Water Resources Protection Regulatory Strategy Guide

Final Report

Town of Peterborough, New Hampshire

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Executive Summary

As the Town of Peterborough and other towns in the southern New Hampshire area develop, industries, retail businesses and subdivisions create more impervious area resulting in increasing amounts of stormwater. Increased surface water runoff is traditionally piped offsite, often to the nearest stream or channel, greatly increasing the intensity and force of stormwater flows while decreasing groundwater recharge. This decrease in groundwater recharge is particularly problematic since it ultimately reduces baseflow. Peterborough has likely experienced this as evidenced by the significant drop in water table at both its north and south aquifers over the past few years. Although the aquifer may recover during particularly wet years, over time a deficit may develop that cannot recover quickly.

Baseflow is the groundwater discharge into streams that occurs during dry weather and droughts. Thus, the same amount of precipitation falling on the watershed now leaves the watershed at a high rate in stormwater flow instead of recharging groundwater for a slow release, damaging both surface water and groundwater resources. Significant water resource impacts include: 1) reduced groundwater recharge resulting in a long-term decline in groundwater levels, impacting water supply wells; and 2) increased stormwater flows loaded with pollutants that impact streams and ponds in the watershed that may eventually pose a public health threat, impacting aquatic habitat, recreation and aesthetic resources of the watershed.

This report, funded by the NH Department of Environmental Services (NH DES), provides recommendations for regulatory changes that would help reduce stormwater impacts to the Town's drinking water supply while promoting infiltration and aquifer recharge. It also outlines the new Phase II Stormwater Regulations and presents ways the Town could incorporate and implement components of this regulatory program.

Principal recommendations resulting from the review of the Town's existing regulations include:

1. The adoption of the NH DES model Stormwater and Erosion Control Regulations. Once adopted, this regulation could be referenced throughout the Town's existing Code.
2. The adoption of guidelines for the design of stormwater Best Management Practices (BMPs). A model Design Guidelines and Criteria for Stormwater Management document has been included in the report's appendix and should also be referenced in the Stormwater and Erosion Control Regulations recommended above.

The use of these criteria as a separate but referenced "manual" will promote groundwater recharge while allowing future flexibility to easily update the manual as new technologies arise and according to the Town's changing needs.

3. The adoption of several additional bylaws and guidelines that are necessary for low-impact development and the protection of the Town's water resource supply. These include:
    a. impervious limits
    b. steep slope protection
    c. the establishment of buffer zones
    d. minimum open space requirements
    e. adoption of landscape design guidelines
    f. use of BMP Operations and Maintenance Agreements

The table on the following page summarizes the full range of regulatory modifications. CEI has termed this "Low Impact Development Regulatory Checklist" since these modifications, accompanied by public education, will result in more environmentally friendly development and redevelopment practices for Peterborough. Examples of each type of modification are located in the Appendices, with the intent that each could be modified and adapted to Peterborough as desired.

LOW IMPACT DEVELOPMENT[1] CHECKLIST	Report Reference
Impervious Limits Bylaw	**Appendix I**
Steep Slopes Bylaw	**Appendix J**
Stormwater BMP Design Criteria:	**Appendix F**
▪ Peak discharge of 2, 10, 25, and 100 year storm	
▪ 1 year sediment maintenance volume – all designs	
▪ Use of conservative CN values pre- and post-	
▪ Treatment of 2 year storm volume	
▪ Infiltration of 1 inch storm	
▪ Pretreatment required; use of treatment train	
▪ Visible failures of BMPs	
▪ No bypass features on BMPs	
▪ Use of runoff prevention methods	
▪ Use of pervious parking where feasible	
▪ Minimum parking spaces proposed	
▪ Clearing and grading minimized	
▪ Topsoil removal and compaction minimized	
▪ Pervious street buffers using low maintenance materials	
Use of Buffer Zones to Protect Water Resources	**Appendix I**
Minimum Greenspace or Open Space Required	**Appendix K**
Landscape Design Guidelines:	**Appendix M**
▪ Topsoil minimum of 6 inches	
▪ Organic matter of topsoil minimum of 8%	
▪ Use of native, drought resistant plantings of a minimum size and quantity	
▪ If irrigation systems are used, low water use systems are preferred	
▪ Curbing or wheel blocks to protect landscaping from compaction	
▪ Landscape buffers between parcels, preferably of native materials	
Stormwater Management and Erosion Control Regulation	**Appendix E**
Maintenance Easements and Agreements with Landowners	**Appendix L**

[1] Redevelopment projects should meet the same criteria to the greatest extent possible.

1.0 Introduction

1.1 Project Goals

Protection of a community's drinking water supplies is one of the most important goals associated with the quality of life in a community and the health, safety and general welfare of the public. As in many communities, the protection of drinking water resources is one of the most important items of concern to residents of Peterborough. The project is intended to specifically address regulatory issues for wellhead protection and other water resource protection by improving the Town's existing regulatory controls with respect to stormwater management and erosion and sediment control. This project is made possible through funding from the New Hampshire Department of Environmental Services Drinking Water Source Protection Program.

This report documents research and analysis of existing regulatory controls related to water quality in the Town of Peterborough. The following regulations were reviewed in this effort:

- Municipal Water System Rules and Regulations
- Highway Department Rules and Regulations
- Site Plan Review Regulations
- Subdivision Regulations
- Excavation Regulations
- Zoning Code

Available map data from the GRANIT web site and the Town were also used in this analysis. Staffs from involved departments were interviewed as part of the review, and the review and recommendations were coordinated with the current update of the Master Plan.

To structure the review, the regulations were reviewed for compliance with the minimum requirements of the EPA Phase II ruling. The regulations were also compared to current model regulations available from the State. Proactive regulations in place in other New Hampshire communities were also reviewed, although most closely resembled the State model regulations. Recommendations were formulated to improve water quality, primarily through stormwater management and erosion and sediment control of proposed development and redevelopment projects that would be subject to the Town's regulations. In addition to regulatory improvements, descriptions of other non-regulatory best management practices that can be implemented by the Town are also provided.

1.2 Water Resources in Peterborough

Peterborough relies on aquifers as its sole source of drinking water. The town's five wells are located in two locations, over gravel aquifers. Most of the aquifers in Peterborough are associated with the Contoocook River and its tributaries. Historically, river basins have been the site of industrial development and transportation routes. During the early days of industrial development, industry located near rivers to access water power. Later, industry located in river basins to access rail lines and roadways, which were built in the river basins because the gentle slopes required less grading and excavation. Route 202 and the industrial and commercial zoning districts in Peterborough are an example of this development pattern (Figure 1-1). Unfortunately, many industrial uses involve pollutants that will contaminate drinking water supplies if they enter the groundwater. As an example, Peterborough's most productive well was closed years ago due to industrial pollution. Other hazardous waste sites are located directly on top of or in proximity to Peterborough's aquifers. The natural topography and the municipal storm drain system may also provide a pathway for toxins to reach surface and groundwater. For these reasons, it is vital for the community to evaluate its water resources and protect those resources as much as possible.

The Water Resources Subcommittee of the Master Plan Steering Committee has been collecting data and information on water resource issues in Peterborough. The subcommittee is preparing a document that provides a history and description of the drinking water system and water resources within the Town, a review of prior studies and recommendations made, discussions of surface and groundwater resources, and identification of some existing potential threats to the water supply. This document will provide valuable information from which the town's water resources can be further evaluated. It will be a useful tool in the preparation of more specific measures to protect the water resources of Peterborough.

2.0 Stormwater Management

2.1 Stormwater Runoff and Water Resources

Stormwater runoff is defined as the water that is not absorbed or infiltrated into the ground during a rain event. Stormwater runoff flows across the surface of the ground, entering drainage systems and eventually discharging to wetlands or watercourses. In a natural vegetated state, approximately half of the rain that falls to the ground seeps into the soil. About half of that water continues to infiltrate into groundwater. Groundwater is stored in aquifers used for drinking water supplies. Groundwater also provides a constant source of cool clean water for streams and rivers, sustaining natural habitats and recreation resources. Increases in the amount of impervious surfaces (rooftops, pavement and concrete) interrupt the natural hydrologic cycle by significantly reducing the amount of water that can infiltrate into the ground and aquifers. This results in greater stormwater runoff volume and an increase in the rate at which stormwater moves. Temperatures of stormwater runoff from impervious surfaces are also higher than from naturally vegetated areas, impacting fish habitat. Impervious surfaces collect sediment, litter and pollutants, which are carried by stormwater runoff to streams and rivers. This is called nonpoint source pollution, which is now the nation's largest water quality problem, according to the U.S. Environmental Protection Agency. Figures 2-1 and 2-2 illustrate the natural hydrologic cycle and impacts to it from development.

Traditional methods of handling stormwater have been designed with the intent of collecting it and carrying it off a site to nearby surface water, sometimes using basins to store and then slowly release it. However, these methods often do not adequately address water quality and the recharge of underlying groundwater aquifers or the downstream effects of the collected water. Pollutants carried by stormwater have degraded wetlands, rivers, streams and ponds, polluting surface water supplies and vegetative and wildlife habitats. Groundwater drinking water supplies have also been reduced, as water is collected from impervious ground surfaces and piped directly to surface waters, rather than infiltrating into the ground. The results of these impacts are profound. Reductions in drinking water supplies and drinking water quality have resulted in water restrictions and increased need for water treatment. Pollution of natural habitat has impacted fishing and other recreational opportunities and our natural heritage. All of these impacts ultimately result in increased costs to communities.

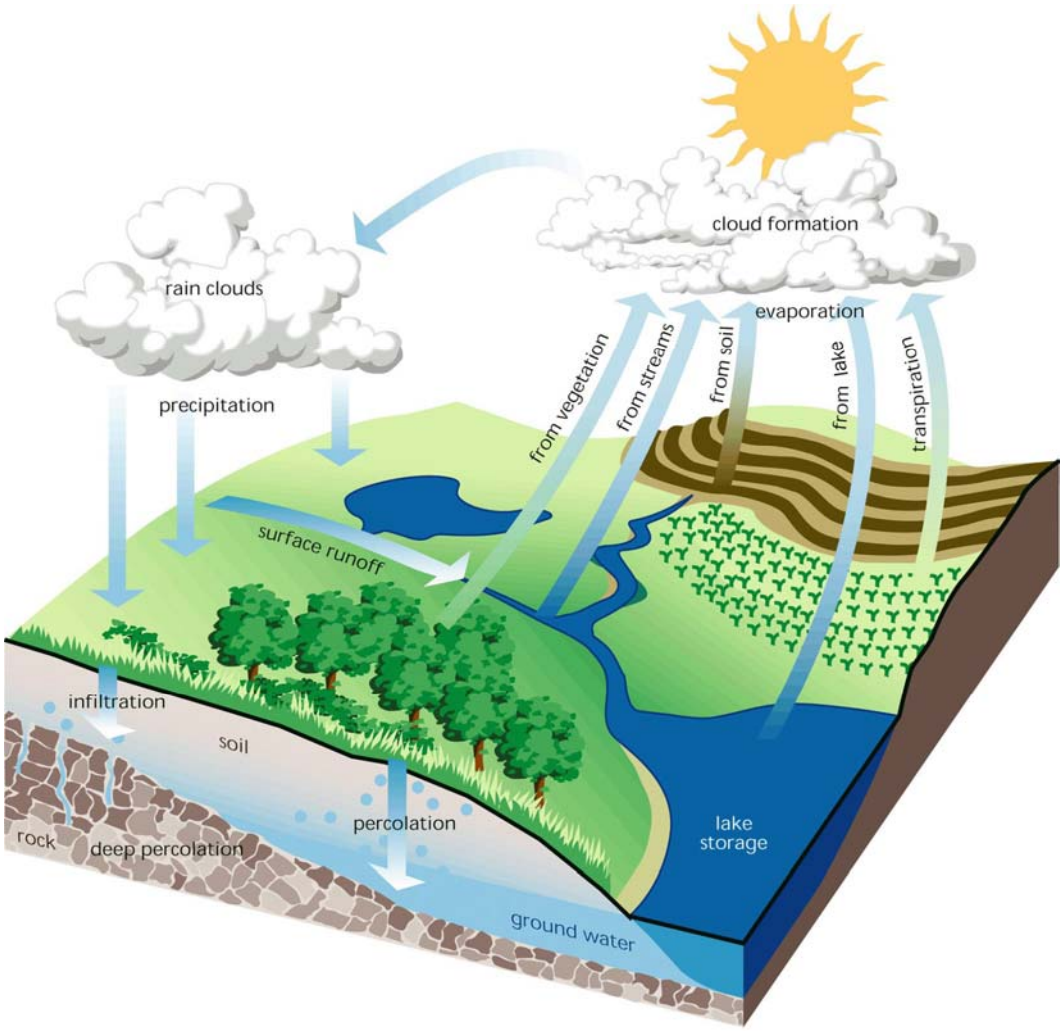

Figure 2-1. The Hydrologic Cycle. Source: *Stream Corridor Restoration: Principles, Processes, and Practices (10/98)*, Federal Interagency Stream Restoration Working Group.

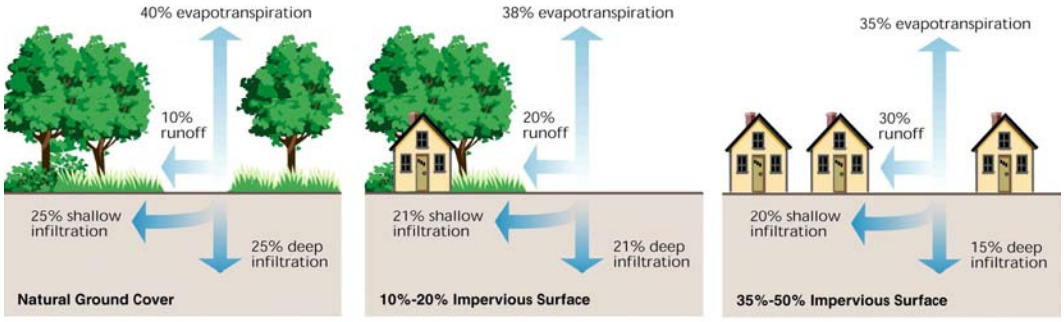

Figure 2-2. Impacts to the Hydrologic Cycle from Impervious Surfaces. Source: *Stream Corridor Restoration: Principles, Processes, and Practices (10/98)*, Federal Interagency Stream Restoration Working Group.

New Best Management Practices (BMP's), including Runoff Prevention Methods (RPM's), have been developed as an alternative to traditional, more costly "end-of-pipe" methods of managing stormwater associated with development and redevelopment. BMP's are based on proven technologies and engineering methods and are designed to treat stormwater runoff before discharging off-site and provide infiltration to recharge groundwater resources.

2.2 EPA Phase II Program

While Peterborough has not been identified as an EPA Phase II community, the Phase II regulations are nevertheless used here as a guide to provide better protection of stormwater runoff quality. The objective of the Phase II program, which was promulgated under the Clean Water Act, is for municipalities to develop effective, site-specific stormwater management programs that reduce the discharge of pollutants from the municipal separate storm sewer system (MS4) to the maximum extent practical. The Phase II ruling includes the following six minimum control measures to improve stormwater runoff quality:

- Public Education
- Public Participation
- Illicit Discharge Detection and Elimination
- Construction Site Runoff
- Post Construction Runoff
- Good Housekeeping

Public Education

The Phase II Stormwater rule requires the development and implementation of a public education program to distribute educational materials or otherwise communicate to the community about the impacts of stormwater discharges on local water bodies and steps that can be taken to reduce stormwater pollution.

Public Participation

The Phase II Stormwater rule requires regulated operators of MS4s to comply with applicable State, Tribal, and local public notice requirements. The intent is to allow the public the opportunity to have input on the development and implementation of measures designed to address water quality issues. Public participation and involvement are important to the success of a stormwater management program and create the following benefits:

- Broader Public Support

- Increasing Public Awareness
- Shorter Implementation Schedules
- Broader Base of Knowledge Resources and Economic Benefits
- Support and Connectivity with Other Environmental Programs

Illicit Discharge Detection and Elimination

Illicit discharges are defined by the EPA as any discharge that is not composed entirely of stormwater. Common illicit discharges include sanitary wastewater, effluent from leaking septic tanks, car wash wastewater, laundry wastewater, and improper disposal of automobile and household products. These illicit discharges contribute high levels of pollutants, including heavy metals, toxic chemicals, oil and grease, nutrients, viruses, and bacteria to waterbodies. Illicit discharges can enter the municipal system either through direct connections (pipes connected directly to the storm drain) or through indirect connections (through cracked pipes, leaking tanks, or dumped by hand into storm drains). The Phase II requirements for Illicit Discharges include adopting an ordinance or other regulatory mechanism that prohibits non-stormwater discharges into the stormwater system and includes appropriate enforcement procedures.

Construction Site Stormwater Runoff Control

The EPA notes that "sediment runoff rates from construction sites are typically 10 to 20 times greater than those of agricultural lands, and 1,000 to 2,000 times greater than those of forest lands. During a short period of time, construction sites can contribute more sediment to streams than can be deposited naturally during several decades. The resulting siltation, and the contribution of other pollutants from construction sites, can cause physical, chemical, and biological harm to our nation's waters." (EPA 833-F-00-008, Fact Sheet 2.6, January 2000).

The Phase II Final Rule requires towns to develop, implement, and enforce a program to reduce pollutants in stormwater runoff entering the municipal storm drain from construction activities that result in a land disturbance of greater than or equal to one acre. Regulatory requirements of this minimum control measure include:

- Adopt an erosion and sediment control ordinance, including inspection requirements, enforcement and sanctions for non-compliance.
- Require site operators to implement erosion and sediment control (ESC) BMP's.
- Require site operators to control waste.

- Implement procedures for site plan review that incorporates consideration of potential water quality impacts.
- Prepare procedures for receipt and consideration of information submitted by the public.
- Implement procedures for site inspection and enforcement of control measures.

Post-Construction Stormwater Management

The Phase II ruling requires that stormwater be addressed from new development and redevelopment projects that disturb one acre or more and which discharge to the Town's municipal storm sewer system (MS4). Recommended actions include zoning tools (cluster or conservation subdivisions, low-impact development, urban growth boundaries, etc.) and other regulatory controls to reduce stormwater runoff and improve water quality. Towards meeting the Phase II goal of reducing pollutants to the maximum extent practical, the EPA recommends a number of structural and non-structural BMP's. Structural BMP's may include infiltration basins, proprietary devices, and other structural devices designed to capture stormwater runoff from a site and remove pollutants before discharging off-site. Non-structural BMP's include on-site treatment, better site design, open space design and preservation, conservation easements, flexible roadway standards, green parking, and zoning. In addition, Phase II requires that the town adopt measures to ensure long-term operation and maintenance of structural BMP's.

The municipality must develop, implement and enforce a program that ensures that controls are in place that will prevent or minimize water quality impacts for all properties involving greater than one acre of disturbance or that drain into the MS4. This requires the:

- Development and implementation of strategies which include a combination of structural and/or non-structural BMP's.
- Use of an ordinance or other regulatory mechanism to address post-construction runoff from and development and redevelopment projects.
- Implementation of measures to ensure the adequate long-term operation and maintenance of BMP's.

Good Housekeeping/Pollution Prevention

The Phase II Stormwater rule requires regulated communities to examine their municipal operations and to alter them as needed to help ensure a reduction of pollutants to stormwater discharges. The alteration of municipal operations should focus on reducing the pollution that collects

on streets, parking lots, open spaces and storage and vehicle maintenance areas. Improvements to land development and flood management practices and the maintenance of storm drain systems should also be considered to reduce pollutant impacts.

By reviewing and improving municipal operations, volumes of stormwater discharges associated with municipal activities can be reduced and stormwater runoff quality can be improved. Some regulated operators may also see an added cost-savings benefit as their daily operations become more efficient.

The development of an operations and maintenance program and employee training for municipal operations are required to fulfill the pollution prevention/good housekeeping element of the Phase II Stormwater rule. EPA recommends including the following program elements:

1. Inspection and Maintenance Plan – includes implementation of maintenance activities, schedules and inspection procedures for structural and non-structural stormwater controls to reduce floatables and other pollutants.

2. BMP's for Municipal Maintenance/Storage Facilities and Town-Wide Municipal Operations – includes implementing actions or controls to reduce or eliminate discharges from streets, roads, highways, municipal parking lots, maintenance and storage yards, waste transfer stations, fleet or maintenance shops with outdoor storage areas, salt/sand storage locations and snow dumps.

3. Handling and Disposing of Stormwater Residuals – evaluates the adoption of procedures for proper disposal of catch basin cleanings, material dredged from detention basins and the like.

4. BMP's for Stormwater Projects – includes the adoption of procedures to ensure that new flood management projects are assessed for water quality impacts and that existing projects are assessed for incorporation of additional water quality protection devices or practices.

5. Employee Training – helps staff learn how to incorporate pollution prevention and good housekeeping techniques into their everyday municipal activities. Municipal operations such as park and open space maintenance, fleet and building

maintenance, new construction and land disturbances, and stormwater system maintenance should be included.

Available Material

The Department of Environmental Services and the Office of State Planning as well as the U.S. EPA have developed a series of technical bulletins and other information concerning the protection of water resources and the NPDES Phase II stormwater program. Selected information sheets are included in Appendices A and B while Appendix C contains additional stormwater, planning, and low-impact development resources that may be of interest.

Additionally, these and other agencies have developed several model ordinances such as the model Stormwater Management and Erosion Control regulation, the model Groundwater Protections Regulation, and model Illicit Discharge Ordinance. These are recommended and discussed later in the report and referenced in the appendix. These model regulations may be included in whole or in part and may be adopted as separate ordinances or included within existing ordinances.

3.0 Regulatory Controls

The Town's existing regulations include many requirements and standards related to stormwater runoff and erosion control. Section 3.0 provides a detailed review of the following pertinent sections of the Code:

- Highway Department, Chapter 156
- Municipal Sewer System (Sanitary Sewer), Chapter 161
- Municipal Water System, Chapter 162
- Site Plan Review, Chapter 233
- Subdivision, Chapter 237
- Excavation Regulations
- Zoning, Chapter 245

3.1 Highway Department, Chapter 156

This chapter includes policies and procedures for the operation of the Highway Department. Of particular note is Article II, Winter Operations-Snow Removal and Ice Control Procedures. This section provides detailed information on the removal of snow and ice, including the use of salt and sand on roadways and sidewalks.

> §156-20. Salt Free Areas
> *Establishes salt-free plow routes to protect drinking water resources and other natural resources. This is proactive.*
> Recommendations: None

3.2 Municipal Sewer System (Sanitary Sewer), Chapter 161

This ordinance regulates the use of public and private sewers and drains, private wastewater disposal, the installation and connection of building sewers, and the discharge of waters and wastes into the public sewer system. It also describes enforcement procedures, including the powers and authority of inspectors, and provides penalties for violations. Portions of the chapter may be used to create an ordinance to prohibit illicit discharges to the municipal storm sewer system.

> § 161-4. Unlawful Disposal.
> *Prohibits the deposition of "human or animal excrement, garbage, or other objectionable waste, in any unsanitary manner on public or private property within the Town of Peterborough, or in any area under the jurisdiction of said town."*
> Recommendations: None

§ 161-5. Unlawful Discharge to Natural Outlet.
Prohibits sanitary sewer discharge "to any natural outlet within the Town of Peterborough, or in an area under the jurisdiction of said town, any wastewater or other polluted waters; except where suitable treatment has been provided in accordance with federal, state and local requirements."
Recommendations: None

§ 161-7. Requirement of Property Owners within 100 ft. of Public Sewer.
Requires connection to public sewer.
Recommendations: None

§ 161-22. Unlawful Discharge
Prohibits unpolluted water to be discharged to "the wastewater facilities." This reduces the load on the wastewater treatment system.
Recommendations: None

§ 161-23. Unpolluted Drainage
Specifies that "Stormwater and all other unpolluted drainage shall be discharged to such sewers as are specifically designated as storm sewers, or a natural outlet approved by the Department of Public Works. Industrial cooling water or process waters require an NPDES permit prior to discharge to a storm sewer or natural outlet."
Recommendations: None

3.3 Municipal Water System, Chapter 162

This chapter consists of the Rules and Regulations of the Water Department, including the rates charged by the Department and a variety of other arrangements, requirements and conditions governing the Department's operations.

Article X, Water Use Restriction Policy
Establishes authority and sets guidelines for policy to restrict water during periods of low supply.
Recommendations: None

Article XI – Emergency Water Management Plan
Provides policies, guidelines, and information concerning water supply emergencies.
Recommendations: None

3.4 Site Plan Review, Chapter 233

This chapter includes procedures, standards and submission requirements for development applications subject to site plan review.

§233-1. Purpose
The first purpose listed is to ensure that development of land "does not impose unreasonable costs upon the community." Among the other standards are the avoidance of erosion, sedimentation, and flooding and the protection of rivers, streams, wetlands, floodplains, and drinking water supplies. Implementing more stringent standards regarding stormwater management will minimize financial impacts to the community and further the purposes of this section.
Recommendations: None

§233-15. Performance Standards

§§A. Drainage.
Item (1) states that "The development or alteration of a site shall not result in increased volume or velocity of surface runoff onto adjacent properties for a 50-year design storm unless specifically approved by the Board and agreed to in some formal, legally binding manner by the affected property owner(s)." The prohibition against increased volume appears to prohibit additional stormwater from leaving the site. This is very proactive.
Recommendations:

- Rename subsection to "Stormwater Management."
- Incorporate stormwater management component of NH model ordinance or reference a new Stormwater Management and Erosion Control ordinance.
- Add references to stormwater manuals, etc. Require compliance with locally adopted design standards. Require stormwater management report that describes the stormwater management system and its components (methodology, BMP's, etc.).
- Add standards with respect to minimization of additional stormwater runoff and impacts to the natural hydrologic cycle.

§§B. Sedimentation and Erosion Control.
Requires a sediment and erosion control plan. Projects must be designed to "limit sedimentation and erosion during and subsequent to construction." Requires preservation of existing vegetation to the maximum extent practical. Also requires that

proposed development plans reduce the likelihood of "excessive storm water runoff from the property." Requires an operation and maintenance program for the control measures, maintenance of the controls throughout the duration of construction, and a security deposit for maintenance and repair for a period of one year from the date of the issuance of the certificate of occupancy.
Recommendations:

- Incorporate erosion control component of NH model ordinance or reference a new Peterborough Stormwater Management and Erosion Control ordinance.
- Add references to BMP manuals, design standards, etc.
- Add an item under subsection (6)(a)[2] requiring the amount of contiguous disturbed areas at any one time, and the total amount of disturbed areas at any one time.

§§E. Landscaping.
Detailed requirements for landscaping. Item (9) permits the Board to require snow fencing or other protective devices to be installed to protect mature vegetation.
Recommendations:

- One of the problems with development is the compaction of soils, particularly in areas proposed to be lawn. Proposed lawn areas should be properly scarified and prepared to promote infiltration and encourage deep root growth, which will reduce water requirements.

§§J. Parking.
Note that there are two "J" sections, the first is labeled "Traffic" and the second is labeled "Parking." This section references the parking requirements in the zoning ordinance and states that additional parking may be required.
Recommendations:

- This subsection should be revised to encourage shared parking, land-banking of unneeded parking spaces, utilization of most recent parking generation data to determine actual parking demand, analysis of average daily demand versus peak demands.

§§M. Soils.
States that soils information will be required and detailed soils information may be required.

Recommendations:

- This section could be improved with a reference to more specific criteria for soils, such as hydrologic group, percolation rates and erodibility factors.

§§O. Filling/Excavation.
Requires detailed information on filling and excavation, including the preparation of a Terrain Alteration Plan, which specifies, among other things, erosion and sediment control measures, sequence and duration of activities, and stabilization measures.
Recommendations:

- Amend subsection (1)(a) to reduce the 60,000 square foot threshold to 40,000 square feet of disturbed area, in accordance with the Phase II requirements.

§§P. Wetlands.
Stated policy to preserve wetlands. Requires a 50-foot setback from wetlands for structures and paved surfaces.
Recommendations:

- This section could be improved with a reference to stormwater management and infiltration, the goal being to minimize impacts to the natural hydrologic cycle on the site.

§§Q. Surface Waters
Item (1)(a) requires the provision of stormwater management plan for sites that contain or are within 150 feet of surface waters.
Recommendations:

- Subsection (1)(b) refers to "Conservation Zone" regulations. This should be clarified (Shoreline Conservation Zone).

3.5 Subdivision, Chapter 237

This chapter includes requirements and standards controlling the subdivision of land. Peterborough permits clustered residential development, for which there are additional standards but flexibility from other standards. Large residential subdivisions are defined as Planned Residential Subdivisions, which also involve additional standards.

§237-9. Lot Information
This section contains basic standards for lot design.
Recommendation:

- §§G. Reduce maximum permitted slopes (currently permits cut and fill slopes to be a maximum of 1½:1) to 3:1 to reduce potential for erosion. It is general landscape practice

that slopes greater than 3:1 are too steep to mow. Specific stabilization measures should be required for slopes in excess of 3:1, including detailed analysis of soils and detailed stabilization plans.

§237-10. Natural Features
Provides for the protection of natural features and environmentally sensitive areas. Subsection "A" includes steep slopes.
Recommendation: None

§237-13. Streets
§§L.
Permits the Planning Board to reduce the standards for private roads. This is very proactive.
Recommendation: None

§237-14. Drainage
Establishes basic policies of handling stormwater runoff associated with the subdivision to ensure "no ponding of water after the system is completed, except for…basins…designed as part of the overall drainage system." Subsection C states that storm drain systems "shall be emptied into the nearest practical watercourse that will be considered convenient and safe."
Recommendations:

- §§A. Revise language to reference new stormwater ordinance. Change "safely dispose" to something more like "adequately manage". This should reflect the idea of stormwater as a resource rather than a waste product.
- §§C. This subsection should be similarly revised. Stormwater should be treated and recharged to the maximum extent practical. Impacts to the natural hydrologic cycle on the site should be minimized to the maximum extent practical.

§237-14.1. Driveways
§§Q. Drainage and Erosion Control.
Identical to §245-25. Not permitted to discharge drainage into public road. States that drainage must be tied to a roadside drainage to the satisfaction of the Director of Public Works. Requires a drainage plan for driveways in excess of 1,000 feet or 15% slope.
Recommendations: None

Article VI – Clustered Residential Development

§237-22. General Provisions
Requires the preservation and respect of natural features and environmentally sensitive areas.
Recommendation: None

§237-25. Streets
§§A.(1) *Permits the Planning Board to modify standards for private roads.*
§§A.(2) *Permits the Planning Board to modify standards for public roads.*
§§A.(3) *Requires the preservation of trees within the right-of-way. These subsections are all very proactive.*
Recommendations: None

§237-26. Drainage
Very simple section. One subsection requiring the provision for stormwater, and one subsection requiring the prevention of erosion.
Recommendations:

- Change the title to "Stormwater Management and Erosion Control."
- Amend the section to add more descriptive language and specific standards on stormwater management and erosion control or reference a new Peterborough Stormwater Management and Erosion Control ordinance.

§237-28. General Provisions
§§C. Environmentally Sensitive Land.
Requires the preservation of environmentally sensitive lands, including slopes over 15%, wetlands, streams, rivers, floodplains.
Recommendations: None

§237-28. General Provisions
§§D. Open Space.
Requires open space for the development (25%). Proactive.
Recommendations:

- Some of the alternative designs are vegetated and may be considered open space. This may be mentioned in this subsection.

§237-28. General Provisions
§§E. Recreational Facilities.
Requires recreational facilities for development. Proactive.
Recommendations:

- It may be possible to creatively incorporate alternative designs that may be utilized as recreation areas when they are not being used to store or treat stormwater.

§237-29. General Concept Plan
Requires the preparation of information depicting the general development concept, the suitability of the land, information on available services, and an aerial photograph.
Recommendations: None

3.6 Excavation Regulations, Chapter 238

The excavation regulations were adopted as a supplement to the regulations contained in New Hampshire RSA 155-E. Some of the pertinent stated purposes of the excavation regulations are to preserve the natural assets of soil, water, forests, and wildlife; to prevent land and water pollution; and to promote soil stabilization.

§238-4. Permit Required
States that "all excavations require a permit except those specifically exempted in RSA 155-E:2 and 155-E:2-a."
Recommendations:

- This law is intended to regulate large excavation projects. However, in order to catch all activities that involve the disturbance of one or more acres of land, in accordance with the Phase II requirements, it might be appropriate to revise this section to require permits for excavation that involves disturbance of 40,000 square feet or more of land area, unless the project requires Subdivision or Site Plan approval. The threshold contained within the model Stormwater Management and Erosion Control regulations is 20,000 square feet.

§238-5. Application for Permit
Requires erosion and sediment control plan.
Recommendations:

- The Site Plan regulations refer to a Land Alteration Permit (§233-4.D.) and a Terrain Alteration Plan (§233-15.O.). However, there do not appear to be specific requirements in the Code for either. This should be clarified. Phase II requires that all activities that involve land disturbance greater than or equal to one acre of land be regulated (we recommend rounding this threshold down to 40,000 square feet for simplicity).

§238-6. Operational Standards

§§G. "No topsoil shall be removed from the site…"
Protecting topsoil from removal is essential to ensuring adequate restabilization of the site.
Recommendations: None.

§§H. "Appropriate erosion, sedimentation, air and water quality measures shall be integrated into the excavation process. Excavations shall comply with the erosion and sediment control provisions in the town's subdivision regulations."
Recommendations:

- Refer to a new Stormwater Management and Erosion Control ordinance, if one is created.

§§J. "Excavation operations shall be set back at least 50 feet from wetlands…and it must be demonstrated that no sedimentation of the wetlands will occur as a result of the excavation. The Planning Board shall have the authority to require greater wetlands setbacks in situations where it can be demonstrated that they will be required to protect the wetlands from degradation due to the proposed excavation operations."
Recommendations: None.

§§K. "Excavation operations shall be performed in such a manner as to not cause substantial damage to any aquifer…"
Recommendations:

- This section should reference Section 245-14, Aquifer Protection District, of the Zoning Code to ensure that requirements are met.

§238-7. Reclamation Standards
Requires detailed information for reclamation of the site.
Recommendations: None.

§238-8. Bonding
Requires a performance bond for reclamation work.
Recommendations: None.

§238-9. Enforcement
Requires annual inspections (or more frequent) by the Planning Board or its designee.
Recommendations: None.

3.7 Zoning, Chapter 245

The Zoning Code includes many requirements and standards for the submission of information related to stormwater management and erosion control. Performance standards for stormwater management and erosion control are also included. The purposes and intent of many of the sections of the Zoning Code identify the preservation of surface and groundwater and the protection of the aquifers and drinking water supplies. The Zoning Code includes specific districts for the preservation of shoreland habitats (§245-12. Shoreland Conservation Zone), aquifers (§245-14. Aquifer Protection District), and wetlands (§245-15. Wetlands Protection District).

General recommendations:

- Adopt a separate stormwater and erosion control ordinance or amend the existing site plan and subdivision regulations to require and specify standards for stormwater management and erosion control plans. The New Hampshire Office of State Planning is currently working on a publication titled "Stormwater and Erosion and Sediment Control Model for Subdivision or Site Plan Review Regulations" that may be helpful in such an effort.

§245-12. Shoreland Conservation Zone
Protects "all land that is within one hundred (100) feet of the natural high-water mark of any pond, river, stream or brook." Includes standards and requirements.
Recommendations:

- §§C.(4) Prohibit the use of fertilizers and pesticides within the 100-foot regulated area.
- §§E. Require that the applicant provide adequate mitigation, to the satisfaction of the ZBA.

§245-13. Floodplain District
Typical regulations to protect against flood damage in response to federal Flood Insurance Program.
Recommendations: None.

§245-14. Aquifer Protection District
The stated purpose of this district is to "protect, preserve and maintain existing and potential groundwater supply and groundwater recharge areas." It has been identified in prior studies and in Section 245-28 that the current aquifer protection district does not provide adequate protection of the aquifers.

Recommendations:

- Amend to follow language from NHDES model Groundwater Protection Ordinance or replace with the model ordinance. Restrict the amount of impervious surfaces. Add language emphasizing infiltration (maybe modify reference documents).
- The references to Subsection F in Subsection D.(1)(b) and D.(1)(g) may be a typographical error (should reference Subsection E).
- §§D.(2)(d) Consider referencing specific pre-treatment design standards.
- Add violations, enforcement, and penalties sections.
- §§D.(3) In the S District, encourage some of the required uses from the P District, such as clustered residential. Consider prohibiting uses with the potential for significant impacts, such as dry cleaning establishments.

§245-15. Wetlands Protection District
One of the specific intents of this district is to "protect potential water supplies, existing aquifers and aquifer recharge areas."
Recommendations:

- This section could be improved by referring to a new stormwater management ordinance and/or stormwater design guidelines that would have more specific information and standards for recharge.

§245-15.F.(5)(b) Stormwater Management
Requires pretreatment of stormwater runoff if 50-foot buffer area is reduced. Prohibits storage of snow within fifteen feet of wetland and modification of existing site hydrology.
Recommendations:

- Eliminate buffer reduction provision of stormwater pretreatment requirement. All stormwater discharged off-site should receive pretreatment to remove sediment and treat at least the first flush volume for other pollutants.

§245-24.5. Off-Site Improvements
Grants the Planning Board the authority to require necessary off-site improvements as a condition of subdivision or site plan approval.
Recommendations: None.

ARTICLE V – Performance Standards
§245-25. Erosion Control
This section states that "no land shall be filled, excavated, graded or cleared until a permit is obtained from the Building Inspector."
Recommendations:

- Either adopt a separate Stormwater Management and Erosion Control ordinance, or amend this section to include more specific standards and application requirements. Include references to outside design standards and manuals such as *Stormwater Management and Erosion and Sediment Control Handbook for Urban and Developing Areas in New Hampshire* and *Best Management Practices for Urban Stormwater Runoff, NH Department of Environmental Services*. The New Hampshire Office of State Planning is currently working on a publication titled *Stormwater and Erosion and Sediment Control Model for Subdivision or Site Plan Review Regulations* that may be helpful in such an effort.
- Set a minimum threshold, such as the 20,000 square feet of land disturbance included in the model Stormwater Management and Erosion Control ordinance, for more significant applications to receive review by the Board.

§245-25. Driveways
§§P. Drainage Control.
Not permitted to discharge drainage into public road. States that drainage must be tied to a roadside drainage to the satisfaction of the Director of Public Works. Requires a drainage plan for driveways in excess of 1,000 feet or 15% slope.
Recommendations:

- Encourage on-site drainage to the maximum extent practical in order to prevent unnecessary and potentially excessive expenditure of municipal funds for the provision or maintenance of the public storm drainage system.

§245-26. Clustered Residential Development
One of the stated purposes is to provide greater flexibility in the design of housing.
Recommendations:

- §§D. and §§E. Add requirements to minimize impacts to the natural hydrologic cycle of the site associated with stormwater runoff from the development. Require the implementation of best management practices to manage stormwater runoff from impervious surfaces, and state that infiltration is the preferred method to provide recharge to

groundwater aquifers. Reference the new Stormwater Management and Erosion Control ordinance and/or Stormwater Design Guidelines.

§245-27. Incentive Zoning
Purpose is to protect open space and environmentally sensitive areas such as steep hillsides, aquifer recharge areas, etc.
Recommendations:

- §§E.(1) Either include a sample list to item (j) that includes on-site treatment and infiltration of stormwater, or create a separate list item for same (can adjust point scheme if separate item).

§245-28. Phased Development
Regulates residential growth "in a manner which will ensure that public services and facilities can be provided to new residents without creating undue burdens on the town."
Recommendations: None.

§245-28.1 Interim Growth Management
Appears to be a moratorium restricting new subdivision development in the Rural District for no more than one year, to permit the Planning Board to study and examine the issues stated in §§B. Statement of Need. Some of the issues include "the current Aquifer Protection Ordinance does not adequately protect the primary aquifers."
Recommendation: None, although it is unclear what the time limits associated with the moratorium are.

§245-32. Off-street Parking
Contains standards for parking design and parking requirements for various land uses.
Recommendation:

- Add a section regarding stormwater runoff design. Provide treatment and infiltration of stormwater, minimize parking area, and utilize pervious surfaces wherever practical.

3.8 Currently Proposed Amendments

§245-15.4 Village Center District
Purpose is to encourage compact, mixed use development in defined areas of the town. Among other requirements, this proposed amendment limits impervious surfaces to 80% of lot coverage, in order to "provide groundwater recharge and Greenspace."
Recommendations:

- Section F, Performance Standards, can be improved with standards for treatment of stormwater runoff, particularly from impervious surfaces, or reference to a new Stormwater Management and Erosion Control ordinance and/or Stormwater Design Guidelines.
- The location of the proposed Village Center District is in proximity to surface waters and aquifers. The proposed amendments should reference, and incorporate to the extent practical, the requirements of the Aquifer Protection District.
- Careful consideration should be given to the amount of impervious surface permitted, particularly impervious surfaces used for parking areas and vehicular travel. At a minimum, these sections should promote the use of pervious pavers and other BMP's to treat stormwater.

4.0 Non-Regulatory Controls

There are many non-regulatory Best Management Practices that can be implemented by the Town to address stormwater runoff quality. The following sections discusses municipal operations and public education and participation examples that can be implemented to protect the community's drinking water supplies, as well as fulfill the Phase II stormwater requirements

4.1 Municipal Operations

The following discuses general pollution prevention and good housekeeping practices along with implementation recommendations for the following municipal operations' topics:

- Stormwater Inspection and Maintenance Plan
- BMP's for Municipal Maintenance/Storage Facilities and Town-Wide Municipal Operations
- Handling and Disposing of Stormwater Residuals
- BMP's for Stormwater Projects
- Employee Training

Stormwater Inspection and Maintenance Plan

Lack of maintenance to structural stormwater controls, including catch basins and stormwater treatment devices can have adverse effects on stormwater quality and that of receiving water bodies due to re-entry of pollutants into the stormwater as it passes through the structure. An inspection and maintenance schedule can help reduce pollutant loads from the drainage network. CEI recommends the following actions:

- Sweep all streets in town at least annually and develop an appropriate sweeping frequency (e.g., based on the volume of sweepings) for the downtown area and drainage areas that contribute to well recharge areas.

- Clean all catch basins and drainage manholes in town at least once each year or as needed to ensure sediments never reach the invert of the drainage outlet pipe. One method for developing a cleaning schedule could be a log of the volume removed from each catch basin (e.g., 2 feet of sediment) that can be used to prioritize structures that require more frequent cleaning. Information for the condition of the drainage structure should also be documented during cleaning efforts.

- At a minimum, other town-owned BMPs (e.g., swales, ditches) should be inspected on an annual basis and cleaned as needed.

- Develop an inspection and maintenance plan for the storm drain system and existing town-owned BMPs. Outline a cleaning frequency for catch basins and street sweeping in the plan. The inspection and maintenance plan should outline components to be inspected, the inspection frequency, what to look for during inspections, and what conditions trigger maintenance. A standardized inspection form will help streamline these activities. Maintenance activities can then be based on the results of the inspection. As data is collected, the inspection frequencies can be reduced as appropriate. The inspection and maintenance plan should also incorporate a policy for disposing of maintenance-generated wastes (i.e., stormwater residuals).

BMPs for Municipal Maintenance/ Storage Facilities and Town-Wide Municipal Operations

Maintenance/ Storage Facilities

Municipal operations at maintenance/ storage facilities can have a significant impact on water quality due to the nature of a facility or its operations (e.g., vehicle fueling and maintenance, fertilizer storage). A list of general Best Management Practices (BMPs) is provided below for the Town of Peterborough to use to evaluate applicable maintenance/ storage facilities.

- Ensure petroleum tanks and dispensing equipment are free of leaks and spills from filling, emptying, deterioration, and damage;
- Ensure hydraulic equipment (e.g., subsurface lifts) is free of leaks;
- Inspect floors for cracks and damage in service bays that act as a point of entry to subsurface soils;
- Do not store junk cars, equipment, and parts outdoors that may be leaking fluids to the ground;
- Prohibit outdoor vehicle/ equipment maintenance activities;
- Ensure leaks and spills are cleaned promptly and properly;
- Ensure proper handling and storage of hazardous materials and wastes;
- Inspect dumpsters or waste containers for open tops and holes in the bottom for rain to enter and rinse wastes onto the ground;
- Cover and contain road salt materials;
- Ensure proper snow disposal practices (e.g., no disposal to surface waters and well recharge areas);

- Properly dispose of wastes (e.g., disposal to sinks and drains connected to the on-site septic system is prohibited);
- Prohibit outdoor vehicle washing to the ground;
- Prohibit outdoor storage of pesticides and fertilizers unless covered;
- Minimize pesticide and fertilizer use at the site;
- Contain and actively manage compost operations;
- Cover and contain manure piles; and
- Contain exposed earth piles and do not store within 100 feet of a wetland or water body.

A checklist for the Town of Peterborough to conduct facility inspections is provided in Appendix D. Groundwater protection BMPs at facilities that store or use regulated substances are provided in ENV-Ws 421 "BMPs for Groundwater Protection" (Appendix B).

Town-Wide Municipal Operations

Existing Town-wide municipal operations include those associated with:

- Parks, Cemeteries, Open Space and Recreation Maintenance
- Road Maintenance
- Winter Roadway Treatments
- Town Waste Disposal
- Snow Disposal

General BMPs for Town-wide operations are highlighted below:

- Parks and Open Space - the Town of Peterborough should ensure that pesticide treatment follows the principles of an Integrated Pest Management (IPM) program, if one is not already in place. Fertilizers should be applied according to the manufacturer's specifications. This applies to the application of pesticides and fertilizers on Town-owned lands such as school fields, parks, and cemeteries. Additionally, pesticides & fertilizers should be applied only by licensed applicators to prevent over application of materials.

- Road Maintenance - the Town of Peterborough should ensure that road maintenance and repairs are conducted in a manner to prevent erosion of materials into nearby surface waters. Paving and painting operations should only performed during dry weather conditions.

- Winter Roadway Treatments – application of de-icing materials can be a balance between public safety and water quality protection; however, the following activities can be performed to minimize over application: routinely calibrate sand/salt spreaders; use sand/salt

spreaders that are capable of adjusting application rates to achieve an optimal application rate according to roadway characteristics (e.g., width and design); train employees in the proper application of deicing materials; adhere to existing salt use restrictions in town; use more efficient alternative de-icing materials (e.g., liquid salt catalysts) to decrease total volume of materials applied; utilize weather and roadway monitoring systems to adjust de-icing activities to changing conditions; minimize roadway pretreatment techniques (e.g., salting prior to storms); and use ice-cutting plow blades to reduce the need and/or volume of de-icing materials.

- Solid and Hazardous Waste Disposal – BMPs to ensure proper disposal of solid and hazardous waste disposal in town can include: sending out mailers to inform residents on the proper methods for rubbish disposal, recycling, and special disposal of regulated materials or equipment; and household hazardous waste collections for residents.

- Snow Disposal – snow disposal activities must be prohibited in well recharge areas and should be conducted in upland locations that are less likely to impact sensitive environmental resources. The following activities should be prohibited: disposal to waterways; disposal at sites with steep slopes that may result in erosion of soils; dumping in sanitary landfills and gravel pits; and disposal on top of storm drain catch basins or in stormwater drainage swales or ditches.

CEI recommends that the Town of Peterborough begin to document the protocols for municipal operations to ensure that existing practices are continued in the future. Documentation of these practices can also assist in evaluating staff needs, providing budget information, and scheduling work.

Handling and Disposing of Stormwater Residuals

Stormwater residuals (i.e., street sweepings and catch basin cleanings) contain elevated levels of pollutants from roadways and must be properly handled and disposed to prevent impact to runoff and groundwater resources. Proper handling consists of containing the materials during transport and storage to prevent migration with wind and rain. Existing approved practices for disposal of stormwater residuals and the NH DES proposed disposal and reuse options are discussed below.

- Current Disposal Options - currently, stormwater residuals (e.g., street sweepings and catch basin cleanings) can be disposed at approved solid waste landfills in accordance with Env-Wm 502 & 2506, the NH

Hazardous & Solid Waste Rules. Disposal generally requires testing for hazardous waste characterization and tipping fees for disposal unless the disposal facility is owned or operated by the town. There are no reuse options for stormwater residuals under current NH DES rules and policies.

- Proposed Disposal & Reuse Options - the NH DES is working on its policy for street sweepings, catch basin cleanings, and stormwater sediment management by the end of 2003. The proposed options for the disposal and reuse of stormwater residuals may include the following: disposal for use as daily cover at approved landfills without testing, if stormwater residuals are not obviously contaminated (determined by visual/olfactory examination); reuse of street sweepings and roadside ditch soils that are mixed with road materials as fill below an impervious surface at a construction site (e.g., roads); reuse of street sweepings and roadside ditch soils as general fill (criteria not yet established); reuse of catch basin cleanings that are mixed with road materials as fill below an impervious surface if the soils meet DES Risk Characterization and Management Policy (RCMP) S-3 soil standards; and reuse of catch basin cleanings as general fill if the soils meet RCMP S-1 soil standards. Additional provisions will be outlined in the policy for the sampling frequency of catch basin materials.

The proposed disposal and reuse options discussed above are subject to change since the NH DES has not finished writing the policy for stormwater residuals management. CEI recommends that the Town of Peterborough evaluate existing town practices with the upcoming NHDES policy for street sweepings, catch basin cleanings, and stormwater sediment management. Additionally, the handling and disposal of stormwater residuals should be addressed as part of the inspection and maintenance plan discussed previously. An EPA fact sheet for the handling and disposal of stormwater residuals is included in Appendix A for background information.

BMPs for Stormwater Projects

The Phase II stormwater rule recommends procedures to ensure that new flood management projects are assessed for water quality impacts and that existing projects are assessed for incorporation of additional water quality protection devices or practices. For example, BMPs implemented to control floods should be designed to improve water quality. BMPs for stormwater quality improvement will serve to protect the Town's groundwater resources from non-point source pollution.

The Town of Peterborough should ensure that any projects proposed to alleviate flooding also consider water quality improvements. As a general BMP, routine stormwater designs and drainage repairs should also consider water quality. For example, the town should consider the use of a vegetated swale for stormwater conveyance, when practicable, to remedy drainage or erosion problems alongside roadways instead of installing a catch basin that is piped to a nearby drainage system or water body. Another BMP opportunity for water quality improvement associated with drainage repairs could be installing leaching catch basins or deep sump catch basins to replace deteriorated or failed structures.

Employee Training

The Phase II rule requires that Town employees be trained on how to incorporate the pollution prevention/good housekeeping BMPs discussed above. Town training programs for stormwater and groundwater are intended to teach employees about stormwater/ groundwater management, potential sources of contaminants, and BMPs for water quality protection. An awareness of pollution prevention efforts throughout Town can significantly decrease the potential water quality impact of municipal operations and other activities.

Existing municipal training programs can be tied into water quality training efforts. Individuals responsible for certain petroleum storage facilities may be required to have spill prevention and control (SPCC) training. SPCC training relates directly to pollution prevention practices, since employees are trained how to properly handle and store oil products and wastes to prevent a release to the environment. Additionally, Fire Department employees are typically familiar with oil and hazardous material spill training techniques. Such training efforts focus on protecting human health and the environment and can be used to convey stormwater awareness and pollution prevention efforts.

The requirements of Phase II impact several town agencies including the DPW, Building Inspector, Planning Board, Conservation Commission, and Board of Health, depending on how the town sets up compliance and enforcement actions. Each of the officials involved in Phase II regulated issues and water quality protection should be trained specifically in the areas that apply to them. For example, DPW personnel should be trained in appropriate operations to minimize stormwater impacts, while the Building Inspector should be trained to identify stormwater impacts from construction projects as part of a routine inspection.

The Town of Peterborough may wish to develop a municipal training program for water quality protection in accordance with the Phase II

requirements. The program should include the following key elements, which can be tailored specifically to town operations.

- Phase II Program & Water Resources Strategy Overview
- Town Department Responsibilities
- Town Drainage System, Water Supply and Water Quality
- Spill Prevention and Response
- Good Housekeeping
- Material Management Practices
- Maintenance of Town-Owned Lands
- Stormwater Inspections
- Illicit Discharge Detection
- Construction Sites and Development

4.2 Community Involvement

Educating the community about the impacts of stormwater runoff is an important non-regulatory stormwater BMP. Making people aware of stormwater pollution and encouraging the public to take steps to reduce their impacts can have great benefits on local waterbodies. The following is a listing of education/outreach and participation/involvement topics and activities that Peterborough could implement help educate and involve the local community on stormwater issues and water resources protection.

Public Education & Outreach

Residents are the largest audience and have the most to gain from reducing the impacts of stormwater runoff. Actions taken by residents can decrease community costs associated with the use and maintenance of expensive stormwater treatment facilities and treating degraded water quality and stream banks. The following topics can be covered in the public education efforts to residents:

- Lawn and Gardens
- Vehicle Leaks
- Septic Systems
- Household Hazardous Wastes
- Pet Waste
- Illicit Discharges

Outreach methods for the above topics could include:

- Mailings
- Local Cable Broadcasts
- Press Releases
- Public Poster Displays

- Free Educational Video Rental

Many business and institution activities can contribute to stormwater pollution. For instance, poor housekeeping practices and large impervious parking lots can impact water quality. Large expensive stormwater treatment facilities, such as detention ponds, are often built to handle runoff from business sites. These systems can be an eye sore in a community and are often neglected resulting in a less than adequate performance. Providing incentives and encouraging good stormwater management practices can be an effective way for towns to approach businesses and institutions. The following topics can be covered in the public education efforts to businesses:

- Housekeeping Practices
- Catch Basin Cleaning
- Vehicle/Equipment Washing
- Toxic Cleaners
- Parking Lots
- Illicit Discharges

Outreach methods for the above topics could include educational brochure mailings and press releases.

Regardless of the audience, all public outreach materials should outline the impacts associated with each topic and describe practices the audience can take to reduce these impacts.

Public Participation & Involvement

Public participation and involvement provides an opportunity for the entire community to become involved in improving stormwater quality and increasing public awareness.

The following are types of programs that can be used to increase community involvement for residents in stormwater management and help reduce the impacts of stormwater:

- Telephone Hotline (Questions/Reporting)
- Storm Drain Marking Program
- River, Stream and Pond Cleanups
- Classroom Education Program
- Native Tree/Shrub Planting
- Stream Monitoring
- Volunteer Stormwater Organization

Local businesses can often participate and help sponsor some of the above resident programs. Additional programs that could be developed for business participation and involvement include:

- Employee Training Programs
- "Clean Stream" Participation Incentives
- Adopt-A-Stream Activities
- Low Impact Development Pilot Program Study

5.0 Final Recommendations

5.1 Regulatory Changes

Table 5-1 summarizes regulatory recommendations detailed in Section 3.0 based on the Town's existing regulations relating to stormwater and erosion control.

Overall, many of the recommendations could be achieved by adopting the NH DES Model Stormwater Management and Erosion Control Ordinance found in Appendix E to meet most of the Town's stormwater management needs. As indicated below, this new ordinance could be referenced throughout the Town's code to meet stormwater objectives.

Similarly, the reference to several other design guidelines such as the Design Guidelines and Criteria for Stormwater Management in Appendix F could substantially help the town protect its water resources. Similar to above, this design criteria could be referenced throughout the Code or alternatively, referenced once in the Town's Stormwater Management and Erosion Control Ordinance if adopted. Reference to the different recommended guidelines will give the Town flexibility in updating the document as technologies change and as new issues need to be addressed. These are further discussed in Section 5.3.

5.2 Regulatory Additions

Many of Peterborough's existing regulatory controls address stormwater and erosion control. The Subdivision Regulations and Zoning Code require stormwater plans and erosion control plans for many types of development. However, regulations concerning erosion and sediment control would need to include construction waste and information on inspection requirements. Procedures for enforcement and sanctions for non-compliance are covered by Section 245-46 of the Zoning Code, Violations and Penalties. In addition, Peterborough would need to adopt an ordinance prohibiting non-stormwater discharges into the stormwater system. Such an ordinance would need to include appropriate enforcement procedures. A procedure for handling input from the public would also need to be implemented and publicized. Several of these recommended regulatory additions are discussed below.

Table 5-1 REGULATORY REVIEW SUMMARY

Regulation	Primary Recommendation[2]
Site Plan Review – Chapter 233	
Drainage, Sedimentation and Erosion Controls	Reference and adopt the DES Model Stormwater Management and Erosion Control Ordinance (Appendix E); Reference and adopt design standards such as Design Guidelines and Criteria for Stormwater Management (Appendix F)
Landscaping	Reference and adopt a low impact development guidance document that includes landscape design standards
Parking	Reference and adopt design standards such as Design Guidelines and Criteria for Stormwater Management and a separate landscape design standard; or revise section to promote shared parking, land banking of unnecessary spaces, and data generation for actual parking spaces needed
Soils	Require additional soils information such as hydrologic grouping, percolation rates and erodibility factors
Filling/Excavation	Reduce 60,000 ft^2 land disturbance threshold to 40,000 ft^2 to meet Phase II requirements and possible 20,000 ft^2 for added protection
Wetlands	Reference stormwater management and infiltration issues in the Design Guidelines and Criteria for Stormwater Management
Surface Waters	Clarify reference for "Shoreline" Conservation Zone
Subdivision – Chapter 237	
Lot Information	Reduce maximum permitted slopes to 3:1 or refer to recommended landscape design standards
Drainage	Reference and adopt the DES Model Stormwater Management and Erosion Control Ordinance and the Design Guidelines and Criteria for Stormwater Management
Cluster Developments	
Drainage	Change title and reference the DES Model Stormwater Management and Erosion Control Ordinance and the Design Guidelines and Criteria for Stormwater Management
Open Space	Note that some alternative vegetative designs may be considered open space
Recreational Facilities	Reference alternative designs that may be safely utilized as recreation areas when they are not being used to store or treat stormwater
Excavation Regulations	

[2] A more detailed discussion of the regulatory recommendations can be found in Section 3.0.

Table 5-1 REGULATORY REVIEW SUMMARY

Regulation	Primary Recommendation[2]
Permit Required	Reduce permit threshold to disturbance of 40,000 or 20,000 ft^2
Application for Permit	Clarify Land Alteration Permit and Terrain Alteration Plan
Operational Standards	Reference and adopt the Stormwater Management and Erosion Control Ordinance in §§H; Reference the existing Aquifer Protection District in §§K
Zoning – Chapter 245	
General Recommendation	Adopt a new ordinance or amend the existing regulation to reflect stormwater and erosion control requirements for site plan and subdivision review
Shoreland Conservation Zone	Prohibit fertilizer and pesticide use within the 100-foot regulated area and require mitigation
Aquifer Protection District	Reference and adopt the NH DES model Groundwater Protection Ordinance (Appendix G); Require pre-treatment design standards or adopt and reference the Design Guidelines and Criteria for Stormwater Management; Add a violations, enforcement and penalties section; Encourage clustered residential in the S District; Prohibit uses with potential for significant impacts
Wetland Protection District	Improve standards for recharge or reference and adopt the Design Guidelines and Criteria for Stormwater Management
Erosion Control	Reference and adopt the DES Model Stormwater Management and Erosion Control Ordinance including the minimum threshold of 20,000 ft^2 of land disturbance for application review
Driveways – Drainage Control	Encourage on-site drainage
Clustered Residential Development	Reference and adopt the DES Model Stormwater Management and Erosion Control Ordinance and the Design Guidelines and Criteria for Stormwater Management
Incentive Zoning	Include sample listing
Off- Street Parking	Add a section for stormwater runoff design that promotes the treatment and infiltration of stormwater, parking area reductions, and pervious surface utilization
Proposed Amendments	
Village Center District	Reference and adopt the DES Model Stormwater Management and Erosion Control Ordinance and the Design Guidelines and Criteria for Stormwater Management; Reference the requirements of the Aquifer Protection District; Promote pervious surfaces and other BMPs to treat stormwater

Illicit Discharge Ordinance

The Town should consider pursuing the implementation of an illicit discharge ordinance, which would specifically prohibit illicit discharges to the municipal storm sewer system and specify enforcement procedures and penalties. The ordinance should be complemented with an inspection program to detect illicit discharges and ensure that proper safeguards are incorporated so that potential contamination of water resources from illicit discharges to the municipal storm sewer system are minimized. A model ordinance has been included in Appendix H.

Model Stormwater Management and Erosion Control Regulations

Model Stormwater Management and Erosion Control Regulations are available from the State of New Hampshire Department of Environmental Services. A copy of these regulations is included in Appendix E. The regulations may be adopted in whole or in part. However, it is generally recommended that such regulations be adopted as a separate section, which is then referenced by other sections of the Code as discussed throughout Section 3.0. In this manner, the stormwater and erosion control requirements and criteria are located in one location and can be updated easily.

Model Groundwater Protection Regulations

The State has also developed a model Groundwater Protection Regulations, included in Appendix G. The regulations may be adopted in whole or in part. It may be possible to incorporate many of the sections into existing sections of Chapter 245, Zoning. This model ordinance includes two regulatory approaches to protecting important groundwater: prohibiting high-risk land uses and ensuring that other land uses comply with performance standards. The model assumes that the Town will be implementing an inspection program. Without inspections to ensure continuing compliance with performance standards, the short list of prohibited uses does not provide a significant level of protection and should be expanded.

Additional Low Impact Development Bylaws

In addition to the above recommended regulatory changes, several bylaws specifically targeting low-impact development are recommended. These include:

- **Impervious Limits** – limits on the area of imperviousness per lot reduces stormwater runoff while promoting

infiltration and the use of pervious material for parking and walkway areas. The NH DES model rules for both groundwater and water supply watersheds give examples of recommended impervious limits (Appendices G and I, respectively).

- **Steep Slopes Bylaw –** prohibiting work in areas with steep slopes helps reduce erosion and stormwater runoff that can often result from the construction and land disturbance associated with steep slope areas. An example of a steep slope restriction adopted in New Hampshire can be found in Appendix J.

- **Buffer Zones –** the use of buffer zones is recommended to help prevent negative impacts from land use activities that could potentially pollute nearby water resources. Buffers can vary depending on their proximity to the water supply, watershed characteristics, and land use activities. The NH DES *Model Rule for the Protection of Water Supply Watersheds* is included in Appendix I and contains model buffers.

- **Open Space Requirement –** requiring open space or greenspace to be set-aside when developing an area can help limit imperviousness and stormwater impacts, retain native vegetation and increase infiltration, and reduce overall land disturbance impacts associated with construction. An example of an open space requirement for low impact development can be found in Appendix K.

5.3 Recommended Guidelines

Stormwater Design Guidelines

Design guidelines help to guide development and improvements in a way that is responsive to the goals of the community. Design guidelines are commonly used for setting architectural and site design standards to preserve the character of a community and may include a set of standards and examples from which proposed development is evaluated. Design guidelines typically exist outside of the town ordinances so that they can be amended more easily. In addition to providing a framework from which to evaluate a project, design guidelines serve to inform applicants of what is expected of them, reducing the costs associated with design and planning of their project. Property owners interested in development or

redevelopment will have a clear sense of how they can respond to the goals and standards contained in the design guidelines.

Stormwater design guidelines work much in the same way as architectural design guidelines. Stormwater design guidelines include a set of standards for design of a stormwater management system. The Town, through the design guidelines, controls the methodology and assumptions used in the calculation of stormwater runoff and the design of the stormwater management system. The design guidelines include information that explain in more detail the specific standards and background for each design criteria. Examples from other sources are referenced for even more specific information. Over time, many communities develop their own list of preferred BMP's, which would either be included within or referenced by the design guidelines. Design guidelines can be amended easily in response to changing technologies and methods and can be implemented throughout the town, within specific designated areas, or for particular types or scales of development. To provide the most protection of water resources and to fully comply with the requirements of Phase II, the design guidelines should be implemented for all development and redevelopment town-wide that involves one acre or more of land disturbance.

Operations and Maintenance Plan

In conjunction with the above guidelines, an Operations and Maintenance (O&M) Plan should be required for all projects utilizing stormwater BMPs. Developers often propose BMP O&M during the design phase of a project, however once the project is complete, the responsibility and ownership of these sites often resides with the homeowners or business owners who have little knowledge of their purpose. In many cases there is no agreement with the new owner to maintain the facilities or to allow access by others to provide necessary O&M. Appendix L provides an example of the recommended O&M material regarding maintenance responsibility and reporting requirements.

Landscape Design Guidelines

As imperviousness is addressed in the above recommendations, it is also worthwhile to address final landscaping practices that typically take place after construction providing further protection through reference to landscape standards. These could be aimed at promoting the protection and enhancement of topsoil, use of organic content and native plantings, and vegetation adept at supporting nutrient and contaminant uptake and increasing the infiltration capacities of the area. An example of a newly adopted Landscape Design Guideline by a NH town can be found in Appendix M.

5.4 Inspection Programs

In order for these types of ordinances to be effective at minimizing the risk of groundwater contamination, the municipality must conduct periodic inspections of every facility that may store or use substances identified as potentially harmful to the town's drinking water supplies. In addition, stormwater BMP's also need to be inspected and maintained in order to ensure proper operation. Inspections should be conducted by Town personnel, who should receive appropriate training. There are many ways to reduce the financial burden on the town for conducting inspections. One method is to identify inspection and maintenance requirements during the development approval process. This is often referred to as an Operation and Maintenance Plan. Templates for the preparation of an Operation and Maintenance Plan are included in the Stormwater Design Guidelines. Property owners would be required, as a condition of approval and/or through the use of a legal document, to submit periodic reports, conducted by qualified professionals, demonstrating compliance with the approved Operation and Maintenance Plan.

5.5 Master Plan

The Town is currently conducting an update of the Town Master Plan. A Master Plan Steering Committee was formed, and a Water Resources Subcommittee was created. The Water Resources Subcommittee has collected information on the water system and water resources of the Town and is preparing a report documenting the results of their findings. The report will also identify potential threats and include recommendations for use by the Master Plan Steering Committee in its efforts. A clean and protected drinking water supply is one of the most important elements impacting the quality of life of a community. This is evidenced by responses to surveys and questionnaires of residents of Peterborough. The Master Plan effort should incorporate water resources as a significant element of the plan, and water resource protection should be improved wherever the opportunity exists.

5.6 Non-Regulatory Best Management Practices

There are several non-regulatory Best Management Practices that can be implemented by the Town to address stormwater runoff quality. Section 4.0 reviews and recommends municipal operational procedures and public education and participation activities that the Town could implement to further address stormwater issues.