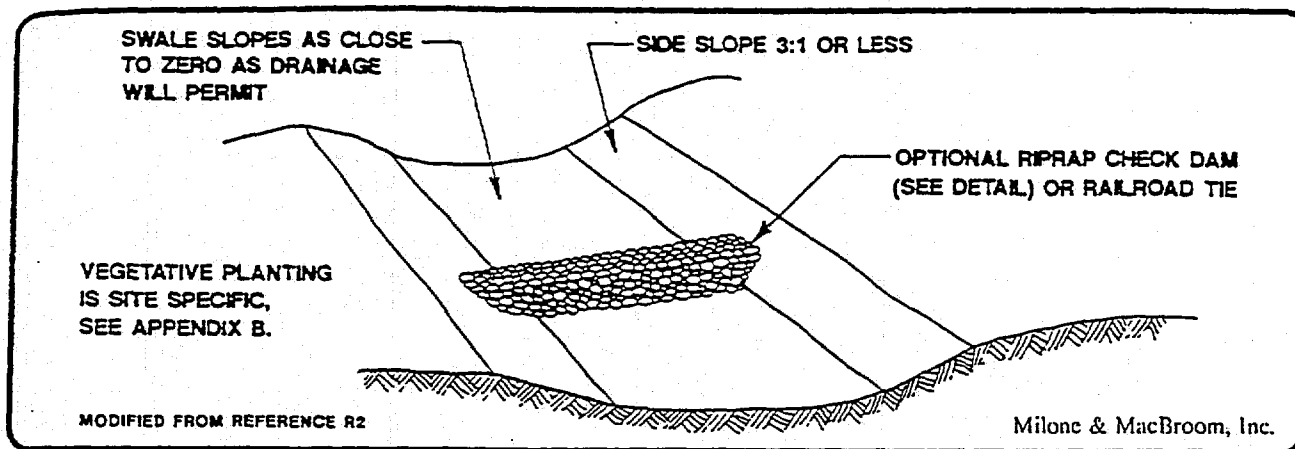
ADVANTAGES

- Reduces pollutant loads
- Increases time of concentration
- Protects soil from erosion
- May double for aesthetic/recreational use
- Can provide wildlife habitat

LIMITATIONS

- Mowing maintenance
- Channels formed from non-sheet flow may short-circuit filter
- Periodic sediment accumulation at top of strip

GRASSED SWALE



DESIGN CRITERIA

- Establish dense cover of water tolerant, erosion resistant grass. See Appendix B.
- Place in soils with moderate to high permeability
- Bottom should be tilled prior to planting
- Check dams of stone or railroad ties can be installed to promote additional infiltration and settling
- Place in areas with groundwater deeper than 2 feet
- Swales which receive concentrated flows should be sodded or planted instead of seeded

APPLICATIONS

- Single family residential developments
- Highway medians
- Alternative to curb and gutter systems
- Slopes less than or equal to 5%
- Can be used with infiltration trench at base

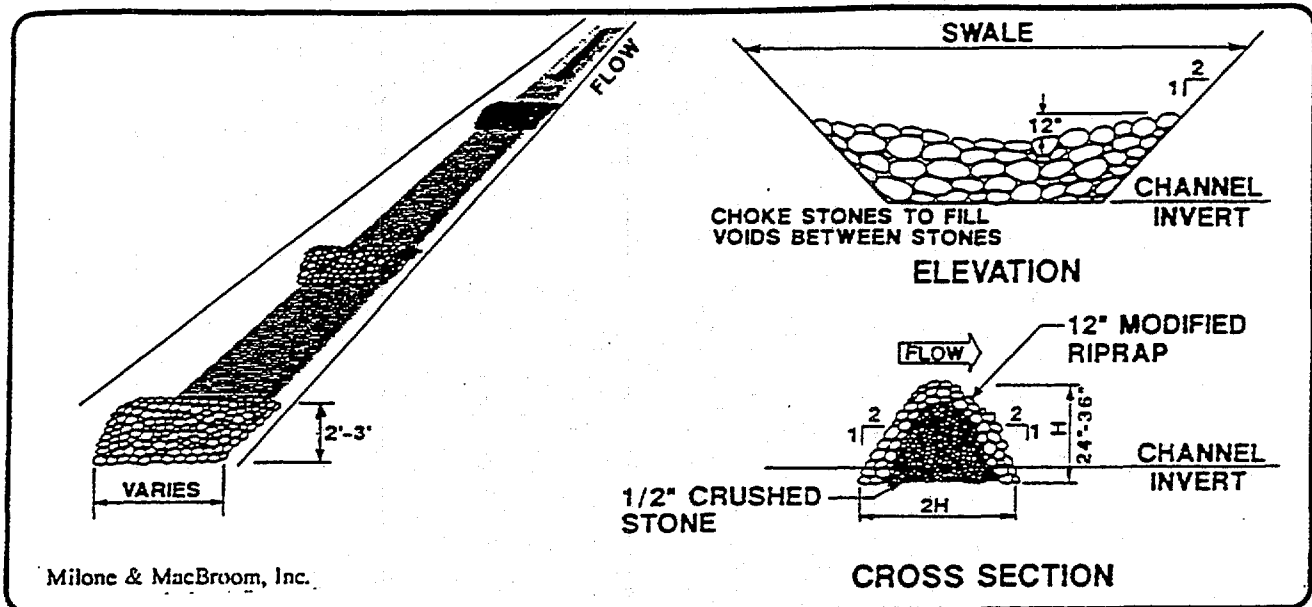
ADVANTAGES

- Promotes infiltration
- Attenuates small flows
- Filters particulate pollutants
- Usually less expensive than curb and gutter systems
- Keeps water away from street surface

LIMITATIONS

- Must often be used in combination with other BMP's to achieve stormwater management goals
- Maintenance (similar to lawn care) is required more than curbed systems
- Less compatible with sidewalks
- May require larger right-of-way

RIPRAP CHECK DAM



DESIGN CRITERIA

- Size to fit swale or channel dimensions
- Size swale and dams to avoid overbank flows

APPLICATIONS

- Temporary or permanent measure for existing channels
- Useful in new temporary or permanent drainage swales
- Used to reduce velocity in grass swales

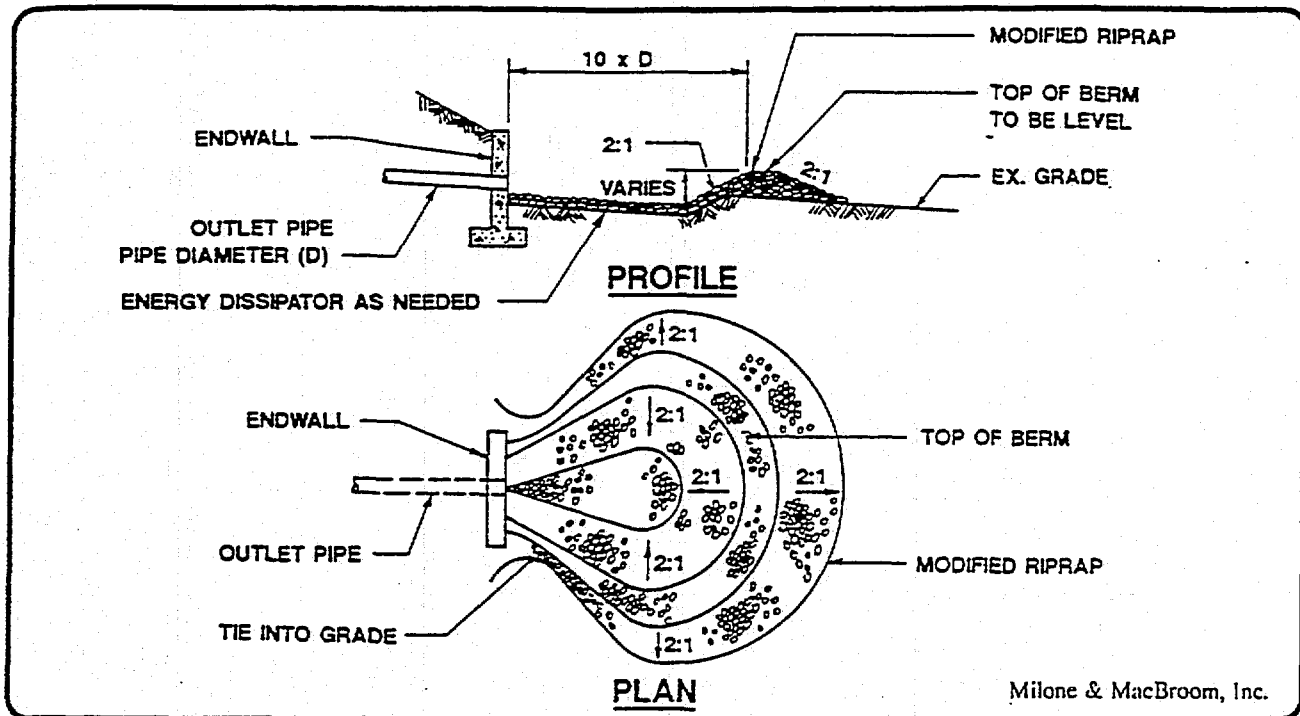
ADVANTAGES

- Acts to settle out coarse material
- Delays runoff timing for small storms
- Reduces velocity
- Distributes water over channel
- Increases infiltration in swales

LIMITATIONS

- Maintenance/stone replacement
- Must periodically remove accumulated sediments from behind dam

LEVEL SPREADER



DESIGN CRITERIA

- Utilize for moderate flows and small drainage areas
- Adjust dimensions for varying pipe sizes, flows, velocities
- Not suitable for velocities > 10 fps, diameter > 3 ft
- For larger outlets requiring energy dissipation, refer to Reference R17

APPLICATIONS

- Discharge to filter strips or vegetated swales
- Construct preferably on undisturbed soils discharging to stabilized downstream areas with moderate slopes

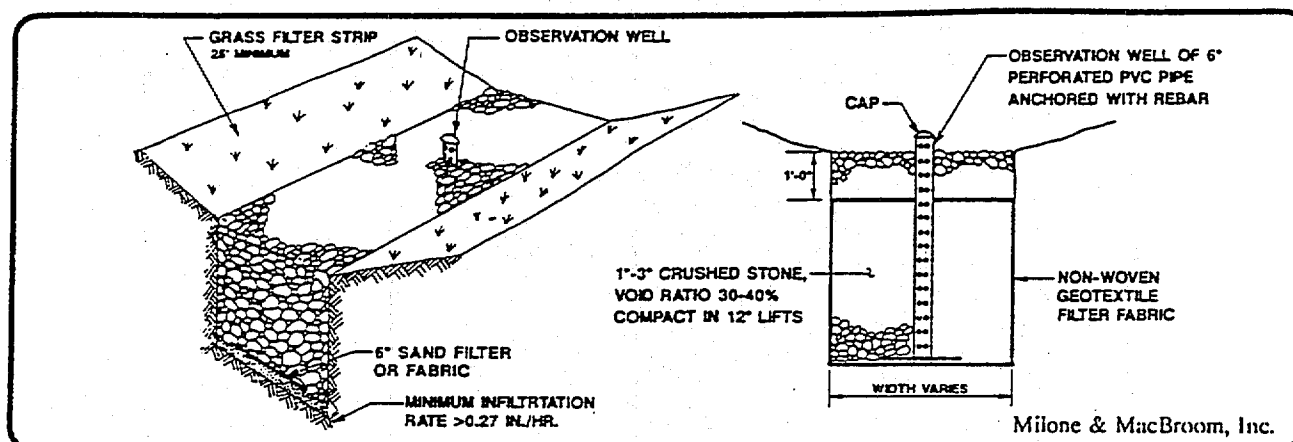
ADVANTAGES

- Slows erosive velocities
- Converts concentrated flow to sheet flow
- Settles coarse sediment
- Encourages infiltration

LIMITATIONS

- Periodic maintenance required after large rainfall events

INFILTRATION TRENCH



DESIGN CRITERIA

- Cannot be located in fill
- Locate a minimum 100 feet from a water supply well
- Provide 4 ft minimum clearance from trench bottom to bedrock
- Provide 2 to 4 ft minimum clearance from trench bottom to seasonally high water table
- Locate 10 ft downgradient and 100 ft upgradient of foundations
- Design for 3 day maximum draining time, 6 hours minimum
- Design to serve 5 acres or less
- Design to hold 1/2 inch of runoff from impervious acreage at a minimum
- All runoff should be pre-treated via sediment chambers or vegetative filter strips
- Drip line of trees should not extend over trench
- Trench bottom should be level
- Hydrologic Soil Groups A & B

VARIATIONS

- May be used with stone reservoir only
- May be located at base of vegetated swales behind check dams
- May be used in combination with a high level overflow pipe for partial exfiltration
- May be used with overflow berm or level spreader

APPLICATIONS

- Residential lots and small commercial areas
- Rooftop runoff
- Adjacent to parking areas with grass filter strips receiving sheet flow
- Highway medians
- Below swales

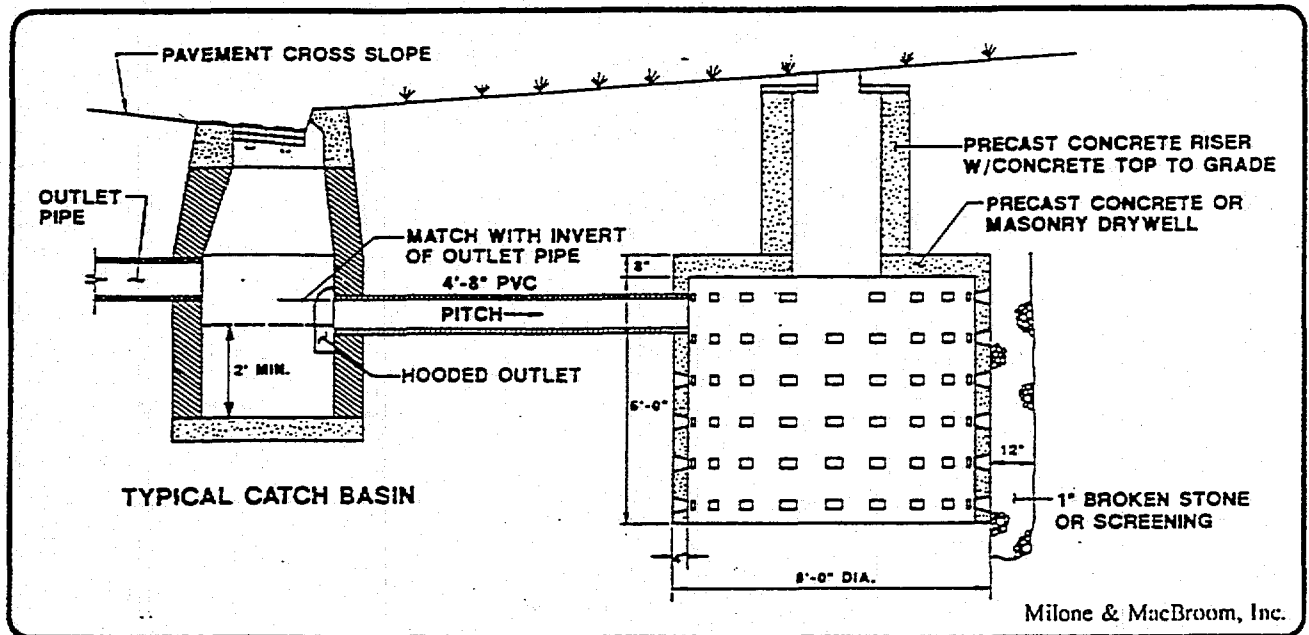
ADVANTAGES

- Easy to fit into site
- Reduces runoff
- Encourages infiltration
- Filters pollutants, metals proven to bind in soils
- Can nearly reproduce natural hydrological conditions
- Maintains baseflow

LIMITATIONS

- Periodic inspection required to monitor function
- Can clog with sediment
- Possible risk of groundwater contamination from spills
- Regular maintenance required
- Rarely achieves peak runoff control

CATCH BASIN - DRYWELL COMBINATION



DESIGN CRITERIA

Drywell must be located in soils with suitable infiltration capacity, hydrologic Groups A & B
 Distance of 2 to 4 feet from drywell bottom to seasonally high groundwater & bedrock req'd.
 Must pretreat runoff w/catch basin sump and hooded outlet to minimize clogging

APPLICATIONS

Areas with moderate pollutant and hydrocarbon loads
 Should be used in areas with well-drained soils to take advantage of infiltration
 Suitable for minor residential roads and small parking lots

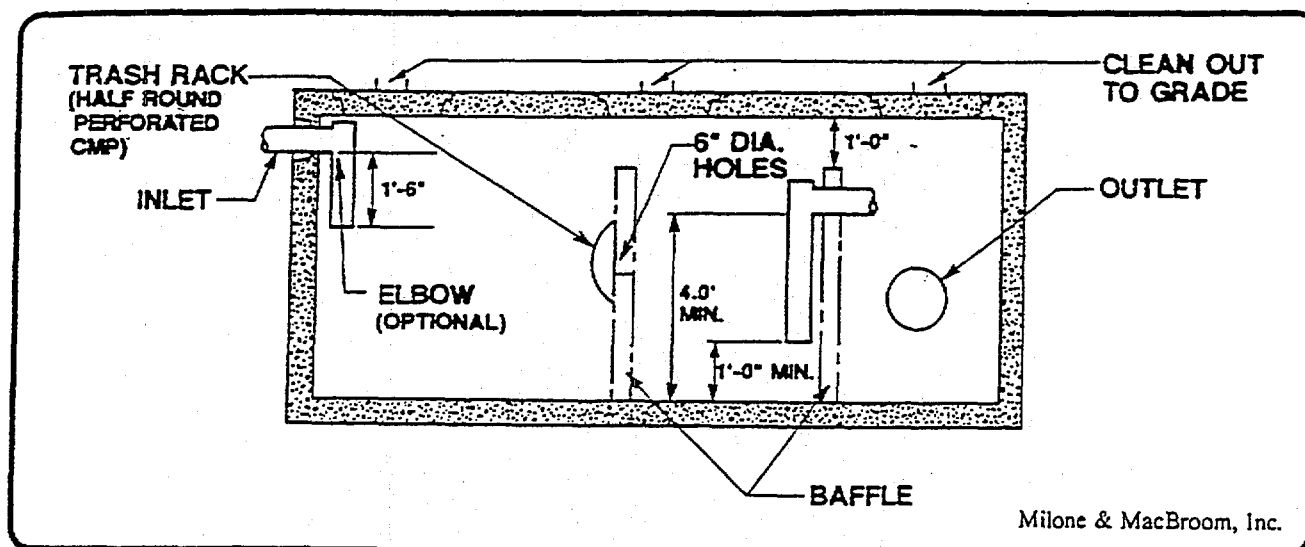
ADVANTAGES

Maintains groundwater table and base flows
 Renovates pollutants in first flush and frequent small storms
 Reduces peak flows

LIMITATIONS

Inspect yearly for ponding
 Cannot clean infiltration surface
 Signs of contamination are out of view

SEDIMENT CHAMBER



DESIGN CRITERIA

- Provide 400 cubic feet of storage per acre of contributing impervious area
- Minimize contributing area to 1 acre or less per unit
- Provide a high flow bypass where possible

APPLICATIONS

- Small and large parking areas with large hydrocarbon and sediment loads and vehicular traffic
- Use as a pretreatment prior to infiltrative systems to prevent clogging

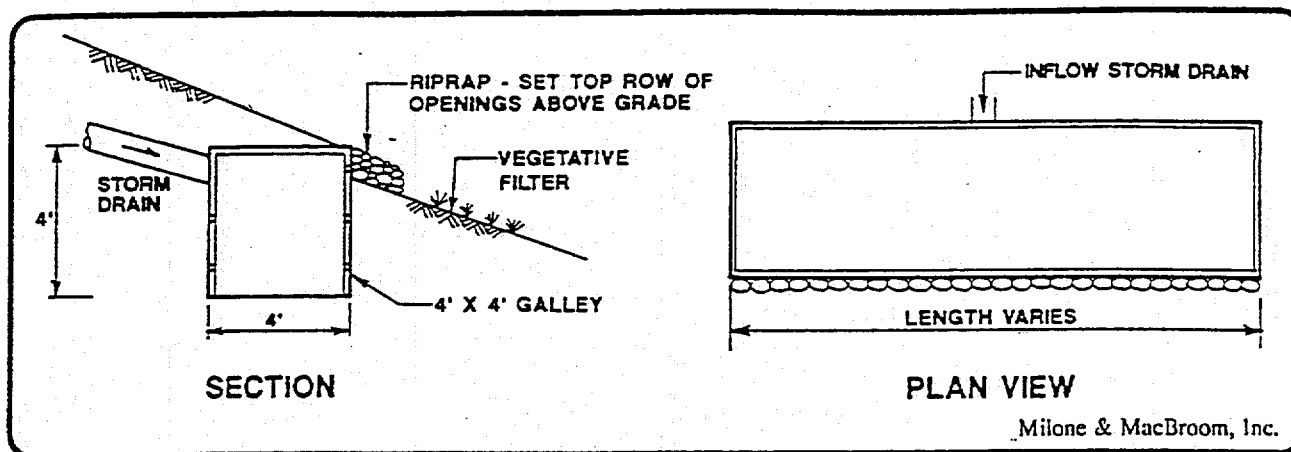
ADVANTAGES

- Removes coarse sediments
- Removes floatables
- Removes various hydrocarbon films

LIMITATIONS

- Must inspect 3 times yearly
- Limited pollutant removal capacity
- Possible re-suspension of fine settled pollutants

INFILTRATION GALLEY W/ LEVEL SIDE OVERFLOW



DESIGN CRITERIA

- Must be located in soils with suitable infiltrative capacity, hydrologic soil groups A and B
- Distance of 2 to 4 feet from galley invert to seasonally high groundwater and bedrock required
- Pre-treat runoff through hooded catch basin with sump or sediment chamber

APPLICATIONS

- Serves as an outlet for small drainage systems
- May be used for rooftop drainage
- Parking lots, driveways, recreation areas

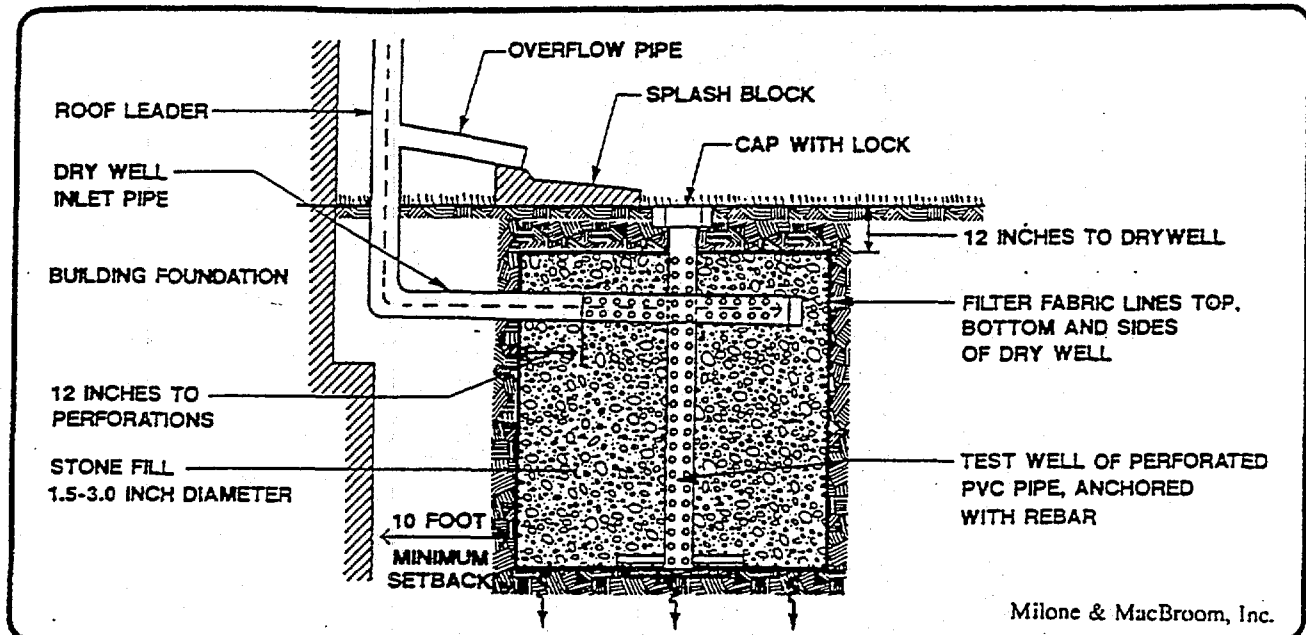
ADVANTAGES

- Infiltrates runoff from small storms
- Excess overflows similar to level spreader and vegetative filter

LIMITATIONS

- Runoff must be pre-treated to prevent clogging of soil

ROOFTOP INFILTRATION VIA DRYWELL



DESIGN CRITERIA

- Hydrologic Soil Groups A & B only
- Size with a volume to capture frequent storms up to 1/2" rainfall
- Provide gutter screens to protect from clogging with leaves
- Provide overflow pipe
- Provide two to four feet above groundwater & bedrock

APPLICATIONS

- To accept rooftop runoff from residential and commercial buildings
- Should not be placed near building underdrains otherwise infiltration will be short-circuited

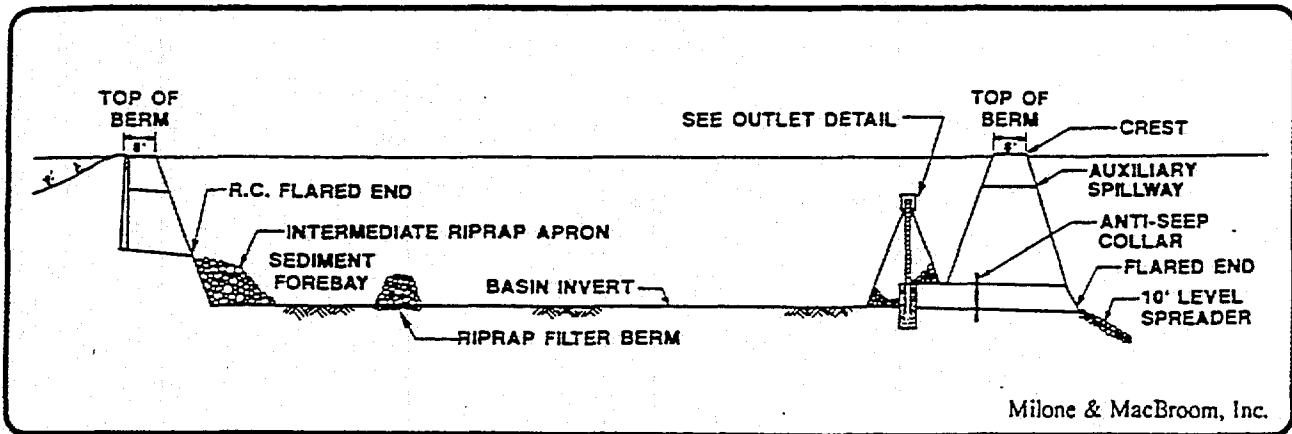
ADVANTAGES

- Reduces runoff volume
- Provides clean water infiltration to enhance groundwater supply
- Reduces size of storm drains required downstream
- Helps maintain base flow

LIMITATIONS

- Clogging possible
- Periodic rejuvenation may be required

SEDIMENT BASIN



DESIGN CRITERIA

- Provide 2 to 4 feet to groundwater
- Provide 2 to 4 feet to bedrock
- Provide maintenance access
- Provide auxiliary spillway outlet
- Maximize length of basin and length from inlet to outlet
- Utilize sediment forebay
- Provide landscaped buffer at perimeter
- Size to capture frequent storms (1/2")

- Plant with dense growth of water-tolerant grass, selection of which is site-specific (App. B)
- Till bottom periodically and after maintenance
- Pre-treat runoff
- Functions best as an off-line system with large flows bypassing
- 3:1 maximum side slopes
- Design basin floor with slope near zero

APPLICATIONS

- Parking lot systems
- Temporary measure during construction
- Permanent measure on large developments with high anticipated sediment load

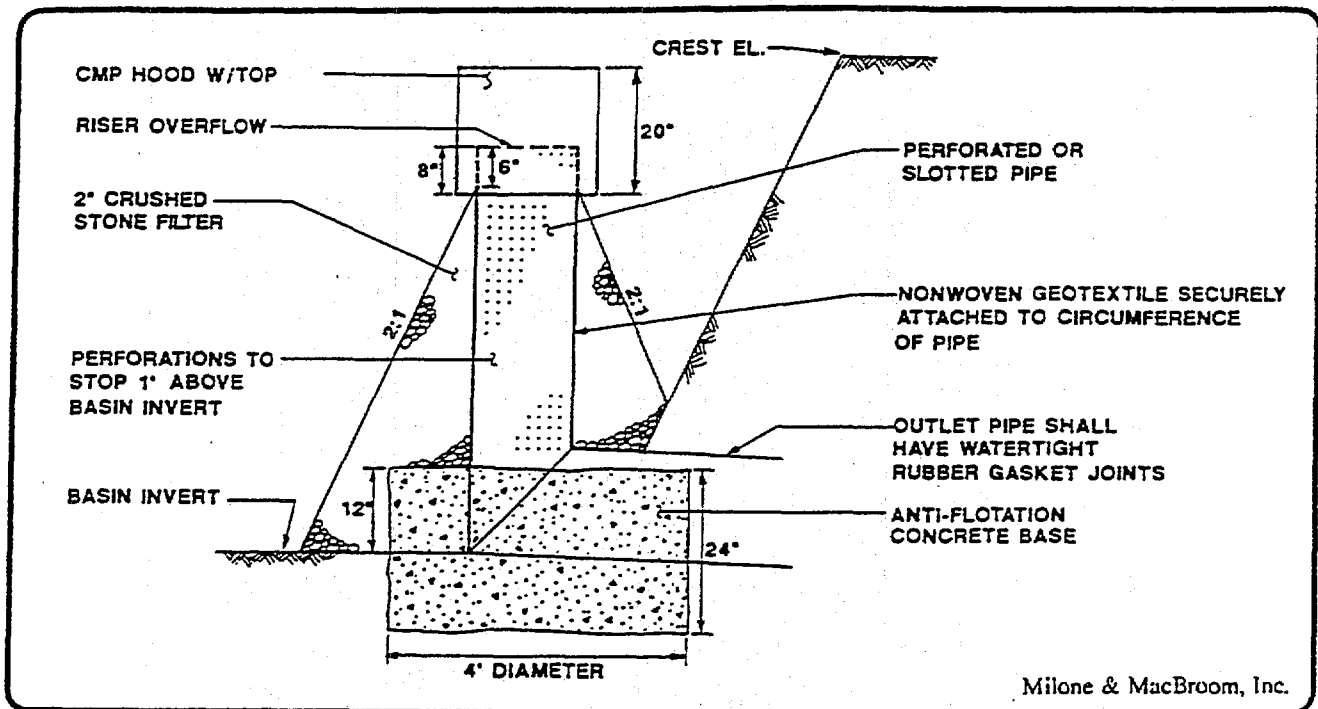
ADVANTAGES

- Traps floatables
- Traps coarse sediment
- Groundwater recharge
- Pollutant filtering

LIMITATIONS

- Sediment removal required
- Periodic inspection and maintenance required

SEDIMENT BASIN OUTLET



DESIGN CRITERIA

- Auxiliary spillway should be provided for high flows
- May be used for settling basins or infiltration basins due to metered outlet
- Provide hood to trap floatables

APPLICATIONS

- Sediment basins (temporary and permanent)
- Infiltration basins
- Ideal for off-line systems that capture small frequent storms

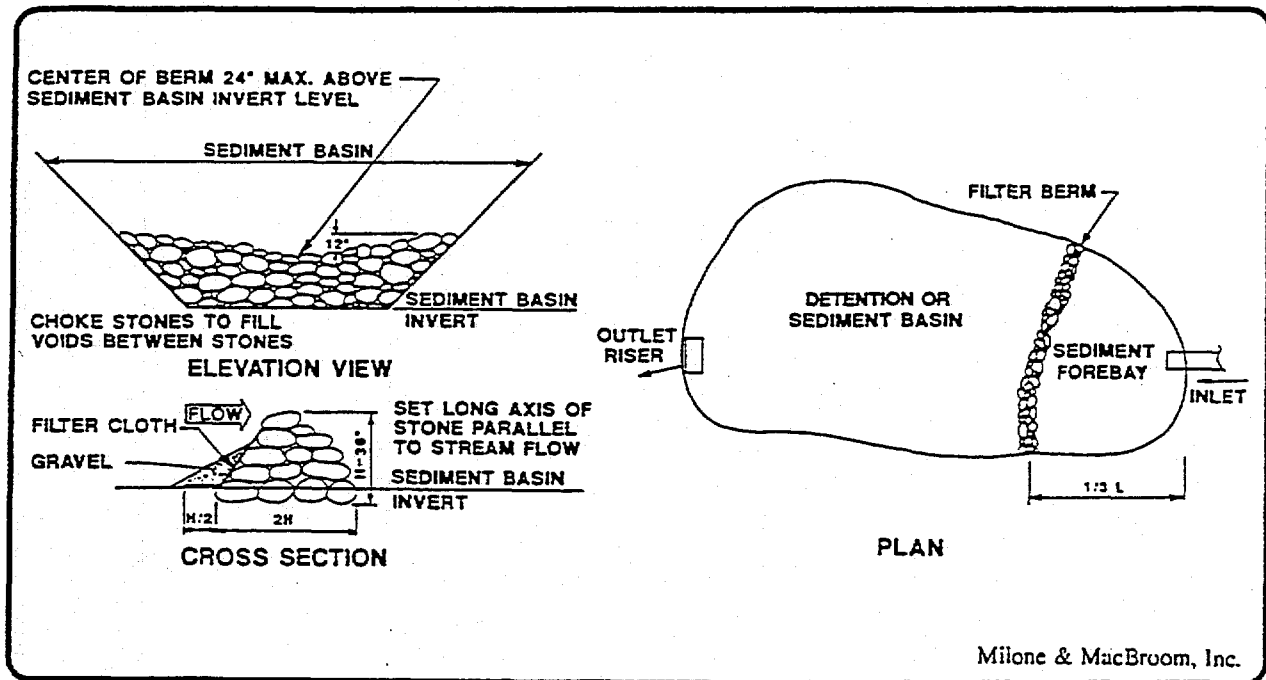
ADVANTAGES

- Hood traps floatables
- Slow metered discharge encourages settling

LIMITATIONS

- Does not accommodate high flows
- Periodically clean stone filter

SEDIMENT FOREBAY/RIPRAP FILTER BERM



DESIGN CRITERIA

- Place around basin inlets to create sediment forebay
- Size riprap for expected incoming velocities
- Typically use 4" dia. riprap with 1/2" dia. chokestone

APPLICATIONS

- Sediment basins
- Infiltration basins
- Dry detention basins
- Shallow wet basins
- Extended Detention Basin

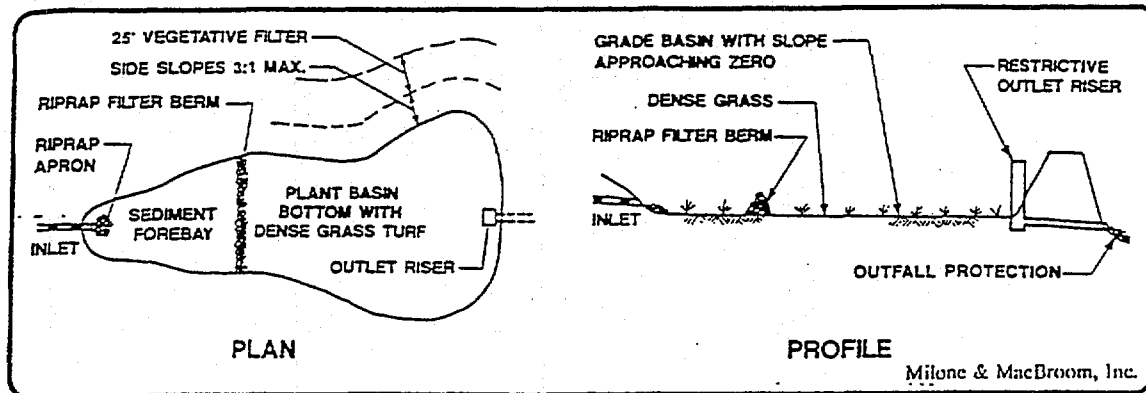
ADVANTAGES

- Prolongs life of basins
- Provides zone to trap coarse sediment before it fills entire basin
- Traps floatables

LIMITATIONS

- Maintenance required
- Filter fabric may clog and have to be replaced

INFILTRATION BASIN



DESIGN CRITERIA

- Maximize surface area of basin floor
- Pre-treat runoff to remove excess sediment load, floatables, and hydrocarbons
- Route flow through entire length of basin
- Prevent concentrated flow through basin, utilize sheet flow over entire width
- Provide for flow control should basins infiltration fail
- Utilize riprap apron at inlets
- Utilize sediment forebay
- Flat basin floor to promote uniform ponding
- Side slopes should not exceed 3:1
- Establish dense turf of water tolerant grass to maintain infiltration, trap pollutants, and uptake solubles (App.B)
- Basin should be tilled after final grading and periodically thereafter

- Design for 3 day maximum draining time, 6 hour min.
- Do not locate in fill soils
- Perform test borings and permeability tests
- Provide 2 to 4 feet minimum clearance to bedrock
- Provide 2 to 4 ft clearance to seasonally high groundwater table
- Locate a minimum 100 feet from drinking water wells
- Locate a minimum 10 ft downgradient and 100 ft upgradient of foundations
- Minimum infiltrative rate of 0.5 in/hr desired
- Provide maintenance access
- Provide a 25 ft vegetated buffer around the basin perimeter
- Area should be protected during site construction to avoid soil compaction and raw sediment input
- Basin should be mowed regularly, clippings removed

VARIATIONS

1. A first flush basin where the first 1/2 inch of runoff is directed to the basin. All larger flows bypass. This provides more efficient pollutant removal.
2. Combination detention/infiltration basin whereby more frequent flows are detained to infiltrate with no outflow. Larger storms utilize the basin's volume to attenuate peak flows in conjunction with a controlled outlet.
3. Full infiltration basin whereby all design storms are fully detained and infiltrated. An emergency overflow system should be provided in case infiltration fails.

APPLICATIONS

- Commercial and large residential developments
- Drainage areas of 5 to 50 acres
- During construction, bottom should be left at 2 ft above final grade and used as a temporary sediment basin
- Any site with well drained soils (hydrologic Groups A & B)
- Should not be used in areas where contaminant spills are likely (industrial areas)

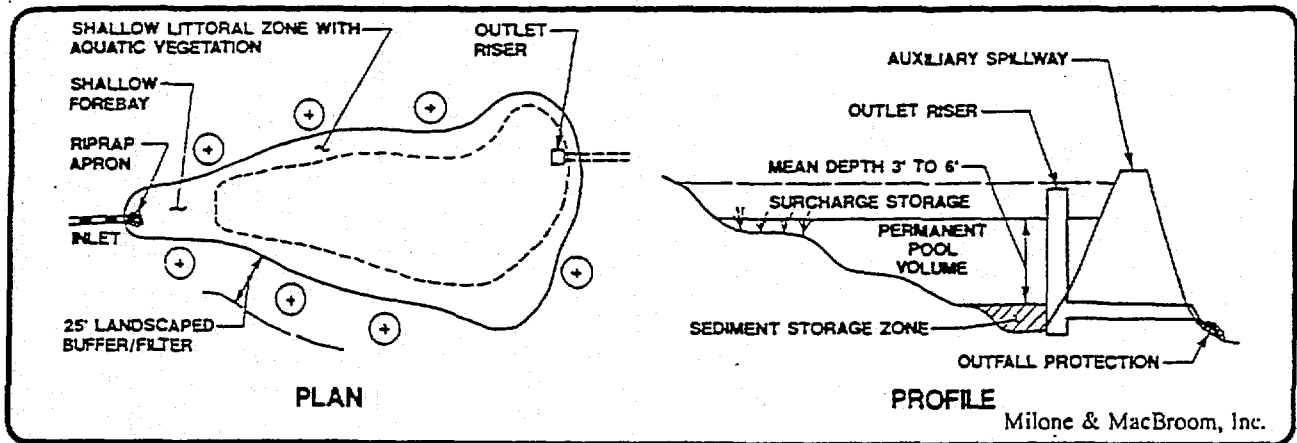
ADVANTAGES

- Removes soluble and particulate pollutants
- Can control peak discharges
- Can serve large drainage areas
- Groundwater recharge
- Preserves natural water balance
- May be used as recreational space

LIMITATIONS

- Fairly frequent maintenance
- High failure rate due to poor soils and poor design
- Infiltration rate may ultimately be determined by accumulated sediments
- Requires relatively large area

WET POND



DESIGN CRITERIA

Provide storage volume 2.5 times watershed runoff vol.
 Provide average hydraulic residence time of 2 weeks
 Mean depth (V/SA) of 3 to 6 feet, avoid thermal stratification
 Minimum permanent pool surface area of 0.25 acre
 20 - 25 acre minimum drainage area desired
 Side slopes 3:1 or flatter
 Loam and plant 2 ft. below and 1 ft above normal stage
 Maximize length to width ratio (3:1 minimum) and distance from inlet to outlet
 Locate in poorly drained soils (C, D) or compact existing soils to minimize drawdown

Surcharge storage may be provided for flood control
 Provide stilling basins at pond inlets
 Provide emergency low level outlet
 Utilize sediment forebay
 Provide 25 ft vegetated landscaped buffer around pond utilizing marsh and wetland species
 Submerged baffles may be used to lengthen flow path
 Littoral zone should cover 30% of pond's area
 Provide shallow slope (6:1) for littoral zone 2 ft deep
 Forebay way be utilized in upper littoral zone

APPLICATIONS

Use where high nutrient control is required including discharges to reservoirs and lakes

Watersheds of tidal embayments and estuaries

Applicable to larger developments greater than 20 acres in size with base flow runoff

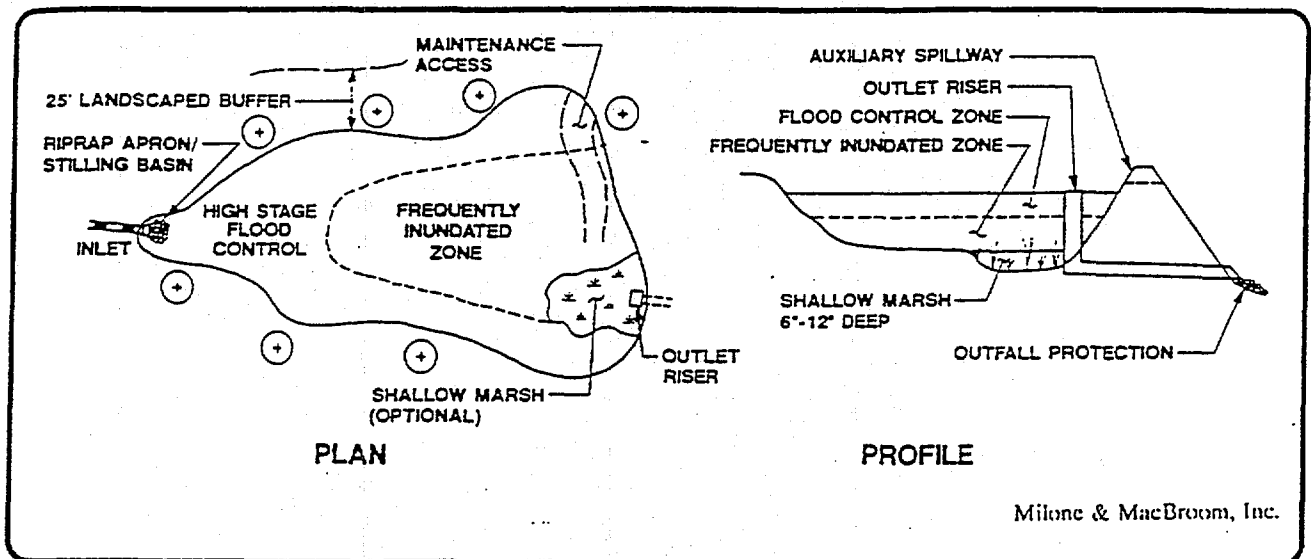
ADVANTAGES

Downstream eutrophication management
 Aesthetic and habitat value
 Wetlands creation
 Less maintenance than dry basins
 High removal of sediment, metals, BOD, and nutrients
 Recreation and landscape amenity
 Can provide runoff peak control

LIMITATIONS

Large land area required
 Potential for thermal discharges
 Possible difficulty permitting in existing wetlands
 Occasional nuisance problems (odor, debris, algae)
 Periodic sediment removal
 Possible safety problem

EXTENDED DURATION DETENTION BASIN



DESIGN CRITERIA

Create optional small 6"-12" deep wet pool or marsh at riser outlet to treat soluble pollutants.
 Utilize two-stage design to pass excessive flows and detain smaller, more frequent flows.
 Design to control a range of storms.
 Side slopes should not exceed 3:1
 Capture first flush (1/2") volume minimum and release over 24 hours or longer.
 Maximize distance between inlet and outlet.
 Maximize length to emulate plug flow particulate settling
 Install stilling basin or riprap apron to slow inlet velocities
 Sediment forebay may be utilized

The lower stage should be sized to accept the runoff from the mean storm event and structured to accept regular inundation.
 The upper stage should be graded to drain quickly and only be inundated infrequently.
 Locate preferably in B or C soils
 Provide maintenance access
 Provide 25' landscaped buffer/filter
 Provide emergency low level outlet to drain wet pool
 For dry detention basins, provide perforated under-drain auxiliary outlet

APPLICATIONS

Retrofit for existing dry basins
 Large residential developments, commercial and industrial complexes
 Regional control measure

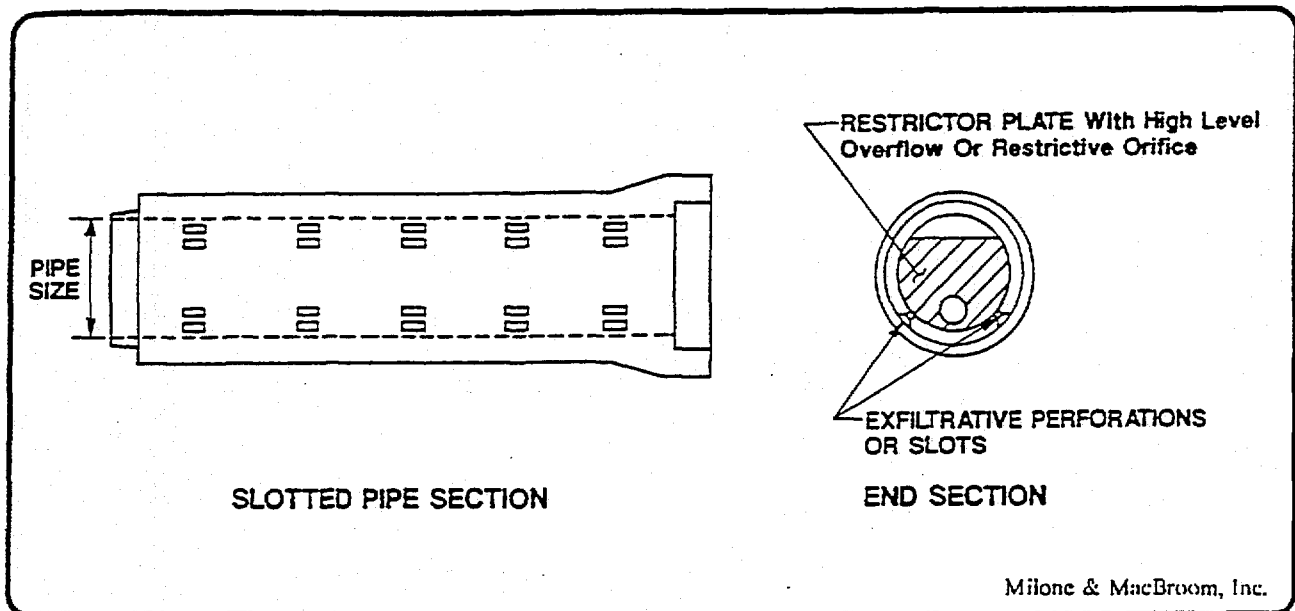
ADVANTAGES

Flood control
 Particulate pollutant removal
 Soluble pollutants removed with wet pool
 Possible recreational use and habitat
 Easy to retrofit old installations

LIMITATIONS

Occasional nuisance in wet portion
 Moderate maintenance
 Sediment removal
 Unattractive

UNDERGROUND EXFILTRATION STORAGE



Milone & MacBroom, Inc.

DESIGN CRITERIA

- Provide two to four feet from pipe invert to groundwater
- Two to four feet to bedrock
- Pre-treat runoff to remove sediment
- Use in moderate and well drained soils
- Place pipes flat with no slope
- Size for 1/2" runoff minimum before outflow
- Can store more runoff in combination with stone bed

APPLICATIONS

- Under parking lots due to space considerations
- Applicable where basins may be unsightly
- Can oversize to control peak discharges by storing runoff

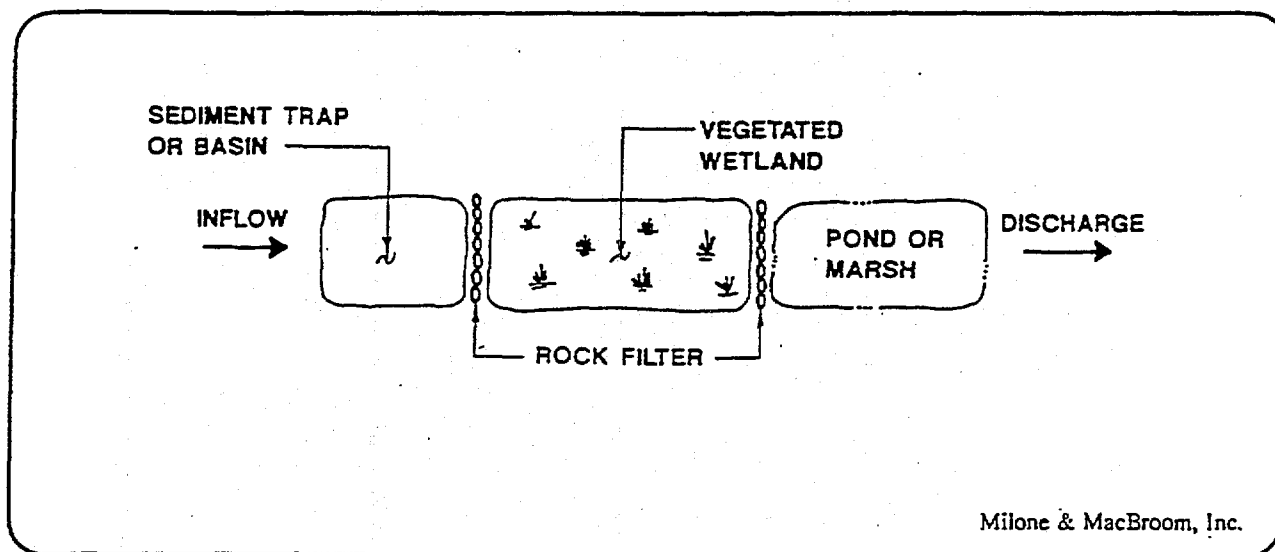
ADVANTAGES

- Commercially available
- Takes little area
- Out of sight
- Groundwater recharge
- Pollutant filtering
- Reduces peak flows

LIMITATIONS

- Cost
- Difficult to restore infiltrative capacity if it fails
- Difficult to monitor
- Frequent cleaning of sediment traps required
- Requires pretreatment of runoff

WETLAND TREATMENT SYSTEMS



DESIGN CRITERIA

Usually a sequence of multiple cells, consisting of a sediment basin, nutrient removal (vegetated wetland) and a clarifier (pond or marsh).
 Pollution removal occurs due to sedimentation, filtration, biological use, chemical reduction.
 Size should be 1-3 percent of watershed.

APPLICATIONS

Sites with large pollution and runoff loads
 Helps mitigate the loss of natural wetlands

ADVANTAGES

Multiple treatment systems
 Nutrient and sediment reductions
 Helps wildlife and groundwater recharge

LIMITATIONS

Requires mild slopes
 Requires larger land area
 Biologically sensitive
 Nutrient removal varies
 Organic soils necessary

CHAPTER 2 - SOIL EROSION
& SEDIMENTATION

SOIL EROSION AND SEDIMENTATION AS A NONPOINT SOURCE OF POLLUTION

HOW ARE SOIL EROSION AND SEDIMENTATION NONPOINT SOURCE POLLUTION?

Pollution can originate in one of two ways:

“point” sources of pollution - pollution which originates from well-defined, usually manufactured “points” or locations such as municipal and industrial sewage treatment plants, combined sewer overflows and other wastewater discharge pipes; and

“nonpoint” sources of pollution - pollution originating from land use and man’s activities, having no well-defined point of entry, such as urban stormwater runoff including street and parking runoff, agricultural and lawn runoff, soil erosion and leachate from landfills and failing septic systems.

Soil erosion and sedimentation qualify as a nonpoint source of pollution with unstabilized soils being eroded and transported over the surface of the land, and often deposited in unfavorable locations.

Erosion - wearing away of the surface of the land by the action of water, wind, ice and gravity

Sedimentation - the deposition of transported soil particles due to a reduction in the rate of flow and transport energy of water carrying these particles

The process of soil erosion and sedimentation occurs in three stages:

detachment → transport → deposition

Once soil is worn away by erosion, the eroded soil is transported and ultimately deposited. Natural or geologic erosion and sedimentation occur at a very slow rate over long periods of geologic time resulting in the wearing away of mountains and the building up of floodplains, some coastal plains, deltas, etc. Erosion and sedimentation become a problem when they are accelerated beyond natural rates. Accelerated erosion and sedimentation are much more rapid than natural erosion and sedimentation. They are primarily the result of influence of man’s activities on the environment. Once exposed, unprotected soil is then subject to rapid erosion, primarily by the action of water.

Land use officials should focus on accelerated water erosion rather than erosion caused by wind, ice and gravitational forces.

Types of Erosion

raindrop erosion or raindrop splash starts the erosion process. Individual soil particles and small soil aggregates are detached and transported with splashing water droplets as the raindrop impacts the soil. Very fine sediments can become suspended in water and then are susceptible to sheet erosion.

sheet erosion is the removal of a thin, fairly even layer of soil from the land surface caused by shallow sheets of water running off the land. The water flow transports soil particles which are detached by raindrop impact.

rill erosion develops as shallow surface flows begin to concentrate in the low spots of the irregular conformation of the land surface. As the flow changes from the shallow sheets to deeper flow in these low areas, the velocity and turbulence of flow increase. The energy of this concentrated flow is able to both detach and transport soil materials. These soil particles bump into other particles, increasing sediment and cutting tiny channels. Rills are these small but well-defined channels which are only a few inches deep.

gully erosion occurs as the flows in rills come together to form larger gully channels. Gullies are too large to be repaired with conventional tillage equipment and usually require heavy earth moving equipment and special stabilization techniques.

stream channel erosion occurs as the volume and velocity of runoff concentrate in drainage channels and cause movement of the streambed and bank materials.

shoreline erosion occurs as daily high tides, wave action and storm surges erode coastal and estuarine shorelines.

WHY IS IT IMPORTANT?

The act of erosion results in the transport of soil as sediment as well as the transport of associated nutrients and pollutants which adversely impact streams, rivers, wetlands and coastal waters. The disturbance of land during development results in the removal of vegetative cover. Further, excavation, filling and stockpiling operations result in uncompacted soil being subjected to the erosive action of concentrated surface flows. These land use changes are the source of much of this polluting sediment transport. The high sediment volumes resulting from rill erosion require costly on- and off-site clean-up and the continual need for site stabilization during site development.

This potential for erosion and sedimentation during land disturbance activities is one example of how land use is strongly linked to water quality. Erosion and sedimentation is one type of nonpoint source pollution, being pollution with no well-defined point of origin, which should be controlled at its source through the site plan review process. Due to the great potential for pollution of inland and coastal surface waters by erosion and sedimentation, it is essential that individuals working in all different aspects of municipal land use understand this source of pollution and how to control it.

WHAT HARM DOES IT POSE?

As erosion occurs, soil washes into waterways and wetlands increasing the suspended soil particles in the water and, in turn, causing impacts ranging from clogged gills in fish to impediments to navigation in rivers and harbors. These impacts can be grouped in terms of biological, chemical and physical consequences with specific impacts dependent upon the particle size of the sediment.

Biological Impacts

Course particles:

- burying of benthic (bottom dwelling) organisms
- habitat degradation by damaging rooted plants and changing substrate (e.g., cobble to sand)
- decrease in biological diversity

Fine particles:

- loss of aquatic eggs, larva and fry
- clogging of fish gills increasing disease susceptibility
- damage to food chain
- decreased biological diversity
- increased algal blooms in downstream impoundments
- reduced ability to grow plants on eroded land

Chemical Impacts

Course particles:

- water temperature increase from increased sunlight absorption caused by shallowing of water body

Fine particles:

- adsorption of pollutants on fine particles, e.g., oils and metals
- nutrient transport (causing increased eutrophication of downstream water bodies and lost fertility from eroded land)
- water temperature increase from sunlight absorption caused by water cloudiness or turbidity
- low dissolved oxygen levels
- decreased light penetration due to cloudy conditions

Physical Impacts

Course particles:

- reduced channel capacity resulting in navigational obstructions requiring dredging
- reduced flood storage resulting in increasing future damage from floods and increasing frequency of floods

- increased maintenance on culverts and storm drains
- loss of reservoir storage capacity for drinking and industrial water supply

Fine particles:

- turbidity adversely affecting use of surface water for drinking supply and manufacturing uses (increased filtration costs)
- poor aesthetics

Stormwater runoff is the most prevalent transporter of sediment with clean runoff picking up and transporting soil particles to surface and coastal waters.

Runoff is the portion of precipitation, snow melt or irrigation that flows over the ground (instead of being absorbed into the ground or retained on the surface) which eventually makes its way to surface waters.

Polluted runoff is rainwater and snowmelt which has become contaminated by picking up pollutants and sediment as it runs off streets, lawns, parking lots, agricultural lands, marinas, landfills and any other sites being used for activities which can generate pollutants.

Land development activities can have an effect on the amount of sediment leaving a site via stormwater runoff depending upon the sediment and erosion controls utilized. Development activities result in:

- decreased vegetation
- decreased infiltration into the soil
- reduction in wetland and depression storage
- increased impervious land cover

In turn, these changes in the land result in:

- increased volume of runoff
- higher runoff flow velocities
- higher peak flow rates
- increased channel erosion
- increases in flood hazards and resultant damage
- water quality degradation

Therefore, land use officials must be aware of these changes in land cover as a potential source of pollution and act to minimize and mitigate it as much as possible.

ARE MUNICIPALITIES REQUIRED TO CONTROL SOIL EROSION AND SEDIMENTATION?

Yes. C.G.S. sections 22a-325 through 22a-329, inclusive, known as the Soil Erosion and Sedimentation Control Act, establishes the state's soil erosion and sediment control program. The program is a statewide coordinated effort to reduce the danger from stormwater runoff, minimize nonpoint sediment pollution from land being developed, and conserve and protect the land, water, air and other environmental resources of the state. The Act mandates that after July 1, 1985, municipal zoning and subdivision regulations include provisions for soil erosion and sediment control. The regulations are also mandated to require the submission and certification of a soil erosion and sediment control plan with any application for development when the disturbed area is more than one-half acre. Disturbances of less than one-half acre and single family homes that are not part of a subdivision are exempt.

Further, in accordance with C.G.S. Sections 22a-28 through 22a-45, the Inland Wetland and Watercourses Act, eroded sediment is a pollutant and the processes of erosion and sedimentation are regulated activities. The Act mandates that municipalities regulate inland wetlands and watercourses within their boundaries in order to prevent pollution caused by eroded soil.

WHAT IS THE GOAL IN MANAGING SOIL EROSION AND SEDIMENTATION?

Key Guidelines for Soil Erosion and Sedimentation Control

The goal of soil erosion and sedimentation control, as provided for in state statute, is to reduce the danger from stormwater runoff, minimize nonpoint sediment pollution from land being developed, and conserve and protect the land, water, air and other environmental resources of the state. The following principles constitute the key guidelines of soil erosion and sedimentation control:

- plan development to fit environmental conditions
- keep land disturbance to a minimum
- slow the flow of water over the site
- keep off-site generated runoff segregated from on-site conditions
- reduce on-site potential internally, installing perimeter controls as backup
- implement a thorough maintenance and follow-up program

Plan development to fit environmental conditions

Select sites that are suitable by their nature for specific proposed activities. Sites should be developed in conformance with the limitations of resource constraints rather than attempting to modify sites to conform with the proposed activities. Goals are to insure that roadways, buildings and other permanent features of development conform to the natural characteristics of the site by minimizing cut and fill requirements, avoiding or minimizing alterations to wetlands, watercourses, beaches, dunes and steep slopes, avoiding the placement of obstructions in flood hazard areas and floodplains, and taking into account erodability and slope of the soil to be disturbed.

Keep land disturbance to a minimum

Keeping land disturbance to a minimum not only involves minimizing time of exposure but also extent of exposure of disturbed soils through techniques such as early slope stabilization, phasing and sequencing. Phasing and sequencing of construction should be done thoughtfully. For example, consideration should be given to restricting the start of subsequent phases until earlier phases are stabilized. Also, natural vegetation should be preserved as much as possible.

Slow the water flow

Detachment and transport of eroded soil must be kept to a minimum by absorbing and reducing

the erosive energy of water. This erosive energy increases as the volume and velocity of runoff increase. These increases occur during development as a result of reduced infiltration rates caused by the removal of existing vegetation and the creation of impervious surfaces. From raindrop splash to gully erosion, these increases must be taken into account when providing for erosion control. The erosion and sedimentation controls must be used to absorb the erosive energies within their structural limitations. In addition, many erosion and sedimentation controls must be designed and installed to have the capacity to store previously eroded sediments.

Keep off-site generated runoff segregated from on-site conditions

The smaller the volume of the sediment-laden water requiring filtration, the easier and cheaper it is to filter runoff and collect sediments. Erosion controls and stormwater management measures should be positioned to prevent clean water from entering and running over disturbed areas. Additionally, the mixing of clean off-site generated runoff with on-site sediment-laden runoff should be prevented until after adequate filtration of on-site waters has occurred.

Reduce on-site potential internally, installing perimeter controls as backup

While it may seem less complicated to collect all waters to one point of discharge for treatment and just install a perimeter control, it is more effective to apply internal controls to many small sub-drainage basins within the site and use perimeter controls as backup. By reducing sediment loading from within the site, the chance of perimeter failure and the potential off-site damage that it causes is reduced. The repair of off-site damage is generally more expensive than installation of proper internal controls. Control sediment generation and deposition within the site and use perimeter controls as a backup.

Implement a thorough maintenance and follow-up program

A failing control that is not promptly repaired is like having no control at all. A site cannot be effectively controlled without thorough periodic checks of the erosion and sediment control measures and subsequent repairs of failures. These measures must be maintained just as construction equipment must be maintained and materials checked and inventoried. Monitoring and maintenance of erosion and sediment controls is essential to the success of an erosion and sediment control plan.

WHAT IS THE IMPLEMENTATION MECHANISM?

State statutes mandate that municipalities require the submission and certification of a soil erosion and sediment control plan with any application for development when the disturbed area is more than one-half acre. Disturbances of less than one-half acre and single family homes that are not part of a subdivision are exempt. These plans include the use of control measures, also known as best management practices.

Best Management Practices (BMPs) - practices which reduce or prevent the discharge of pollutants to surface and groundwaters and which have been determined to be acceptable based upon technology, economic and institutional feasibility.

Below is a listing of various types of BMPs for soil erosion and sedimentation control. For a complete description of each measure, *Connecticut Guidelines for Soil Erosion and Sediment Control* (1984), as amended, should be consulted.

Three categories of measures:

Vegetative Measures

Non-structural Measures

Structural Measures

Vegetative Measures

- Temporary vegetative cover (TV)
- Permanent vegetative cover (PV)
- Sodding (SO)
- Trees, shrubs, vines and ground cover (GC)
- Tree protection (TP)
- Vegetative streambank stabilization (VP)

Nonstructural Measures

- Temporary mulching (MU)
- Permanent mulching (PM)
- Dust control (DC)
- Topsoiling (TO)
- Land grading (LG)
- Sediment barriers (ST)
- Silt curtain (SI)

Structural Measures

- Grassed waterway (GW)
- Diversion (DV)
- Permanent lined waterway (LW)
- Sediment basin (SB)
- Detention basin (DB)
- Construction entrance (CE)
- Outlet protection (OP)
- Subsurface drain (SD)
- Riprap (RR)
- Gabions (G)
- Reinforced concrete retaining wall (RW)
- Precast cellular blocks (CB)
- Prefabricated retaining wall (PW)
- Grade stabilization structure (GS)
- Temporary stream crossing (SC)
- Temporary channel lining (TL)

Selection of the most appropriate BMPs is critical in achieving the most effective control of soil erosion and sedimentation. The following flow chart/planning matrix and basic steps for selection can be used to guide the choice of control measures.

Measure Selection Matrix

Control Measure Selection Process

IDENTIFY CONTROL PROBLEM	IDENTIFY PROBLEM AREAS	IDENTIFY REQUIRED STRATEGY	IDENTIFY CONTROL MEASURE GROUP	SELECT SPECIFIC CONTROL MEASURE	PLAN KEY	
CONTROL SOIL MOVEMENT	Graded Areas	Protect Surface Manage Surface Water	Vegetative Soil Cover	Temporary Vegetative Cover	TV	
Sheet and Rill Erosion	Slopes			Permanent Vegetation Cover	PV	
Wind Erosion	Small Areas			Sodding	SO	
Protect Onsite Areas	Exposed Areas			Trees, Shrubs, Vines & Ground Cover	GC	
Natural Resource Degradation	Travel Areas		Nonvegetative Soil Cover	Vegetative Streambank Protection	VP	
	Borrow and Stockpile Areas		Manage Site Resources Protect Amenities	Temporary Mulching	MU	
			Environmental Enhancement	Permanent Mulching	PM	
				Tree Protection	TP	
				Topsoiling	TO	
				Land Grading	LG	
CONTROL WATER MOVEMENT	Drainageways	Direct Runoff	Diversions	Diversions	DV	
Gully Erosion	Watercourses	Convey Runoff	Waterways	Grassed Waterway	CW	
Channel and Stream Erosion	Steep Slopes			Temporary Channel Lining	TL	
Protect Onsite and Offsite Areas	Long Slopes			Permanent Lined Waterway	LW	
Natural Resource Degradation		Stabilize Outlets	Outlets	Outlet Protection	OP	
		Intercept Ground Water	Enclosed Drainage	Subsurface Drain	SD	
				Riprap	RR	
				Gabions	G	
		Stabilize Steep Slopes	Stabilization	Reinforced Concrete Retaining Wall	RW	
		Stabilize Watercourses	Structures	Precast Cellular Blocks	CB	
				Prefabricated Retaining Walls	PW	
				Grade Stabilization Structure	GS	
	CONTROL SEDIMENT MOVEMENT	Large Areas	Trap Sediment	Sediment Control	Sediment Basin	SB
	Protect Offsite Areas	Small Areas	Detain Runoff		Detention Basin	DB
Wind Erosion	Waterbodies			Temporary Stream Crossing	SC	
Natural Resource Degradation	Travel Areas	Control Sediment	Mud and Dust Control	Dust Control	DC	
	Borrow and Stockpile Areas			Construction Entrance	CE	
			Filter Sediment	Sediment Filters	Sediment Barriers	ST
				Silt Curtain	SI	
STEP 1	STEP 2	STEP 3	STEP 4	STEP 5		

STEP 1

STEP 2

STEP 3

STEP 4

STEP 5

While commission members and municipal land use staff should not be expected to design soil erosion and sedimentation controls for applicants, they should have an understanding of these controls in order to adequately evaluate land use proposals under their review.

Selection of Erosion and Sediment Control Measures

In determining the most effective erosion and sedimentation measures, the first concern should be minimizing soil detachment followed by soil transport and lastly soil deposition. Proposed plans should aim to keep the soil covered as much as possible with temporary or permanent vegetation or with various mulch materials.

Proposed practices should keep runoff velocities to a minimum, and effectively isolate the development site from surrounding areas as a backup to internal controls. Infiltration of runoff from disturbed soils should be allowed prior to discharge into off-site runoff.

Five basic steps in selecting the most appropriate BMPs:

1. Identify Problem Areas

Identify areas that are to be disturbed. Areas where erosion is to be controlled will usually fall into the three categories of slopes, graded areas and drainageways. Slopes include graded rights-of-way, stockpile areas, and all cut or fill slopes. Graded areas include all stripped or filled areas other than slopes. Drainageways are areas where concentrations of water flow naturally or artificially and the potential for gully erosion is high.

Problem areas where sediment is to be controlled fall into two categories:

small areas - usually considered to be areas of one acre or less where filtering or settling of sediment can be accomplished

large areas - include any drainage area larger than one acre where sediment must be trapped

2. Identify the Control Problem

The three basic methods used to control erosion and sedimentation on construction sites are:

1. soil stabilization
2. runoff control
3. sediment retention

1. *Soil stabilization* should be used as the first line of defense, particularly where soil properties and topography of the site make the design of sediment trapping facilities

impractical or where much of the site will not be disturbed and much of the existing vegetation can be preserved. Where soil stabilization is not possible, select runoff control and sediment control measures for installation before the contributing area of soil disturbance is expected to occur.

2. *Runoff control* is necessary to direct runoff around and through disturbed areas or areas in the process of being stabilized. They divide the erosion areas into sufficiently small sub-watersheds so that sediment retention measures like sediment barriers can be effective.

3. *Sediment retention* is used on large developments where major grading is planned, where it is impossible or impractical to control erosion. It is also used on large and small sites where sensitive areas such as wetlands and watercourses can be impacted by off-site sediment deposition.

3. Identify the Required Strategy

There may be several strategies used individually or in combination to provide the solution. For example, if there is a cut slope to be protected from erosion, the strategies may be to protect the ground surface, divert water from the slope or shorten it. Any combination of the above can be used.

When combination strategies are proposed, techniques to establish vegetation should be implemented as early as possible, using mulch whenever areas are seeded or not actively being worked. If no rainfall except that which falls on the slope has the potential to cause erosion and if the slope is relatively short, protecting the soil surface is often all that is required to solve the problem.

Structures are generally more costly and less efficient than vegetative controls. However, they are often necessary since not all disturbed areas can be protected with vegetation. Structural measures are often used as a second or third line of defense to capture suspended sediment before it leaves the site.

- diversions, stone dikes, silt fences and similar measures can be used to break flow lines and dissipate stormwater energy
- runoff should be directed and filtered to adjoining undisturbed areas to minimize the creation of concentration of flows
- concentrated runoff from development should be safely conveyed to a stable outlet using riprapped channels, stable waterways, diversions, storm drains or similar measures
- construction site runoff should be kept isolated from wetlands, watercourses and drainageways that flow through or near the development until the sediment in that runoff is trapped or filtered

- conveyance systems should be designed to withstand the velocities of projected peak discharges
- trapping and detaining runoff should be considered when there is a potential for flooding and damage to downstream facilities resulting from increased runoff from the site
- sedimentation basins are recommended for discharges with disturbed drainage areas greater than five acres

4. Identify Control Measure Group

Once required strategies to solve the erosion and sedimentation problem are identified, the planning matrix leads to the group or groups of control measures that will accomplish one strategy. Control measures within each group have similar purpose, scope, application, design criteria, standard plans and construction specifications.

5. Select Specific Control Measures

The final design for sedimentation and erosion control involves adaption of any control measures within a group to solve the specific erosion and sedimentation problem. The one measure which is most economical, practical, efficient and adaptable to the site should be selected.

Plan Keys

Once the specific control measure has been selected, the plan key symbol given in the matrix can be placed on the erosion and sediment control site plan to show where the measure will be used. Standardized design, plan, and construction specification sheets can then be completed for each control measure. This also facilitates installation in the field.

Monitoring and Maintenance

A requirement for monitoring and maintenance is very important in any approval of a sedimentation and erosion control plan. Sites that are heavily traveled must have grades maintained in the travelway on a daily basis to insure the proper functioning of diversions, swales, leakoffs and constructed storm drain systems. No travelway or portion of the site being actively worked should be left at the end of any work day without the grades and control practices checked and corrected or repaired in the event of an overnight rainfall. Responsibility for implementation and maintenance of control measures should be identified and assigned to one person at the construction site by the owner/applicant/permittee.

WHAT IS THE ENFORCEMENT MECHANISM?

Once a site plan which includes adequate sedimentation and erosion controls is approved, enforcement of those controls is carried out by the municipal zoning enforcement and/or inland wetlands agent. A municipality can also require bonding for sedimentation and erosion control plans to ensure that a required plan is indeed implemented.

Should an applicant fail to implement required controls which results in pollution of the state's waters or wetlands, the DEP has the authority to intervene. Such action can take the form of an order to abate the pollution. In addition, any activity which would result in a discharge to the waters of the state which violates the state's water quality standards is not permitted. Any noncompliance with an issued water quality certificate is also enforceable pursuant to the state's water pollution control statutes.

MODEL REGULATIONS

From

Connecticut Guidelines for Soil Erosion and Sediment Control

Note: These Guidelines are currently undergoing revision by the DEP.
When available, the updated Regulations should be used.

MODEL SOIL EROSION AND SEDIMENT CONTROL REGULATIONS FOR LAND DEVELOPMENT

INTRODUCTION

Until a 1983 state law was passed, municipalities had the option to regulate activities regarding soil erosion and sedimentation. Now municipalities must provide for erosion and sediment control within certain land use activities associated with development.

These model regulations have been prepared by the Soil Erosion and Sediment Control Task Force's Model Regulations Subcommittee under the direction of the Connecticut Council on Soil and Water Conservation to help municipalities comply with the 1983 legislation.

Public Act Number 83-388 entitled "An Act Concerning Soil Erosion and Sediment Control" amends Sections 8-2, 8-13d and 8-25 of the General Statutes. Towns must be in compliance with these amendments on or before July 1, 1985. This will require that towns revise their zoning, planned unit development and subdivision regulations authorized by the above stated General Statutes, to provide for proper provisions concerning soil erosion and sediment control during development. Towns with existing erosion and sediment control regulations may have to revise these regulations to be in compliance with the provisions of the new law. The Act requires:

1. soil erosion and sediment control plans be submitted with each development application;
2. certification of such plans by the review authority to assure compliance with local erosion and sediment control regulations; and
3. Inspection of control measures during construction.

The Act also establishes minimum requirements for soil erosion and sediment control plans and provides for assistance to towns from the County Soil and Water Conservation Districts.

The legislation's purpose is to minimize soil erosion and sedimentation that occurs as a result of the construction of residential, industrial and commercial development. Accelerated soil erosion caused by land use changes necessitates costly repairs to gullies, washed out fills, roads, and embankments. In addition, erosion destroys the soil's capabilities to support vegetation. The resulting sediment entering water bodies and wetlands is a major pollutant and reduces water quality and supply.

Aesthetic, recreational and fish and wildlife habitat values are also degraded. Sediment deposition clogs storm sewers and road ditches, reduces channel capacities which can result in

flooding, reduces water depth and volume, may cause subsequent erosion and may damage adjoining properties. The expense of sediment removal also identifies prevention as the cost-effective alternative.

An examination of the legislative proceedings leading to the Act's passage identifies the legislative intent to exclude agricultural activities.

Providing adequate soil erosion and sediment control is very site specific, and many factors contribute to determining how complex a control plan must be. Topography, disturbed area size, concentration and direction of runoff water, solid characteristics, vegetative cover and time of year are some factors to evaluate in predicting which types of erosion are likely to occur and to identify preventive measures which should be taken.

Creating the ideal town regulation is challenging. The regulations should contain enough criteria to assure prevention of off-site sediment and at the same time provide flexibility to preclude any unnecessary burden on an applicant in less erosion prone situations.

As part of the assistance to towns in establishing regulations for adequate soil erosion and sediment control, the Act requires the Connecticut Council on Soil and Water Conservation to develop model regulations. The following model regulations are the result of a cooperative effort by many agencies and organizations. The regulations were constructed to meet the minimum statutory requirements and to contain the technical and administrative guidance and clarification deemed necessary for effective regulations and control.

Those portions of the model regulations in italics are adapted from P.A. 83-388. The remaining text complements the statutory requirements with the technical and administrative clarification. Appended to the model regulation are notes which provide further explanation and guidance on many sections of the regulations.

All towns will need to take action to fully comply with the Act. They will have to amend any existing zoning, subdivision and planned until development regulations. This can be accomplished by supplementing the existing regulations by:

1. adopting a "stand alone" document, such as the model provided; or
2. incorporating directly into the existing regulation those select portions of the model which satisfy the statutory requirements.

The first alternative above will likely be less costly, and easier to adopt and use.

Many municipalities may already provide for erosion and sediment control through regulations or administrative procedures under the jurisdiction of planning, zoning and conservation commissions or other town agencies. These provisions will be helpful in coordinating local implementation of P.A. 83-388.

MODEL SOIL EROSION AND SEDIMENT CONTROL REGULATIONS
FOR LAND DEVELOPMENT

SECTION 1. DEFINITIONS

- 1.1 "Certification" means a signed, written approval by the _____ Commission (its designated agent or the _____ County Soil Water Conservation District) that a soil erosion and sediment control plan complies with the applicable requirements of these regulations.
- 1.2 "Commission" means the _____ Commission of the Town (or City) of _____.
- 1.3 "County Soil and Water Conservation District" means the _____ County Soil and Water Conservation District established under subsection (a) of section 22a-315 of the General Statutes.
- 1.4 "Development" means any construction or grading activities to improved or unimproved real estate.
- 1.5 "Disturbed area" means an area where the ground cover is destroyed or removed leaving the land subject to accelerated erosion.
- 1.6 "Erosion" means the detachment and movement of soil or rock fragments by water, wind, ice or gravity.
- 1.7 "Grading" means any excavating, grubbing, filling (including hydraulic fill) or stockpiling of earth materials or any combination thereof, including the land in its excavated or filling condition.
- 1.8 "Inspection" means the periodic review of sediment and erosion control measures shown on the certified plan.
- 1.9 "Sediment" means solid material, either mineral or organic, that is in suspension, is transported, or has been moved from its site of origin by erosion.
- 1.10 "Soil" means any unconsolidated mineral or organic material of any origin.
- 1.11 "Soil" Erosion and Sediment Control Plan" means a scheme that minimizes soil erosion

and sedimentation resulting from development and includes, but is not limited to, a map and narrative.

SECTION 2. ACTIVITIES REQUIRING A CERTIFIED EROSION AND SEDIMENT CONTROL PLAN

A soil erosion and sediment control plan shall be submitted with any application for development when the disturbed area of such development is cumulatively more than one-half acre.

SECTION 3. EXEMPTIONS

A single family dwelling that is not a part of a subdivision of land shall be exempt from these soil erosion and sediment control regulations.

SECTION 4. EROSION AND SEDIMENT CONTROL PLAN

- 4.1 To be eligible for certification, a soil erosion and sediment control plan shall contain proper provisions to adequately control accelerated erosion and sedimentation and reduce the danger from stormwater runoff on the proposed site based on the best available technology. Such principles, methods and practices necessary for certification are found in the Connecticut Guidelines for Soil Erosion and Sediment Control (1985) as amended. Alternative principles, methods and practices may be used with prior approval of the Commission.
- 4.2 Said plan shall contain, but not be limited to:
 - A. A narrative describing:
 1. the development;
 2. the schedule for grading and construction activities including:
 - a. start and completion dates;
 - b. sequence of grading and construction activities;
 - c. sequence for installation and/or application of soil erosion and sediment control measures; and
 - d. sequence for final stabilization of the project site.

3. the design criteria for proposed soil erosion and sediment control measures and stormwater management facilities.
 4. the construction details for proposed soil erosion and sediment control measures and stormwater management facilities.
 5. the installation and/or application procedures for proposed soil erosion and sediment control measures and stormwater management facilities.
 6. the operations and maintenance program for proposed soil erosion and sediment control measures and stormwater management facilities.
- B. A site plan map at a sufficient scale to show:
1. the location of the proposed development and adjacent properties;
 2. the existing and proposed topography including soil types, wetlands, watercourses and water bodies;
 3. the existing structures on the project site, if any;
 4. the proposed area alterations including cleared, excavated, filled or graded areas and proposed structures, utilities, roads and, if applicable, new property lines;
 5. the location of and design details for all proposed soil erosion and sediment control measures and stormwater management facilities;
 6. the sequence of grading and construction activities;
 7. the sequence for installation and/or application of soil erosion and sediment control measures; and
 8. the sequence for final stabilization of the development site.
- C. Any other information deemed necessary and appropriate by the applicant or requested by the Commission or its designated agent.

SECTION 5. MINIMUM ACCEPTABLE STANDARDS

- 5.1 Plans for soil erosion and sediment control shall be developed in accordance with these

regulations using the principles as outlined in Chapters 3 and 4 of the Connecticut Guidelines for Soil Erosion and Sediment Control (1985), as amended. Soil erosion and sediment control plans shall result in a development that minimizes erosion and sedimentation during construction; is stabilized and protected from erosion when completed; and does not cause off-site erosion and/or sedimentation.

- 5.2 The minimum standards for individual measures are those in the Connecticut Guidelines for Soil Erosion and Sediment Control (1985), as amended. The Commission (or County Soil and Water Conservation District) may grant exceptions when requested by the applicant if technically sound reasons are presented.
- 5.3 The appropriate method from Chapter 9 of the Connecticut Guidelines for Soil Erosion and Sediment Control (1985), as amended, shall be used in determining peak flow rates and volumes of runoff unless an alternative method is approved by the Commission.

SECTION 6. ISSUANCE OR DENIAL OF CERTIFICATION

- 6.1 The _____ Commission (or the _____ County Soil and Water Conservation District) shall either certify that the soil erosion and sediment control plan, as filed, complies with the requirements and objectives of this regulation or deny certification when the development proposal does not comply with these regulations.
- 6.2 Nothing in these regulations shall be construed as extending the time limits for the approval of any application under Chapters 124, 124A or 126 of the General Statutes.
- 6.3 Prior to certification, any plan submitted to the municipality may be review by the County Soil and Water Conservation District which may make recommendations concerning such plan, provided such review shall be completed within thirty days of the receipt of such plan.
- 6.4 The Commission may forward a copy of the development proposal to the conservation commission or other review agency or consultant for review and comment.

SECTION 7. CONDITIONS RELATING TO SOIL EROSION AND SEDIMENT CONTROL

(*7.1) The estimated costs of measures required to control soil erosion and sedimentation, as

(*7.1) This first 7.1 is adapted for use in subdivision or planned unit development regulations.

specified in the certified plan, may be covered in a performance bond or other assurance acceptable to the Commission in accordance with the provisions specified under Section _____ of the regulations.

OR

- (**7.1) The estimated costs of measures required to control soil erosion and sedimentation, as specified in the certified plan, that are a condition of certification of any modified site plan may be required to be covered in a performance bond or other assurance acceptable to the Commission in accordance with the provisions specified under Section _____ of the regulations.
- 7.2 Site development shall not begin unless the soil erosion and sediment control plan is certified and those control measures and facilities in the plan scheduled for installation prior to site development are installed and functional.
- 7.3 Planned soil erosion and sediment control measures and facilities shall be installed as scheduled according to the certified plan.
- 7.4 All control measures and facilities shall be maintained in effective condition to ensure the compliance of the certified plan.

SECTION 8. INSPECTION

- 8.1 Inspections shall be made by the Commission or its designated agent during development to ensure compliance with the certified plan and that control measures and facilities are properly performed or installed and maintained. The Commission may require the permittee to verify through progress reports that soil erosion and sediment control measures and facilities have been performed or installed according to the certified plan and are being operated and maintained.

NOTES ON MODEL REGULATIONS

The purpose of these notes is to provide municipalities with further insight, explanation and guidance on the Model Regulations. The notes emphasize administrative procedures which can be helpful in implementing these regulations. These notes also focus on other important issues concerning management of erosion and sedimentation not specifically referred to within the state law. It may be prudent to discuss these issues with your town

(**7.1) This second 7.1 is adapted for use in zoning's site plan review regulations.

attorney prior to promulgation of the regulations by the town to ensure that the regulations conform with the Law. The notes first address the Model Regulations specifically by sections and then on a general basis.

SECTION 1. DEFINITIONS

Other definitions may be deemed appropriate to add to this section dependent on local circumstances.

If erosion and sediment control provisions are to be incorporated directly into the existing regulations (as compared to adoption of the "stand alone" document), then the definitions section in the existing regulations will require a revision to add the model's definitions. Remember to retain proper alphabetical order.

Also check for conflicting or inconsistent definitions in the existing and in the model regulations. Revise as needed.

SECTION 2. ACTIVITIES REQUIRING A CERTIFIED EROSION AND SEDIMENT CONTROL PLAN AND SECTION 3. EXEMPTIONS

Municipalities that already have existing erosion and sediment control regulations should review those regulations for conformity with the new law with special attention given to the requirements contained in Sections 2 and 3 of the Model Regulations.

It is suggested that the contents of these sections be included in any use and/or zone tables and in any descriptions of the permitted uses and/or various zones which may appear within the existing regulations.

Based upon the legislative history of PA 83-388, agricultural activities are deemed exempt from erosion and sediment control regulations.

The Law exempts the development of an individual residential building lot for residential purposes from the erosion and sediment control regulations. However, it is not the intent of the Law to allow a fragmented parcel-by-parcel development of a subdivision without the required erosion and sediment control provisions. Therefore, subdivision approvals should provide for erosion and sediment control during development.

SECTION 4. EROSION AND SEDIMENT CONTROL PLAN

4.1 (Basis for Plan)

The applicant has the responsibility to develop his control plan based on the best available technology. The Connecticut Guidelines for Soil Erosion and Sediment Control publication is specifically referenced as the current state-of-the-art source and readily available from the Department of Environmental Protection's Natural Resources Center. However, there are other acceptable publications which contain the principles, methods and practices for certified plans.

The phrase, "reduce the danger from stormwater runoff" relates to erosion only, for example, downstream streambank conditions. Towns have always had the authority to require stormwater management provisions. Some towns already do this and it may be the timely thing to do along with erosion and sediment control. However, PA 83-388 does not mandate storm water management. Agencies which can assist towns in developing stormwater management regulations are the Department of Environmental Protections, county soil and water conservation districts, USDA Soil Conservation Service, University of Connecticut Cooperative Extension Service and regional planning agencies.

4.2.A (Narrative)

The narrative is extremely useful to the certifier, inspector, enforcer, developer and developer's contractor. Erosion and sediment control is a procedure often calling for written descriptions to explain the basis for any proposed plan, detailed control measures, and interactions such as timing of earth moving or stabilization.

The narrative is an appropriate place to include provisions for contingency plans if unforeseen erosion or sedimentation problems arise. Contingency plans may be handled by requiring statements within the narratives that identify the permittee's (and the contractor's) responsibilities to deal with unforeseen erosion and sedimentation problems and to have the capability to deal effectively with such problems.

Other components of a good narrative would include self-monitoring and active maintenance procedures. A good erosion and sediment control plan will identify someone (engineer, contractor, etc.) responsible for monitoring control measures with whom an inspector representing the town would be able to communicate routinely. On-site operational and maintenance procedures for erosion and sediment control measures should be required on a daily basis.

Having the narrative printed on the site plan map as noted is beneficial so long as it does not clutter the map. Specific components of the narrative are needed for the contractor to properly review, install and apply measures. Such components appear on the site plan map requirements so they do not become detached from one another.

4.2.B (Map)

An appropriate map scale for soil erosion and sediment control measures is site specific. Normally, a linear scale of 1 inch = 40 feet and contour intervals of 2 feet provide enough site plan detail for most projects. Circumstances may warrant more or less detail. Flexibility is highly desirable to meet site-specific needs and to not unnecessarily burden the applicants.

All of the site plan map requirements are important for soil erosion and sediment control. Such information is important in evaluating a proposed erosion and sediment control plan and in predicting the plan's effectiveness. The information is needed by the contractor in explicit detail so control measures can be properly located and installed or applied. The information is needed by inspectors to check if installation, operation and maintenance are as planned. The information becomes more crucial when the development site is large and/or an environmentally sensitive area.

As stated earlier, the site plan map requirements also contain components of the narrative, namely B(6), (7) and (8). The components are needed by the contractor during construction to tell him when and how to implement the control plan. These components will appear in the narrative, as required by law, but by having them also appear on field construction plans is advantages. The construction workers would then only need the plan to work from and have before them only relevant narrative details, thus reducing the chances of the narrative being "forgotten about" during construction.

All of site plan map requirements should be integrated with mapping requirements in the existing regulations, not repeated.

4.2.C (Other Information)

This section provides a "catch all" for those development sites requiring additional or special control measures or facilities not covered in Section 4.2(A) and (B). This section also allows for special controls or plan features to meet site specific situations that either the applicant or the commission wishes to address.

SECTION 5. MINIMUM ACCEPTABLE STANDARDS

Subsections 1 through 3 again reference the Connecticut Guidelines for Soil Erosion and Sediment Control as a source for establishing the "what to do" and "how to do it" in devising a control plan. Otherwise, a more lengthy section specifically covering the

seemingly unlimited standards would evolve. Referencing these Guidelines provides the flexibility needed for site-specific development.

Performance standards are the desired goal for control of soil erosion and sediment, and the source from which control measures were designed are secondary. The Guidelines are meant to be a readily-available source to attain these desired performance standards.

SECTION 6. ISSUANCE AND DENIAL OF CERTIFICATION

6.1 (Commission Shall Certify or Deny)

It is suggested that the certifier keep public records defining the basis for all decisions. It is important that good public records be kept.

6.2 (Time Limits)

With the new Law, an application before the planning and/or zoning commission is automatically "incomplete" unless there is a control plan. Once a "complete" application is received, the timetable a commission must adhere to in their actions is established by statute. Proper provisions for soil erosion and sediment control must be done within the established timetable. THEREFORE, IT IS IMPERATIVE that commissions act promptly to review plans for certification, including prompt submittal of plans to others if their review is deemed necessary.

6.3 (Review by County Soil and Water Conservation Districts)

If the County Soil and Water Conservation District is to be designated as the certifying authority, then delete this subsection.

6.4 (Other Review)

Communication and coordination usually need to be improved upon among all parties interested in environmental safeguards. The municipal wetlands agency has a role in erosion and sediment control as part of its statutory charge for protecting wetlands and watercourses.

SECTION 7. CONDITIONS RELATING TO SOIL EROSION AND SEDIMENT CONTROL

An additional component to consider in Section 7 would be titled "Compliance with Plan Requirements." It would state, "Any person engaged in development activities who fails

to file a soil erosion and sediment control plan in accordance with these regulations, or who conducts a development activity except in accordance with provisions of a certified plan shall be deemed in violation of these regulations.”

7.1 (Bonding Options)

When the “stand alone” document approach is taken, the user should cross-reference the applicable bonding provisions similar to how they appear in the Model Regulations. THERE ARE TWO WAYS for such bonding requirement provisions to be stated in the regulations. The one used depends upon the regulations being amended. The first, 7.1, is only legal for subdivision of planned until development regulations. The second, 7.1, is only legal for zoning’s site plan review regulations and is also conditional to that portion of the modified site plan.

Bonding should be effected according to the normal bonding procedures established by each municipality, but may not have to be implemented at the time of soil erosion and sediment control plan certification. Bonding at the time building permits are requested may be preferable.

Establishing who (i.e., town engineer) is to recommend “the estimated costs required to control soil erosion and sedimentation” may be stated in the regulations.

SECTION 8. INSPECTION

Although the inspection section is brief, it is very important. Inspection is mandated by state law and should be seriously accomplished to protect the town’s liability.

The second sentence of 8.1, beginning with “The Commission may require...”, can be considered an “as-built” requirement that can be used on large, complex or sensitive developments. Progress reports are not necessary for all control plans, but in special instances can be used to guarantee compliance by the applicant. Normally, the applicant would be expected to pass this responsibility on to the consultant who prepared the control plan.

Inspection records or reports should be kept in the event of possible enforcement action. Types of information for such inspection records include: inspection dates, weather conditions, people spoken to on-site, what was looked at, discussed, and agreed upon. Additionally, inspection reports may include drawings, sketches, or photographs of relevant features or problem areas.

Check the existing regulations for inspection and investigation provisions which grant access to the development site. Consider such provision here if they do not exist in the regulations.

OTHER NOTES

Delegation of the certifying authority responsibilities may be possible for a municipality, especially where existing erosion and sediment control mechanisms are already in place. It is recommended to consolidate past mechanisms with new requirements, especially the certification and inspection responsibilities.

Any Preapplication process for development that may be ongoing between the town and the potential applicant should consider including the county soil and water conservation district as a source of resource information concerning soil erosion and sediment control.

Amendments to an existing certified soil erosion and sediment control plan may be sought at a later date. Adherence to the plan amendment provisions already appearing in existing regulations will need to be enforced. The Act does not contain provisions for amendment to certified plans. It is recognized that municipalities already deal with minor technical changes to approved plans in a variety of ways. Each municipality should consider including in their regulations a formal erosion and sediment control amendment provision for substantive changes.

However, experience will bear out that unforeseen circumstances during construction will necessitate technical changes and contingency measures.

Enforcement proceedings by a municipality can be kept to a minimum if the municipality insists that carefully prepared and well-thought-out soil erosion and sediment control plans be submitted, properly reviewed for certification and implemented. Substandard plans must be rejected or denied, and certified plans, when implemented, must be inspected periodically by the town enforcement agent. For significant development applications, bonding and the requirement for as-built soil erosion and sediment control measures have been shown to increase compliance with environmental laws.

Inland wetlands authorities can independently exercise enforcement action when soil erosion and sedimentation impacts upon their regulated areas. The State of Connecticut, Department of Environmental Protection can ultimately enforce situations that pollute the waters of the state.

WHERE CAN I TURN FOR HELP AND ADDITIONAL INFORMATION ?

PUBLICATIONS

- Guidelines for Soil Erosion and Sedimentation Control - CT DEP/CT Council on Soil and Water, 1988.
Contains methods and techniques for minimizing soil erosion and sedimentation
Available from CT DEP, Map and Publication Sales, 79 Elm Street, Store Level, Hartford, CT 06106-5127, (860)424-3555
- Connecticut Erosion and Sedimentation Control Pocket Guide - CT DEP, Bureau of Water Management, 1994
A field guide intended for use by contractors, inspectors and those responsible for the control of erosion during construction or other disturbances
Available from CT DEP, Map and Publication Sales, 79 Elm Street, Store Level, Hartford, CT 06106-5127, (860)424-3555
- Stormwater Management Quantity and Quality (prepared for the CT DEP by Milone & MacBroom, Inc.), February, 1992
Provides information to help evaluate the need for and use of stormwater management systems
Draft document available from Milone & MacBroom, Inc., (203)271-1773.
- "Upstream Solutions to Downstream Pollution" - A Citizens' Guide to Protecting Seacoasts and the Great Lakes by Cleaning Up Polluted Runoff, 1993. Sarah Chasis, Jessica Landman, Beth Lillemann, Diane Cameron and Ann Notthoff, principal authors.
Good overview of nonpoint source pollution, not too technical
Available through the Natural Resources Defense Council and Coastal Alliance (send \$7.50 plus \$1.45 shipping and handling to: NRDC Publications Department, 40 West 20th Street, New York, NY 10011)
- Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters - EPA, January, 1993
Contains guidance developed in accordance with Section 6217 of the 1990 federal Coastal Zone Act Reauthorization Amendments specifying management measures to control sources of nonpoint pollution in coastal waters
Contact EPA Office of Water, Washington, D.C., by calling (202)260-7100.
- Connecticut Nonpoint Source Material Summary - Bibliography of Publications
available through the DEP including the following:

- Assessment of Nonpoint Sources of Pollution in Urbanized Watersheds: A Guidance Document for Municipal Officials - (Shreve-Gibb, B. and W. Boucher, Metcalf & Eddy, Inc.), CT DEP Bulletin #22, April 1995.
Provides information on stormwater and nonpoint source pollution prevention and control; provides a process to follow for evaluating and improving existing regulations and practices
Available from CT DEP, Map and Publication Sales, 79 Elm Street, Store Level, Hartford, CT 06106-5127, (860)424-3555.
- Nonpoint Source Pollution: An Assessment and Management Plan - CT DEP, February 28, 1989.
An assessment of the state's nonpoint source problem, providing a management strategy to address Connecticut's nonpoint source concerns
Available from CT DEP, Map and Publication Sales, 79 Elm Street, Store Level, Hartford, CT 06106-5127, (860)424-3555
- Protecting Connecticut's Water-Supply Watersheds: A Guide for Local Officials
Doenges, J.M., C.P. Allan, J. Benson, and R.J. Jontos, Jr. (Eds.), 1993.
Provides municipalities with guidance and information on existing and recommended programs for protection of public surface water supplies
Available from CT DEP, Map and Publication Sales, 79 Elm Street, Store Level, Hartford, CT 06106-5127, (860)424-3555.

STAFF

DEP Office of Long Island Sound Programs staff
79 Elm Street
Hartford, CT 06106-5127
(860)424-3034

DEP Water Bureau Staff:
Long Island Sound water quality: (860)424-3020
Stormwater management and water quality enforcement: (860)424-3018
79 Elm Street
Hartford, CT 06106-5127

Connecticut Council on Soil & Water Conservation - (860)424-3905

Soil and Water Conservation Districts/County Offices:
Fairfield (203)743-5453

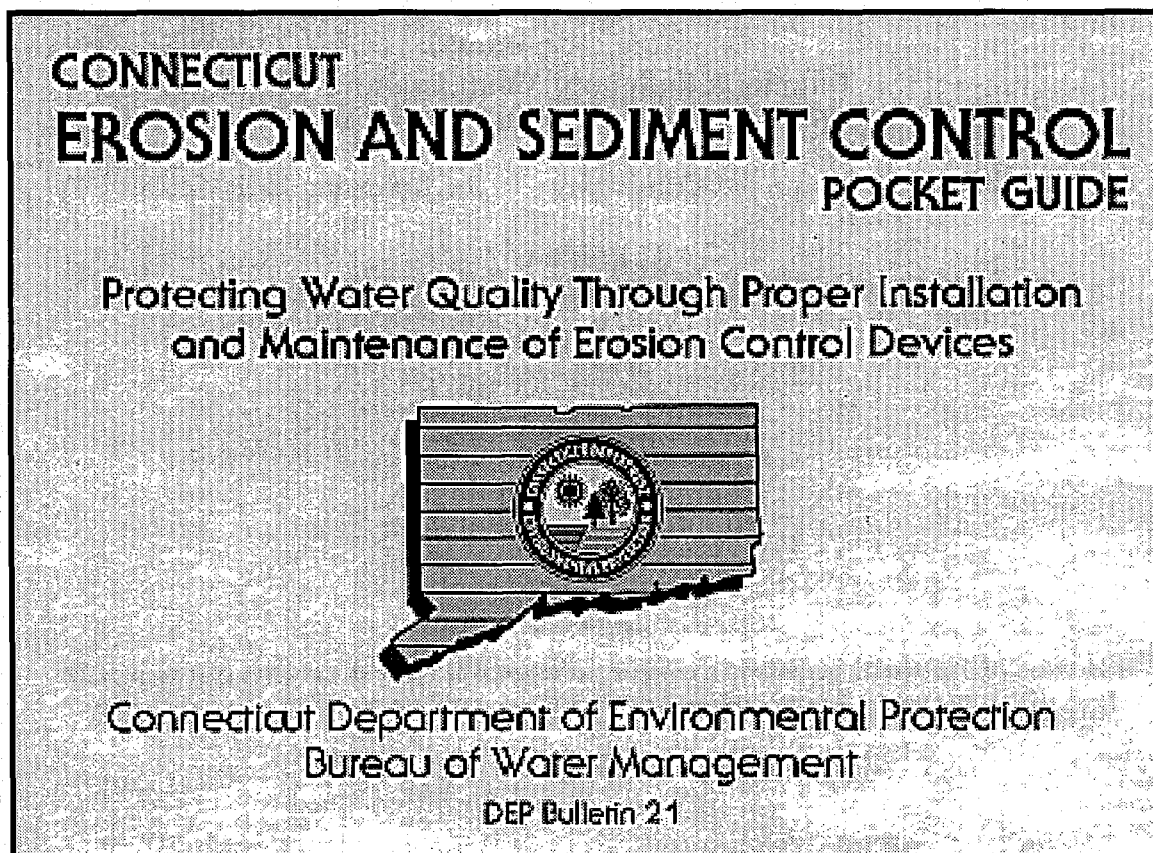
Hartford (860)688-7725
Litchfield (860)567-8288
Middlesex (860)345-3219
New Haven (203)269-7509
New London (860)887-3604
Tolland (860)875-3881
Windham (860)774-0224

UConn Cooperative Extension Service
Nonpoint Education for Municipal Officials (NEMO)
1066 Saybrook Road, P.O. Box 70
Haddam, CT 06438
(860)345-4511

APPENDIX

SOIL EROSION & SEDIMENTATION CONTROL BMPs

The following pages, taken from the Connecticut Erosion and Sedimentation Control Pocket Guide, provide site applications, installation steps and maintenance scenarios for the most commonly used soil erosion and sedimentation control measures. A complete listing and description of BMPs related to soil erosion and sedimentation control can be found in the document Connecticut Guidelines for Soil Erosion and Sedimentation Control.



Mulch

■ Definition

Plant residues or other biodegradable materials, applied on a temporary basis, to prevent soil erosion and/or promote vegetative growth.

■ Application

- 100% coverage of disturbed soil for best results.
- Not for use in areas of concentrated flow.
- Use mulch anchor in windy areas (hilltops, long-exposed slopes or adjacent to high-speed roadways).
- Soil stabilization blankets can be used in place of anchored mulch.
- Select mulch material based on soil, site conditions, season and use (e.g., landscaping).

MULCH ONLY

When disturbed soils will not be brought to final grade within 30 days and/or temporary seeding is not feasible use:

- Hydromulch as tackifier for straw or hay.
- When grass seed is to be applied at a later date, remove wood chips or till into ground with nitrogen application prior to seeding.

SEED MULCH

In areas of disturbed soils when temporary or permanent seeding is required, use:

- Quickly decaying organic materials.

LANDSCAPING MULCH

For use in conjunction with tree, shrub and ground cover plantings:

- Use slow decaying organic materials.
- Apply additional nitrogen when composition of organic material reduces soil infertility.

■ Installation

1. Prior to mulching, complete grading and install needed sediment control practices.
2. Lime and fertilize (seed mulch).
3. Roughen surface by tracking or light disking (seed mulch).
4. Seed area prior to mulching, where seed is applied as part of hydroseeder slurry containing fiber mulch or following winter spread of hay (seed mulch).
5. Mulch material shall be spread uniformly by hand or machine.
6. Mulch liberally in mid-summer and prior to winter, and on cut slopes and southern exposures.

■ Maintenance

1. Inspect all mulched areas for rilling weekly and follow rain event of ½" or greater or exposure to high winds; make repairs as needed.*
2. Periodically inspect mulch seed with ornamental planting, throughout the year for soil coverage and decay.
3. Apply additional mulch as needed.

*See following Troubleshooting chart

MULCHING NEED VS. MULCH TYPE			
Mulch Type	Exposure Period	How Applied	Limitations/Considerations
Mulch only - temporary soil cover when seeding dates cannot be met			
Hay	0-6 months	by hand or machine blown	• preferred over other mulches • requires anchoring in windy areas • hay will supply weed seeds
Wood Chips	>1 year	by hand or graded by machine	• must be removed or tilled into ground before seeding or planting • may reduce soil fertility during decay process requiring subsequent fertilization for plant growth • lasts longer than hay • no anchoring required
Bark Chips/ Shredded Bark	0-1 year	by hand	• same as wood chips
Seed Mulch - temporary soil cover until seeds germinate and grow sufficiently to stabilize soil			
Hay	0-6 months	machine blown	• requires anchoring in windy areas • hay will supply weed seeds
Cellulose Fiber*	0-6 months	spray in slurry with water	• reduces volunteer weed seeds in lawn seeding • wood fiber per unit cost generally more expensive than paper fiber, but requires less product for equivalent coverage • may be used in summer with seed only with adequate irrigation
Landscape Mulch - soil cover inhibiting weed growth around planted trees, shrubs & vines			
Wood chips	>1 year	by hand or graded by machine	• may reduce soil fertility during decay process, requiring application of nitrogen • slippage may occur on steeper slopes if wood chips are applied over a large area • may be underlain with weed barrier, i.e., plastic
Bark Chips/ Shredded Bark	0-1 year	by hand	• same as wood chips

* See *CT Guidelines* for special concerns on the use of various cellulose mulches.

TROUBLESHOOTING - MULCH		
Problem	Cause	Fix
rill* erosion from top of slope	concentrated flow entering area	install top of slope diversion and/or temporary downslope drain
rills start internal to slope	mulch too thin	apply additional mulch
	slope too long, too steep without bench	install silt fence, hay bales or stone check dam to slow flow and re-mulch or regrade and install blanket - repeated failure may require regrading to installation of bench
mulch cover diminishing, exposing soil	wind blowing	apply additional mulch with tackifier, netting or replace with blanket
	mulch decaying	apply additional mulch

* linear channel erosion

Soil Stabilization Blankets (also known as mats)

■ Definition

Manufactured combination of mulch and anchoring material on seeded surface of a steep slope, channel, road shoulder, or shoreline to promote vegetative growth.

■ Application

- Blankets are more costly than mulches, but may reduce overall stabilization costs due to fewer repairs.
- Manufacturers specifications shall be matched to site conditions, due to wide array of available blanket materials.
- For use on smooth soil surfaces since blankets need continuous contact with soil.

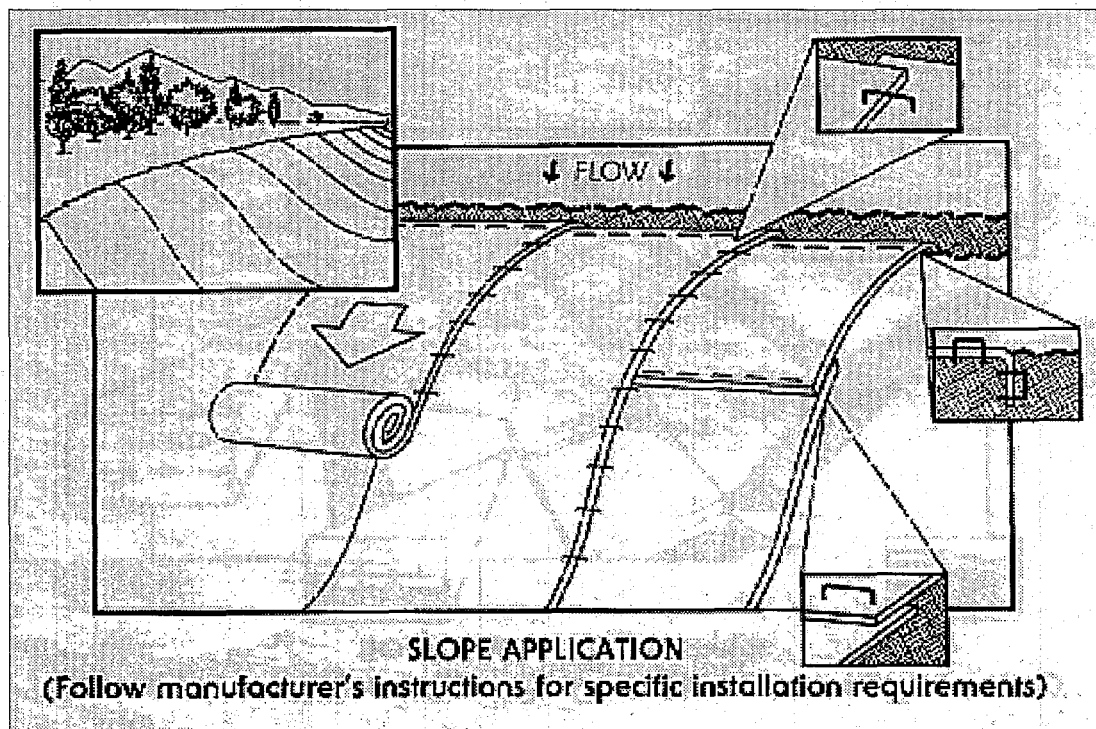
■ Installation

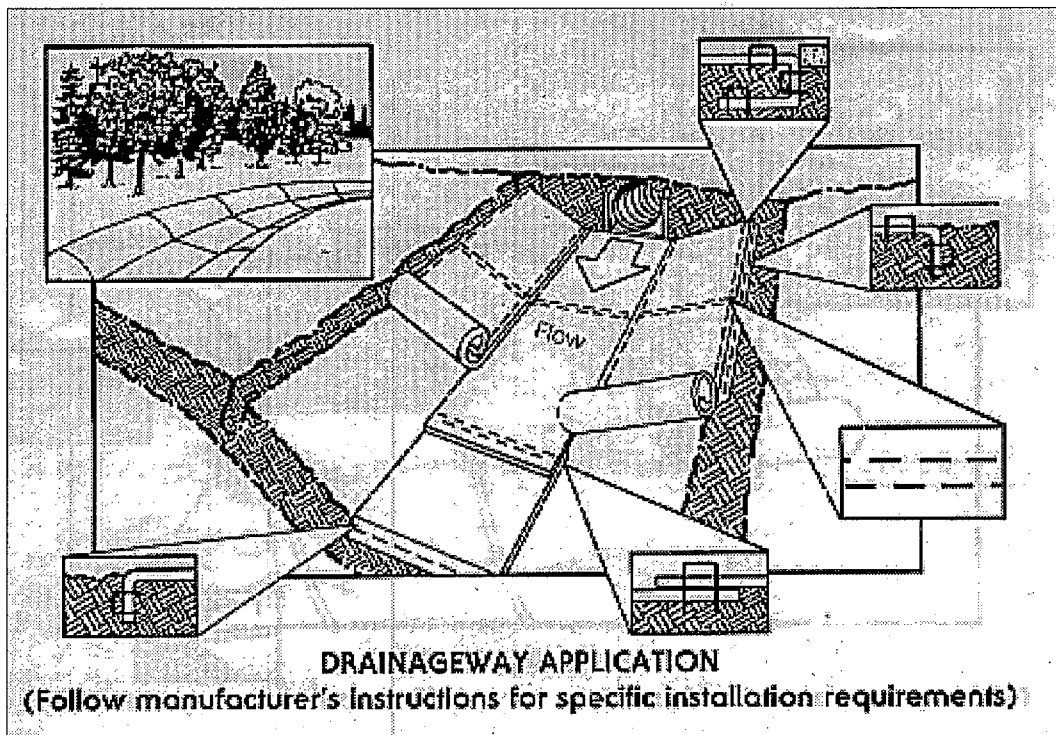
1. Grade soil to provide even, smooth surface.
2. Clear surface of extraneous debris.
3. Lime, fertilize and seed in accordance with planting plan.
4. Install per manufacturer's recommendations.

■ Maintenance

- Inspect weekly and after every rainfall greater than ½" or exposure to high winds.
- Repair as necessary.

*See following Troubleshooting chart





TROUBLESHOOTING - SOIL STABILIZATION BLANKETS		
Problem	Cause	Fix
rills form along edge of blanket	blanket not installed to concentrate flow in center of blanket	check manufacturer's installation requirements, regrade and reinstall
	blanket not installed with flow line in center	
	blanket too narrow for swale flows	
	on slopes, blanket placed on grades higher than surrounding ground	
rills develop under blanket	flows too high, contributing watershed too large	replace with riprap channel (see <i>CT Guidelines</i>)
	blanket stretched during installation	remove blanket, regrade smooth, reseed, reinstall
	applied to rough soil surface	
	improper stapling	
general blanket failure	did not match need to manufacturer limitations	check manufacturer specifications, change blanket or measure

Sediment Barriers

■ Definition

Silt fences, hay bales and stone check dams, and similar temporary sediment barriers composed of natural or synthetic materials, designed to intercept and retain eroded sediments within small areas of disturbed soils.

■ Application

See comparison chart below.

■ Maintenance

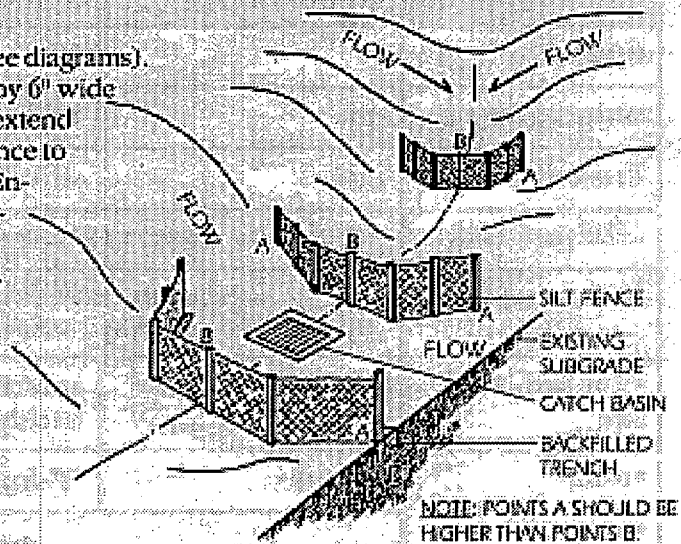
- Inspect weekly, repair or replace as necessary, following each rainfall greater than ½".
- Remove sediment deposits when they reach approximately ½ the height of barrier or install new control immediately upslope from existing control.
- Remove control only after upslope area has been permanently stabilized.
- **SPECIAL CASE REPAIRS DURING FROZEN GROUND CONDITIONS FOR CRITICAL WATER RESOURCES AREAS:** at point of discharge, lay bed of loose hay sufficient to provide a flat surface for hay bales. Place hay bales to form dam, wedge joints, and cover with 2½" - 3" stone to angle of repose extending ends to prevent water from running around end of barrier.

COMPARISON OF SEDIMENT BARRIERS			
Application	Hay Bales	Silt Fence	Stone Check Dam
maximum slope length	150'	150'	150'
maximum drainage area	1 acre	1 acre	1 acre
life expectancy	<3 months	per manufacturer's specs	>1 year
time of year to install	before ground freezes		year round
location on landscape	install on soft surface to allow proper entrenching or anchoring		allow on hard surfaces
• sheet flows - toe of slope	on the contour 0-10' below toe of slope	on the contour 0-10' from toe to slope	not advised
• swales	not advised	"U" shaped across swale	"U" across swale
• catch basins - in hallows	ring basin		
- on slopes	twin "U" shaped up- and downslope of basin		

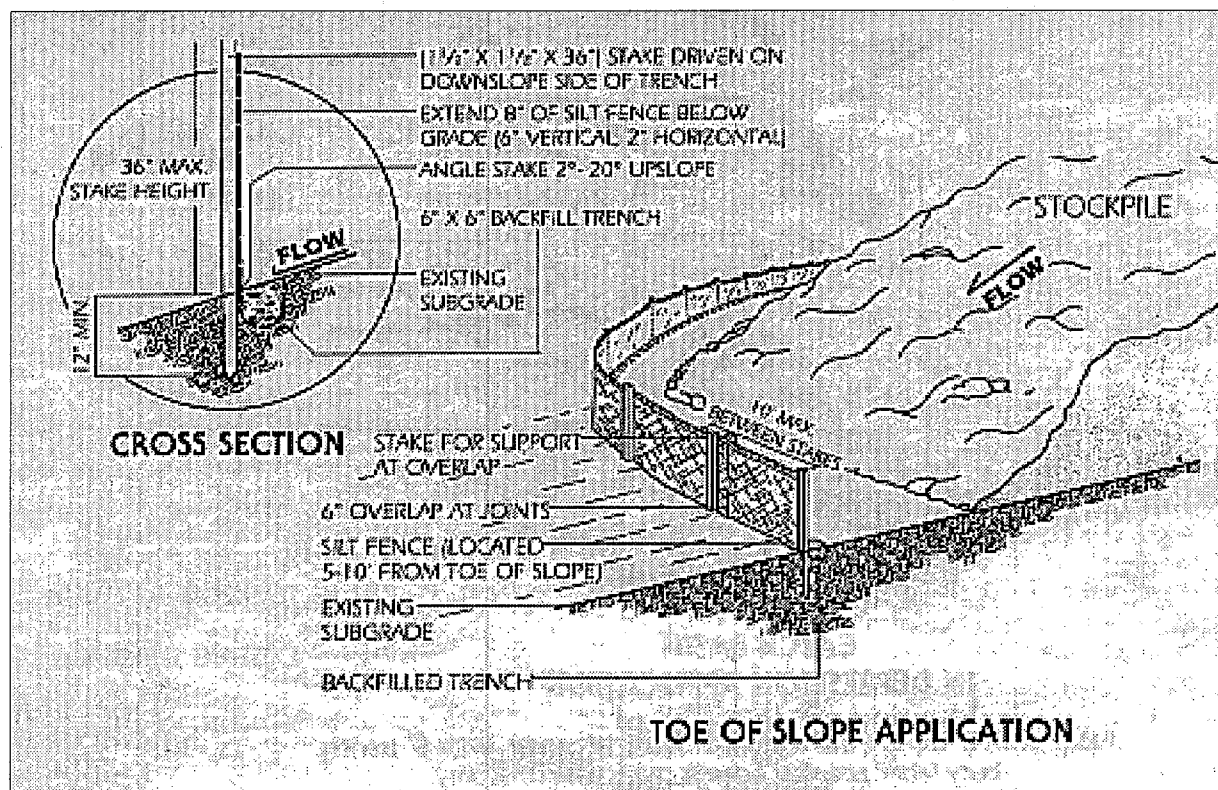
Silt Fence (also known as Filter Fence)

■ Installation

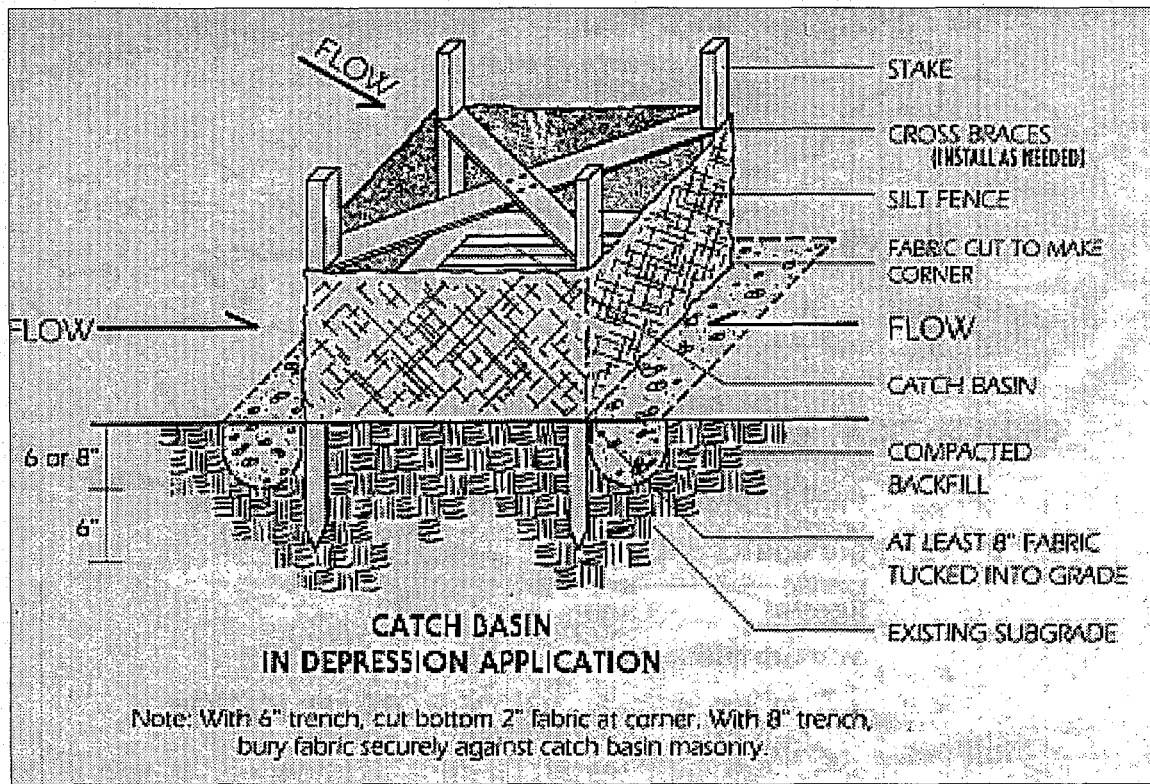
1. Locate as necessary for application (see diagrams).
2. Excavate trench a minimum 6" deep by 6" wide on upslope side of fence. For slopes extend trench upslope at both ends of the fence to prevent water from running around. Encircle catch basins in depressions, cutting fabric on the bottom corners 41" to allow fabric to lay flat around corner.
3. Drive hardwood stakes (1 1/4" X 1 1/2" X 36") on downslope side of trench at a maximum spacing of 10' or closer when concentrated flows are anticipated.
4. Staple or secure fence to stakes per manufacturer's instructions such that at least 8" of fabric lays within trench.
5. Place fabric joints at stakes with a 6" overlap of fabric.
6. Backfill and compact trench.



**SWALE & CATCH BASIN
ON SLOPE APPLICATION**



TOE OF SLOPE APPLICATION



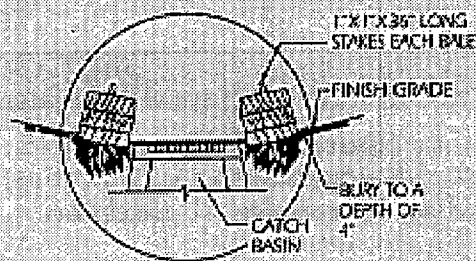
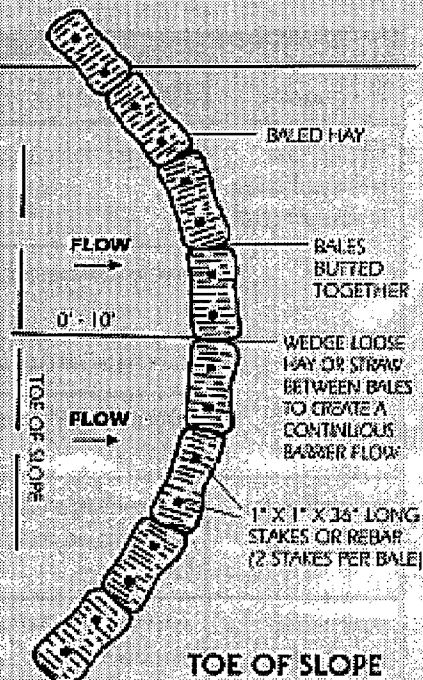
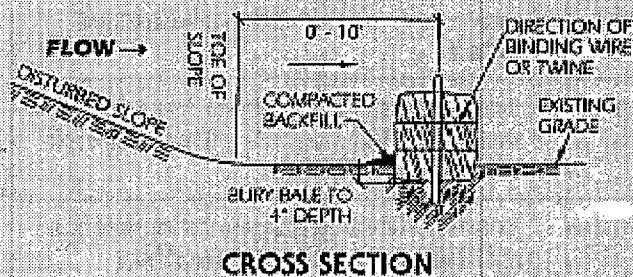
TROUBLESHOOTING - SILT FENCE

Problem	Cause	Fix
fallen fence or broken stakes due to water pressure	drainage area too large	change to stone check dam and add additional controls upslope to reduce velocities and sediment loading (see <i>CT Guidelines</i> for other measures available)
	flows too concentrated	repair or replace fence, increase staking frequency, angle stake upslope, consider adding guy wire for support
	stake not driven deep enough	repair or replace fence, increase stake depth
	fabric not properly attached to stakes	check manufacturer's instructions on attachment and reattach
undercutting, toe failure	poor trenching or inadequate compaction, not enough fabric buried	install new fence properly or retrench, drive stakes deeper as necessary to bury enough fabric, fill and compact trench and downslope rills
water running around ends	not extending end of fencing dam far enough upslope	extend fence far enough upslope so that bottom of fence end is higher than top of lowest portion of fence

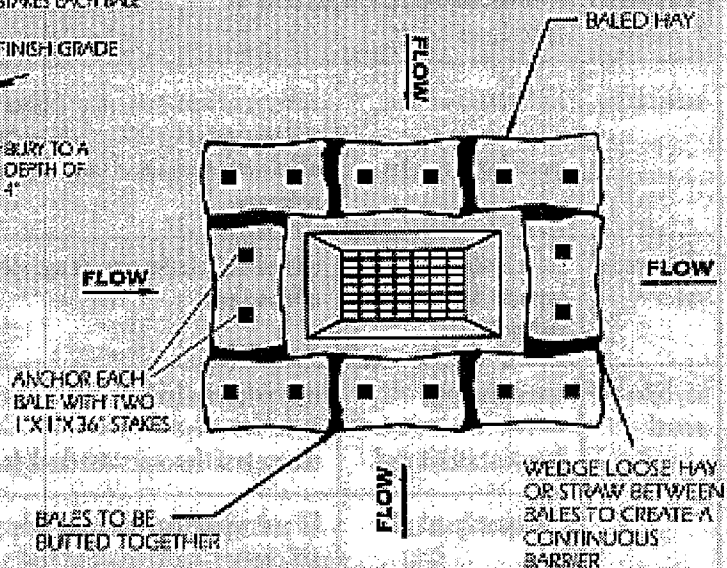
Hay Bales

■ Installation

1. Excavate trench, on contour, to width of bale and depth of 4".
2. Locate hay bales in single row, tightly abutting one another.
3. Extend ends of trench upslope in each direction so that the bottom end of bales will be higher than the top of the lowest bales to force water over top of structure.



4. Drive at least 2 hardwood stakes (1" X 1" X 36") to anchor each hay bale to the ground, to minimum depth of 6".
5. Backfill on upslope side of bale and compact trench, with a minimum of 4" soil.



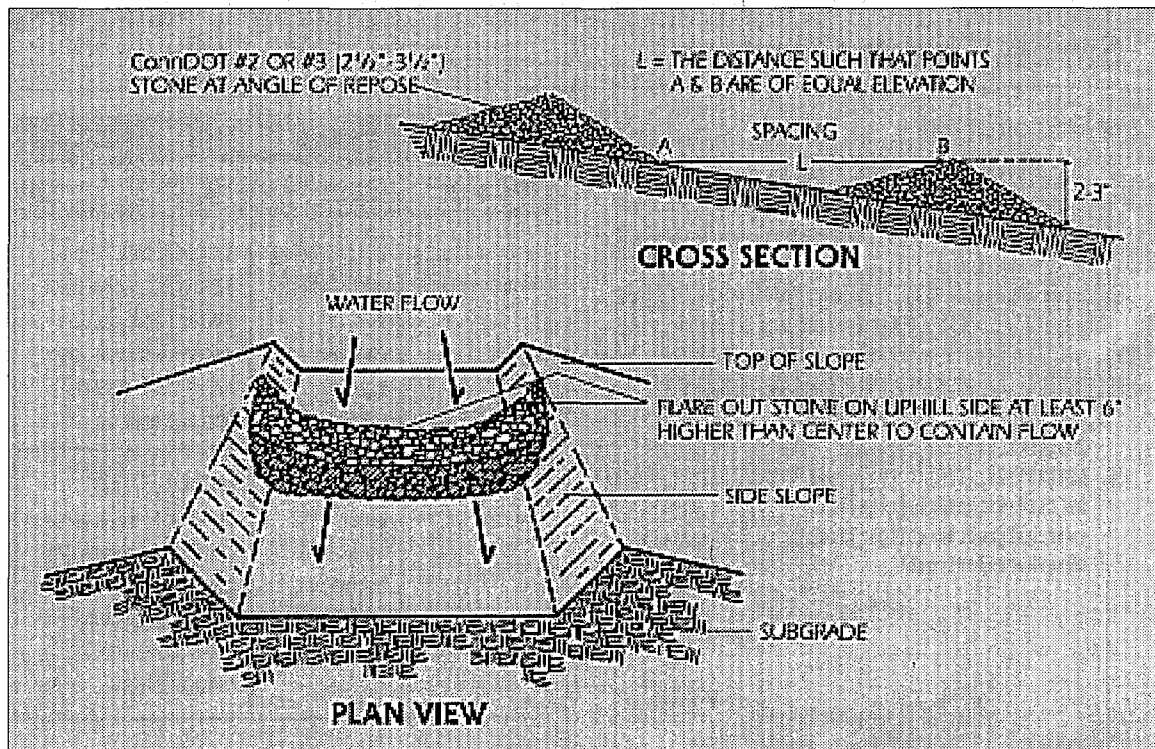
TROUBLESHOOTING - HAY BALES		
Problem	Cause	Fix
undercutting	inadequate trenching	either reset bales properly or if failure is small, backfill downslope rills, fill and compact under failing bale, wedge joints with hay, backfill upslope side of bale with 4" wedge of wood chips or compacted soil; replace bales as necessary
	spaces between bales	
rilling around end	not extending end of hay bales far enough upslope	extend hay bales far enough upslope so bottom of last bale is higher than top of lowest bale
hay bales removed	watershed too large	change to stone barrier
	flows too concentrated	change to silt fence or stone check dam
	inadequately staked	fill and compact any rills at hay bales, reinstall bale, wedge joints, backfill and compact, increase staking depths

Stone Check Dam

■ Installation

1. Set spacing of check dam to assure the elevations of the crest of the downstream dam is at the same elevation of the toe of the upstream dam.
2. Place ConnDOT stone size =2 or =3 (average 2½" - 3½") stone at angle of repose across swale such that center of check dam is at least 6" lower than outer edges with a minimum height of 24" and a maximum height of 36".
3. Ensure that structures within the channel such as culvert entrances below check dams are not subject to damage or blockage from displaced stones.

TROUBLESHOOTING - STONE CHECK DAM		
Problem	Cause	Fix
water running around ends	not extending end of check dam far enough upslope	extend check dam far enough upslope so that bottom end of stone barrier is higher than top of central portion of stone barrier
check dam washed out	velocities too great, watershed too large	review hydraulic analysis to determine if other measures are needed, or increased frequency of check dams may sufficiently reduce velocity



Water Bar (also known as Diversion)

■ Definition

A channel with a ridge of compacted soil on the downslope side, constructed across an access road or similar disturbed slope, to reduce flow length and erosion potential.

■ Application

- Life expectancy of one year or less.
- Spacing of water bar is dependent on road grade. (Refer to *CT Guidelines*)

■ Installation

1. Refer to CT Guidelines for design specifications.
2. Install water bar as soon as access road is cleared and graded.
3. Compact earthen water bar to design specification.
4. Locate outlet in undisturbed, stabilized area.
5. Provide outlet protection as needed.

■ Maintenance

- Inspect after heavy vehicle use, weekly and after every rainfall until stabilization is complete.
- Remove sediment from channel and make repairs as necessary.

Construction Entrance

■ Definition

An entrance to the site specifically designed to reduce the amount of sediment tracked off site by vehicles.

■ Application

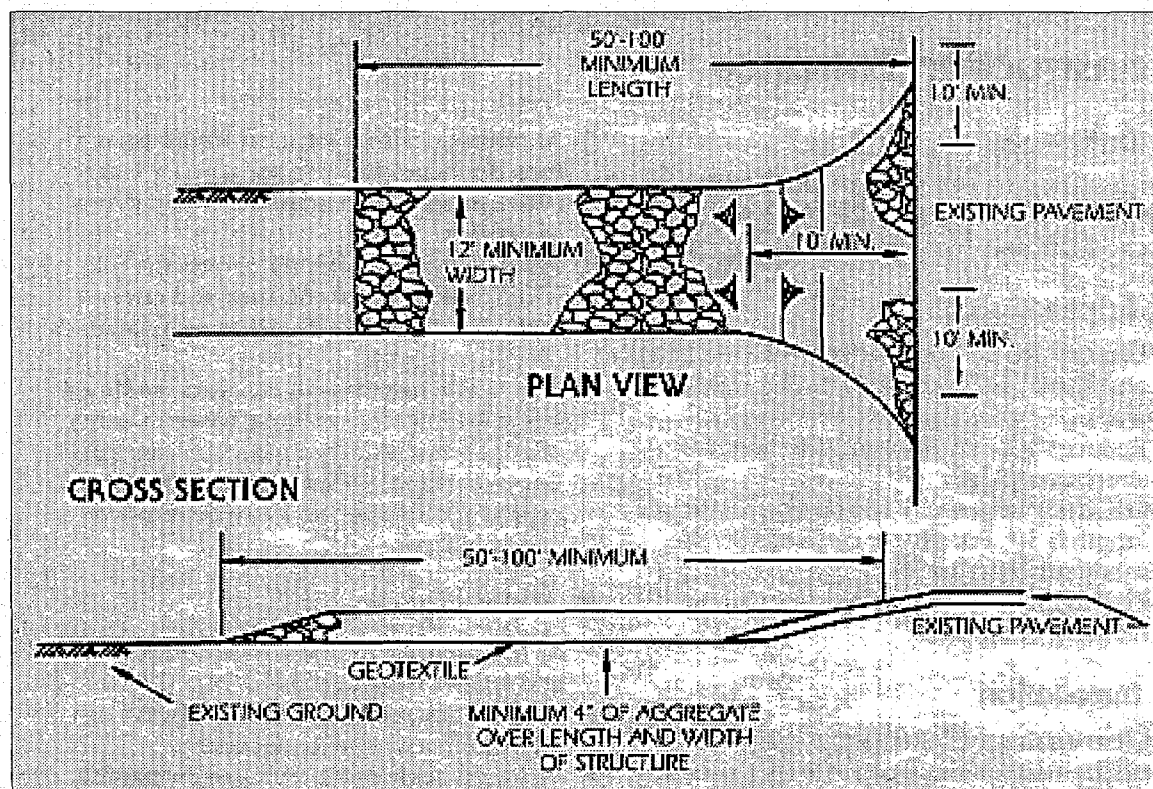
- Located where construction vehicles enter and leave work site onto public rights-of-way.
- Reduces but may not eliminate need for street sweeping.
- For sandy or gravelly soil on site, minimum length is 50'. For silty or clayey soils on site, minimum length is 100'.
- Plan to make stone available for maintenance of entrance.

■ Installation

1. Clear entrance of all vegetation and extraneous materials and excavate to a minimum of 4".
2. At poorly drained location, install subsurface drainage, proved for surface water conveyance under entrance with culverts as needed.
3. Place filter fabric underliner over the full width and length of entrance and cover with ConnDOT #3 (2"-4") stone to a depth of no less than 4".
4. As needed, install wash racks and sedimentation facilities for washing, when majority of mud is not removed from vehicles traveling over stone. Sediment should be intercepted and trapped so it can be removed and stabilized.

■ Maintenance

- As required, apply additional stone or wash and rework existing stone.
- Remove any sediment from roadways or storm drains whenever necessary.
- Inspect weekly or following every rainfall greater than ½".



Turbidity Curtain (also known as Silt Curtain)

■ Definition

A floating pervious barrier anchored in water that is at least 3 feet deep to isolate construction waters from clean waters.

■ Application

- Obstruct that flow of water as minimally as possible to reduce chance of failure.
- To be used along tidal and non-tidal water bodies when construction work is occurring in or on the banks of a water body.
- Use curtains only in low velocity situations. For high velocity situations use coffer dams and diversions.

■ Installation

- For each type of curtain installation, follow manufacturer's design standards.
- Extend curtain entire depth of watercourse. In situations of heavy wind or tidal conditions, leave a minimum 1" gap between end of skirt and bottom.
- In flowing streams, always locate curtain parallel to flow direction.

■ Maintenance

- Repair kits are available from geotextile fabric manufacturers.
- Entrapped material is typically removed by backhoe or dragline.
- Remove sediment in stages since disturbance causes suspension.
- Minimize turbidity when the curtain is to be removed; allow sediment to settle for a minimum of 6-12 hours prior to removal.
- Inspect weekly for anchoring and wear on load lines; replace and repair as necessary.

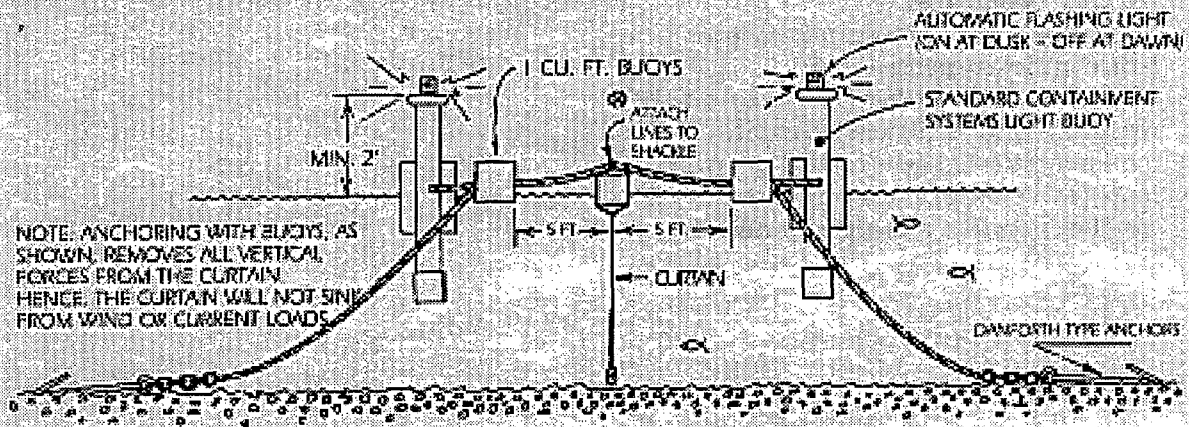
Type I

1. Set anchor points, tow the curtain in the furled position out and attach to anchors.
2. As necessary, set additional stakes or buoyed anchors to curtain to maintain curtain location.
3. Cut furling lines to let curtain skirt drop.

Type II, III & IV

1. Set all curtain anchor points prior to placing furled curtain in the water.
2. Utilize anchor buoys on all anchors to prevent submergence; anchor both sides of curtain when water is tidal.
3. Secure furled curtain to upstream anchor point and then sequentially attach to each next downstream anchor point.

4. Cut furling lines to allow skirt to drop.
5. Always attach anchor lines to the flotation device, not to bottom of curtain.



TIDAL WATER APPLICATION (Type IV Example)

ON-SITE SEWAGE DISPOSAL SYSTEMS AS A NONPOINT SOURCE OF POLLUTION

HOW ARE ON-SITE SEWAGE DISPOSAL SYSTEMS NONPOINT SOURCES OF POLLUTION?

An on-site sewage disposal system, also known as a subsurface sewage disposal system but most commonly referred to as a septic system, is a system which provides for the treatment and disposal of domestic sewage. The system usually consists of a tank where organic solids settle out and are partially broken down, a distribution box, and a leach field where the remaining liquid waste water is dispersed and treated by passage through the soil.

Improperly working systems can become nonpoint sources of pollution when pollutants, especially pathogens, begin to disperse throughout the surrounding soil and migrate to distant locations. In addition, even properly functioning systems release nitrogen which can adversely affect coastal water quality if systems are proximal to coastal waters.

“point” sources of pollution - pollution which originates from well-defined, usually manufactured “points” or locations such as municipal and industrial sewage treatment plants, combined sewer overflows and other wastewater discharge pipes

“nonpoint” sources of pollution - pollution originating from land use and man’s activities, having no well-defined point of entry, such as urban stormwater runoff including street and parking runoff, lawn runoff, soil erosion and failing septic systems

WHY IS IT IMPORTANT?

Septic systems are important because improperly working systems can be a source of nonpoint source pollution and can create a significant health threat. Water quality is strongly linked to land use including the installation and operation of septic systems. Due to the potential for pollution of inland and coastal surface and ground waters by malfunctioning septic systems or even outdated cesspools, it is essential that individuals working in all aspects of municipal land use understand this potential source of pollution and how to control it.

WHAT HARM CAN IT POSE?

Septic systems can pollute groundwater and surface water supplies when they are not sited or operating properly. Improper operation can be due to factors related to: location, design, installation and maintenance. Septic systems must be located in suitable soils and adequately setback from wetlands and watercourses, properly designed and installed, and regularly maintained to prevent discharge of pollutants to the surface of the ground and into ground waters that are closely hydrologically connected to surface waters. Otherwise, they can pose a public health risk and result in water contamination. The primary pollutants of concern are pathogens and nutrients but, when systems are used improperly, toxic contaminants may also be a problem.

Pathogens are disease-causing microorganisms such as bacteria and viruses which come from the fecal wastes of humans and animals. In unsuitable soil conditions, these microbes are not adequately treated by a septic system, can migrate considerable distances through surface and groundwater passages and contaminate drinking water supplies. Further, pollutants can flow to coastal waters resulting in contamination of commercial and recreational shellfish beds. Such contamination can result in illnesses such as cholera, hepatitis, gastroenteritis and typhoid.

Nutrients in the form of nitrogen and phosphorus emanate from properly functioning septic systems at reasonable densities and in acceptable levels. However, high nitrogen levels in drinking water can pose a health risk, and high nitrogen and phosphorus levels can cause algal blooms in coastal and fresh waters, respectively. Further, nutrients in large concentrations result in excess growth of algae which, upon decay, use up life-sustaining dissolved oxygen, thereby endangering oxygen-dependent aquatic life. This low oxygen condition is called **hypoxia** and poses a significant threat to the health of Long Island Sound.

Toxic contaminants are substances which can persist indefinitely and can harm the health of aquatic life and/or human beings when they enter groundwater resources and, in turn, surface waters. They are added from a variety of sources and include heavy metals (e.g. copper, zinc, lead), pesticides and organic compounds. Sources include chemicals used in the home and garden. When substances containing these contaminants are poured down a drain or flushed down a toilet, they can work their way into ground and surface waters, potentially harming people and aquatic life.

ARE MUNICIPALITIES REQUIRED TO ADDRESS POTENTIAL NONPOINT SOURCES OF POLLUTION FROM SEPTIC SYSTEMS?

Each new septic system constructed in the state must be located, designed, installed, and operated in accordance with technical standards established in the public health code to prevent nonpoint sources of pollution from septic systems. Applicants must demonstrate that their plan for a new subsurface sewage disposal system complies with the design and location requirements contained in the Connecticut Public Health Code, Regulations and Technical Standards for Subsurface Sewage Disposal Systems. The health code and technical standards ensure that new septic systems are properly located and operated, thereby preventing the discharge of pollutants to the surface of the ground and to reduce discharge into groundwaters.

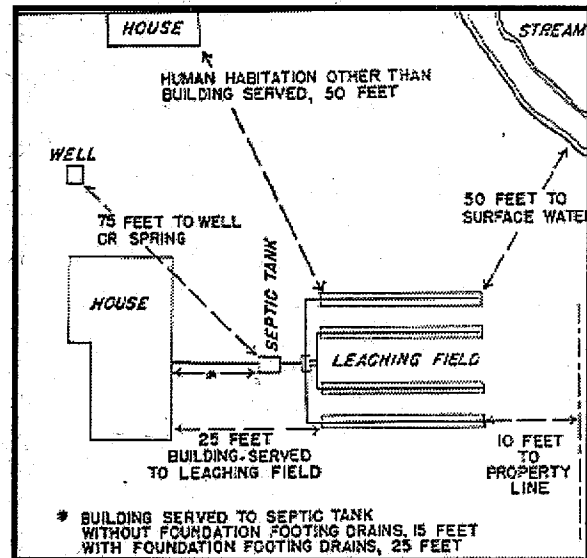
Municipal directors of health are responsible for ensuring that new systems meet the health code and its standards. Therefore, municipal land use officials should work to support an adequate, professional health department for the municipality, coordinate the health department review into planning, zoning and wetland reviews, and heed the advice of the health department professionals.

WHAT IS THE GOAL IN DESIGNING AND LOCATING SEPTIC SYSTEMS?

Main Objectives in Septic System Location

The main objective in locating and installing septic systems is to prevent the discharge of pollutants to the surface of the ground and into ground waters that are closely hydrologically connected to surface waters. In general, this is achieved by:

- locating septic systems away from unsuitable areas such as poorly or excessively drained soils, and prohibiting their installation where high ground water, surface flooding, or ledge rock will interfere with their effective operation;
- locating individual septic systems at least 50 feet from any open watercourse; and
- complying with all separation distances as established in the public health code.



Separation distances required by the Connecticut Public Health Code

Source: Septic Systems Manual: A Guide to On-Site Subsurface Sewage Disposal for Local Land-Use Officials

Septic System Guidelines

Specific measures directed toward meeting the above objectives include the following:

No permit or approval may be issued for any subsurface sewage disposal system where:

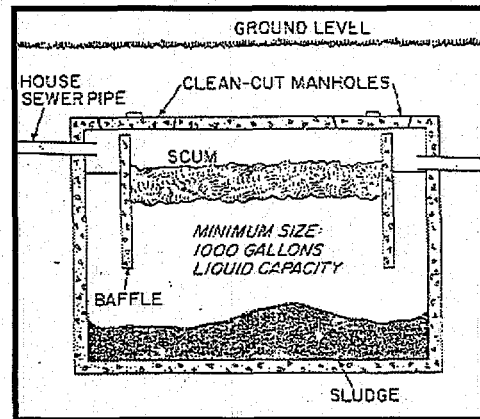
- it would discharge or overflow any sewage or treated effluent to any watercourse;
- the soil conditions in the area of the leaching system are unsuitable for sewage disposal purposes;

unsuitable soil conditions - conditions where the existing soil is impervious, or where there is less than 4 feet depth of suitable existing soil over ledge rock, or where the ground water is less than 18 inches below the surface of the ground for a duration of one month or longer during the wettest season of the year

- the surrounding naturally occurring soil cannot adequately absorb or disperse the expected volume of sewage effluent without overflow, breakout, or detrimental effect on ground or surface water (Section 19-13-B103e of the Public Health Code); and
- it would allow for the discharge to any subsurface disposal system of oils, greases, industrial or commercial wastes, toxic chemicals, waste from water treatment, or other liquids that will adversely affect the operation of the subsurface sewage disposal system or which may pollute wells.

In flood-prone areas, new and replacement septic systems must be designed to minimize or eliminate infiltration of flood waters into the systems and discharges from the systems into flood waters. Further, septic systems must be located to avoid impairment to them or contamination from them during flooding.

Technical standards recommend that septic tanks be cleaned out every two to four years, determined on the basis of 100 gallons of tank capacity per person per year. As an additional consideration, the use of a garbage disposal increases solids by approximately 50 percent, thereby necessitating the pumping out of tanks twice as often. Accordingly, the installation and use of garbage disposals with septic systems is specifically discouraged.



Typical septic tank installation

Source: Septic Systems Manual: A Guide to On-Site Subsurface Sewage Disposal for Local Land-Use Officials

Septic Systems in Areas of Special Concern

Disposal systems for areas of special concern merit particular investigation and special design. The following have been determined to be areas of special concern:

- designated as wetland under the provisions of Sections 22a-36 through 22a-45 of the Connecticut General Statutes (Inland Wetlands and Watercourses Act); or
- located within the drawdown area of an existing public water supply well with a withdrawal rate in excess of fifty gallons per minute, or within five hundred feet of land owned by a public water supply utility and approved for a future well site by the Commissioner of Public Health; or

- soils with slopes exceeding twenty-five percent; or
- maximum ground water less than three feet below ground surface; or
- a minimum soil percolation rate faster than one inch per minute; or
- a minimum soil percolation rate slower than one inch in thirty minutes; or
- ledge rock less than five feet below ground surface; or
- consisting of soil types interpreted as having severe limitations for on-site sewage disposal by most recent edition of the National Cooperative Soil Survey of the Soil Conservation Service.

In Connecticut's shallow glacial till soils, one of the principle causes of septic system malfunction is the lack of hydrogeologic capacity of the site to transmit additional water. A common symptom of this type of problem is a system that will function adequately except during the spring high ground water period, when effluent reaches the ground surface before being properly treated. This problem can generally be overcome if lot layout and system design are based upon the flow of water in the soil. The State Department of Public Health has incorporated a form of hydrogeologic analysis into their technical standards referred to as the Minimum Leaching System Spread (MLSS) requirement. As of 1994, all new systems must be designed to meet this requirement. Each proposed system is evaluated using this formula to determine the length that must be spread along a contour line, thereby determining the hydraulic load on a given cross section of soil. The required length along a contour line combined with the required system size determines the system's design. Determination of MLSS is made by entering percolation rate and depth to restrictive layer or ground water into a formula that also includes a calculated sewage flow factor. The result is given as the MLSS. This analysis must be done unless a full site specific hydrogeologic evaluation is done, as may be required in areas of special concern.

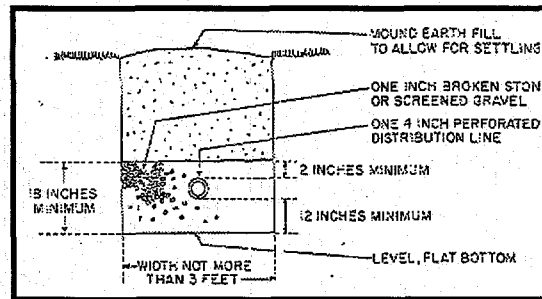
Plans for new subsurface systems in areas of special concern must be prepared by a professional engineer registered in the state of Connecticut, and must include all pertinent information as to the basis of design and soil conditions, test pit locations, ground water and ledge rock elevations, both original and finished surface contours and elevation, property lines building locations, open water courses, ground and surface water drains, nearby wells, and water service lines.

Thus, the application of the public health code ensures that all septic systems within the jurisdiction of the Commissioner of Public Health are properly located, designed, installed, operated, inspected, and maintained to prevent discharge of pollutants to the surface of the ground and into ground waters that are closely hydrologically connected to surface waters.

WHAT IS THE IMPLEMENTATION MECHANISM?

To assure that on-site disposal systems do not become a nonpoint source of pollution, two steps are necessary:

- 1) proper design, location and installation of systems, which is primarily the responsibility of the municipal health official, coordinated with the review by land use officials, as discussed above; and
- 2) proper operation and maintenance of systems which is primarily the responsibility of the individuals utilizing the systems.
This step is KEY to effective treatment!



Typical leaching trench specifications

Source: Septic Systems Manual: A Guide to On-Site Subsurface Sewage Disposal for Local Land-Use Officials

Proper operation and maintenance is achieved in large part through the use of best management practices.

Best Management Practices (BMPs) - practices which reduce or prevent the discharge of pollutants to surface and ground waters and which have been determined to be acceptable based upon technology and economic and institutional feasibility

Operational and maintenance BMPs for septic systems are universally applicable to all systems, and, therefore, do not require selection based upon site-specific conditions and anticipated pollutants.

The most important BMP is to educate homeowners about septic systems, their operation and maintenance. Therefore, municipalities should develop programs to disseminate information on septic systems and to ensure that these BMPs are followed.

Operation and maintenance BMPs for septic systems:

- Pump septic systems at least once every five years.
Some systems may need more frequent pumping based upon their age, size and use, especially if garbage disposals are utilized routinely. The need for frequent pumping could be a sign of system failure.

- Conserve water and avoid overloading the system.
 - Fix leaks
 - Use water-saving devices
 - Spread the use of water-using appliances over the entire week
- Do not use chemical additives even though they are heavily promoted.
- Do not use bacteria and enzyme additives to treat a malfunctioning system. There is no credible, scientific evidence that any septic system additive will improve the performance of a system, and some additives can cause very serious problems.
- Do not pour substances containing toxic substances down the drain or into the toilet. They kill the bacteria necessary for the proper operation of the system. In older improperly sited systems, this practice can result in ground and surface water contamination.
- Use garbage disposals sparingly or not at all. They can result in clogs as well as more frequent pumping of the system.
- Do not use the toilet as a trash can. Tissue, paper towels, baby wipes, disposable diapers, sanitary napkins and tampons are slow to decompose.
- Protect the leach field.
 - Know where it is and mark the tank access for easy pumping
 - Do not drive vehicles over it
 - Do not allow roof drains to flow to the leach field
 - Do not connect sump pump to a domestic drain
 - Do not cover the field with impervious surface such as asphalt or concrete
 - Keep trees and shrubs at least 10 feet away from a leach field
 - Plant densely-rooted grass and shallow-rooted plants over the leach field

Residential Densities in Septic System Areas

Communities can establish minimum residential densities in areas served by septic systems and on-site wells in order to protect water resources from failing septic systems.

In Connecticut, the residential densities on the following page are recommended. These figures are based on septic system reliability as well as other environmental and health standard considerations such as pollutant impacts, stormwater runoff, construction impacts, and water quality.

	<u>w/o Public Water</u>	<u>w/ Public Water</u>
Minimum lot area	1 unit per acre	1 unit per 0.6 acre
In public water supply watershed	1 unit per 2 acres	1 unit per 2 acres
In high yield aquifers	1 unit per 2 acres	1 unit per 2 acres
In inland and coastal waterfront areas	1 unit per 1.5 acres	1 unit per 1.5 acres

Note: All figures are exclusive of wetlands

Source: Report for the Blue Ribbon Commission on Housing, on the Land Required to Support Residential Development in Connecticut

Prepared by the Connecticut Department of Environmental Protection, Water Compliance Unit, May 1989

Therefore, not only are municipal officials responsible for the proper location and operation of septic systems, but the individuals using the systems must also be aware of BMPs in order to allow for their septic systems' optimal operation.

WHAT IS THE ENFORCEMENT MECHANISM?

All installers of subsurface sewage disposal systems must be certified by the Commissioner of Public Health. The Department of Public Health (DPH, formerly the Department of Public Health and Addiction Services) licenses approximately 3,000 subsurface sewage disposal system installers and septic tank cleaners, and 320 registered sanitarians are employed by local health departments. The DPH is responsible for taking action against licensed individuals when complaints are received or when violations of the Public Health Code and Statutes occur.

Under Chapter 446k (Water Pollution Control) of Connecticut's general statutes, the Commissioner of Environmental Protection has full authority to require the correction of any malfunctioning septic system of any size. The Commissioner has authority to issue orders and seek civil penalties up to and including fines of \$25,000 per day of violation. In addition, the Commissioner can determine that a problem such as a cluster of failed septic systems is a "community pollution problem," best solved by municipal action. Under those circumstances he can require resolution by the municipality.

C.G.S. Section 19a-206 (formerly 19-79) delegates enforcement to local directors of health (DOH) with respect to permitting and enforcement of on-site sewage disposal systems. This includes both civil and criminal penalties for persons who maintain a "nuisance or source of filth." The local DOH will normally try to remediate problem septic systems in an informal manner seeking the owner's cooperation. If this is not forthcoming, the DOH will normally issue a Notice of Violation which constitutes an order to remedy the particular situation. If the property owner remains in non-compliance, civil penalties (\$250.00/day) would normally be sought (C.G.S. Section 19a-206). In some cases of non-compliance, criminal penalties (\$100 or up to three months imprisonment) could be sought.

WHERE CAN I TURN FOR HELP AND ADDITIONAL INFORMATION?

AVAILABLE INFORMATION

PUBLICATIONS

- Septic Systems Manual: A Guide to On-Site Subsurface Sewage Disposal for Local Land-Use Officials, 1985, published by the DEP.
Available from CT DEP, Map and Publication Sales, 79 Elm Street, Store Level, Hartford, CT 06106-5127, (860)424-3555.
- Connecticut Public Health Code: Regulations and Technical Standards for Subsurface Sewage Disposal Systems, State of Connecticut Department of Health Services, (860)240-9277.
- Design of Subsurface Sewage Disposal Systems for Households and Small Commercial Buildings, State of Connecticut Department of Health Services, (860)240-9277.
- Upstream Solutions to Downstream Pollution - A Citizens' Guide to Protecting Seacoasts and the Great Lakes by Cleaning Up Polluted Runoff, 1993. Sarah Chasis, Jessica Landman, Beth Lillemann, Diane Cameron and Ann Notthoff, principal authors.
Good overview of nonpoint source pollution, not too technical
Available through the Natural Resources Defense Council and Coastal Alliance (send \$7.50 plus \$1.45 shipping and handling to: NRDC Publications Department, 40 West 20th Street, New York, NY 10011)
- Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters - EPA, January, 1993
Contains guidance developed in accordance with Section 6217 of the 1990 federal Coastal Zone Act Reauthorization Amendments specifying management measures to control sources of nonpoint pollution in coastal waters
Contact EPA Office of Water, Washington, D.C., by calling (202)260-7100.
- Connecticut Nonpoint Source Material Summary - Bibliography of Publications available through the DEP including the following:
 - Carrying Capacity of Public Water Supply Watersheds: A Literature Review of Impacts on Water Quality from Residential Development, DEP Bulletin 11, 1990 - Doenges, J.M., C.P. Allan, R.J. Jontos, Jr., and C.A. Liebler.

Available from CT DEP, Map and Publication Sales, 79 Elm Street, Store Level, Hartford, CT 06106-5127, (860)424-3555.

- Assessment of Nonpoint Sources of Pollution in Urbanized Watersheds: A Guidance Document for Municipal Officials - (Shreve-Gibb, B. and W. Boucher, Metcalf & Eddy, Inc.), CT DEP Bulletin #22, April, 1995.
Provides information on stormwater and nonpoint source pollution prevention and control; provides a process to follow for evaluating and improving existing regulations and practices
Available from CT DEP, Map and Publication Sales, 79 Elm Street, Store Level, Hartford, CT 06106-5127, (860)424-3555.
- Nonpoint Source Pollution: An Assessment and Management Plan, CT DEP, February 28, 1989
An assessment of the state's nonpoint source problem, providing a management strategy to address Connecticut's nonpoint source concerns
- Protecting Connecticut's Water-Supply Watersheds: A Guide for Local Officials
- Doenges, J.M., C.P. Allan, J. Benson, and R.J. Jontos, Jr. (Eds.), 1993.
Provides municipalities with guidance and information on existing and recommended programs for protection of public surface water supplies.
Available from CT DEP, Map and Publication Sales, 79 Elm Street, Store Level, Hartford, CT 06106-5127, (860)424-3555.
- Best Management Practices for the Protection of Groundwater, A Local Official's Guide to Managing Class V Underground Injection Control Wells - Inglese, O., Jr., 1992.
Discusses the operations commonly associated with many types of facilities, the materials used and the wastes generated; describes shops and services such as printing, dry cleaners, auto service and repair, beauticians and non-agricultural pesticide application.
Available from the DEP Map and Publication Sales, 79 Elm Street, Store Level, Hartford, CT 06106-5127, (860)424-3555.

STAFF

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UConn Cooperative Extension Service
Nonpoint Source Education for Municipal Officials (NEMO)
1066 Saybrook Road, P.O. Box 70
Haddam, CT 06438
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MARINAS AS A NONPOINT SOURCE OF POLLUTION

HOW ARE MARINAS NONPOINT SOURCES OF POLLUTION?

At marinas, potential sources of pollution include boat discharges to surface waters, spills during fueling and sewage pumping operations, discharges from stormwater or other discharge pipes and polluted runoff entering waters from parking and boat maintenance areas.

Pollution at marinas can originate in one of two ways:

“Point” sources of pollution - pollution which originates from well-defined, usually manufactured “points” or locations such as stormwater discharge pipes originating from parking lots and other waste water discharge pipes

“Nonpoint” sources of pollution - pollution having no well-defined point of entry, originating from upland and in-water maintenance activities, vessel repair and vessel operation such as contaminated stormwater sheet runoff from car parking areas, boat storage and outdoor hull maintenance areas, and spills during fueling and sewage pumpout operations



Typical marina bulkhead with high potential for nonpoint sheet runoff

Many of the potential sources of pollution at marinas fall into the category of nonpoint source pollution.

WHY IS CONTROL OF MARINA NONPOINT SOURCE POLLUTION IMPORTANT?

Due to their location on the waterfront, marinas and associated activities have the potential to adversely affect both inland and coastal water quality. Procedures associated with the construction of marina facilities and their subsequent use such as day-to-day marina operations and boat maintenance procedures can contribute sediments, nutrients, toxic organic compounds,

heavy metals, oils and grease, and other contaminants to ground and surface waters. Further, the improper operation of boat heads can contribute pathogens to surface waters. Due to this potential for the release of various types of pollution to inland and coastal surface and ground waters, individuals working in all aspects of municipal land use must understand the potential sources of pollution presented by marinas and how to control them.

WHAT HARM DOES IT POSE?

Due to their location right on the water's edge with little, if any, buffering, pollutants generated at marinas can easily enter the water with little or no treatment. Further, the diverse nature of marina operations can expose coastal waters to a wide variety of pollutants, with a good portion resulting from clean runoff becoming polluted and transporting various contaminants to ground and surface waters. In addition, because marinas rely on natural or manmade wave protection, circulation and flushing is often less than that which is available at more open locations.

Runoff is the portion of precipitation, snow melt or irrigation that flows over the ground (instead of being absorbed into the ground or retained on the surface) which eventually makes its way to surface waters.

Polluted runoff at marinas is rainwater and snowmelt which has become contaminated after picking up pollutants and/or sediment as it runs off driveways, lawns, parking areas, maintenance areas, docks and boat surfaces.

Site layout, development and marina operation have an effect on both quantity and quality of stormwater runoff. General stormwater concerns applicable to most development, including marinas, are discussed in the stormwater chapter. However, the nature of marina operations poses additional concerns above and beyond generic site development considerations.

Marina Pollutants

A variety of pollutants are associated with marina operations such as oil-based contaminants, metals, nutrients and bacteria. Typical pollutants include:

- petroleum hydrocarbons from fuel including fuel mixed with bilge waters;
- copper from antifoulant boat paints (scraping, power washing);
- oil-based paints and varnishes (scraping, power washing);
- fecal coliform bacteria and nutrients from boat heads (toilets);
- floatable debris from improperly discarded trash;
- detergents and other boat cleaning substances;
- arsenic from paint pigments, pesticides and wood preservatives;
- zinc from zinc anodes used to deter corrosion of metal hulls and engine parts;
- lead from fuel and ballast;
- tin from butyltin, a biocide used in paint (its use in bottom paints is now regulated);
- antifreeze;
- nutrients from lawn fertilizers; and
- sediment which can contain many of these pollutants.

These pollutants can enter coastal and ground waters as a result of many activities performed at marinas such as boat maintenance (scraping and power washing hulls, painting and varnishing

hulls and topsides of boats), conditioning motors, winterizing, fueling boats, pumping heads, and disposing of garbage. While not advised, some of these activities are carried out while boats are in the water when they would be better performed on land where resultant pollution can be better controlled. Further, due to marina locations immediately adjacent to coastal waters, pollutants from land are easily washed into the water.

The variety of potential pollutants at marinas pose many hazards to coastal waters which can be broken down into four general categories as follows.

Hypoxia is a condition which occurs as the result of excess nutrients, in particular, nitrogen in coastal waters. Excessive amounts of nitrogen can enter coastal waters from marinas in the form of fecal wastes from spills during the pumping of heads or marine toilets into shore-based disposal facilities, deliberate emptying of heads directly into the water, septic systems (see chapter on on-site sewage disposal systems) and from nitrogen-laden runoff from upland activities such as excessive lawn fertilization. Nutrients in large concentrations result in excess growth of algae which, upon decay, use up life-sustaining dissolved oxygen, thereby endangering oxygen-dependent aquatic life.

Pathogens are disease-causing microorganisms such as bacteria and viruses which come from the fecal wastes of humans and animals and which can result in illnesses such as cholera, hepatitis, gastroenteritis and typhoid. Sources include spills during the pumping of heads to shore-based disposal facilities, deliberate emptying of heads directly into the water, and faulty or improperly installed and/or maintained septic systems (see chapter on on-site sewage disposal systems).

Toxic contaminants are substances that can harm the health of aquatic life and/or human beings. They are created in a variety of ways and include heavy metals (e.g. copper, zinc, lead), pesticides and organic compounds like PCBs (polychlorinated biphenyls). Sources at marinas include oil and grease from boat maintenance and operation, certain paints and varnishes, antifreeze, grease, oils and gasoline from parking lots and chemicals used on lawns.

Debris is waste material which, upon entering surface and coastal waters, causes aesthetic problems and can pose a threat to aquatic organisms through ingestion or entanglement. Sources include trash cans which are infrequently emptied, careless disposal of trash, blowing garbage and runoff which picks up improperly discarded garbage.

ARE MUNICIPALITIES REQUIRED TO ADDRESS NONPOINT SOURCES OF POLLUTION FROM MARINAS?

Yes. The Connecticut legislature recognized the impact of nonpoint sources of pollution to Long Island Sound when it passed Public Act (P.A.) 91-170 and P.A. 91-398 (codified in Connecticut General Statutes (C.G.S.) Sections 8-2, 8-3b, 8-23 and 8-35a) which require reasonable consideration for the restoration and protection of Long Island Sound. While this legislation is directed toward coastal municipalities, *all* towns should be working to better control nonpoint sources of pollution in order to restore, protect and enhance their ground and surface water resources, many of which ultimately flow to Long Island Sound. C.G.S. Section 8-2(b) specifically requires the following:

In any municipality that is contiguous to Long Island Sound the regulations adopted under this section shall be made with reasonable consideration for restoration and protection of the ecosystem and habitat of Long Island Sound and shall be designed to reduce hypoxia, pathogens, toxic contaminants and floatable debris in Long Island Sound. Such regulations shall provide that the commission consider the environmental impact on Long Island Sound of any proposal for development.

Further, coastal municipalities are required to conduct coastal site plan reviews (C.G.S. Sections 22a-105 through 22a-109) for the development of new marinas or the significant alteration of existing marinas. Before receiving approval from municipal land use boards and commissions, applicants must demonstrate, in part, that proposed activities will not degrade water quality through the significant introduction into either coastal waters or ground water supplies of suspended solids, nutrients, toxics, heavy metals or pathogens, or through the significant alteration of temperature, pH, dissolved oxygen or salinity [(C.G.S. Section 22a-93(15)(A)]. Municipalities should carefully review and analyze marina proposals for potential pollution sources, e.g., proposed industrial-type activities and proximity of such activities to coastal waters.

Finally, it should be noted that all work waterward of the high tide line, e.g., the installation or repair of docks, bulkheads and floats and dredging of bottom sediments, requires prior authorization from the DEP's Office of Long Island Sound Programs and the U.S. Army Corps of Engineers prior to initiation.

WHAT IS THE GOAL IN MANAGING NONPOINT SOURCES OF POLLUTION AT MARINAS?

When controlling any type of pollution, the general goals are:

- First:** Prevent pollution at its source, primarily through preconstruction planning.
- Second:** Control unavoidable pollution as close to the source as possible through BMP selection and associated maintenance plans.
- Third:** Mitigate for existing sources of pollution, often through retrofitting at already developed marinas.

Pollution prevention, which is the most efficient and cost effective means of pollution control, is best achieved during the siting and design of marinas which includes considerations for marina operation and maintenance activities. However, few new marinas are being proposed in Connecticut as compared to existing operations. Therefore, the review of proposals for modifications to existing marinas should include careful examination of ways to minimize existing sources of pollution. For example, the use of toxic chemicals for which there are nontoxic substitutes could be prohibited, and activities which could be particularly toxic to the marine environment could be prohibited from areas which do not allow for proper containment of the pollutants generated.

Some potential sources of pollution, e.g., fueling and pump-out facilities, are an integral part of some marinas. Therefore, such facilities should be planned for during the siting and design of new marina facilities or examined for retrofitting in the case of modifications to existing marina. Fueling and pump-out facilities should be located away from the most sensitive resources on the site, if possible, in order to protect them in the event of a spill. Further, the facilities themselves should be safeguarded as much as possible to first, prevent spills, and second, to contain any that might occur.

Stormwater has the potential to carry marina-related pollutants rapidly to coastal waters due to their waterfront location. The proposed or existing path of stormwater and what can be picked up based upon the proposed or existing design of a marina should be carefully scrutinized during the site plan review process. For example, stormwater should not be allowed to pass through boat maintenance areas, thereby possibly picking up toxics such as oils, chemicals and paints prior to discharge. Such areas should be enclosed to allow for containment of pollutants, easy clean up and proper disposal, preferably by being indoors. At a minimum, impervious surface material and curbing should be installed to prevent toxic substances from entering ground and coastal waters.

Once again, applications for modifications to existing marinas should be seen as an opportunity to upgrade existing facilities. Local officials should look for opportunities to retrofit existing operations to eliminate existing and potential pollution sources. For example, maintenance areas can often be improved through the installation of impervious surface and curbing, and catch

basins can be retrofitted with gross particle separators, thereby preventing pollutants from being washed off into ground or coastal waters.

WHAT IS THE IMPLEMENTATION MECHANISM?

The implementation mechanism for control of nonpoint sources of pollution at coastal marinas is the use of best management practices.

Best Management Practices (BMPs) - practices which reduce or prevent the discharge of pollutants to ground and surface waters and which have been determined to be acceptable based upon technology and economic and institutional feasibility.

The document Best Management Practices for Coastal Marinas is available through the DEP. The following description and discussion of best management practices is condensed from this document. For a full discussion of the following BMPs, this document should be consulted.

BMPs at marinas fall into two general categories:

- I - Marinas Siting, Design and Site Improvements
- II - Routine Operations and Maintenance

Within these categories, management practices can be grouped based upon their intent:

- source reduction

Discontinue the use of undesirable materials or practices, implement approaches to reduce potential spills, and employ strategies to minimize the generation or transport of pollutants.

- treatment

Employ strategies to removed pollutants once generated.

“Source reduction” efforts are preferred over “treatment” techniques because, in general, prevention of discharges is far more effective, and less costly, than providing treatment after a discharge has occurred.

The BMPs below are grouped as follows:

- I - Marina Siting, Design and Site Improvements

- marina site selection
- marina design and construction
- fuel handling facilities
- hazardous materials handling facilities

- sanitary waste facilities
- stormwater management practices

II - Routine Operations and Maintenance

- education, training and notification
- marina rules and regulations
- vessel maintenance and repair
- vessel storage
- fuel handling
- storage, handling and disposal of hazardous materials and waste
- solid waste handling
- sanitary waste handling
- stormwater runoff quality management
- maintenance of physical structures

In reviewing them, it is important to keep in mind that not only marinas but also industrial and manufacturing facilities such as boat building and commercial fishing operations may generate wastewater, stormwater, rinse water runoff, and other discharges which contain a wide array of potentially harmful pollutants. The various BMPs listed in this document may be applicable to these operations as well.

I - Marina Siting, Design and Site Improvements

The potential impact of small craft marinas on coastal water and sediment quality from nonpoint sources of pollution is influenced by their upland and marine environments. The selection of marina sites is a critical factor in limiting the environmental impacts of new marinas and the modification of existing facilities. The proper layout of a marina, or an expansion, can also minimize the potential for nonpoint sources of pollution.

It is important that the best management practices and policies for water quality control be applied to both the selection of new marinas and the modification of existing sites.

BMPs should be applied to both:

- new marinas, and
- modifications of existing marinas.

Good planning and design of marina improvements and new facilities can also simplify or minimize the need for routine management practices to control nonpoint source pollution.

While proper siting of new marinas is important in minimizing nonpoint sources of pollution, municipal land use officials are most often involved after site selection has occurred. Therefore, emphasis will be placed on those BMPs which are applicable after site selection. For a complete

discussion of site selection issues, *Best Management Practices for Coastal Marinas* should be consulted.

- marina site selection

Site selection considerations can be broken down into the categories of:

- deep water access
- access to infrastructure
- water circulation
- flood hazards
- critical habitats

For a complete discussion of these topics, please consult *Best Management Practices for Coastal Marinas*.

- marina design and construction

- water circulation

Water quality - design marinas to avoid degrading water and sediment quality.

- site access

Access to public roads - marinas should have direct, safe access to public roads capable of accommodating anticipated traffic, with such access minimizing the discharge of untreated stormwater runoff into sensitive areas.

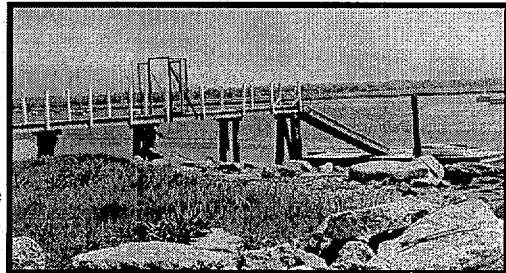
Marina entrances - improve existing marina entrances to avoid accident-prone roadways and to minimize the risk of pollutants reaching water bodies and sensitive areas.

- site layout and design considerations

Resource protection - the following resources should not be disturbed and setbacks to protect them should be used:

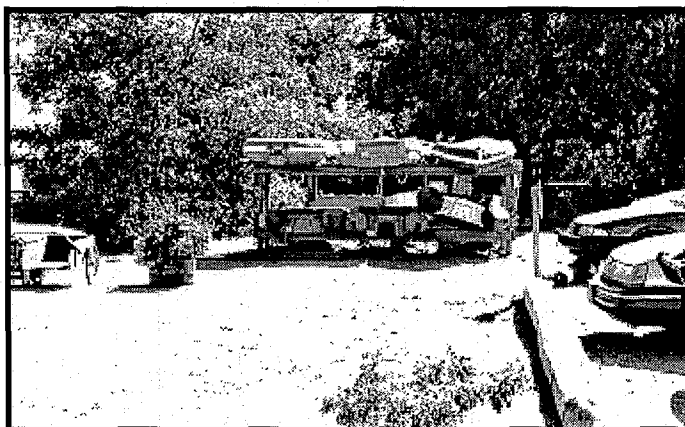
- submerged aquatic vegetation (SAV);
- intertidal flats;
- riparian vegetation;
- shellfish areas;
- wetlands; and
- other critical habitats such as beaches and dunes.

Elevated walkway designed to minimize impact on tidal wetland vegetation
Stratford, CT



Buildings and hazardous materials - all buildings and hazardous materials should be placed above the elevation of the base flood as designated by the Federal Emergency Management Agency (FEMA).

Parking and storage - parking lots and boat storage areas should not be located at the edge of the water or bulkheads. Vegetated buffer zones should be established to filter and attenuate stormwater runoff pollutants.



Vegetated and pervious buffer zone, being used for dinghy storage and walkways. Buffer separates marina parking from the water's edge and serves to filter stormwater runoff.

Mystic Shipyard
Groton, CT

Maintenance areas - all outdoor boat maintenance areas should be on impervious surfaces with curbs and stormwater drainage systems to collect accidental discharges and spillage.

Sewage disposal - on-site subsurface sewage disposal systems should be at least 50 feet and preferably 100 feet from surface waters, should be located in the best available soils, should not be paved over, and should not be subjected to vehicular traffic.

Hazardous waste - holding tanks should be provided for the collection of hazardous materials and potential pollutants for off-site disposal. In addition, dry storage yards should be equipped with tanks for collecting oil, antifreeze and batteries.

Fuel tanks - above-ground fuel tanks should have curbed or diked storage areas; underground fuel tanks should have leak-detection equipment and overfill protection.

Restrooms - public on-shore restrooms should be provided. Showers and laundry facilities may also be appropriate at marinas with larger boats.

Fueling operations - automatic fuel tank and pump leak shut-offs should be provided; fueling areas on land should be curbed to contain spills.

Waste receptacles - all waste disposal facilities should be well marked to encourage their proper use.

Excavated, dredged material disposal - upland disposal sites for excess excavation material and dredged sediment should be managed to create good habitat and avoid the creation of areas with nuisance plant species such as *Phragmites australis*. Suitable buffers between upland containment areas and wetlands and other water resources should be provided.

Dock structures - dock and pier systems should be designed to provide safe, adequate access and egress during emergencies and storm events.

Buffers - buffer zones should be established between marina activities and critical habitat areas; natural vegetation should be preserved where possible, particularly along the water's edge.

Buffer strip adjacent to marina slips which includes a naturally vegetated slope and a grassed and treed upland strip
Chester, CT



Stormwater treatment - sufficient space must be allocated for stormwater treatment systems with the goal of treating the first half inch to inch of runoff.

Sedimentation, erosion control - provide sedimentation and erosion control practices during construction and provide permanent stabilization measures to prevent development-related sedimentation of coastal waters.

- fuel handling facilities

All storage and handling of fuels and vessel fueling operations should be done in accordance with applicable state and local fire protection codes. In the absence of such codes, marinas should adhere to applicable portions of the National Fire Protection Association's (NFPA) 303, Fire Protection Standard for Marinas and Boatyards and NFPA 302, Fire Protection Standards for Pleasure and Commercial Motor Craft.

Underground tanks - underground fuel storage tanks should meet applicable state regulations for such tanks.

In-ground tanks - in-ground storage tanks should be designed and installed with leak detection systems.

Above-ground tanks - above-ground fuel tanks should have curbed or diked storage areas with containment volumes meeting state and local codes and applicable provisions of the NFPA's standards.

Fuel pumping operations - automatic fuel tank and pump leak shut-offs should be provided.

Fueling areas - fueling areas on land should be curbed to contain spills.

Spill containment - spill containment equipment and materials should be provided in locations immediately accessible to receiving facilities and fuel dispensing facilities; *contingency plans for spill containment and remediation are required.*

- hazardous materials handling facilities

Design - design facilities to require the minimum use and storage of hazardous materials; design facilities to incorporate provisions for spill contingency procedures.

Exposure to the environment - for facilities anticipated to require the use and storage of hazardous materials, provide for facilities that minimize the risk of exposure of these materials to the environment.

Storage areas - storage areas should be designed and constructed in accordance with state regulations and local codes and fire regulations.

Outside storage - if outside storage must be provided, solid chemicals, chemical solutions, paints, oils, solvents, acids, caustic substances and waste materials, including batteries, should be stored in a manner which will prevent spillage by overflowing, tipping or rupture. Further,

- *hazardous liquid storage areas* - hazardous liquid storage areas should have durable impervious surfaces and be bermed or diked, having a capacity equal to 10 percent of the total tank or container volume or 110 percent of the largest tank container, whichever is greater;

- *liquid wastes* - liquid wastes should be stored under cover, under tarpaulins or roofed structures, or in enclosed vessels; and

- *reactive materials* - incompatible or reactive materials should be segregated and securely stored to prevent mixing.

- sanitary waste facilities

Sewage pump-out systems and dump stations - Vessels with marine sanitary devices (MSDs) that utilize holding tanks require pump-out systems to convey sewage for shore-side collection and disposal. Smaller vessels can have portable toilets from which sewage is poured into a receiving dump station. Sanitary sewage facilities should be provided at all existing marinas, and marina expansions should not be allowed without adequate sanitary sewage disposal. If possible, marinas should be served by public sanitary sewers. Further, marinas should be encouraged to install on-shore restrooms, including showers, where appropriate, to reduce reliance on facilities in vessels while in port. Facilities should be kept clean and attractive to encourage their use.

Regulations - State regulations governing the provision of pump-out facilities are currently pending. These regulations are anticipated to deal in detail with the following:

- standards for determining where pump-out systems are required, such as size of the marina facility, water quality standards, location of other sources of pollution, location and nature of critical habitats, and feasibility of installation
- detailed design criteria for pumps, suction and discharge lines, holding tanks, and associated appurtenances
- operational considerations
- submittal and review requirements

On-site sewage disposal facilities (see Chapter 3)

On-site sewage disposal facilities are used at marinas where hooking up to municipal sewage facilities is not feasible. Design of these facilities is governed under the Connecticut Public Health Code or DEP requirements, depending upon the size of the system (see below). Modifications to existing systems may be necessary when discharge from pump-outs or dump stations is added.

- all on-site sewage disposal systems with average flows less than 5,000 gallons per day should be designed in accordance with the Connecticut Public Health Code
- systems larger than 5,000 gallons per day should be designed in accordance with DEP requirements
- sanitary waste from vessels with holding tanks and portable toilets should be discharged to septic systems only if those systems are specifically designed to receive such waste
- since chemicals in MSDs can stop bacteriological activity in septic tanks, the disposal system should be designed to prevent such harm such as allowing for dilute of the MSD waste by ordinary domestic sanitary flows
- adjacent to poorly flushing coves, embayments or harbors where nutrients pose a significant problem, alternative on-site wastewater treatment systems may need to be considered to enhance nitrogen removal

- stormwater management practices

Stormwater runoff from parking lots and other developed surfaces represents a significant mode of transport of pollutants from land-based activities to coastal waters. In marinas, runoff from parking areas, buildings, repair yards and access roads include pollutants typical of urban runoff (e.g., nutrients, metals, suspended solids, and hydrocarbons). The treatment of stormwater runoff is discussed in detail in chapter 1. However, depending upon the nature of the specific activities at a marina (e.g., boat scraping, painting,

cleaning, fueling, engine repair), runoff from such areas may contain higher concentrations of some pollutants. It is recommended that in both new and expanding marinas, drainage associated with maintenance and repair activities be separated from other stormwater discharges and that maintenance practices specific to those activities be employed as discussed throughout this chapter.

II - Routine Operations and Maintenance

The following is a list of BMPs most applicable to upland activities for routine operations and maintenance at marinas. A complete description and explanation of these BMPs can be found in the document *Best Management Practices for Coastal Marinas*.

- education, training and notification

Those who are involved in marina construction, operation and use should be informed about BMPs and their proper implementation.

- marina rules and regulations

Marina rules and regulations should be developed to:

- specifically identify user responsibilities related to BMP measures
- clearly designate areas restricted to activities such as painting and scraping, waste handling, and boat washing
- designate prohibited areas within the site
- designate activities restricted to performance by authorized personnel, e.g., fuel handling and pump-out operation

- vessel maintenance and repair

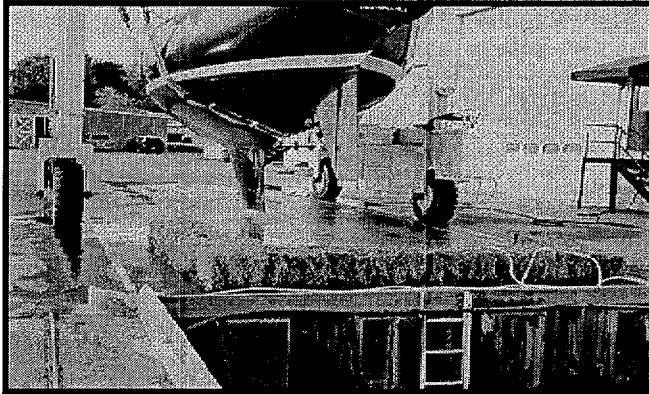
- general, including engine maintenance and repair

- designate activities which may be undertaken onboard vessels while in the water and those which should be conducted at shore-side facilities

- cleaning

- encourage the use of appropriate cleaning agents, cleaning methods, paints, and varnishes in appropriate areas
- require proper disposal of hazardous materials and wastes

- *scraping and sand blasting*
 - designate appropriate areas for these activities, preferably enclosed areas (if outdoor work is necessary, limit it to non-windy days), and properly collect and dispose of residue



Hull maintenance area in an established marina with impervious surface and hay bales to provide some filtering of wash water.

Mystic Shipyard
Groton, CT

- *painting*
 - encourage the use of non-toxic paints or coatings, limit in-water painting activities to areas where materials and spills can be contained, perform upland work in order to collect all residue and spills, and properly dispose of waste materials.
- **vessel storage**

Properly prepare and store boats depending upon the storage method.
- **fuel handling**

Properly site and operate fuel handling facilities, including compliance with all Bureau of the State Fire Marshall requirements and development of a spill contingency plan. Fuel storage areas should be properly contained to prevent spills.
- **storage, handling and disposal of hazardous materials and waste**

The use and storage of hazardous materials on-site should be minimized, where feasible. Chemicals and chemical solutions, paints, oils, solvents, acids, caustic solutions, batteries and waste materials should be stored to prevent spillage and their inadvertent entry into coastal and ground waters. All federal and state regulations should be followed regarding the proper storage and handling of these substances. All handling of paints and solvents should be done within bermed areas. A spill contingency plan is required where oil and hazardous materials are used or stored.

- solid waste handling**- disposal and recycling**

- encourage the use of recyclable materials and provide for their collection
- waste disposal and collection bins should be required, clearly marked and accessible
- rules and regulations for disposal of solid waste should be posted at the disposal areas
- waste disposal areas should be conveniently located with respect to repair and maintenance areas
- waste disposal areas should be inspected daily (this provision should be included in the maintenance plan for the facility)

- fish waste handling

- disposal of fish wastes in marina basins should be prohibited
- fish wastes may be disposed of in offshore ecosystems from which the fish were originally harvested. However, they should not be recycled in waters where they will wash up onto a shoreline or cause odor or other nuisances.
- fish cleaning on docks and floats should be prohibited unless done in a pan or on a cloth and disposed of in a proper manner
- fish cleaning areas should be designated with waste receptacles
- rinse water drainage from fish cleaning should be directed to a sanitary sewer or a sand filter

- sanitary waste handling**- operation and maintenance of pump-out facilities (see glossary for full description of pump-out facilities)**

- hoses and fittings should not be washed in the marina basin
- hoses, fittings, pumps and accessory equipment should not be washed on pier, dock or adjacent upland
- sanitary waste from vessels should not be discharged to an on-site disposal system unless designed for such use
- waste holding tanks should be secured and have a containment area
- pump-outs should only be operated by trained personnel
- pump-out facilities and regulations should be clearly posted

- operation and maintenance of on-site wastewater disposal systems (see chapter on on-site disposal systems for a complete discussion of these facilities)

- sanitary waste from vessels should not be discharged to an on-site disposal system unless designed for such use

- paving, vehicular traffic, or dispose of dredge spoils should not be allowed over a septic tank leach field unless the system is designed for this loading which can compact soil and crush pipes
- tanks should be pumped regularly to prevent overflows and clogging of the leach field
- disposal of fats, solvents, oils, disinfectants, paints, poisons, other hazardous materials, diapers and other similar products should be prohibited in drains or toilets
- signs notifying patrons of pertinent rules and regulations should be posted
- **stormwater runoff quality management** (*see chapter on stormwater management for a complete discussion of this topic*)
 - *surface sweeping and cleaning*
 - areas within marinas should be cleaned on a regular basis to prevent oils, paints, dust, grinding residues and other materials from being washed into surface waters
 - adequate containment and clean up in sandblasting areas should be required to prevent debris from entering coastal waters
 - boatyards should be cleaned up regularly
 - *maintenance of oil and sediment trapping devices*
 - runoff from boat maintenance and repair areas should be separate from ordinary parking lot and roof runoff
 - sediment traps and oil/grease separators should be inspected on a monthly basis and cleaned as necessary
- **maintenance of physical structures**
 - natural vegetation should be used for shoreline stabilization wherever feasible, and maintained in good condition
 - riprap revetments which provide greater habitat and reduce wave reflections are generally encouraged over vertical bulkheads

It is unlikely that any single approach will provide adequate control for all marina operations and maintenance activities. Rather, some combination of source reduction and treatment techniques may be required. The specific management practices falling into these two categories may range from appropriate posting of information and "good housekeeping" to more intensive or complex control practices. The following table summarizes the applicability of various management practices to routine operation and maintenance activities.

ROUTINE OPERATION AND MAINTENANCE BMPS

LEGEND																
○ APPLICABLE																
● NOT APPLICABLE																
MARINA USE OR ACTIVITY		SIGN POSTING	RESTRICTED WORK AREAS	WASTE MATERIAL RECEPICALS	EMPLOYEE TRAINING	CURBING	TARPS	VACUUMS/SWEEPING	HOLDING TANKS/ SEPARATE DRAINAGE	MATERIAL USE RESTRICTIONS	COVER	SPILL CONTAINMENT	OIL TRAP/ GRIT CHAMBER	SEDIMENT BASIN	PUBLIC EDUCATION	
VESSEL MAINTENANCE & REPAIR	SCRAPING	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
	PAINTING	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
	CLEANING	○	○	○	○	○	○	●	○	○	○	○	○	○	○	
	ENGINE REPAIR & MAINTENANCE	○	○	○	○	○	●	●	○	●	○	○	○	○	○	
	FUELING	○	●	●	○	○	●	●	○	●	○	○	○	●	○	
FISH WASTE DISPOSAL	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
DRY BOAT STORAGE	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
PHYSICAL STRUCTURES MAINTENANCE	●	●	●	○	○	○	○	○	●	○	●	●	●	●	○	
SOLID WASTE DISPOSAL & RECYCLING	○	●	●	○	○	○	●	●	●	○	○	○	●	●	○	

WHAT IS THE ENFORCEMENT MECHANISM?

Municipal Enforcement

Harbor Management Planning

A municipality can influence the location and siting of new marinas through the establishment of a harbor management commission and development of a harbor management plan in accordance with C.G.S. Sections 22a-113k through 22a-113t. A harbor management plan is a municipally prepared document which contains recommendations for the use, development and preservation of in-water areas of a harbor. State and municipal regulatory decisions must be generally consistent with an approved municipal harbor management plan. Recommendations contained in approved and adopted plans are binding on any official of the state unless such official shows cause why a different action should be taken. State-appointed harbor masters have the authority to enforce the provisions contained in a state-approved and locally adopted plan.

Coastal Site Plan Review

Municipal enforcement under the coastal site plan review process can ensure appropriate stormwater management for new marina developments, or modifications to existing marina operations. Coastal site plan approval can incorporate conditions for stormwater management, including bonding to assure compliance. In addition, municipal stormwater regulations such as the model ordinance proposed in Chapter 1 can also apply to marina coastal site plan applications.

Activities which violate coastal site plan conditions or requirements are declared public nuisances pursuant to C.G.S. Section 22a-108. Both municipalities and the DEP may initiate litigation to abate such nuisances, and municipalities may also exercise other enforcement options such as those provided by C.G.S. Section 8-12. As an additional consideration, the commissioner of environmental protection has the authority to appeal any municipal coastal site plan review decision in court if he finds such decision to be inconsistent with the policies and standards of the Connecticut Coastal Management Act.

State Enforcement

Coastal Permit Programs

DEP authorization is required for any activity in the tidal, coastal, or navigable waters of the state waterward of the high tide line (Sections 22a-359 through 22a-363f) or in tidal wetlands (C.G.S. Sections 22a-30 through 22a-35). Regulated activities include dredging, filling, and the construction of structures such as docks and bulkheads. Unauthorized activities, activities which do not comply with their authorizations, or activities which, regardless of their authorization, are

causing adverse impacts to natural resources or the environment are subject to all enforcement authorities of the Department. These enforcement authorities include the following:

- Issuance of a Notice of Violation (NOV), an informal notification that a violation exists at a site, and offering the respondent a chance to come into compliance without formal enforcement action.
- Issuance of an administrative order, which may require removal of unauthorized structures and restoration of a site, or may initiate revocation of a permit, pursuant to section 22a-6.
- Referral to the Attorney General to seek civil penalties of up to \$1,000 per day for violations of the state's structures and dredging program under section 22a-361a, and for willful violations of tidal wetlands statutes under section 22a-35.
- Referral to the Attorney General to enjoin or abate any violation of the terms and conditions of any authorization issued pursuant to C.G.S. Sections 22a-359 through 22a-363f.
- Issuance of a cease and desist order under 22a-7, in cases of imminent and substantial hazard to the environment. If the respondent fails to comply, the Commissioner may abate the hazard and seek restitution pursuant to C.G.S. Section 22a-363e.
- Pursuant to C.G.S. Section 22a-363f, the Commissioner may issue a cease and desist order for any ongoing or imminent unpermitted activity.

Stormwater General Permit

In accordance with C.G.S. Section 22a-430b, the Department administers a stormwater general permit program for all construction activities with land disturbance of five acres or more, commercial activities with five acres or more of contiguous impervious surface, and industrial activities. Eligible applicants must register with the DEP, and a stormwater pollution control plan must be developed and kept at the site.

For construction activities, each stormwater pollution control plan must include soil erosion and sedimentation controls, effective both during and after construction, and long-term water quality controls. For industrial activities, each plan must include measures and controls appropriate for potential pollutants as identified by the permittee, based on a required inventory of exposed materials. Permittees for industrial activities are also responsible for annual stormwater monitoring and recording of analyses results. For commercial activities, each pollution control plan must provide for regular sweeping of parking areas, sidewalks and driveways, and for the proper storage of potential pollutants such as raw materials, intermediate and final products, by-products and waste materials. The DEP has oversight responsibilities and enforcement authority.

C.G.S. Section 22a-430b(c) authorizes the DEP to require individual permits if the commissioner of the DEP determines that an individual permit would better protect the waters of the state from pollution than the general permit.

Water Pollution Control Statutes

C.G.S. Section 22-427 prohibits the pollution of any of the waters of the state or the continuing discharge of any treated or untreated wastes by any person or municipality.

Discharges may be permitted under C.G.S. Section 22a-430, provided they comply with the state's water quality standards adopted under C.G.S. Section 22a-426. If the DEP finds that any person or municipality has initiated, created, originated, or is maintaining any discharge into the waters of the state without a permit as required or in violation of such permit, it may issue an order to abate such pollution in accordance with C.G.S. Sections 22a-428, 22a-431, or 22a-432. Such orders may be issued to owners of land from which the pollution originates, and may be entered on municipal land records. The Department may also request the attorney general to bring an action in superior court to enjoin unpermitted discharges until a permit is received or compliance with an issued permit is achieved. Violators of water pollution control statutes, permits, or orders are liable for civil penalties of up to \$25,000 per day under C.G.S. Section 22a-438, with an additional \$25,000 per day for willful or criminally negligent violations.

State Fire Codes, Fire marshals and Fire Hazards

Chapter 541 provides for the imposition of penalties for violations of state regulations developed for the proper handling of hazardous materials. In particular, the commissioner of public safety is responsible for enforcing regulations concerning the safe storage, use and transportation of flammable or combustible liquids.

WHERE CAN I TURN FOR HELP AND MORE INFORMATION?

AVAILABLE INFORMATION

PUBLICATIONS

- Best Management Practices for Coastal Marinas, Final Report (prepared for the CT DEP by Fugro McClellan), August, 1992.
A program of BMPs to minimize the adverse impacts of marina construction, expansion and operations on Connecticut's coastal water quality
Available through the DEP Office of Long Island Sound Programs - (860)424-3034
- Upstream Solutions to Downstream Pollution - A Citizens' Guide to Protecting Seacoasts and the Great Lakes by Cleaning Up Polluted Runoff, 1993. Sarah Chasis, Jessica Landman, Beth Lillemann, Diane Cameron and Ann Notthoff, principal authors.
Good overview of nonpoint source pollution, not too technical
Available through the Natural Resources Defense Council and Coastal Alliance (send \$7.50 plus \$1.45 shipping and handling to: NRDC Publications Department, 40 West 20th Street, New York, NY 10011)
- Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters - EPA, January, 1993.
Contains guidance developed in accordance with Section 6217 of the 1990 federal Coastal Zone Act Reauthorization Amendments specifying management measures to control sources of nonpoint pollution in coastal waters
Contact EPA Office of Water, Washington, D.C. by calling (202)260-7100.
- Guidelines for Soil Erosion and Sedimentation Control - CT DEP/CT Council on Soil and Water, 1988.
Contains methods and techniques for minimizing erosion and sedimentation
Available from CT DEP, Map and Publication Sales, 79 Elm Street, Store Level, Hartford, CT 06106-5127, (860)424-3555
- Stormwater Management Quantity and Quality (prepared for the CT DEP by Milone & MacBroom, Inc.), February, 1992.
Provides information to help evaluate the need and use of stormwater management systems
Draft document available from Milone and MacBroom, Inc., (203)271-1773.

- Connecticut Nonpoint Source Material Summary - Bibliography of Publications available through the DEP including the following:
 - Assessment of Nonpoint Sources of Pollution in Urbanized Watersheds: A Guidance Document for Municipal Officials - (Shreve-Gibb, B. and W. Boucher, Metcalf & Eddy, Inc.), CT DEP Bulletin #22, April, 1995.
Provides information on stormwater and nonpoint source pollution prevention and control; provides a process to follow for evaluating and improving existing regulations and practices
Available from CT DEP, Map and Publication Sales, 79 Elm Street, Store Level, Hartford, CT 06106-5127, (860)424-3555.
 - Nonpoint Source Pollution: An Assessment and Management Plan -CT DEP, February 28, 1989.
An assessment of the state's nonpoint source problem, providing a management strategy to address Connecticut's nonpoint source concerns
Available from CT DEP, Map and Publication Sales, 79 Elm Street, Store Level, Hartford, CT 06106-5127, (860)424-3555
 - Protecting Connecticut's Water-Supply Watersheds: A Guide for Local Officials
- Doenges, J.M., C.P. Allan, J. Benson, and R.J. Jontos, Jr. (Eds.), 1993.
Provides municipalities with guidance and information on existing and recommended programs for protection of public surface water supplies
Available from CT DEP, Map and Publication Sales, 79 Elm Street, Store Level, Hartford, CT 06106-5127, (860)424-3555
 - Best Management Practices for the Protection of Groundwater. A Local Official's Guide to Managing Class V Underground Injection Control Wells - Inglese, O., Jr. 1992.
Discusses the operations commonly associated with many types of facilities, the materials used and the wastes generated; describes shops and services such as printing, dry cleaners, auto service and repair, beauticians and non-agricultural pesticide application
Available from the DEP Map and Publication Sales, 79 Elm Street, Store Level, Hartford, CT 06106-5127, (860)424-3555

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Stormwater management (860)424-3018

GLOSSARY

- aquifer** - a geologic formation, group of formations or part of a formation that contains sufficient saturated, permeable materials to yield significant quantities of water to wells and springs
- best management practices (BMPs)** - practices or structural devices which reduce or prevent the discharge of pollutants and which have been determined to be acceptable based upon technology and economic and institutional feasibility
- BOD** - biochemical oxygen demand - the amount of oxygen measured in parts per million, that is removed from aquatic environments rich in organic material by the metabolic requirements of aerobic microorganisms
- catch basins** - masonry drainage inlets equipped with a sump to trap debris and settleable material before it enters storm drains. Some catch basins have baffles or hoods over the storm drain outlet to trap floating material in the sump
- culverts** - pipes or conduits that convey runoff beneath roads or driveways from one side to the other
- curbs** - low concrete, bituminous concrete or stone barriers located at the edge of roads and parking lots to intercept overland flow and direct its movement
- debris** - trash which, upon entering surface and coastal waters, causes aesthetic problems and can pose a threat to aquatic organisms through ingestion or entanglement; debris often takes the form of street litter which is carried in runoff to waterways
- detention facilities** - depressed or impounded areas used to temporarily store excess surface runoff, gradually releasing the water over an extended period of time so as to have a discharge rate lower than the peak inflow rate
- detention ponds** - earthen embankments or excavated ponds whose main purposes are the temporary detention of stormwater to control peak runoff rates and the settlement of particulate pollutants
- drainage channels** - artificial linear channels constructed to convey drainage runoff, as opposed to natural watercourses; may be lined to prevent erosion
- endwalls** - masonry, concrete, timber or metal walls that reinforce the exposed ends of storm drains or culverts and help to direct the flow of water and minimize scour damage
- erosion** - wearing away of the surface of the land by the action of water, wind, ice and gravity
- eutrophication** - the natural aging process of surface waters (such as rivers, streams and reservoirs) through enrichment by nutrients. Eutrophication is accelerated by people's activities; in the end, eutrophication results in the complete filling in and drying up of a water body.
- first flush** - initial runoff, usually the first inch, of rainfall which contains higher pollutant concentrations than subsequent runoff. This is due to rain rapidly washing dry weather deposits off of paved surfaces in higher initial concentration levels than those washed off later in a storm. This effect is particularly pronounced with initial heavy rainfalls.
- ground water** - water found beneath the ground surface that completely fills the open spaces between particles of sediment and within rock formations
- gutters** - shallow open channel flow depressions usually associated with curbs which convey stormwater along the edge of paved areas and minimize water ponding on roadways
- hypoxia** - low dissolved oxygen; the result of excess nutrients, in particular, nitrogen in coastal

waters. Nutrients in large concentrations result in excess growth of algae which, upon decay, use up life-sustaining dissolved oxygen, thereby endangering oxygen-dependent aquatic life. Sources of nutrients include faulty sewage treatment plants, septic tanks, and runoff containing fertilizers.

impervious surface - material or structure on, above or below the ground that does not allow precipitation or surface water to penetrate directly into the soil

infiltration basin - a water impoundment made by constructing an earthen embankment or by excavating down to relatively permeable soils (sands and gravels)

infiltration trench - shallow excavated ditch, generally 2 to 10 feet in depth backfilled with a coarse stone aggregate, which allows for temporary storage of stormwater runoff

manholes - underground masonry structures located to provide maintenance access to storm drains and serve as junctions for two or more storm drains

MLSS - Minimum Leaching System Spread - a form of hydrogeologic analysis used to determine the capacity of soil to transmit water for purposes of siting a septic system

MSD - marine sanitation device - any equipment for installation on board a vessel which is designed to receive, retain, treat or discharge sewage

overland flow - excess rainfall flowing across the land surface without defined channels; typically a shallow sheet of water moving through grass or over paved surfaces

pathogens - disease-causing microorganisms such as bacteria and viruses which come from the fecal wastes of humans and animals and which can result in illnesses such as cholera, hepatitis, gastroenteritis and typhoid. Sources include faulty sewage treatment plants, improperly functioning septic tanks, and runoff containing animal wastes.

polluted runoff - rainwater and snowmelt which has become contaminated after picking up pollutants and sediment as it runs off streets, lawns, parking lots, agricultural lands, marinas, landfills and any other sites being used for activities which can generate pollutants

porous pavement - asphaltic paving material that allows for rapid infiltration and temporary storage of urban stormwater runoff

pump-out - a fixed or mobile mechanical unit which is used to remove sanitary wastes from boats. Fixed pump-outs, including a holding tank and pump, are usually located at the end of a pier or dock, often on or near the fueling pier. Vessels access the facility by approaching and securing to the dock or pier. Mobile facilities consist of a small vessel with a holding tank and a pump, which services boats at their moorings or slips. Pumps, which are typically electrically driven, pump wastes to a central storage tank through a flexible hose attached to the boat deck using a universal fitting. Wastes are then hauled off-site for treatment.

retention pond - an earthen embankment or excavated pond that usually contains a permanent pool whose main purpose is the retention of stormwater runoff and the settlement of particulate pollutants

sand filters - a self-contained bed of sand underlain with pipe that is designed to treat the first flush of stormwater runoff; runoff filters through the sand bed, collects in the underground pipe system and is then directed to the receiving water. Sand filters may be enhanced by layers of peat, limestone and/or topsoil and may be over planted with grass.

sediment - solid material, either mineral or organic, that is in suspension, is transported, or has been moved from its site of origin by erosion

shallow marsh creation - a shallow marsh around the perimeter of or at the entrance end of a detention pond, retention pond, infiltration basin, or sediment basin

soil - any unconsolidated mineral or organic material of any origin

storm drains - underground pipes or conduits used to transport excess surface runoff to discharge points, supplementing gutters and channels

stormwater runoff - precipitation that falls onto the land surface, collects and runs over the ground instead of being absorbed into the ground or retained on the surface. Stormwater runoff can carry a variety of pollutants such as oil-based contaminants, heavy metals (copper, lead, zinc), nutrients and bacteria.

swales - natural or artificial channels that convey runoff, but with distinctive mild vegetative banks and bed. They usually only have intermittent flow.

toxic contaminants - substances that can harm the health of aquatic life and/or human beings. They are created in a variety of ways and include heavy metals (e.g. copper, zinc, lead), pesticides and organic compounds like PCBs. Sources include oil, grease and gasoline from roadways and driveways and chemicals used in the home, garden and on farm crops.

trash hood - feature in a catch basin which traps debris such as litter and keeps it from being discharged from the catch basin

urban forestry - the protection of trees and forest land during the construction phase of development; the planting of trees after the site has been cleared; or homeowner landscaping after the site has been fully developed

urban stormwater runoff - precipitation that falls onto the surfaces of roofs, streets, parking lots, roads and the grounds of developed areas. Urban precipitation is not absorbed by the ground or retained in its surface, but collects and runs off, carrying a wide variety of pollutants such as oil-based contaminants, heavy metals (copper and lead), nutrients and bacteria

vegetative filter strips - an area of vegetative cover through which runoff containing sediments and other pollutants may flow before it leaves a site or enters a stormwater management practice

vegetative swales - grassed watercourses whose purpose is to retard or impound concentrated runoff to induce infiltration and decrease velocities

water quality inlet - structure whose purpose is to separate oil and sediments from parking lot and street runoff

watershed/drainage basin - the area defined by the slopes and contours of the land surface, that drains into a river or river system. It is important to note that these basins generally do not conform to municipal or political boundaries.