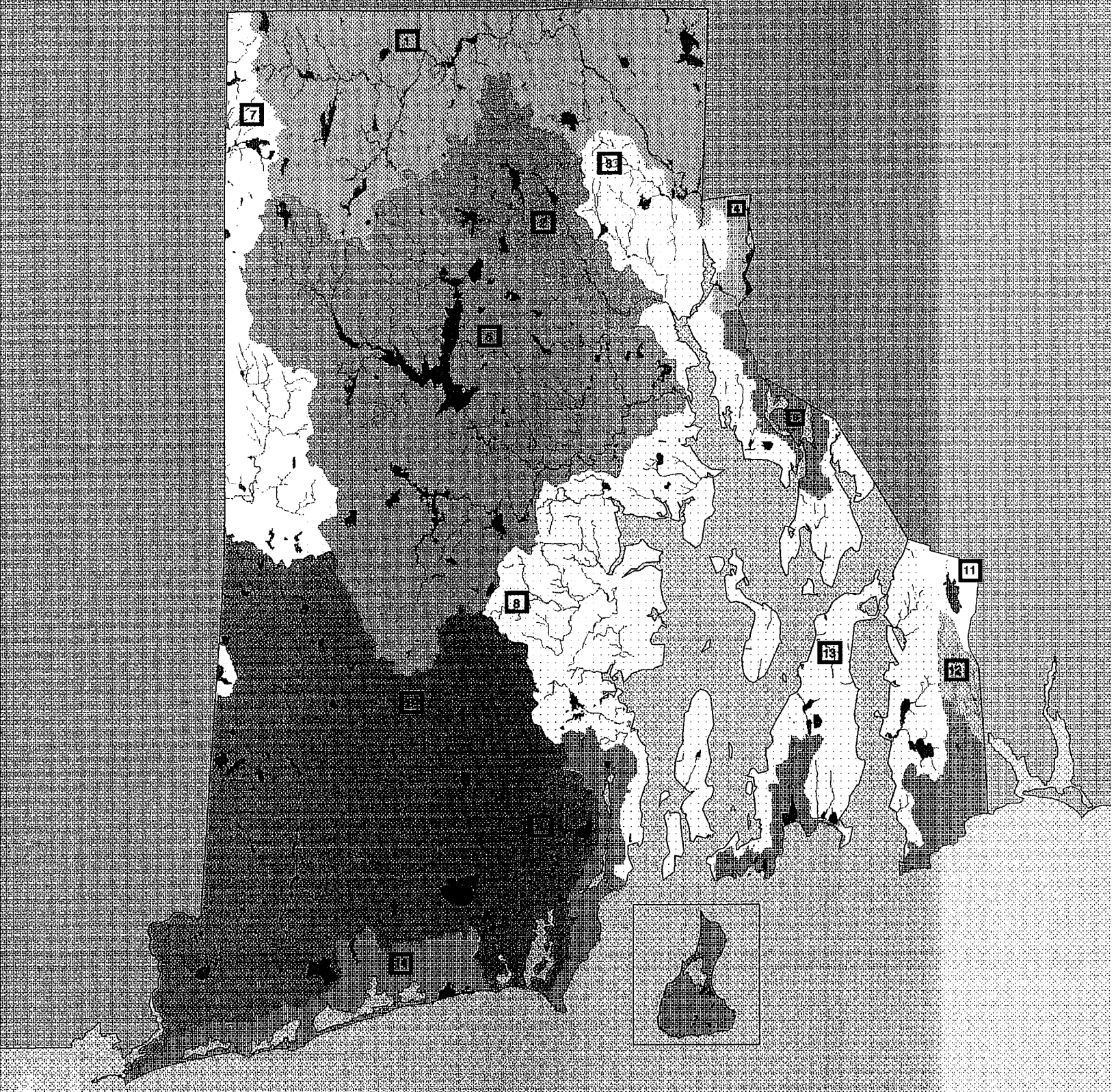
Rhode Island
Nonpoint Source Pollution Management Plan

State Guide Plan Element 731
Report Number 87



October 1995

RI Department of Environmental Management
Office of Environmental Coordination

RI Department of Administration
Division of Planning

The Division of Planning, Rhode Island Department of Administration, is established by Chapter 42-11 of the *General Laws* as the central planning agency for state government. The work of the Division is guided by the State Planning Council, comprised of state, local, and public representatives and federal and other advisors.

The objectives of the Division are: (1) to prepare strategic and systems plans for the state; (2) to coordinate activities of the public and private sectors within this framework of policies and programs; (3) to assist local governments in management, finance, and planning; and (4) to advise the Governor and others concerned on physical, social, and economic topics. Activities of the Division are supported by state appropriations and federal grants.

* * * * *

About the cover...

The map on the cover was prepared by the Rhode Island Department of Environmental Management using Geographic Information System (GIS) technology and the Rhode Island Geographic Information System (RIGIS) database. The map depicts the twelve major river basins (watersheds) and the two principal coastal watersheds (Narragansett Bay and the Coastal Waters region) that occur in Rhode Island. Watersheds, or sub-basins within watersheds, serve as the most suitable hydrologic unit within which actions can be taken to restore and protect water quality. Accordingly, this plan places strong emphasis on a watershed-based approach to nonpoint source pollution management.

The fourteen major basins and watersheds are as follows:

1 Blackstone River	6 Warren River	11 Taunton River
2 Woonasquatucket River	7 Thames River	12 Westport River
3 Mosshasuck River	8 Hunt River	13 Narragansett Bay
4 Ten Mile River	9 Pawcatuck River	14 Coastal Waters
5 Pawtuxet River	10 Saugatucket River	

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Report Number 87

RHODE ISLAND

NONPOINT SOURCE POLLUTION MANAGEMENT PLAN

State Guide Plan Element 731

October 1995

Produced by the

NONPOINT SOURCE POLLUTION MANAGEMENT PROGRAM

OFFICE OF ENVIRONMENTAL COORDINATION

RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

and the

DIVISION OF PLANNING

RHODE ISLAND DEPARTMENT OF ADMINISTRATION

We pass the word around; we ponder how the case is put by different people; we read the poetry; we meditate over the literature; we play the music; we change our minds; we reach an understanding. Society evolves this way ...

Lewis Thomas
The Medusa and the Snail

ABSTRACT

TITLE: Rhode Island Nonpoint Source Pollution Management Plan

SUBJECT: Water quality management

DATE: October 1995

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One Capitol Hill
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ABSTRACT:

This plan updates and replaces Rhode Island's original Nonpoint Source Management Plan, which was developed in 1989. This plan has two primary purposes: to maintain the State's eligibility for federal funding under Section 319 of the Clean Water Act over the next four years; and to provide a vehicle for coordinating and integrating nonpoint source pollution control activities, both statewide and in high-priority watersheds.

This plan addresses the protection and restoration of all waters of the state -- surface and ground waters -- that are threatened or impaired by nonpoint sources of pollution. A primary goal of the plan is to maintain a balanced approach between preventing and mitigating nonpoint source pollution. The plan recognizes the need to maintain and enhance the various regulatory and enforcement programs governing nonpoint source pollution management in the state, but the plan places primary emphasis on non-regulatory initiatives.

The plan is divided into two principal parts: statewide management strategies and watershed management strategies.

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ACKNOWLEDGEMENTS

This plan, like the issue it addresses, is an aggregate comprised of many diverse components. Each component was developed essentially from scratch, using common tools of the trade: brain cells, BiC round stick medium pens, reams of paper, word processors, fax machines, telephones, piles of documents, chairs, desks, conference tables ... and people. Lots and lots of people -- colleagues, interns, government officials, environmentalists, scientists, planners, industry representatives, specialists, concerned citizens. People in the know, people who care, people willing to serve on committees, people willing to review drafts, people willing to commit large amounts of time and energy to the often painstaking process of churning out a comprehensive plan on a multi-faceted issue. Notwithstanding the value of the physical and electronic tools that were utilized (and it does boggle the mind to imagine how plans like this were written before there were personal computers), the key to the development of this plan was the involvement of the many talented people who participated in the plan development process.

More than a hundred people served on the various committees and subcommittees that reviewed sections, or entire drafts, of the plan. The committee lists appear both at the beginning (pp. iv-vi) and end (Appendix H) of this plan. Special thanks go out to those individuals who chaired the committees and subcommittees, especially Susan Morrison, Chief of Systems Planning with the Rhode Island Department of Administration, Division of Planning, who chaired the Interagency Nonpoint Source Advisory Committee and helped usher the plan through the review process conducted by the State Planning Council. Appreciation is also extended to the Natural Resources Conservation Service in Warwick, R.I. for very graciously making its conference room available to the committees for most of the meetings that were held on the plan.

Actually, the plan was not really developed from scratch. Much of the framework and philosophy of this plan stems from Rhode Island's original Nonpoint Source Plan, developed in 1989 by Elizabeth Scott. Ms. Scott is truly the pioneer of nonpoint source pollution management in Rhode Island, and she also happens to be one heck of a good friend. Her very thoughtful original work -- and her bright smile -- will forever guide and inspire those of us who continue down the path that she first blazed.

The plan was prepared by Robert Ballou, Senior Environmental Planner, RIDEM/ OEC, NPS Program, who coordinated the planning process and wrote the plan. Mr. Ballou was guided in these tasks by Scott Millar, Supervising Environmental Scientist, RIDEM/ OEC, NPS Program and, in turn, Mr. Millar was guided by Janet Keller, Chief, RIDEM/ OEC, and JoAnne Sulak, NPS Coordinator w'th the U.S. Environmental Protection Agency's Region I Office in Boston, MA.

The author wishes to extend his sincere appreciation to Mr. Millar for his vision as program coordinator, for his competence as project supervisor and, above all, for the unique

blend of wisdom and sensitivity that characterizes his interactions with friends and colleagues. Scott has an amazing ability to bring out the best in people, and he does this by relying on a few simple, but very important concepts -- i.e., listening carefully to what people have to say, respecting people's opinions, offering constructive comments, and always providing lots of support and encouragement.

The author also wishes to extend heartfelt thanks to James Riordan, Environmental Planner, RIDEM/OEC, NPS Program, and officemate, for his assistance in writing several sections of the plan (particularly the System for the Selection of High Priority Watersheds), for his willingness to serve as a sounding board (on issues of style, substance, and everything in between), and, most importantly, for his good humor, which proved to be particularly therapeutic during the author's occasional bouts of high anxiety. In a similar context, a sincere thank you is also extended to Carolyn Weymouth, Senior Environmental Scientist, who did a tremendous job in pulling together the chapter on Agencies, Programs, and Funding Sources (with no advance notice and a "due yesterday" deadline) and, with a desk situated just a few feet away from the author's, also politely endured the chorus of nonpoint source babble that accompanied much of the writing of the plan.

The author owes a debt of gratitude to two student interns from the University of Rhode Island -- Eric Marcotte and David Tria -- who conducted research, gathered materials, and worked on outlines and initial drafts for several key chapters.

Finally, as tends to be the case with most large projects, some of the most important contributions to this plan were those provided by the support staff. Carmella Grimes, Theresa Ryan, Lola Wright, Melissa Santos, Christina Clement, Regina Clement, Debra Roscoe, and Millie Delgado -- all present or former members of the RIDEM/OEC staff -- provided invaluable assistance with a host of tasks, ranging from typing, printing, and mailing to setting up meetings, resolving computer questions, and managing copy jobs. Much of the copying and miscellaneous leg work was performed by Paul Gonsalves.

Funding for the development of this plan was provided by the U.S. Environmental Protection Agency pursuant to a grant administered under Section 319 of the Clean Water Act. Section 319 funds provide primary support for state nonpoint source pollution management projects. A total of $53,855 of federal 319 monies was allocated to the Rhode Island Department of Environmental Management for the development of this plan.

The plan was produced by the Rhode Island Nonpoint Source Pollution Management Program, which is coordinated by Scott Millar. Comments on the plan are welcome. Contact Mr. Millar at (401) 277-3434 or write to the Nonpoint Source Pollution Management Program, c/o the Rhode Island Department of Environmental Management, Office of Environmental Coordination, 83 Park Street, Providence, R.I. 02903.

The plan was adopted as State Guide Plan Element 731 by the State Planning Council on 10 October 1995, following a public hearing held on 11 September 1995. Amendments to adopted State Guide Plan elements are made periodically to report progress, incorporate new data, revise policies, and update recommendations. All proposed amendments are reviewed by the State Planning Council in accordance with its adopted *Rules of Procedure*, and are presented for public comment at a public hearing prior to action by the Council.

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EXECUTIVE SUMMARY

This plan updates and replaces Rhode Island's original Nonpoint Source Management Plan, which was developed by the Rhode Island Department of Environmental Management and approved by the U.S. Environmental Protection Agency in 1989. This plan has two primary purposes: 1) to maintain the State's eligibility for federal funding under Section 319 of the Clean Water Act over the next four years; and 2) to provide a vehicle for coordinating and integrating nonpoint source pollution control activities, both statewide and in high-priority watersheds.

Under Section 319 of the Clean Water Act, federal funds are awarded annually to states to implement federally approved Nonpoint Source Pollution Management Plans. This plan will thus serve as the basis for subsequent Section 319 work plans developed by the Rhode Island Nonpoint Source Pollution Management Program. All projects targeted for funding under Section 319 must be consistent with the recommendations in this plan.

As an Element of the State Guide Plan, this plan also serves as a means for coordinating the many different programs and activities relating to nonpoint source pollution management that are conducted in Rhode Island, many of which draw from other funding sources. This plan thereby strengthens the ability of state and federal agencies and municipal governments to manage nonpoint sources of pollution throughout Rhode Island in an orderly and consistent manner.

This plan addresses the protection and restoration of all waters of the state -- surface and ground waters -- that are threatened or impaired by nonpoint sources of pollution. A primary goal of this plan is to maintain a balanced approach between preventing and mitigating nonpoint source pollution. This plan recognizes the need to maintain and enhance the various regulatory and enforcement programs governing nonpoint source pollution management in the state, but this plan places primary emphasis on non-regulatory initiatives.

This plan is divided into two principal parts: statewide management strategies and watershed management strategies.

Under statewide management strategies, this plan covers fourteen categories of nonpoint source pollution that are known to contribute, or have the potential to contribute, to water quality problems in Rhode Island. In terms of statewide applicability and known water quality impacts, the most significant nonpoint source categories are considered to be on-site sewage disposal systems and surface runoff for surface waters, and (underground) storage tanks for groundwaters. It is important to recognize, however, that because of variations in land use from one watershed or groundwater area to the next, the significance of particular sources of nonpoint pollution will also vary; as such, priority concerns can only be determined on a site-by-site basis. In view of the clear relationship between land use and water quality, the plan includes an extensive chapter on land use management.

For each of the categories and chapters covered under statewide management strategies, a range of applicable policies and recommendations are set forth. Some of the recommendations lend emphasis to practices or activities that are already being undertaken and/or funded. Most of the recommendations, however, are offered as proposals for new or revised projects and initiatives, the implementation of which will depend on the availability of additional funds. This part of the plan also includes a chapter that identifies and characterizes the various agencies and programs that are associated with the control and management of nonpoint source pollution in Rhode Island, including the various funding sources that support these agencies and programs. A generalized implementation schedule for pursuing the recommendations in the plan is also provided.

The second major part of the plan -- watershed management strategies -- sets forth a targeted, watershed-based approach for addressing nonpoint source pollution problems and concerns in high priority watersheds and groundwater areas. This approach is not offered as a new program designed to replace or compete with existing programs; rather, it is intended to serve as a flexible framework for focusing and integrating current nonpoint source pollution management efforts to achieve maximum efficiency and effect. The plan outlines the basic principles of watershed management and lists a series of steps that can be followed in order to carry out the process.

In view of the fact that each of the state's watersheds differs in terms of what needs to be done and who should do it, this plan does not attempt to delineate precise roles and responsibilities regarding watershed management. This plan does, however, discuss how the range of agencies, groups, and organizations that are likely to have a role in the watershed management process can contribute their individual resources and expertise in collaborative efforts directed at specific watersheds.

A ranking system for selecting high-priority watersheds and groundwater areas is also provided. Candidates are selected from four broad waterbody types: surface water drinking supplies, groundwater drinking supplies, other freshwaters (non-drinking), and estuarine/coastal waters. Each of the four waterbody types is assessed using two divergent set of criteria that address value characteristics on the one hand, and management feasibility on the other. The first-tier criteria rank threatened or impaired waterbodies based on public health, public benefit, and ecological value. The second-tier criteria address the management feasibility and the public and financial support for water quality improvements. High-priority watersheds and groundwater areas selected via the ranking system are then targeted for protection and/or restoration via the watershed management process.

Rounding out the watershed management strategies is a chapter addressing the restoration of aquatic habitats. This chapter sets forth a broad range of potential habitat restoration activities that can and should be considered for the purpose of implementing broad-based watershed management initiatives.

The Rhode Island Nonpoint Source Pollution Management Program plans to focus its efforts over the next four years on specific implementation projects in high-priority watersheds and groundwater areas. This approach comports with current U.S. Environmental Protection Agency policy regarding the most appropriate use of Section 319 funds, and it fills a vital niche in the state's overall efforts to address nonpoint source pollution. In recognition of the need to maintain a multi-faceted approach to nonpoint source pollution management, the Rhode Island Nonpoint Source Program will also continue to carry out and support efforts involving monitoring and assessment, public education, training, technical assistance, enforcement, and regulatory reform. However, additional resources and expertise will be needed to effectively carry out many of these other important functions.

PART 731.01: INTRODUCTION

01-01 OVERVIEW OF NONPOINT SOURCE POLLUTION

Rhode Island is at a critical juncture; decisions made today will determine where and at what cost Rhode Islanders will draw their drinking water, harvest fish and shellfish, and swim or enjoy other water-related recreational opportunities. Rhode Island has the distinction of being one of the nation's most densely populated states, and over the past decade it has witnessed an unprecedented increase in the rate of land development. Residents continue to boast of the high quality of the state's largest water supply source, the Scituate Reservoir, and the state's rural ponds, streams, and coastal shoreline. However, Rhode Island's appealing quality of life -- marked by the juxtaposition of outstanding natural resources in close proximity to the conveniences of urban centers -- is threatened. Nonpoint sources of pollution associated with a variety of land use activities are increasingly affecting the quality of the state's waters.

01-01-01 Definition of Nonpoint Source Pollution

In the 1970s, following adoption of the federal Clean Water Act, the term "nonpoint source pollution" was coined to describe water quality degradation in situations where no outfall pipe or "point source" was visibly discharging pollutants. The term conjured up the vision of mysterious pollution sources having no identity. The issue initially received scant attention, due mainly to the large amount of attention paid to point source discharges, which were then widely regarded as the primary contributors to water quality problems.

Today, nonpoint source pollution has an identity; it describes a varied group of activities and processes that contribute pollutants to surface and ground waters. Examples include failing or poorly functioning septic systems, erosion from construction sites, and stormwater runoff from streets, lawns, and agricultural fields.

Nonpoint source pollution primarily involves water quality degradation resulting from the interaction between the natural hydrologic cycle and various land use activities. As rainfall and snowmelt runs off or seeps into the land, it carries with it dissolved pollutants from many diffuse sources on the land surface and subsurface. Eventually, these pollutants are transported and deposited into streams, rivers, ponds, lakes, drinking water supply reservoirs, groundwater aquifers, wetlands, and coastal waters. The general category of nonpoint source pollution has also been broadened to include various diffuse activities that are not necessarily linked to the natural hydrologic cycle, such as underground discharges and sewage discharges from boats.

01-01-02 Extent and Nature of the Problem in Rhode Island

The following summaries and analyses of water quality problems affecting Rhode Island's surface and ground waters are drawn from The State of the State's Waters -- Rhode Island - A Report to Congress (RIDEM, 1994a). The report contains compilations of waterbody-specific assessments, based on the most recent data available.

Rhode Island surface waters are classified by water quality standards that define the water quality goals for each waterbody. Water quality standards consist of a designated use of a waterbody and the water quality criteria necessary to protect the designated use. The surface waters of the state are assigned to one of six classes: Class A, B, or C for freshwaters, and Class SA, SB, or SC for salt waters. For the definitions of these classes, see Appendix A. The R.I. Department of Environmental Management assesses water quality conditions on the basis of use support status -- i.e., the degree to which they meet their classifications. There are four use support categories: 1) fully supporting; 2) fully supporting but threatened; 3) partially supporting; and 4) not supporting. There are separate approaches for each individual use support category, based primarily on the type of data and information available. These approaches are defined in Appendix B.

Lakes/Ponds

Just 9 percent (approximately 1,600 lake acres) of all lakes/ponds in Rhode Island fully support their water quality classifications. The vast majority (69 percent, 11,936 acres) of the lakes/ponds in the state fully support their classifications, but are threatened by nonpoint sources of pollution -- namely, nutrients and bacteria associated with runoff and septic system loadings. These threatened waterbodies include almost all of the 32 lakes that are used as drinking water supply sources. Some 18 percent (approximately 3,200 acres) of Rhode Island's lakes/ponds partially support their water quality classifications, while 3.5 percent (605 acres) do not support their classifications.

A small number of urban lakes and reservoirs are impacted by metals (mainly bound up in sediments), which usually enter through storm drains from parking lots and roads. The majority of lakes in partial support are impacted by high nutrient inputs causing severe eutrophication problems. These problems include extremely low dissolved oxygen in most of the lower layer or extremely low alkalinity buffering capacity. Low alkalinity, which causes high susceptibility to acid rain/acid deposition, is related to natural bedrock type, but other water quality impacts are due mainly to nonpoint sources, including stormwater runoff, agricultural runoff, soil erosion from cleared land, and poorly functioning septic systems. Moderate impacts to lakes are attributable to elevated bacteria levels, increases in nutrients and turbidity, elevated sodium and chloride (road salt) levels, and elevated levels of metals (lead and copper) and petroleum hydrocarbons. A significant number of surface and drinking water supplies are considered to be threatened or partially supporting their classifications due to taste and odor problems associated with recurring algae blooms, high

nutrients, and high turbidity -- conditions requiring moderate to expensive treatment levels. Many other lakes are also experiencing threats from dense bottom vegetation growth, and many exhibit significant algae blooms.

Many of Rhode Island's lakes and ponds are man-made impoundments of rivers and streams. As such, they often act as shallow settling basins for materials flowing downstream. These ponds therefore inevitably develop sedimentation/shallowing problems, high nutrient levels from the organic matter that settles out of streams in these areas, and increased bottom vegetation growth. This "aging" process is a natural development in the life of all ponds, but it may be accelerated by human-related development in a lake watershed. Increased drainage flowing from roadways and the installation of septic systems in poor soils close to ponds will cause increased loadings of nutrients (phosphorus is the nutrient of greatest concern for fresh waters) and total suspended solids. In many cases, such impacts follow the conversion of summer cottages to year-round residences, along with development in the lake watershed. These impacts will drive most lakes towards rapid nutrient enrichment (eutrophication), with its heavy algae blooms or bottom weed growth eventually limiting uses such as boating and swimming.

Unless steps are taken to limit storm water runoff, control the use of fertilizers on lawns and farms, and manage septic system inputs, lake water quality is likely to deteriorate. Most "restoration" techniques to deal with eutrophic lakes are short-term, expensive "band aids," which fail to produce pristine lake conditions and merely push the aging process back a season or two. Nutrients locked up in the sediments at the bottom of a lake are capable of recycling for decades, causing algae blooms or vegetation overgrowth to continue even if inputs of nutrients are stopped. Techniques such as alum treatment or dredging can reduce algae blooms, but such treatments are expensive. Moreover, in most lakes where such techniques are employed, the eutrophication process will return rapidly if nutrient inputs from septic systems, runoff, and other nonpoint sources continue unabated. Herbicides can control weed growth, but ecological risks make this a "last resort" technique. The most effective protection of water quality for lakes involves the use of nonpoint source controls before a lake becomes eutrophic.

Rivers/Streams

Some 26 percent (176 miles) of all river/stream miles assessed in Rhode Island fully support their water quality classifications and are not threatened by pollution. Just about one-half (337 miles) of river/stream miles in the state fully support their classifications, but are threatened by nonpoint sources of pollution -- namely, heavy metals (especially lead), nutrients, and bacteria emanating from urban runoff, highway runoff, failed or poorly functioning septic systems, and contaminated in-place sediments. About 7 percent (46 miles) of Rhode Island's assessed river/stream miles partially support their water quality classifications, while 16 percent (109 miles) do not support their classifications. In addition to nonpoint sources of pollution, a significant percentage of rivers and streams are impacted

by point sources of pollution (i.e., combined sewer overflows and municipal and industrial discharges).

Estuaries/Coastal Waters

Most of the state's estuarine/coastal waters (73 percent, 141 square miles) fully support their water quality classifications. Just under 6 percent (11 square miles) of the estuarine/coastal water areas of the state fully support their classifications, but are threatened by nonpoint sources of pollution. These areas include many of the salt ponds in the southern part of the state, and many coves in Narragansett Bay that receive pollutant loads from stormwater runoff and poorly functioning septic systems. About 10 percent of the state's salt waters (20 square miles) partially support their water quality classifications; most of these areas encompass the conditionally approved shellfish growing areas in Upper Narragansett Bay and the Warren and Barrington Rivers. Another 10 percent (20 square miles) of the state's salt waters do not support their classifications, due mainly to elevated heavy metal levels in the Providence River and closures of certain SA waters to shellfishing because of bacterial contamination. Major water quality impacts in the upper bay region are from point sources (namely, combined sewer overflows and municipal waste water treatment facilities). Urban stormwater also contributes significant amounts of bacteria, nutrients, and metals, along with petroleum hydrocarbons. Poorly functioning septic systems and certain recreational activities are known contributors of nonpoint source pollution to several salt water areas. Contaminated in-place sediments are also a problem in some areas. A significant source of pollutants to the Providence River and Upper Narragansett Bay is the Blackstone River.

It has been determined that a number of coves and embayments around Narragansett Bay currently suffer from seasonal dissolved oxygen depletion, algal blooms, and occasional fish kills related to organic loadings from many sources, including failing or poorly functioning septic systems. In addition, over 32 percent of Narragansett Bay is permanently or conditionally closed to shellfish harvesting because of actual or suspected contamination from sewage-derived bacteria and viruses. Much of this contamination is attributable to combined sewer overflow discharges of untreated sewage in the Upper Bay following rain storms. Yet all of the closures in recent years have occurred in suburban areas such as the Narrow River, Point Judith and Green Hill Ponds, and Greenwich Bay, all as a result of increasing levels of fecal coliform bacterial contamination from poorly functioning septic systems, storm drains, and boats.

Groundwaters

Rhode Island's groundwater resources are generally free of anthropogenic pollutants and are of an acceptable quality to support their primary intended use: drinking water. Yet there continue to be major threats as well as discoveries of new contamination problems

affecting some private wells. In 1990, RIDEM's Groundwater Section developed an assessment of the impacts of nonpoint source pollution on Rhode Island's groundwater resources. This assessment revealed that the vast majority of the state's groundwaters are threatened (80 percent) or impacted (9 percent) by nonpoint pollution sources. These findings were deemed largely attributable to the relatively densely developed landscape of the state. Indeed, the areas found to be neither threatened nor impacted were very rural in nature and contained sizable public holdings of open space.

Rhode Island's groundwater resources are clearly extremely vulnerable to contamination from a wide variety of pollution sources. Approximately 100 different contaminants have been detected in the state's groundwaters, with the most common being petroleum products, organic solvents (particularly volatile organic compounds, or VOCs), nitrates, and historically the pesticide aldicarb (Temik). Contaminant sources include leaking underground fuel storage tanks, hazardous and industrial waste disposal sites, illegal or improper waste disposal practices, chemical and oil spills, landfills, poorly functioning septic systems, road salt application and storage practices, and fertilizer and pesticide applications. There are now over 300 confirmed areas of groundwater contamination that are classified as nonattainment areas -- areas that do not meet their designated water quality classification.

Most groundwater contamination problems occur on a localized basis. To date, groundwater contamination has caused permanent or temporary closure of at least thirteen community and eight non-transient, non-community public wells. In addition, over 600 private wells have been found to contain concentrations of contaminants that required treatment for varying lengths of time or closure. Since 1990, new reports of private well contamination problems have come in at the rate of 15-30 each year. The leading cause of new groundwater contamination incidents is the release of petroleum products stored in underground storage tanks.

While most of the state's groundwater resources are of generally high quality, the growing number of known contamination cases reflects the ease with which various chemicals have polluted portions of the state's aquifers. Conditions such as high water table, unconfined permeable soils, and fractured bedrock render most of the state very vulnerable to groundwater contamination.

01-02 BASIS AND PURPOSE OF THE PLAN

01-02-01 Federal Clean Water Act Requirements

In 1987, the federal Clean Water Act was amended in a number of ways, one being the addition of Section 319, titled "Nonpoint Source Management Programs." This new section established the first national program to authorize federal funding for the control of nonpoint sources of pollution. To be eligible for federal funding under Section 319, each state was required to prepare two reports: a State Assessment Report describing the state's nonpoint source (NPS) pollution problems and a State Management Program explaining what the state planned to do in the next four fiscal years to address its NPS pollution problems.

In accordance with Section 319 requirements, the State of Rhode Island, through its Department of Environmental Management (RIDEM), Office of Environmental Coordination, developed "An Assessment of Nonpoint Sources of Pollution to Rhode Island's Waters" in 1988 and "Rhode Island's Nonpoint Source Management Plan" in 1989. Both of these reports were approved by the U.S. Environmental Protection Agency (EPA), and these approvals triggered formation of the Rhode Island Nonpoint Source Pollution Management Program (hereafter referred to as the "RI NPS Program") within RIDEM's Office of Environmental Coordination.

In 1990, the state's Nonpoint Source Assessment Report was folded into the State of the State's Waters Report, which is prepared on a bi-annual basis by RIDEM's Division of Water Resources pursuant to Section 305(b) of the federal Clean Water Act. Funding constraints and program limitations have limited RIDEM's ability to update the waterbody-specific descriptions regarding threats and impairments by nonpoint source pollution in the 305(b) reports issued since 1990. As such, the 1990 nonpoint source assessment has remained unchanged, except for some updated information pertaining to lakes. To the extent that any additional funds become available for conducting assessments relative to nonpoint sources and causes, the 305(b) report will continue to serve as the vehicle for gathering, analyzing, and conveying this information.

Since formation of the RI NPS Program in 1989, the Program has supported and carried out a range of projects and activities emanating from the recommendations set forth in the 1989 Nonpoint Source Management Plan. An overview of major programmatic activities undertaken during the past several years appears in Appendix C.

In 1993, as the four-year lifespan of the original Nonpoint Source Management Plan began to wind down, the RI NPS Program began working on the development of an updated and revised plan. A year-long effort ensued, resulting in the production of this document. This revised plan addresses the protection and restoration of all waters of the state -- surface and ground waters -- that are threatened or impacted by nonpoint sources of pollution. This revised plan will be used by the RI NPS Program to guide its activities over

the next four years, and by EPA/Region I to review annual work plans submitted by the Program pursuant to Section 319 grant application requirements.

This revised plan has been developed in accordance with the national "Nonpoint Source Guidance," issued in December 1987 by EPA's Office of Water, and with the "Guidance on Revised Management Programs, Region I," with addendum, issued in November 1993 by the EPA/Region I.

01-02-02 Statewide Coordination of Nonpoint Source Pollution Management

This revised Nonpoint Source Plan is intended primarily to serve as a means of informing the EPA regarding the state's proposed use of Section 319 funds over the next four years. Indeed all projects incorporated in subsequent Section 319 work plans must be referenced in this plan. However, this plan is also designed to serve as a vehicle for coordinating the many different programs and activities relating to nonpoint source pollution management that are conducted in the state, many of which draw from other funding sources besides Section 319.

A key aspect of this revised plan, which distinguishes it from the original plan, is its status as an Element of the State Guide Plan. The State Guide Plan serves as a means for centralizing and integrating long-range goals, policies, and plans with short-range project plans; and implementing programs prepared on a decentralized basis by the agency or agencies responsible in each functional area.

As an Element of the State Guide Plan, this revised Nonpoint Source Plan strengthens the state's ability to manage nonpoint sources of pollution in an orderly and consistent manner. All state agencies must carry out programs and activities that are consistent with the plan. Moreover, all municipalities, through their Comprehensive Plans and any associated land use ordinances, must also maintain consistency with the plan.

The vast array of threats and impacts to Rhode Island's waters that are attributable to nonpoint source pollution, the complexity of these issues, and the multitude of agencies and programs that have roles to play regarding nonpoint source pollution management underscore the need for enhanced inter- and intra-governmental coordination. Many of the source-specific recommendations in this plan advocate better coordination among applicable parties. Moreover, the plan places strong emphasis on a watershed-based approach to nonpoint source pollution management. This approach emphasizes the involvement of all affected stakeholders and stresses the need for integrated actions on the part of government agencies at all levels as well as other non-governmental entities, to achieve the greatest improvements with the resources available.

01-02-03 Relationship to Other Plans and Programs

This plan is designed to serve as the guiding document for nonpoint source pollution management in Rhode Island. A number of other state-administered plans and programs provide detailed information on how various portions of the RI NPS Program will be carried out. The most important of these plans and programs are described below.

Rhode Island Groundwater Protection Strategy
Rhode Island Wellhead Protection Program
Scituate Reservoir Watershed Management Plan
Comprehensive Conservation and Management Plan for Narragansett Bay

These four documents all contain important nonpoint source components, and they are all closely linked with Rhode Island's Nonpoint Source Pollution Management Program. All of the documents were formally reviewed and approved prior to the development of this revised Nonpoint Source Plan, and two -- the Scituate Plan (Element 125) and the Comprehensive Conservation and Management Plan for Narragansett Bay (Element 715) -- have also been adopted as State Guide Plan Elements.

In lieu of reiterating each and every relevant policy and recommendation from these four documents in this revised Nonpoint Source Plan, the documents have all been incorporated into Rhode Island's Nonpoint Source Pollution Management Program by document reference. As such, all applicable policies and recommendations in these documents that address the management of nonpoint source pollution are considered part of the state's overall nonpoint source pollution management strategy.

Comprehensive State Groundwater Protection Program

As noted above, the Rhode Island Groundwater Protection Strategy, adopted in 1989, has been incorporated by document reference into Rhode Island's Nonpoint Source Pollution Management Program. The Strategy outlines a series of recommendations for improving groundwater protection on a statewide basis. A large majority of the recommendations from the Strategy have been successfully implemented by various divisions of RIDEM, as well as other agencies. Accordingly, in order to serve as an effective planning document, the Strategy needs to be updated.

RIDEM's Groundwater Section will be producing an updated protection strategy by developing a Comprehensive State Groundwater Protection Program (CSGWPP) document. Pursuant to EPA guidance, state strategies have been replaced by a more specific resource protection approach known as the CSGWPP process. Due to the involvement of groundwater issues across many programs, it is the goal of CSGWPP to provide a framework for integrating and applying a consistent approach to groundwater protection on a statewide

basis. RIDEM's Groundwater Section expects to be actively pursuing the CSGWPP process, with assistance from EPA/Region I, during 1995-1996. RIDEM expects many of the activities outlined under the CSGWPP to reflect the recommendations of this Nonpoint Source Pollution Management Plan. At the appropriate time, the CSGWPP is expected to be incorporated into Rhode Island's Nonpoint Source Pollution Management Program by document reference.

Wellhead Protection Program

A key component of the overall state strategy for protecting groundwater is the implementation of the Rhode Island Wellhead Protection Program, which was approved by the EPA in 1990. RIDEM is continuing to implement the program via regulation, technical assistance, and public education. The program is aimed at protecting the critical portions of aquifers which supply the over 600 public wells located throughout the state. In 1993, RIDEM designated over 90,000 acres as wellhead protection areas (WHPAs). These areas are now targets for the completion of pollution source inventories and the implementation of local wellhead protection plans. RIDEM is providing technical assistance to local entities, based on the recognition that effective wellhead protection requires a joint state and local effort. The deadline for completing local wellhead protection plans is 1996.

The designation of wellhead protection areas has been integrated into the state's groundwater classification system, which provides a basic framework for prioritizing groundwater resources. The classification system provides for a differential approach to protection that recognizes certain aquifer areas as being of higher value than others. Community WHPAs are classified GAA and provided the most stringent protection under the groundwater regulations. WHPAs will continue to remain a high priority for protection in various RIDEM programs, particularly those governing high-risk activities such as Underground Storage Tanks and Underground Injection Control. This prioritizing system is consistent with national EPA groundwater protection strategies and guidance.

Pesticide and Fertilizer Ground Water Protection Program

EPA, through its pesticide regulatory authorities under the Federal Insecticide, Fungicide, and Rodenticide Act and its Pesticides and Ground Water Strategy, requires that states develop pesticide and groundwater State Management Plans. Accordingly, Rhode Island has established a Pesticide and Ground Water Protection Program. The objectives and methods of the program are outlined in Rhode Island's [Draft] Management Plan for the Protection of Ground Water from Pesticides and Nitrogenous Fertilizer (RIDEM, 1994c). The goal of this plan is to prevent adverse effects to human health and the environment while ensuring the long-term protection of the state's groundwater resources. In accordance with EPA's Strategy, Rhode Island's Plan provides direction in determining what measures are needed when and if 1) a pesticide or nitrogen is found, 2) pesticide or nitrogen

concentrations increase over time, 3) pesticide or nitrogen concentrations approach an established reference point, or 4) pesticide or nitrogen concentrations reach or exceed a reference point.

Rhode Island Coastal Nonpoint Pollution Control Program

Section 6217 of the Coastal Zone Act Reauthorization Amendments of 1990 requires that states with federally approved coastal zone management programs develop Coastal Nonpoint Pollution Control Programs to be approved by the EPA and the National Oceanic and Atmospheric Administration (NOAA). These programs are designed to strengthen the links between federal and state coastal zone management and water quality programs in order to enhance state and local efforts to manage land use activities that degrade coastal waters and coastal habitats. This is to be accomplished primarily through the implementation of a series of required management measures in conformity with guidance published by EPA (see USEPA, 1993). The fifty-three management measures fall within five broad categories which, according to NOAA and EPA, represent the five major categories of nonpoint source pollution that impair or threaten coastal waters nationally. These categories are: agricultural runoff, urban runoff, silvicultural runoff, marinas and recreational boating, and hydromodifications. The Section 6217 requirements also include three management measures for wetlands, riparian areas, and vegetated treatment systems that apply generally to various categories of sources of nonpoint pollution. In addition, states must identify critical areas and develop additional management measures, if needed. This revised NPS Plan is consistent with Rhode Island's Coastal Nonpoint Pollution Control Program.

State Clean Water Strategy

The State Clean Water Strategy is a multi-year approach to water quality planning developed by RIDEM and the EPA. The strategy is designed to set priorities and direct efforts and resources to maximize environmental benefits, while taking into account the fiscal and staffing constraints that impact the state as federal funding decreases or shifts. RIDEM's Division of Water Resources updates this four-year water quality plan periodically. The plan accords with EPA guidance which prescribes a three-stage integrated process of waterbody/resource assessment, waterbody targeting, and strategic management planning. This revised NPS Plan is intended to serve as the primary nonpoint source component of the State Clean Water Strategy.

Other Programs

A complete listing of other programs involved in the control and management of nonpoint source pollution in Rhode Island is set forth in Chapter 02-04 of this Plan.

01-03 GOALS AND STRATEGIES FOR ADDRESSING NONPOINT SOURCE POLLUTION MANAGEMENT

01-03-01 Goals for Nonpoint Source Pollution Management

The major goals for nonpoint source pollution management in Rhode Island are set forth below. To the extent possible, the RI NPS Program will endeavor to address these eight goals in the annual work plans it develops over the next several years. However, funding constraints will inevitably limit the capacity of the RI NPS Program to support and carry out all activities necessary to achieve these goals. Accordingly, and in recognition of guidance issued by EPA on the use of Section 319 funds, the RI NPS Program will continue to focus a majority of its efforts on implementing specific nonpoint source pollution control strategies, particularly the design and construction of best management practices, in high priority watersheds and aquifers. Other types of projects that are consistent with the goals set forth below will still be considered by the NPS Program as candidates for funding in subsequent work plans. However, other funding sources will be needed to support the full range of activities necessary to achieve the goals. For further information regarding additional funding sources, see Chapter 02-04 of this plan. The following goals are intended to be consistent with other State Guide Plan goals, including but not limited to those relating to the promotion of sound economic development.

GOAL #1

Maintain a balanced approach between mitigating and preventing nonpoint source pollution in high priority watersheds and aquifers.

GOAL #2

Continue to address statewide nonpoint source pollution problems, while placing increased emphasis on watershed-based management.

GOAL #3

Monitor and assess water quality and land use conditions and, based on this information, develop and implement specific nonpoint source pollution management strategies in high priority watersheds and aquifers.

GOAL #4

Strengthen public education efforts to increase awareness of nonpoint source pollution concerns and to enhance the role of citizens in addressing these concerns.

GOAL #5

Provide technical assistance and training to facilitate implementation of nonpoint source pollution management activities.

GOAL #6

Test and promote the use of new or alternative methods for managing nonpoint source pollution.

GOAL #7

Improve the effectiveness of nonpoint source pollution management by enhancing coordination and collaboration among all applicable parties and programs.

GOAL #8

Restore impaired aquatic habitats, beginning with high priority watersheds.

01-03-02 Strategies for Nonpoint Source Pollution Management

A primary thrust of the initial NPS Plan was to establish statewide nonpoint source pollution prevention strategies. Accordingly, some of the most significant early accomplishments of the RI NPS Program involved the strengthening of regulations governing nonpoint source pollution and the development of manuals and guides addressing soil erosion and sediment control, individual sewage disposal systems, stormwater, marinas, and community nonpoint source control programs, among other topics (see Appendix C).

While pollution prevention remains at the fore of the state's nonpoint source pollution management strategy, the RI NPS Program plans to focus its efforts over the next four years on specific implementation projects in high priority watersheds and aquifers. This approach comports with current EPA policy regarding the most appropriate use of Section 319 funds, and it fills a vital niche in the state's overall efforts to address nonpoint source pollution. In recognition of the need to maintain a multi-faceted approach to nonpoint source

pollution management, the RI NPS Program will also continue to carry out and support efforts involving public education, training, technical assistance, enforcement, and regulatory reform. However, additional resources and expertise will be needed to effectively carry out many of these other important functions.

In view of the clear relationship between land use and water quality, this Plan devotes an entire chapter to the issue of land use management. This focus on land use also stems from the recognition that it is much more practical and cost-effective to take steps to avoid water pollution and habitat degradation than it is to adopt regulatory responses aimed at mitigating existing problems. What's more, the key tools for preventing land use impacts to water quality -- local zoning and subdivision regulations -- can generally be applied only proactively to control new uses, not retroactively to control existing uses.

This plan also aims to enhance existing land use and water quality regulatory programs, where possible, by encouraging creativity, flexibility, and the development of objective standards that will provide adequate environmental protection while accommodating new growth. Emphasis is also placed on improved communication, coordination, and cooperation among federal, state, and local officials, and between the public and private sectors.

A number of recommendations set forth in this Plan relate to the importance of giving special consideration to "critical areas." As defined in the Comprehensive Conservation and Management Plan for Narragansett Bay, critical resource areas are "significant areas of outstanding ecological or public use value with resources that are vulnerable to various anthropogenic activities that cause environmental degradation" (p. 4.172). Critical resource areas of outstanding ecological significance include areas that have already achieved federal or state recognition for their ecological value (such as wetlands, nutrient-sensitive resources, coastal features, outstanding resource waters, wildlife refuges, and management areas), areas that contain rare species or support rare or diverse natural communities, and areas that provide important breeding, feeding, or nursery areas for native and migratory fish and wildlife. Critical resource areas of outstanding public use value include public drinking water supplies (namely, surface water reservoirs and their watersheds, groundwater aquifers and their recharge areas, and wellhead protection areas), areas of exceptional recreational value, areas that support important commercial or recreational fisheries, natural hazard areas (such as barrier beaches, erosion areas, and floodplains), and outstanding scenic areas and cultural sites. For a more detailed discussion of critical resource areas, see the Critical Resource Area Protection "Briefing Paper", Publication No. NBP-92-88, available from RIDEM's Narragansett Bay Project.

PART 731.02:
STATEWIDE MANAGEMENT STRATEGIES

This part of the plan sets forth a range of policies and recommended strategies for addressing nonpoint source pollution on a statewide basis in Rhode Island. Some of the recommendations lend emphasis to practices or activities that are already being undertaken and/or funded. But most of the recommendations are offered as proposals for new or revised projects and initiatives, the implementation of which will depend on the availability of additional funds. Section 319 funds will continue to serve as a source of funding for certain qualified projects. Other sources of funding -- several of which are identified in this plan -- will be needed to support implementation of those recommendations that are beyond the scope of the RI NPS Program.

Many of the source-specific recommendations set forth in Chapter 02-01 include references to specific implementation methods and management practices. A broad range of additional methods and practices have been compiled in various guides and manuals, several of which were developed with the use of Section 319 funds. A representative sampling of some of the major sources from which applicable best management practices will be selected for the purpose of implementing nonpoint source pollution control projects can be found in Appendix D.

This part of the plan also identifies the various agencies and programs associated with the control and management of nonpoint source pollution in Rhode Island, as well as the various funding sources which support these agencies and programs. A generalized implementation schedule for tackling the recommendations in Chapters 02-01 and 02-02 is also offered, with the understanding that priorities and strategies may shift over time and thus lead to various schedule changes.

02-01 SOURCE-SPECIFIC CONCERNS, POLICIES, AND RECOMMENDATIONS

This chapter identifies fourteen categories of nonpoint source pollution that are known to contribute, or have the potential to contribute, to water quality problems in Rhode Island. Some categories, such as on-site sewage disposal systems and surface runoff, are more significant than others in terms of their actual or potential water quality impacts. Also, certain categories, such as construction activities and storage tanks, have statewide applicability, while other categories, such as agriculture and boating facilities, are more localized or regional in scope.

02-01-01 On-Site Sewage Disposal Systems

Water Quality Concerns

Approximately 150,000 housing units in Rhode Island (35 percent of the total) are served by on-site sewage disposal systems (OSDS) -- known in their conventional form as septic systems. Each year, these systems discharge something on the order of seven billion gallons of wastewater into Rhode Island's soils and groundwater. Many of these systems do their job well, effectively discharging treated effluent to the soil and providing many years of satisfactory performance. However, there is no shortage of substandard systems that fail to do what they are supposed to do. What's more, even properly functioning OSDS, if improperly sited, can cause problems, since most of the pollutants from OSDS effluent can migrate long distances down-gradient from their point of release.

Household wastewater can contribute high levels of bacteria and viruses to ground and surface waters. In saturated soil conditions, these microbes are not adequately treated and can move with groundwater over distances exceeding 1,000 feet; under these conditions, survival times for bacteria range from three to six weeks, with longer survival rates for viruses (Gerba, 1985). Outside of Rhode Island, outbreaks of gastroenteritis, hepatitis, and typhus have been linked to septic system contamination of drinking water supplies (Gerba, 1985; McGinnis and Dewalle, 1983). The USGS has reported that samples from private wells, tested by the RI Department of Health (RIDOH) between 1975 and 1985, on average exceeded the drinking water standard for bacteria in 40 percent of shallow dug wells and 8 percent of deeper, drilled wells. Given that RIDOH focused on wells with suspected water quality problems, it is presumed that these averages are higher than those expected from a random sampling of wells (RIDEM, 1994).

Several surface water areas in Rhode Island are continuing to show indications of impacts due to nonpoint sources of total and fecal coliform. The most probable causes of increased coliform levels in many of these areas are failed septic systems and stormwater runoff. Septic system failures, which are often due to poor maintenance, poor soils, and/or high water tables, can result in the leaching of sewage onto the ground surface, where it can be carried via runoff into stormwater drains. These stormwater drains often discharge into local waterbodies. Reportedly, this situation has been occurring in the Narrow River, which flows through the Towns of North Kingstown, South Kingstown, and Narragansett. This river has been closed to shellfishing since 1986 due to elevated levels of bacteria detected during RIDEM shellfish monitoring surveys in the river. A majority of the monitoring stations in the river significantly exceed its Class SA water quality criteria for bacteria. In addition, some very high counts, occasionally exceeding Class criteria, have been detected in areas known to have consistently high rates of septic system failures. Leachate and/or overflows from septic systems are also thought to be at least partly responsible for past shellfishing closures in Green Hill Pond, portions of other salt ponds in southern Rhode Island, the Kickemuit River, the Island Park area of Portsmouth, and Greenwich Bay.

Nutrient pollution in the form of nitrogen and phosphorus can also be attributed to septic systems. The average septic tank effluent contains 40 milligrams per liter (mg/l) of total nitrogen. Nitrates are very soluble and have the potential to move extensive distances within groundwater. Nitrate levels exceeding the federal and state standard of 10 mg/l in drinking water (measured as Nitrogen) can cause methemoglobinemia (also known as "blue baby syndrome"). When nitrates are consumed at elevated levels, methemoglobinemia can be lethal to infants. For its Private Well Survey, RIDEM collected groundwater quality samples from private wells in four areas with a high concentration of septic systems. A total of 63 private wells (70 samples) were tested for nitrates and several other parameters. The results for nitrate showed a range of concentrations from non-detectable to 19.0 mg/l, with an average of 3.45 mg/l (RIDEM, 1994). (It should be noted that lawn fertilization is also expected to contribute to the observed concentrations of nitrate.)

Nitrate inputs can also cause algal blooms in marine and brackish waters (Nixon and Pilson, 1983). Research in the coastal salt ponds region of the state found elevated nitrates in groundwater associated with the more densely developed portions of the watershed. Septic systems, as well as fertilizers, were cited as the primary sources of the nitrate contamination. Phosphorus alone is not considered a public health threat, but even low levels of this nutrient in freshwater bodies and low-salinity coastal embayments can cause nuisance algal blooms and promote the rapid eutrophication of ponds and lakes. Massive aquatic plant growth adds to the cost of drinking water treatment and impairs the recreational use of surface waters. Phosphorus does not move through the soil as readily as nitrate, but in saturated soils it may travel significant distances.

A report done for the USEPA identified fourteen organic chemicals as priority pollutants found in commonly used household products (drain cleaner, oven cleaner, automotive cleaning products, paint thinner, etc.) and routinely discharged into septic systems (Hathaway, 1980). Depending on local conditions, many of these chemicals can be very persistent in groundwater resources. Of particular concern is the use of septic system cleaners containing organic chemicals. Their use greatly increases the likelihood of contamination of groundwater at levels that would impair its use for drinking water purposes. Two of the most common chemicals associated with these cleaners are methylene chloride and 1,1,1 - trichloroethane. Rhode Island has banned the use of cleaners with organic solvents and those using acids, but this provision is difficult to enforce (RIDEM, 1994).

Improperly sited, designed, installed, or maintained OSDS are often the root of the above-described environmental and public health concerns. The first three factors are regulated primarily by RIDEM, though local zoning is important in helping to control OSDS densities. Maintenance is the responsibility of property owners. Municipal oversight of operation and maintenance issues occurs in communities that establish wastewater management districts.

Policies and Recommendations

Siting Of New OSDS

POLICY 1.1 Minimize adverse water quality impacts resulting from OSDS by directing placement of OSDS away from areas that are unsuitable.

RECOMMENDATIONS:

(1) On an ongoing basis, continue to re-evaluate RIDEM's OSDS regulations, particularly with regard to siting concerns. Consideration should be given to the following issues, among others:

A) Re-evaluate existing depth-to-groundwater and depth-to-impervious-layer requirements, and consider increasing these vertical separation requirements where necessary to protect water quality.

B) Re-evaluate existing horizontal setback requirements, and consider increasing these requirements where necessary to protect water quality.

C) Consider adopting special protective criteria which must be met for critical areas as part of the permit review process for large OSDS and subdivisions where total combined flow exceeds 2,000 gallons/day.

(2) Pursue enhanced use of scientific methods for predicting seasonal high water tables, setback distances, and other siting factors.

(3) To determine seasonal high water tables, soil permeability, and other OSDS siting limitations more effectively:

A) Pursue the development and implementation of a soils-based site evaluation system.

B) Following adoption of the site evaluation system, develop a training handbook for ISDS designers.

C) Following development of the training handbook, establish a training or certification program for OSDS site evaluators.

D) Once this training or certification program is initiated, pursue a stable source of funding to cover program costs, such as through a fee for receiving training or certification.

(4) Continue to pursue the development of improved mechanisms for assessing the potential cumulative impact of OSDSs with respect to water quality, e.g., review various nitrate modeling approaches. Prepare guidance materials for use by engineers and consultants.

Design Of New OSDS

POLICY 1.2 Minimize adverse water quality impacts resulting from OSDS by requiring OSDS designs that maximize treatment efficiency and effluent quality and facilitate proper maintenance.

RECOMMENDATIONS:

(5) Encourage, and consider mandating, the use of effluent filters in septic tanks to prevent large solids from being discharged to leach fields, and/or the use of alarm-equipped effluent filters to indicate when pumping is needed.

(6) Consider expanding the requirements relating to reserve leach fields to cover other critical areas, in addition to areas where drinking water is obtained from private wells.

(7) With reserve leachfields, consider utilizing primary and backup systems in combination, alternating the use of each system (e.g., switching every six months), so that systems in marginally permeable soils can continue to operate properly.

(8) Continue to discourage the use of garbage disposals in newly constructed or reconstructed facilities served by OSDS. Through the State Building Code, consider adopting a ban on garbage disposals in newly constructed or reconstructed facilities served by OSDS, particularly in nutrient-sensitive areas.

(9) Pursuant to the State Building Code ("Water Closets"), continue to mandate the use of low-volume plumbing fixtures in new buildings serviced by OSDS, as well as renovations and replacements of existing structures.

(10) Encourage, and where necessary to minimize pollutant inputs to ground or surface waters, require the use of alternative OSDS technologies or other mitigative controls.

(11) On a continuing basis, update and revise RIDEM's OSDS regulations to allow for new technologies that have been demonstrated to be effective and practical.

(12) Pursue the establishment of a standardized mechanism for reviewing, approving, and tracking permit proposals involving alternative OSDS technologies. Develop baseline data on the performance of new OSDS technologies.

(13) Consider linking certain permits for alternative OSDS to maintenance and/or monitoring requirements and other guarantees.

(14) Continue to provide planners, regulators, engineers, and contractors with classroom and field training on the design of alternative OSDS technologies, utilizing vehicles such as URI's Rhode Island On-Site Wastewater Training Program. Require this training as a prerequisite for anyone planning to design an alternative system. Pursue a stable source of funding to cover program costs.

(15) Consider establishing a certification or licensing requirement that would establish minimum qualifications for OSDS designers, particularly those involved with the design of alternative systems.

(16) Evaluate, and where appropriate pursue, the establishment of enhanced treatment requirements, such as secondary or advanced wastewater treatment, for large-scale OSDS, where conditions warrant.

(17) Consider changes to RIDEM's OSDS regulations that would allow soils with good treatment capabilities to be kept in place rather than replaced with bank-run gravel.

Installation Of New OSDS

POLICY 1.3 Ensure that new OSDS operate properly by using appropriate techniques and methodologies during installation and verifying that all systems are installed in accordance with approved designs.

RECOMMENDATIONS:

(18) Continue to provide planners, regulators, engineers, and contractors with classroom and field training on the installation of alternative OSDS technologies, utilizing vehicles such as URI's Rhode Island On-Site Wastewater Training Program. Consider requiring this training as a prerequi-

site for anyone planning to install an alternative system. Pursue a stable source of funding to cover program costs.

(19) Continue to ensure that OSDS installations are properly inspected by RIDEM personnel.

(20) Consider establishing a mechanism that would require OSDS designers to take on more oversight and legal responsibility for proper OSDS installations. Ensure adequate training of installers.

(21) Consider establishing a requirement that newly installed leachfields be staked, fenced, or otherwise demarcated to prevent damage during on-site landscaping and construction activities.

Operation and Maintenance of Existing OSDS

POLICY 1.4 Ensure that existing OSDS are properly operated and maintained so as to minimize adverse water quality impacts and guard against system failures.

RECOMMENDATIONS:

(22) Encourage retrofits of septic tanks with effluent filters to prevent large solids from being discharged to leach fields, and/or alarm-equipped effluent filters to indicate when maintenance (pumping) is needed.

(23) Pursuant to the State Building Code ("Water Closets"), continue to mandate the use of low-flow plumbing fixtures in: (1) existing buildings built since July 7, 1989; (2) renovations to existing buildings; and (3) replacements in existing structures. Continue to encourage the use of low-flow plumbing fixtures in buildings built prior to July 7, 1989.

(24) Continue to discourage and, through the State Building Code, consider adopting a ban on, the use of garbage disposals in facilities serviced by OSDS.

(25) Continue to discourage and, through the State Building Code, continue seeking a ban on the use of phosphate laundry and dishwashing detergents in facilities serviced by OSDS.

(26) Continue to enforce the ban on the use of harmful OSDS additives and cleaners, such as acid and organic chemical solvents. Consider taking steps aimed at banning the advertising and sale of these chemicals.

(27) Pursue measures aimed at ensuring that OSDS -- particularly those located in critical areas -- are inspected at least once every 2-3 years and pumped as necessary.

(28) Pursue the adoption and implementation of municipal Waste Water Management Districts (WWMDs) that address community-wide septic system maintenance, repair, and replacement needs.

A) Provide technical assistance to municipalities to encourage and facilitate the development of WWMDs.

B) Establish financial incentives to aid and encourage communities to adopt WWMDs.

C) Encourage municipalities to establish user fees sufficient to cover all costs associated with administering and operating WWMDs.

D) Consider mandating the establishment of WWMDs, either statewide or in the watersheds of critical areas. Place particular emphasis on the establishment of WWMDs in areas with consistently high rates of septic system failure and/or exhibited surface and/or groundwater impacts.

(29) Consider developing a computer program that municipalities could use to administer WWMDs.

(30) RIDEM should require all communities or sewer authorities that receive a grant/loan for the upgrading, expansion, or improvement of municipal wastewater treatment facilities to accept septage from unsewered communities in the state, as long as they can do so without exceeding the septage design capacity, exceeding any negotiated cap, or violating applicable state or federal regulations. The installation or upgrade of a septage receiving station should continue to be an eligible expense under such funding.

(31) Consider mandating that certain types of OSDS -- including large-flow and alternative systems, as well as any system requiring a variance -- be maintained via the issuance of operating permits.

(32) Continue to provide planners, regulators, engineers, and contractors with classroom and field training on the operation and maintenance of alternative OSDS technologies, utilizing vehicles such as URI's Rhode Island On-Site Wastewater Training Program. Pursue a stable source of funding to cover program costs.

(33) Conduct enhanced public education and outreach programs aimed at:

A) Promoting proper operation and maintenance of OSDS.

B) Informing owners of homes and facilities serviced by OSDS of the concerns associated with the use of garbage disposal systems, phosphate laundry and dishwashing detergents, harmful OSDS additives and cleaners, and the disposal of household hazardous materials, such as cleaning agents, cosmetics, deodorizers, disinfectants, paints, and pesticides, as well as the impacts of excessive nutrient loading to the State's waters.

C) Explaining RIDEM's OSDS permit program, particularly with regard to OSDS repairs.

D) Promoting proper water conservation practices.

(34) Consider launching a public education initiative aimed at informing prospective buyers about the types of OSDS-related issues that should be investigated prior to the purchase of any parcel of land serviced by an OSDS. Such issues should include, but not be limited to: the type of OSDS, location of system, size of tank, maintenance history (particularly, date of most recent pumping), and record of system failure. Prospective buyers should be encouraged to seek, from the seller, a certification of OSDS structural integrity (which may be determined visually by a certified septage pumper or hauler).

(35) Evaluate and implement an appropriate means of indexing and computerizing, if needed, historical OSDS records in order to increase the usefulness of data and to facilitate the access to such records by the public, e.g., homebuyers, realtors, etc.

(36) Consider establishing a training program for septage pumpers and haulers, utilizing vehicles such as URI's Rhode Island On-Site Wastewater Training Program.

(37) RIDEM's Division of Groundwater & ISDS, in conjunction with URI Cooperative Education, should develop and distribute a checklist covering proper procedures for OSDS inspections. The checklist should be designed to inform municipalities interested in establishing wastewater management districts, as well as pumpers, homeowners, and other members of the private sector who perform OSDS maintenance and inspections, on uniform procedures that are consistent with recommended standards established by RIDEM's Division of Groundwater & ISDS.

Failing and Malfunctioning OSDS

POLICY 1.5 Reduce pollutant inputs to ground and surface waters by ensuring that failing or malfunctioning OSDS are identified and then properly repaired, replaced, or modified.

RECOMMENDATIONS:

(38) Institute regular OSDS inspection procedures through municipal Waste Water Management Districts, or other appropriate mechanisms.

(39) Continue to pursue targeted RIDEM inspection/enforcement projects in priority areas that are known to be, or suspected of being, impacted by failing or malfunctioning OSDS.

(40) Continue to require that failing cesspools be replaced with OSDS, and that failing or malfunctioning OSDS be repaired, replaced, or modified.

(41) Through revisions to RIDEM's OSDS regulations, strengthen the state's OSDS repair policy, making it more consistent with the regulatory review requirements for new systems.

(42) Evaluate alternatives for replacement of failed OSDS where existing conditions or small lots prevent repairs in compliance with regulations.

(43) Continue to recommend or require OSDS upgrades -- utilizing alternative technologies as appropriate -- where necessary to minimize pollutant loadings to ground and surface waters in critical areas.

(44) Consider legislation or some other appropriate mechanism to require upgrades of substandard or failed OSDS when properties are sold.

(45) Continue to provide technical assistance, and continue to pursue financial assistance, to help landowners rectify failing cesspools and OSDS.

(46) Continue to undertake efforts aimed at educating landowners on the concerns associated with failing cesspools and OSDS.

(47) Consider establishing a trouble-shooting mechanism to provide assistance to homeowners regarding problems/concerns associated with OSDS.

(48) Establish a centralized data base for use in tracking OSDS failures and evaluating the causes of failures. Also, utilize technologies that allow computer mapping of identified failure sites.

Water Quality Concerns

Precipitation that falls on impervious surfaces such as roads, parking lots, and driveways is often collected and discharged into nearby waterways to prevent local flooding problems. Pollutants that have accumulated on impervious surfaces are swept up, carried along, and dumped into receiving waters by surging stormwater runoff flows, resulting in water quality degradation.

Stormwater runoff contaminant concentrations vary considerably as a function of the storm and the type and intensity of land use. As would be expected, the more urbanized land uses, such as high-density residential, commercial, and industrial, contribute greater pollutant loads than lower-intensity uses, such as low-density residential and forestland. Potential contaminants in stormwater runoff may include suspended solids, nitrogen, phosphorus, hydrocarbons, heavy metals, pathogenic organisms (bacteria and viruses), and road salts.

To provide an understanding of the nature of urban runoff from commercial and industrial areas, their impacts on water quality, and control techniques, the US EPA funded the Nationwide Urban Runoff Program (NURP) from 1978 through 1983. The program involved 28 separate projects around the country. The data from the NURP study indicated that on an annual loading basis, suspended solids in stormwater from residential, commercial, and light industrial areas are approximately an order of magnitude greater than secondarily treated sewage. In addition, the study indicated that annual loading of chemical oxygen demand from stormwater is comparable to secondarily treated sewage (US EPA, 1988).

Roadways contribute a wide range of pollutants to the air, surface water, and groundwater. Heavy metals, hydrocarbons, bacteria, and salt are common constituents of road runoff; copper, lead, and zinc are the most common heavy metals. Traditional curbing and piped drainage systems escalate delivery of untreated road runoff to watercourses. Higher runoff rates also contribute to flood hazards and affect watershed stream flow patterns. Activities associated with road use are also significant sources of pollutants.

Two RIDEM reports have documented stormwater runoff as a contributor of pollutants to Narragansett Bay (RIDEM, 1988a, 1990a). The reports concluded that urban and highway runoff from heavily developed and industrial areas of Providence, East Providence, Warwick, and Cranston are major nonpoint pollution sources to the Upper Bay. This runoff is known to contribute heavy metals, petroleum products, hydrocarbons, polycyclic aromatic hydrocarbons, sediments, nutrients, bacteria, and suspended solids. In addition, these contaminants are contributed by upstream loadings from the Blackstone, Seekonk, Moshassuck, Woonasquatucket, Providence, Warren, and Pawtuxet Rivers, which all run through urban land and discharge to the Bay.

In one study, it was determined that a waterway will begin to show evidence of stormwater runoff contamination when development exceeds an average of one home for each two acres of land or an impervious area of 10 percent in the watershed. When the density of development reaches or exceeds an average of two homes per acre in the watershed, which equates to 25 percent of the watershed covered by impervious surfaces, stormwater runoff contaminants can impair a stream's water supply, swimming, and some aquatic life uses (Klein, 1984). Stormwater runoff from watersheds with a 25 percent or greater impervious cover will also dramatically increase flooding problems, stream channel scouring, erosion, and sedimentation. These conditions result in the degradation of fish habitat and aesthetics. These percentages are only approximations. The type of development, its location within a watershed, and the maintenance of buffer strips or other attenuation measures all factor significantly into the stormwater impact equation. However, the estimates are useful planning guides.

Stormwater runoff may also impact groundwater resources. The disposal of groundwater into the subsurface, vis-a-vis its effect on groundwater quality, is discussed in Chapter 02-01-03. Hydraulically, as more area is developed to be impervious, it is possible that less water is available to recharge aquifers. If circumstances developed in which water tables were lowered, then it is also possible that dry weather stream flows would be reduced, thereby impairing the stream's ability to assimilate pollutants.

Channel or streambank erosion is an important contributor to the sediment load in streams and rivers (National Research Council, 1993). While streambank erosion primarily results from the force of water flowing in a river or stream, the overland flow of surface water runoff can also dislodge sediments on the bank face through sheet flow or through the creation of rills and gullies on the shoreline banks and bluffs. The erosion of shorelines and streambanks is a natural process that can have either beneficial or adverse impacts on the creation and maintenance of riparian habitat. Sands and gravels eroded from streambanks are deposited in channels and used as instream habitat during the life stages of many benthic organisms and fish. However, excessively high sediment loads can smother submerged aquatic vegetation beds, cover shellfish beds and tidal flats, fill in riffle pools, and contribute to increased levels of turbidity and nutrients. There are few research results that can be used to identify levels below which streambank erosion and shoreline erosion is beneficial and above which it is a nonpoint-source-related problem.

The Chesapeake Bay is one waterbody for which significant data exist to characterize the relative importance of shore erosion as a source of sediment and nutrients (Ibison et al., 1990, 1992). Erosion of the shores above mean sea level contributes 6.9 million cubic yards of sediment per year, or 39 percent of the total annual sediment supply to the Chesapeake Bay (USACE, 1990). This sediment from shoreline erosion contributes 3.3 percent of the total nonpoint source nitrogen load to the Bay and 46 percent of the total nonpoint source phosphorus load to the Bay (USEPA-CBP, 1991).

Policies and Recommendations

POLICY 2.1 Properly manage the quantity and quality of surface runoff from new and existing development. Minimize pollution problems associated with runoff from new and existing development by preventing the release of pollutants to runoff, or, once released, by treating runoff to reduce the quantities of pollutants delivered to surface or groundwaters.

RECOMMENDATIONS:

Management Practices

(1) For new development projects that are subject to state regulatory review, RIDEM and the CRMC should continue to require that appropriate stormwater management measures -- including both water quantity control and water quality treatment measures -- are employed in accordance with Rhode Island Stormwater Design and Installation Standards Manual, which is consistent with the requirements of the Rhode Island Coastal Nonpoint Pollution Control Program (RICNPCP), developed pursuant to Section 6217 of the Coastal Zone Act Reauthorization Amendments. In particular, the agencies should require that, at a minimum, the 80 percent average annual removal rate for total suspended solids is met. In addition, nutrient removal goals should be established and upheld for critical areas.

(2) To prevent drainage problems and protect water quality, municipalities should adopt a stormwater runoff ordinance for new development projects. The aim of the ordinance should be to ensure proper stormwater management for projects not within the jurisdiction of RIDEM or the CRMC, and to ensure consistency in the review of projects subject to both state and local jurisdiction. The Rhode Island community stormwater ordinance in conjunction with the Rhode Island Stormwater Design and Installation Standards Manual should be used by municipalities to have programs that are consistent with the RICNPCP.

(3) Municipalities should continue to procure the services of the RI Conservation Districts to review the adequacy of stormwater plans and designs and to conduct site visits for compliance with stormwater runoff ordinances. A permit fee charged by municipalities could generate sufficient funds to compensate the Districts for their assistance.

(4) State and local regulatory authorities should seek to ensure that all regulatory programs governing the control and treatment of stormwater in Rhode Island are well-coordinated.

(5) A working group should be established to explore the possibility of combining all state regulatory reviews for stormwater and soil erosion control into a single RIDEM division. The consolidated programs employed by the States of Maryland and Delaware should be used as a guide.

(6) Where appropriate, the RI Department of Transportation (RIDOT) should encourage applicants for Physical Alteration Permits (PAP) -- seeking approval for tie-ins to state drainage systems -- to use appropriate best management practices in accordance with the recommendations and standards set forth in the Rhode Island Stormwater Design and Installation Standards Manual. On the PAP instruction sheet, RIDOT should make applicants aware of all environmental permitting requirements. The specific wording for these advisories should be developed jointly by RIDOT and RIDEM.

(7) The Rhode Island Stormwater Design and Installation Standards Manual should be periodically evaluated and updated or revised as needed by RIDEM and the CRMC, within the context of a broad-based technical review committee. The advantages and disadvantages of specific best management practices, and acceptability in various sites, are among the topics that should be considered for inclusion in the next revision of the manual.

(8) RIDEM and the CRMC should consider and encourage the use of innovative designs and techniques for treating stormwater. Consideration should be given to a range of innovative techniques, including but not limited to bioretention, engineered vegetated treatment systems such as constructed wetlands or vegetated filter strips, and side-of-the-road drainage combined with vegetated swales.

(9) Where streambank, shoreline, or upland erosion is determined to be a nonpoint source pollution problem, employ appropriate stabilization techniques. Preference should be given to the use of vegetative methods (using native species) and bioengineering.

(10) Preserve, enhance, or establish buffers and/or greenways along waterbodies and their tributaries to enhance wildlife values and guard against impacts from runoff. For more information on greenways see A Greener Path ... Greenspace and Greenways for Rhode Island's Future (RIDOP, 1994).

Operation, Maintenance, and Management

(11) RIDEM, the CRMC, and municipalities should ensure that proper operation, maintenance, and inspection procedures are instituted for all new and existing stormwater treatment systems. Such procedures, including but not limited to the designation of responsible parties, should be incorporated as requirements into applicable state or local permits.

(12) The RI Conservation Districts, in conjunction with RIDEM, should develop and distribute a standard inspection checklist for the proper installation, operation, and maintenance of stormwater management measures.

(13) The RI Conservation Districts, in conjunction with RIDEM, should provide technical assistance and outreach to subdivision homeowners' associations responsible for long-term operation and maintenance of stormwater BMPs and associated drainage systems.

(14) A tracking system should be developed to determine the frequency and location of stormwater management measure inspections.

(15) To facilitate proper operation and maintenance of stormwater treatment systems, and to address other stormwater management and pollution prevention issues at the local level, municipalities should adopt and implement stormwater utility districts. The RI Legislature will first need to adopt appropriate enabling legislation.

(16) The RI Conservation Districts, in conjunction with RIDEM, should continue to provide guidance and technical assistance to municipalities on operation and maintenance procedures, site inspections, the establishment of stormwater utility districts, and other related issues.

(17) State and local authorities, in conjunction with the RI Conservation Districts and URI's Cooperative Extension Program (URI/CE), should continue to encourage and facilitate the use of alternative designs and maintenance strategies for existing impervious areas, particularly large parking lots and driveways, as well as other innovative techniques for controlling and treating stormwater runoff associated with existing development.

(18) Municipalities should systematically survey all storm drains in their jurisdictions to detect illegal cross connections, the dumping of pollutants into storm drains, or other illegal practices linked with dry weather flows. Shoreline survey data collected by RIDEM and citizen monitoring groups

should be used by state and local authorities to help detect illegal dry weather storm drain flows.

(19) RIDOT, in conjunction with Rhode Island's municipalities, should continue to assess tie-ins to existing drainage networks to eliminate illicit connections.

(20) RIDEM, the CRMC, and the RI Conservation Districts should continue to encourage watershed-based solutions to stormwater management -- targeting regional rather than site-specific stormwater concerns -- wherever possible.

(21) RIDEM, the RI Conservation Districts, URI/CE, and/or other appropriate entities should provide technical assistance to commercial facilities and other private sector entities that are not subject to RI Pollution Discharge Elimination System (RIPDES) program requirements to assist them with the prevention and mitigation of stormwater runoff impacts to water quality. Like the RIPDES Program, the development and implementation of stormwater pollution prevention plans, identifying appropriate BMPs to keep pollutants from coming into contact with stormwater, should be the primary focus of this non-regulatory effort. Training could be provided to local groups, such as Conservation Commissions, watershed organizations, and/or college or university students to enable them to assist local businesses, at little or no cost, with the development of appropriate pollution prevention strategies.

(22) The need for proper maintenance of stormwater treatment systems must be addressed in all stormwater best management practices, training seminars, and updates of the Rhode Island Stormwater Design and Installation Standards Manual.

(23) RIDOT should be authorized to use a portion of the funds collected through the state gas tax for maintaining stormwater treatment systems associated with state roads.

New or Improved Treatment Systems

(24) Municipalities, in conjunction with RIDEM, should identify priority sites for improvements to existing stormwater treatment systems and development of new stormwater treatment systems, as needed.

(25) Once priority sites have been identified, pursue the design and installation of stormwater retrofits and new treatment systems.

(26) RIDEM should prioritize stormwater discharges from existing state roads and pursue their mitigation by RIDOT as part of major road improvement projects. RIDEM should coordinate with RIDOT to evaluate state and federal policy regarding the use of state matching funds and federal highway funds to finance highway drainage retrofits and maintenance of highway best management practices.

Training and Public Education

(27) The RI Conservation Districts, URI/CE, the RI Technology Transfer Center, and/or other appropriate entities should continue to develop and implement training and education programs and materials for state and local personnel, contractors, and others involved with the siting, design, installation, operation, maintenance, and inspection of stormwater treatment systems.

(28) RIDEM and the CRMC, in conjunction with URI/CE, environmental and watershed organizations, and/or other appropriate entities, should continue to pursue the implementation of source reduction/pollution prevention and public education programs to eliminate or reduce discharges of pollutants to storm drains and other runoff conveyances. Emphasis should be placed on explaining the water quality benefits of proper stormwater management and promoting appropriate best management practices. Recommended topics and projects should include but not be limited to storm drain stenciling, the misuse of storm drains for waste disposal, the importance of diverting roof gutter discharges to vegetated areas rather than impervious surfaces, and litter clean-up and control programs. (See Chapters 02-01-06, 02-01-09, and 02-01-14 for additional recommendations pertaining to individual sources, namely, lawn and garden activities, household hazardous materials, automobile fluids, and pet wastes.)

Statewide Coordination

(29) The existing INSAC Technical Advisory Subcommittee on Stormwater should rename itself the Stormwater Management Committee and continue to meet regularly to review and evaluate key environmental issues pertaining to stormwater. Other related committees or subcommittees should be consolidated into this central group. Issues to be reviewed and evaluated by this group should include but not be limited to: compliance with all applicable statutes and regulations (e.g., Section 6217 of CZARA, RIPDES); coordination of state programs; revisions to state

laws and regulations and the Stormwater Handbook; adoption of stormwater management ordinances; establishment of stormwater utility districts; training programs; public education initiatives; and all relevant funding proposals.

02-01-03 Underground Discharges

Water Quality Concerns

In Rhode Island, public sewers are available in select locations, and areas serviced by sewers constitute less than 20 percent of the state's land area. As a result of this limited access to sewers, there are many discharges of non-sanitary wastewaters into the subsurface. These discharges may emanate from a wide variety of land use activities. Since 1984, RIDEM has regulated underground discharges via its Underground Injection Control (UIC) Program. Operating with broad jurisdiction, the UIC Program addresses underground discharges from industrial, commercial, institutional, and certain agricultural uses. The discharges may occur via floor drains, dry wells, leaching catch basins, septic systems, leaching chambers, or other structures. The discharges, which vary widely in quality, may be intermittent or continuous in nature.

Although located throughout the state, including in areas served by public sewers, underground discharges are regulated primarily because of their potential to degrade groundwater resources. In 1992, a review of 104 active sites found that 70 percent were located in areas where groundwater is classified GAA and GA, i.e., areas where it is the State's policy to maintain a groundwater quality consistent with its use for drinking water supplies. The UIC program has records on over 300 sites, but it is estimated that there are likely thousands of underground discharges yet to be addressed. Historically, limited resources have prevented a comprehensive inventory of all underground discharge practices. Lack of awareness on the part of facility owners results in a continuing problem of non-compliance with UIC requirements, not only in Rhode Island but in most other states as well.

Data available from regulated UIC sites indicates that widespread past practices relating to underground disposal of non-sanitary wastewaters have frequently caused localized contamination problems. Soil contamination occurs at many UIC sites, and significant groundwater contamination has been associated with some sites. The chief contaminants of concern are total petroleum hydrocarbons, volatile organic compounds (VOCs), and metals, all of which tend to be associated with the discharge of oily wastes in facilities such as auto repair shops. Other commercial uses in RI that are considered as potential threats unless managed properly include dry cleaners (cleaning on-site), print shops, and photo-finishing shops, among others. Significant amounts of chemicals are used in such operations, and best management practices are necessary to ensure that wastewaters are properly handled and disposed.

Industrial sites may be associated with a wide variety of potential contaminants, including VOCs and metals. Agricultural sites may involve the disposal of wastewater with a high organic or nutrient content. Certain discharges, such as most cooling water and the reinjection of treated groundwater in association with remediation projects, are considered

generally low-risk threats to groundwater quality.

Stormwater can also be discharged underground. This practice occurs throughout the non-urban portions of the state that lack extensive stormwater collection systems. Stormwater discharges are of highest concern when located in areas of active groundwater use, such as wellhead protection areas. Stormwater from areas where pollutants may be concentrated -- e.g., industrial sites and oil storage facilities -- are also of greater concern than stormwater from residential areas. Best management practices and proper maintenance of stormwater systems need to be encouraged in order to mitigate the potential for groundwater pollution. Overall, the research available on the impact to groundwater from underground discharges of stormwater is limited. However, there are concerns with the transport of hydrocarbons, nutrients, salts, and possibly metals, depending on the specific situation. Spills or illegal releases of pollutants into such systems are always a serious concern, particularly in areas where public or private wells may be in use.

During the last decade, the understanding and awareness of the nature and persistence of groundwater contamination has increased dramatically. Once in the subsurface saturated zone, contaminants may persist for decades. The process of completely remediating groundwater is generally very lengthy, very expensive, and often technically infeasible. Therefore, it is particularly important in dealing with groundwater resources to work to prevent the contamination from occurring in the first place.

Policies and Recommendations

Location of New and Existing Discharges

POLICY 3.1 Minimize degradation to groundwater quality by directing locations of new underground discharges away from unsuitable areas and insuring all existing underground discharges are identified and addressed.

RECOMMENDATIONS:

(1) As part of revising RIDEM's Underground Injection Control (UIC) regulations, evaluate the need to restrict siting of new high-risk UICs in high priority areas, such as wellhead protection areas and drinking water supply watersheds.

(2) Update and refine a statewide stormwater policy that provides clearer guidance on where different types of stormwater disposal practices should be utilized. The policy should be designed to eliminate any conflicts among the individual permitting processes applicable to stormwater practices.

(3) Conduct targeted inventories of UIC sites in high priority groundwater areas. Building on the results of local pollution sources inventories performed pursuant to the wellhead protection program, use the inventories to supplement and/or fill gaps in order to more comprehensively address the UIC pollution threat on an aquifer-wide basis.

(4) Consider developing and implementing programs that provide incentives, such as a financial benefit and/or technical assistance with best management practices, to encourage the closure of high-risk UICs in high priority groundwater areas.

(5) Update and enhance the tracking of UIC locations within GIS, and establish mechanisms to provide this information to communities in order to facilitate local wellhead protection activities.

Design and Construction

POLICY 3.2 Minimize groundwater degradation by ensuring the proper design and construction of underground discharge systems.

RECOMMENDATIONS:

(6) Revise the UIC regulations to incorporate improved understanding of the threat of subsurface discharges. Update as new information becomes available.

(7) Continue to enforce the UIC regulations with respect to reviewing the potential for an underground discharge to affect groundwater quality.

(8) Where insufficient technical information is available, conduct research to characterize the pollution potential of certain types of non-sanitary wastewaters, e.g., milk house wastes, stormwater, and certain commercial uses. Encourage EPA to conduct additional research on suspected high-risk UIC discharges.

(9) Encourage EPA to improve its compilation and distribution of data and information about subsurface disposal practices to state and federal agencies as well as other interested entities.

(10) Research/evaluate the design, maintenance, and operating effectiveness of oil-water separators to provide engineers and consultants with improved guidance on the application of separators to discharges of various sizes and types.

Operation and Maintenance of Underground Discharge Sites

POLICY 3.3 Ensure that all UICs are operated and maintained in a manner that provides for effective protection of groundwater quality.

RECOMMENDATIONS:

(11) Enhance the computer tracking system for the UIC program to allow for more efficient and cost-effective oversight of active sites. Re-evaluate the best means to track the reporting of maintenance activities at sites.

(12) Maintain an effective level of compliance activity and oversight of registered facilities.

(13) In conjunction with revising RIDEM's UIC regulations, incorporate requirements for implementing best management practices and proper system maintenance at UIC sites.

(14) Expand technical assistance and outreach to the regulated community including:

A) Compiling/preparing an updated information packet on UIC best management practices geared to small business operators. Conduct workshops to address topics relating to groundwater protection, wellhead protection, and underground discharges.

B) Expand RIDEM's Pollution Prevention Program to address the needs of small business operations and make technical assistance available on issues relating to implementing best management practices.

C) Encourage local outreach and assistance projects targeted to UIC facility operators via the wellhead protection program.

(15) Continue to target underground discharges in high priority groundwater areas, such as wellhead protection areas and drinking water supply watersheds, for inspection and enforcement in order to insure their operations are in compliance with state requirements. Inspections should be cross-media oriented to maximize the benefit of the inspection process and to assist the site operator in addressing pollution concerns in a comprehensive manner for his/her facility.

Oversight of Closures

POLICY 3.4 Maintain effective oversight of the closure of underground discharges in order to ensure that an evaluation is made of the impact to groundwater quality at the time of closure and that where contamination is confined, actions are taken to remove and remediate the affected soils or groundwater resource.

RECOMMENDATIONS:

(16) Continue to encourage the closure of high-risk and other threatening underground discharges.

(17) Evaluate the need for developing and/or expanding financial assistance or incentives for small businesses in order to overcome obstacles to closures of high-risk discharges.

(18) Continue to coordinate with RIDEM's Division of Site Remediation concerning the closure of UICs on sites also conducting other remedial activities.

(19) Coordinate with RIDEM's Division of Water Resources to ensure that closures of UIC sites do not result in water quality impacts.

02-01-04 Construction Activities

Water Quality Concerns

Soil erosion is the process by which the land's surface is worn away by wind, water, ice, and gravity. Natural erosion occurs at a very slow and uniform rate. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has determined that an acceptable loss for most soils in Rhode Island is three tons per acre per year (SCS, 1988). Accelerated erosion occurs when the surface of the land is disturbed and vegetation is removed by either natural forces or man's activities. Exposed, unprotected soil is then subject to rapid erosion by the action of wind or water. Land-disturbing activities in Rhode Island fall primarily into two categories: agricultural practices and construction activities. This chapter addresses the second category; agricultural practices are addressed in Chapter 02-01-05.

If appropriate best management practices are not employed, soil loss from sites under construction in Rhode Island has been estimated at approximately 36 tons per acre per year, twelve times the acceptable soil loss rate and more than three times the estimated soil loss rate from cultivated lands in Rhode Island (RIDOP, 1979). Whereas erosion on agricultural land occurs mainly as sheet and rill erosion over a period usually measurable in years, erosion on developing land is usually in the form of gully erosion on land disturbed for a year or less. Both conditions result in a lower-quality soil resource. However, gully erosion is the result of concentrated flows to surface runoff. These high energy flows increase the cutting action and transport of soil as sediment.

Disturbed land associated with development typically has relatively short but steep slopes with much of the vegetative cover removed. Excavation, filling, and stockpiling operations result in uncompacted soil subject to the erosive action of concentrated surface flows. The high sediment volumes resulting from gully erosion require costly on- and off-site clean-up and the continual need for site stabilization during development.

Erosion and sedimentation can be damaging to water quality and aquatic life. Soil washed into waterways increases the turbidity (suspended soil particles) in the water. In addition to reducing the clarity of the water, turbidity can clog the gills of fish, impair the respiration of other aquatic organisms, reduce the amount of oxygen in the water, and prevent sunlight from reaching submerged aquatic plants. Turbidity also increases drinking water treatment costs. In addition, as soil particles settle to the bottom, they cover gravelly substrates that support certain aquatic organisms, including native brook trout, that inhabit some high-quality streams. With further sedimentation, the stream's capability to support even less sensitive species declines. In advanced stages, sediment fills ponds and river beds, restricting flow and reducing water storage volume. At this point, sedimentation is a major factor contributing to local flooding.

In coastal areas, sedimentation has caused reduction in available habitat for commercial finfish and shellfish. In addition, sedimentation has impeded navigation for users of several harbors and many marinas around Narragansett Bay and resulted in the need for dredging of sites.

Many potential pollutants other than sediment are associated with construction activities. These pollutants include pesticides; fertilizers; petrochemicals (e.g., oils, gasoline, and asphalt degreasers); construction chemicals such as concrete products, sealers, and paints; wash water associated with these products; and various solid wastes (Washington State Department of Ecology, 1991). The majority of all pollutants generated at construction sites are carried to surface waters via runoff. Yet "junk holes" -- excavated pits used to dispose of unwanted building materials -- can adversely affect groundwaters. Junk holes are prohibited in Rhode Island.

Policies and Recommendations

Erosion and Sediment Control

POLICY 4.1 Minimize adverse water quality and habitat impacts resulting from construction and other land-disturbing activities by reducing erosion and preventing sedimentation.

RECOMMENDATIONS:

(1) For construction projects that are subject to state regulatory review, RIDEM, the CRMC, and where applicable RIDOT, should continue to require that appropriate soil erosion and sediment control measures are employed in accordance with the Rhode Island Soil Erosion and Sediment Control Handbook, which is consistent with the Rhode Island Coastal Nonpoint Pollution Control Program (RICNPCP), developed pursuant to Section 6217 of the Coastal Zone Act Reauthorization Amendments.

(2) To prevent expensive maintenance to drainage systems and damage to adjacent properties (issues that are generally not the primary focus of state regulatory programs), as well as to mitigate water quality impacts, municipalities should adopt a soil erosion and sediment control ordinance for new development projects, particularly those that are not within the jurisdiction of RIDEM or the CRMC. The model soil erosion and sediment control ordinance set forth in RIGL 45-46-4-5, as amended, in conjunction with the best management practices provided in the Rhode Island Soil Erosion and Sediment Control Handbook, should be used by municipalities to ensure that their programs are consistent with

the RICNPCP.

(3) Municipalities should continue to ensure the adequacy of soil erosion and sediment control plans submitted by developers and continue to conduct site visits to ensure compliance with such plans and applicable ordinances. Municipalities which are equipped to carry out these functions themselves should continue to do so. Municipalities which are not equipped to carry out these functions should continue to procure the services of the RI Conservation Districts. A permit fee charged by municipalities could generate sufficient funds to compensate the Districts for their assistance.

(4) To minimize duplication of effort, state regulatory programs should coordinate the review of erosion and sediment control plans with the RI Conservation Districts.

(5) A working group should be established to explore the possibility of combining all state regulatory reviews for stormwater and soil erosion control into a single RIDEM division. The consolidated programs employed by the States of Maryland and Delaware should be used as a guide.

(6) All projects using state funds (or federal funds administered through a state agency) should be required to comply with the procedures and requirements detailed in the Rhode Island Soil Erosion and Sediment Control Handbook.

(7) For the purpose of achieving standardized and upgraded procedures for field inspections and the enforcement of soil erosion and sediment control requirements, the RI Conservation Districts, in conjunction with RIDEM, should develop a soil erosion and sediment control measure inspection checklist for use by state and local officials.

(8) State contract provisions specifying the installation and maintenance of soil erosion and sediment control measures should be properly managed, with appropriate controls as separate items in the contract and with penalties for noncompliance. Sites should be inspected routinely to insure compliance with contract provisions.

(9) RIDEM, in conjunction with the RI Conservation Districts, URI's Cooperative Extension Program (URI/CE), the CRMC, and the RI Technology Transfer Center, should continue to explore the use of innovative designs and techniques for controlling erosion and sedimentation.

(10) The Rhode Island Soil Erosion and Sediment Control Handbook should

be periodically evaluated and updated or revised as needed by RIDEM and the CRMC, within the context of a broad-based technical review committee.

(11) The RI Conservation Districts, URI/CE, the RI Technology Transfer Center, and other appropriate entities should continue to develop and implement training and education programs for state and local personnel, contractors, and others involved with the control of erosion and sedimentation at construction sites. Topics to be covered by the programs should include but not be limited to: use of the Rhode Island Soil Erosion and Sediment Control Handbook; site plan reviews; and the proper installation, maintenance, and inspection of soil erosion and sediment control measures.

(12) State and local regulatory authorities should seek to ensure that all regulatory programs governing the control of soil erosion and sedimentation in Rhode Island are well-coordinated.

(13) The need for proper maintenance must be addressed in all erosion and sediment control best management practices, training seminars, and updates of the Rhode Island Soil Erosion and Sediment Control Handbook.

Construction Materials

POLICY 4.2 Minimize adverse water quality impacts resulting from the improper use, storage, and disposal of construction materials and other potential pollutants (besides sediment) associated with construction activities.

RECOMMENDATIONS:

(14) Through their respective regulatory programs, RIDEM, the CRMC, and municipalities should seek to ensure that all chemicals, solid wastes, and other potential pollutants used during construction activities are properly used, stored, and disposed in accordance with the requirements of the RICNPCP. The definition of potential pollutants needs to be consistent among all applicable regulatory programs.

(15) Where the types of building/construction materials are deemed to be contributing factors to water pollution problems, efforts aimed at identifying and promoting the use of non-harmful alternatives should be pursued.

(16) Training and education programs for designers, contractors, and builders should include coverage on the proper use, storage, and disposal of materials associated with construction activities.

Water Quality Concerns

Nationally, agricultural operations are a major contributor to nonpoint source pollution problems. According to the EPA, agriculture is the leading contributor of nonpoint source pollution in lakes and rivers throughout the U.S., the second leading contributor in groundwater, and the third leading contributor in estuaries (USEPA, 1994). Water quality contaminants associated with agricultural operations include nutrients (primarily from fertilizers and animal wastes), pathogens and organic materials (primarily from animal wastes), sediment (from field erosion), pesticides, and petroleum products. Overuse or improper use of irrigation water can exacerbate some of these pollution problems and also affect stream flows and groundwater levels.

In Rhode Island, agricultural operations have only a limited effect on water quality, due primarily to the limited presence of agriculture in the state. Farms in Rhode Island comprise approximately 5 percent of land use, but farmland in production amounts to less than 3 percent (RIDEM, 1990c). In 1990, farmers in Rhode Island maintained 580 operations totaling about 33,000 acres statewide. Of this total acreage, however, only 56 percent -- or just under 20,000 acres -- was actually in production.

What's more, Rhode Island farmers use much of their land for low-intensity agriculture. Crops like turf, pasture, and hay account for some 10,282 acres, or over half of all productive farmland. The Rhode Island Land Use Classification System -- developed for the Scituate Reservoir Watershed Management Plan (RIDOP, 1990) and subsequently used in the nine Nonpoint Source Management Plans for Water Supply Watersheds (RIDEM, 1993) -- classifies these crops as the lowest risk form of agriculture and indicates that, overall, such crops pose only a slight risk to water quality.

Notwithstanding the above, there can be, and have been, localized water quality impacts from agriculture operations in Rhode Island. In addition, water withdrawals are an issue of increasing concern. The need for irrigation water can place strong demands on local groundwater or surface water supplies which, in turn, can cause base flow depletion.

With respect to groundwater, agricultural pesticides do have the potential to adversely affect groundwater quality. Rhode Island experienced a significant problem with the pesticide aldicarb in the 1980s. It was detected in over 200 private wells, and it also disrupted the use of a public well. However, aldicarb concentrations in groundwater have steadily declined since 1985, when the use of the pesticide was suspended, and in many wells the contaminant is no longer detected. To prevent similar situations from developing, RIDEM is developing a Management Plan for the Protection of Groundwater from Pesticides and Nitrogenous Fertilizer, in accordance with EPA guidance. The plan will provide a more detailed framework of actions that will be taken to manage the use of pesticides and fertilizers

in Rhode Island.

In terms of future trends, it appears that increased residential development will likely continue to limit the extent and intensity of agricultural operations in Rhode Island. Moreover, figures show that more and more farmers are converting their operations from potato farms and nurseries to turf farming, which, from the standpoint of soil disturbance and chemical applications, is a less intensive type of operation (though associated with somewhat more intensive water withdrawal needs). Despite these trends, farming operations will continue to take place in Rhode Island, and thus it is important to ensure that these operations continue to be conducted in a manner that will avoid water quality impacts, particularly with respect to water withdrawal problems. This can be accomplished by encouraging farmers to continue working, on a voluntary basis, with the well-established technical assistance and cost-share programs administered by RIDEM's Division of Agriculture, the Natural Resources Conservation Service, URI/Cooperative Extension, and the Consolidated Farm Services Agency.

Policies and Recommendations

POLICY 5.1 Minimize adverse water quality impacts resulting from agricultural activities by encouraging farmers to develop and implement site-specific plans that provide integrated solutions for all applicable nonpoint sources of pollution.

RECOMMENDATIONS:

(1) All farmers should be encouraged to pursue the development and implementation of integrated farm system plans, involving a balanced combination of management practices to address various site-specific water quality concerns. RIDEM's Division of Agriculture (RIDEM/ DOA), in conjunction with the Natural Resources Conservation Service (NRCS) and URI/Cooperative Extension (URI/CE), should continue to take the lead in guiding and assisting farmers with the development and implementation of these plans. Plans should address the following concerns, where applicable:

A) Soil erosion and sediment control.

B) Use/storage/disposal of fertilizers and pesticides.

C) Animal wastes (namely, runoff from livestock facilities and storage/application/disposal of manure).

D) Composting activities.

E) Use of irrigation water.

F) Use/storage/disposal of petroleum products.

G) Protection of groundwaters, streams, wetlands, other waterbodies, riparian areas, and other critical areas.

(2) RIDEM/DOA, in conjunction with NRCS and URI/CE, should develop and distribute a Best Management Practice Source Guide for Agricultural Operations in Rhode Island. The guide should serve primarily as an outreach and education tool. Issues to be covered in the manual should include but not be limited to:

A) Nonpoint source pollution concerns associated with agricultural operations (tailored specifically to the primary operations carried out in Rhode Island).

B) The importance of pursuing a systems approach to managing nonpoint source pollution on farms, and the role of site-specific plans in fostering this approach.

C) Referenced literature containing recommended components of site-specific plans.

D) Referenced literature containing recommended steps in developing site-specific plans.

E) Referenced literature containing recommended management practices.

F) Types of technical and financial assistance that are available to assist farmers in addressing water quality concerns, and the means for accessing these assistance programs.

(3) NRCS should update its Field Office Technical Guide (FOTG) in conjunction with RIDEM/DOA, URI/CE, and the RI Coastal Resources Management Council. Informal or, where necessary, formal agreements should be established and documented in the FOTG on the following issues:

A) Nonpoint source pollution concerns associated with agricultural operation in Rhode Island.

B) The components of conservation management systems and

criteria for acceptable systems.

C) Standards for best management practices.

(4) On a statewide basis, particular attention should be given to any agricultural operations that are known to be causing (or strongly suspected of causing) water quality and quantity problems. Such operations should be targeted for assistance regarding the development and implementation of integrated farm system management plans that specify appropriate management practices. Involved agencies should pre-establish procedures to address cases in which the above-described voluntary approach proves ineffective and water quality threats or impacts persist. Such procedures should include:

A) How the problem will be documented.

B) What will "trigger" the process.

C) Who will contact whom to begin resolution.

D) The need for legislation and/or regulations to ensure compliance.

(5) Technical and financial assistance programs should target agricultural operations in high priority watersheds and aquifers. Such assistance should include but not be limited to: the development and implementation of site-specific management plans (see Recommendation (1) above); demonstration projects; and public outreach and education initiatives.

(6) RIDEM/DOA, NRCS, and URI/CE should continue to take the lead and coordinate with each other with regard to providing various forms of technical assistance and outreach to the agricultural community concerning nonpoint source pollution management.

(7) RIDEM/DOA should continue to take the lead with regard to the implementation of Rhode Island's Management Plan for the Protection of Groundwater from Pesticides and Nitrogenous Fertilizer. Implementation will involve coordination with municipalities through RIDEM's Wellhead Protection Program.

(8) Applicable agencies should promote the development and use of new technologies and innovative methods for controlling nonpoint pollution from agricultural sources.

(9) URI/CE, NRCS, RIDEM/DOA, and the RI Department of Health

should research and analyze the production and effect of pathogens by animal operations within priority watersheds. Of particular concern at present are cryptosporidium in water supply watersheds, and e. coli near coastal waters.

Water Quality Concerns

The care and maintenance of residential lawns and gardens, and other landscaped areas such as golf courses, cemeteries, athletic fields, and parks, can contribute significantly to water quality degradation. (Agricultural operations involving turf farms are addressed in Chapter 02-01-05.)

Studies have shown that over 50 percent of the nitrogen in fertilizer leaches from lawns when improperly applied (Schultz, 1989). Leaching rates in coastal areas with sandy soils may be much higher. Nitrates are very soluble and have the potential to move extensive distances within groundwater. Nitrate levels exceeding the federal and state standard of 10 milligrams per liter in drinking water may be lethal to infants. Surface runoff from fertilized areas can also cause eutrophication (i.e., nutrient enrichment) problems in neighboring surface waters. Inputs of phosphorus from fertilizers are of particular concern in freshwaters, while inputs of nitrogen are the main concern with regard to coastal waters.

A 1988 Rhode Island study concluded that medium-density residential development has the highest loading factor of fertilizers for all land uses examined. The study also revealed that from 1980 to 1986, there was a 63 percent increase in residential use of fertilizers in the state, compared to a 48 percent decrease in agricultural use. Moreover, of the total amount of fertilizer used in Rhode Island in 1986 (22,849 tons), 91 percent (20,868 tons) was from residential use (RIDEM, 1988b).

The method of entry of pesticides and fertilizers into ground and surface waters is well known. Chemicals may penetrate through the soil or wash off the surface. Surveys have shown that, in some areas, as many as 50 to 80 percent of all household users apply some form of pesticides for lawn and garden use. Household users often apply pesticides excessively or in too concentrated a formulation.

The potential for water quality impacts from applied fertilizers and pesticides is also a concern with regard to turf management on public and commercial properties. In many cases, chemical application rates in these areas -- particularly greens and tees on golf courses -- can rival and even exceed those used in intensive agricultural operations. Golf courses are also intensive water consumers. This need for irrigation water can place strong demands on local groundwater or surface water supplies which, in turn, can cause base flow depletion (Schueler, 1994a).

With regard to both residential and non-residential lawn and turf management, the application of pesticides and fertilizers is not the only concern associated with these practices. Problems can also originate from storage and disposal practices. Chemicals have been known to leak from hoses and containers, either accidently or because of carelessness

or negligence. Improper storage procedures are especially threatening when chemicals are located near critical resource areas. Disposal of leftover and unusable pesticides, as well as containers and rinse water, can have a devastating effect on water quality if proper procedures are not followed.

A final problem associated with lawn care involves the improper disposal of grass, leaves, and other yard wastes. Grass clippings, high in nitrogen, are of particular concern with respect to coastal waters, while leaves, which contain relatively high amounts of phosphorus, are of particular concern with respect to freshwaters. When clippings or leaves are deposited along roads -- or worse, in or alongside wetlands -- they may be washed down storm sewers or injected directly into surface waters, resulting in elevated nutrient loadings (and/or blockage of conveyance systems).

The most effective way to minimize water quality problems associated with lawn care is simply to minimize lawn area. To the extent that some landscaping is desired, minimum maintenance/minimum disturbance and xeriscaping strategies (the use of plant materials that require low moisture and/or nutrient requirements) should be pursued. Such policies can be implemented through public education campaigns, or possibly through local ordinances.

Improved nutrient and pesticide management and lawn waste disposal practices are the keys to ensuring that existing lawns and gardens are properly maintained. In addition, users of fertilizers and pesticides must exercise care in the storage, handling, and disposal of these materials. Although some degree of regulation may be warranted for certain lawn and turf care activities, the primary vehicle for managing these activities will continue to be broad-based education and training. URI/Cooperative Extension's Greenshare and Master Gardener Programs are particularly well-suited for providing these types of education and training services.

Policies and Recommendations

POLICY 6.1 Minimize, and where possible prevent, adverse water quality impacts by promoting the proper maintenance and management of lawns, golf courses, and other landscaped areas.

RECOMMENDATIONS:

(1) RIDEM's Division of Agriculture (RIDEM/DOA), URI Cooperative Extension (URI/CE), RIDEM's Ocean State Cleanup and Recycling Program, environmental and watershed organizations, and other appropriate entities should continue to develop and implement pollution

prevention, education, and training programs that provide guidance to homeowners on proper lawn care and gardening practices. Such practices should include but not be limited to:

A) Low-impact landscaping.

B) Proper application, storage, and disposal of pesticides.

C) Proper application and storage of fertilizers (see also Chapter 02-01-09).

D) Proper timing and frequency of waterings.

E) Maintenance of buffers between surface waters or conveyance systems and areas treated with fertilizers or pesticides.

F) Proper disposal of grass clippings, leaves, and other yard wastes, grass recycling, and backyard composting.

(2) Proper lawn care and gardening practices should be incorporated into new or existing school curricula that involve watershed protection issues.

(3) URI/CE and RIDEM/DOA should continue, and if necessary improve or expand, their training and certification programs for pesticide applicators.

(4) Consideration should be given to amending the Rhode Island General Laws to include all commercial lawn care professionals (i.e., those who apply only fertilizers as well as those who apply pesticides) under state training and certification requirements. If such a statutory change is enacted, the expanded training and certification process should be added to the current training and certification programs administered by URI/CE and RIDEM/DOA.

(5) RIDEM/DOA and URI/CE should continue to develop and implement programs to reduce nonpoint source pollutants generated from turf management on golf courses and other non-residential landscaped areas, such as parks, athletic fields, recreation areas, and cemeteries. Consideration should be given to the development of an environmental guide for golf courses (drawing upon Powell and Jollie, 1993; see Recommendation (6) below) and an associated training program for course managers and maintenance personnel. Once established, the guide and program should be expanded to cover turf management on other non-residential landscaped areas.

(6) In addition to addressing water quality concerns associated with existing golf courses, steps should be taken to ensure that new courses are properly sited, designed, and constructed. The state should develop appropriate guidelines, using the best management practices set forth in Environmental Guidelines for the Design and Maintenance of Golf Courses, a Baltimore County, Maryland publication (Powell and Jollie, 1993), as a starting point.

02-01-07 Silviculture

Water Quality Concerns

Potential water quality concerns associated with silvicultural practices primarily involve erosion and sedimentation, which can result from road construction and use, timber harvesting, operation of mechanical equipment, and burning. Other potential impacts include increased water temperature and stream flow, caused by the removal of riparian zone vegetation, and water quality degradation caused by the accumulation of organic debris or chemical applications.

Although about 60 percent of Rhode Island is forested, commercial forestry operations in the state occur only on a very small scale. Moreover, with the exception of clearing for development, the harvesting operations that do take place in Rhode Island generally involve selective cutting in localized areas. No known chemigation takes place in the State, and prescribed burning occurs only on a very limited basis.

Due to the low -- and as of late, dwindling -- level of forestry operations in Rhode Island, silvicultural practices pose no documented threat to water quality. The nonpoint source concerns associated with forestry activities in Rhode Island are therefore limited to potential problems, particularly erosion and sedimentation, in localized areas of operation.

Policies and Recommendations

POLICY 7.1: Minimize adverse water quality impacts resulting from forestry operations by ensuring that all loggers follow appropriate pollution prevention practices and procedures.

Recommendations:

(1) As currently required, all loggers should continue to register with RIDEM's Division of Forest Environment (RIDEM/DFE), and all loggers planning to cut more than 35 cords or 5,000 board feet of wood should continue to file intent-to-cut forms with the Division before undertaking the operations.

(2) RIDEM/DFE should continue to advise loggers to conduct their operations in accordance with the Division's (draft) Best Management Practices (BMP) Manual for Timber Harvesting, Forest Protection, and Water Quality.

(3) RIDEM/DFE, in conjunction with the RI Forest Conservator's Organiza-

tion, should print and distribute copies of the BMP Manual to all loggers.

(4) To facilitate implementation of the BMP Manual, RIDEM/DFE, in conjunction with the RI Forest Conservator's Organization, should conduct training and education workshops for loggers.

(5) If freshwater wetlands are present in areas that are intended for harvest, loggers must continue to obtain a permit from RIDEM's Division of Freshwater Wetlands to alter any wetlands, unless the logging activities are specifically exempted under the provisions of Rule 6.02 of the Rules and Regulations Governing the Administration and Enforcement of the R.I. Freshwater Wetlands Act.

(6) RIDEM/DFE should conduct workshops for local officials, including tax assessors, regarding the benefits of preserving land under the Farm, Forest, and Open Space Act and the Forest Legacy Program.

02-01-08 Storage Tanks

Water Quality Concerns

Underground storage tanks (USTs) and above-ground storage tanks (ASTs) are used throughout Rhode Island to store petroleum products such as motor fuels and heating oils. USTs and ASTs may also be used to store other types of chemicals.

In Rhode Island, leaking USTs have been identified as the leading cause of new groundwater contamination problems (RIDEM, 1994). As of 1994, 511 leaking UST sites had been identified, with 75 percent of those involving gasoline. Over two-thirds of the sites have required field investigation, with a growing number undergoing active remediation. Releases of petroleum may result in the presence of free petroleum product and/or dissolved contaminants in the groundwater. Leaking USTs have caused significant impacts, including the contamination of numerous private wells, temporary disruption in the use of public wells, explosions and fires at construction sites, explosion hazards within buildings, and the leaching of petroleum into surface waters. While millions of dollars have been expended by both governmental and private sector entities during the past decade to address leaking USTs, the impacts from leaking UST sites is not expected to abate until the process of upgrading UST facilities is completed.

RIDEM registers all USTs except home heating oil tanks less than 1,100 gallons in capacity that are located at residences and on farms. As of March 1994, RIDEM had records on 12,042 USTs of which 5,944 were in active use at over 2,650 facilities statewide. The main products stored in these USTs were: gasoline (36 percent), #2 heating oil (36 percent), and diesel fuel (12 percent). One-third of the USTs are government owned. RIDEM regulations require motor fuel USTs to be upgraded by 1998 to be resistant to corrosion. All new USTs are required to be of double-walled construction. New UST facilities are prohibited in community wellhead protection areas.

Home heating oil USTs that are less than 1,100 gallons are exempt from registration requirements, and as a result there is no inventory on such tanks available. RIDEM estimates that there may be thousands of such tanks located throughout the state. Even among those heating oil tanks subject to state registration requirements, there continues to be a lack of awareness concerning these requirements, and as a result there are a large number of unregistered and abandoned heating oil USTs. RIDEM is currently encouraging the inventory of home heating oil tanks in wellhead protection areas.

While home heating oil tanks have thus far not caused the same extensive degradation of groundwater as have larger USTs, they have been associated with localized contamination of soils, groundwater, private wells, and surface waters. Numerous spills associated with filling such tanks are reported each year and may contribute to the contamination of stormwater.

Above-ground storage tanks are also located throughout the state. They range in size from small ASTs for heating oil, of which there are thought to be several thousand, to bulk oil storage facilities, such as those in the Port of Providence, which are estimated to number less than 100. RIDEM has imposed certain design and operational standards, including provisions for spill containment, on ASTs greater than 550 gallons capacity. Releases from the operation of AST facilities have been associated with extensive soil and groundwater contamination, as well as surface water impacts.

Both UST and AST facilities have the inherent potential to cause significant degradation of groundwater, as well as pollution of surface waters, if contaminants stored in tanks are released to the environment. The proper siting, design, construction, operation, and maintenance of such sites is critical to minimizing the opportunities for such releases to occur.

Policies and Recommendations

Underground Storage Tanks

POLICY 8.1 Minimize the opportunities for the release of petroleum products and other hazardous materials from underground storage tanks (USTs) by ensuring the proper siting, design, construction, operation, and maintenance of UST facilities.

RECOMMENDATIONS:

(1) Target compliance and enforcement activity in high priority groundwater areas and/or surface water supplies in order to prevent releases. Initiate leak detection compliance inspections and focus on water supplies in which petroleum related contaminants have been detected. Coordinate with the wellhead protection program to respond to potential compliance concerns at groundwater sites reported via local pollution source inventories, e.g., continue participation in the established wellhead protection enforcement initiative.

(2) Maintain an effective level of enforcement activity to ensure that leak detection requirements and other important operating practices are followed. Enforce siting restrictions in wellhead protection areas, consider adopting siting restrictions in surface water supply watersheds, and consider the need for additional protective requirements such as more stringent installation requirements, e.g., P.E. certification.

(3) Improve and enhance the capabilities of the UST database to support

program activities and allow linkage of critical UST data to the geographic information system (GIS). Update the UST and leaking underground storage tank (LUST) coverages in GIS to reflect current information.

(4) Expand technical assistance and outreach activities to address the needs of UST facility owners. Prepare a range of written and other materials for distribution to target audiences of UST owners, e.g., gasoline station owners and other groups such as municipal officials and realtors. Consider conducting workshops to encourage understanding of UST regulatory requirements in conjunction with other RIDEM programs such as UIC and RCRA. Expand efforts to publicize and explain the 1998 upgrading deadline applicable to motor fuel USTs.

(5) Pursue a program to provide greater opportunities for providing financial assistance to UST owners. This could include re-activating the Leaking UST Revolving Loan Fund, which is supported by a $1.5 million bond issue. Consider expanding the scope of this program to meet the needs of a larger number of small businesses.

(6) Encourage local communities dependent on groundwater resources and/or surface water supplies to exercise their existing legal authority to address the threat that may be associated with home heating oil tanks. Provide technical assistance to communities to assess and mitigate concerns with home heating oil tanks in wellhead protection areas, other high-priority groundwater areas, and/or surface water supply watersheds.

(7) Encourage and provide technical assistance to local communities dependent on groundwater resources and/or surface water supplies to institute local controls focusing on identifying, tagging, maintenance, testing, and mapping of USTs of less than 1,100 gallons.

(8) Develop and implement incentive programs to encourage the removal of underground home heating oil tanks and, where needed, the replacement of underground tanks with above-ground tanks. Develop local projects in wellhead protection areas and/or surface water supply watersheds that facilitate removal of abandoned USTs, e.g., by providing financial assistance.

(9) Conduct education and outreach activities to owners of home heating oil tanks in wellhead protection areas and/or surface water supply watersheds. Develop specific educational materials. Focus particu-

larly on USTs older than 20 years.

(10) Consider incorporating into regulation a leak detection requirement for large heating oil USTs that have reached the expected life of the UST, e.g.. 20-30 years. Such USTs are currently not required to test for leaks.

(11) Develop and promulgate rules to implement the Leaking UST Trust Fund Program adopted by the legislature in 1994.

(12) Continue to place a high priority on responding to suspected and confirmed leaking USTs located in wellhead protection areas, surface water supply watersheds, and other critical resource areas.

(13) RIDEM should develop a program in conjunction with local officials to identify and address abandoned USTs. The state should seek a source of funding to execute the proper closure of USTs on properties that have been abandoned and seek reimbursement from the property owner if applicable.

Above-Ground Storage Tanks

POLICY 8.2 Minimize the opportunities for release of petroleum products and other hazardous materials from above-ground storage tanks (ASTs) by promoting and ensuring proper siting, design, construction, operation, and maintenance of AST facilities.

RECOMMENDATIONS:

(14) Update and revise the Oil Pollution Control Regulations to improve the effectiveness of the state regulatory program with respect to larger-scale AST facilities. Consider siting restrictions on certain new facilities and development of a program that parallels the UST program.

(15) Continue to inventory, inspect, and review the compliance status of large-scale ASTs subject to on-going monitoring and other operation and maintenance provisions of the state oil pollution control regulations. Target inspection and enforcement activities in high-priority resource areas, e.g., sensitive watersheds, coastal waters, wellhead protection areas, etc.

(16) Update and maintain the GIS data layer for large-scale ASTs.

Incorporate this information into ongoing wellhead protection and surface water protection programs.

(17) Continue to assist local entities in efforts to inventory residential and other small ASTs that pose a potential pollution threat.

(18) Conduct education and outreach activities targeted to the owners of small ASTs, including residential tanks, in order to promote improved maintenance and upgrading of ASTs. For existing ASTs that are located in such a manner as to be a significant pollution threat, support development of local incentive programs that facilitate the removal of the tanks or the installation of appropriate BMPs.

(19) Support the design and construction of projects that demonstrate improved or more effective controls of stormwater runoff from AST facilities.

(20) Continue to ensure that spill response plans and capabilities are adequate at large-scale AST facilities. RIDEM staff should continue to coordinate with and participate in training exercises to maintain spill response readiness.

(21) Continue the coordinated site investigation and remedial efforts aimed at assessing and mitigating the impacts of AST facilities along the Providence River and Upper Narragansett Bay.

Water Quality Concerns

The improper use, handling, storage, and disposal of hazardous materials can have a significant impact on surface and groundwater quality. Hazardous materials is a broad category that generally includes toxic, corrosive, flammable, or explosive materials which, due to their quantity, concentration, or physical/chemical characteristics, may, upon release or exposure, cause or contribute to human health or environmental hazards. Concerns associated with hazardous materials generally involve their use in industrial or commercial operations; yet even small amounts of household hazardous materials have the potential to impact water quality.

Automobiles and automobile-related facilities are among the more frequently discussed potential sources of nonpoint pollution. No Rhode Island study has documented any widespread water quality impairments attributable to automobiles. In fact, the volume of some of the most toxic hydrocarbons associated with automobiles has declined since the 1970s. However, studies from other states have shown that automobiles contribute significant loadings of hydrocarbons and trace metals to the environment. Inputs include tire and brake wear, emissions, and leaks. The studies also point to "hotspots" in the urban landscape that produce significantly greater loadings of hydrocarbons and trace metals than other areas. These hotspots are often linked to places where vehicles are fueled and serviced, such as gas stations, bus depots, and vehicle maintenance areas, and places where many vehicles are parked for brief periods, such as malls, convenience stores, fast food outlets, commuter or airport parking lots, and office parks (Schueler, 1994b). Other potential contributors include junk and salvage yards.

Used motor oil and antifreeze may also enter the environment as a result of improper maintenance and disposal practices conducted by car owners in their driveways or backyards. A variety of other hazardous materials are used routinely during regular household activities. Items such as paints, solvents, detergents and cleansers may impact water quality as a result of improper storage, handling, or disposal practices. (A related nonpoint pollution source, home use of fertilizers and pesticides, is addressed in Chapter 02-01-06.)

Discharges and releases of toxic chemicals and other hazardous materials to the environment are regulated by a variety of federal and state laws and programs. The major federal laws include the Clean Water Act, the Resource Conservation and Recovery Act, the Clean Air Act, the Toxic Substances Control Act, the Comprehensive Environmental Response, Compensation and Liability Act (and the 1986 SARA Amendments for TRI Release Reporting), and the Federal Insecticide, Fungicide and Rodenticide Act.

Rhode Island has also established nonregulatory programs for reducing industrial discharges of toxics to the environment. Two Rhode Island laws specifically address reducing the discharge and disposal of toxic wastes. The Hazardous Waste Reduction, Recycling, and Treatment Research and Demonstration Act (RIGL 23-19.10-1 et seq.) provides grants to industry for the development and demonstration of waste reduction and recycling technologies. The Hard-to-Dispose Material -- Control and Recycling Act (RIGL 37-15.1-1 et seq.) levies a surcharge on "hard-to-dispose" materials, such as organic solvents, oil, and antifreeze in order to encourage recycling and decrease use of hazardous materials. These programs are administered by RIDEM's Pollution Prevention Program, which is part of RIDEM's Office of Environmental Coordination. The Pollution Prevention Program also performs multi-media source reduction assessments for Rhode Island industries, recommends more effective pollution prevention practices, and tracks cost savings and toxic use reductions achieved by industries that implement these practices.

Other waste reduction programs in Rhode Island include the statewide Capacity Assurance Plan, which updates waste reduction targets for hazardous wastes, including metals, and develops disposal strategies to account for the total volume of hazardous waste generated in Rhode Island. Another program is EPA's 33/50 Project, under which the state has agreed to work with industry to reduce total environmental releases of 17 pollutants by as much as 50 percent by 1995.

While hazardous waste is highly regulated, there are no State regulations governing the above-ground storage and handling of many potentially hazardous materials (solvents, acids, bases, etc.). In addition, it is virtually impossible to regulate the use of household hazardous materials. Future management needs therefore involve continuing emphasis on source reduction and public education, with particular attention to households, commercial facilities/small businesses, and other small-quantity generators.

Policies and Recommendations

POLICY 9.1 Minimize, and where possible prevent, adverse impacts to ground and surface waters by (A) reducing the use of toxic and hazardous materials, (B) promoting the substitution of non-hazardous alternatives, and (C) ensuring that hazardous materials are properly used, stored, handled, and disposed.

RECOMMENDATIONS:

Commercial/Industrial Operations

(1) Pursuant to local zoning ordinances, new commercial/industrial operations that use or store hazardous materials below thresholds established for state regulations should be required to develop a storage, handling, and disposal plan and comply with applicable best management practices. In water supply watersheds, wellhead protection areas, and groundwater aquifers, municipalities should consider prohibiting operations which, due to their storage or handling of hazardous materials, or generation of pollutants or hazardous waste, would pose a significant risk to human health or the environment.

(2) RIDEM should develop a manual of best management practices for the storage, handling, and disposal of hazardous materials that are not governed by state regulatory programs. The USEPA document titled Storm Water Management for Industrial Activities: Developing Pollution Prevention Plans and Best Management Practices (USEPA, 1992) should be used as a starting point.

(3) Municipalities should link the granting of commercial licenses for facilities that use or store hazardous materials below thresholds established for state regulations with requirements to implement appropriate best management practices (BMPs). Municipalities should deny requests for license renewals from any commercial operation found to be not in compliance with such BMP requirements.

(4) Municipalities, with assistance from RIDEM, should conduct pollution source inventories for existing commercial/industrial operations that use hazardous materials to determine their potential to contribute pollutants to ground or surface waters. The methodology used to conduct pollution source inventories for wellhead protection areas should be used as a guide. Appropriate mitigative measures should be recommended to attenuate any pollution problems found to be present. Municipalities should deny requests for license renewals from any commercial operation found to be contributing pollutants to ground or surface waters until the

problem is corrected, with adequate assurance that the problem will not recur.

(5) RIDEM, in conjunction with the American Planning Association, should pursue the development of guidance or a model ordinance for local officials on the regulation of commercial/industrial operations associated with the storage, handling, or disposal of hazardous materials. Existing reference sources, such as those published by the National Fire Protection Association, should be used as a starting point.

(6) Where there are no state regulations governing commercial/industrial operations associated with the use or storage of hazardous materials, RIDEM should consider establishing such regulations. Where state regulations are already in effect, RIDEM should consider updating and revising them to afford better protection of water quality.

(7) RIDEM, through its Pollution Prevention Program, should expand existing pollution prevention and education programs for commercial/industrial operations associated with the storage, handling, or use of hazardous materials. In accordance with the requirements of the Rhode Island Coastal Nonpoint Pollution Control Program (RICNPCP), developed pursuant to Section 6217 of the Coastal Zone Act Reauthorization Amendments, particular attention should continue to be given to commercial operations not under the purview of the Rhode Island Pollution Discharge Elimination System Program, such as automobile repair facilities and gas stations. Existing public education materials -- such as the slide show/video and accompanying booklet called The Tuned-Up Shop: Best Management Tips For A Smooth-Running, Environmentally Friendly Auto Repair Operation, available through RIDEM's Nonpoint Source Pollution Management Program -- should be used as a starting point.

(8) RIDEM should encourage and participate in local education and outreach programs aimed at promoting BMPs and pollution prevention for commercial/industrial facilities which may be developed as part of wellhead protection or watershed protection programs.

(9) RIDEM should continue to make available and distribute to target audiences technical assistance materialsconcerning pollution prevention and the implementation of BMPs for small businesses. RIDEM's Pollution Prevention Program should facilitate such outreach, and the overall effort should occur through a variety of RIDEM activities in order to maximize increased awareness and pollution prevention actions.

(10) RIDEM's Underground Injection Control (UIC) Program should continue to require the implementation of BMPs as part of the permitting process for authorizing active UIC discharges or closing existing systems (see Chapter 02-01-03).

(11) RIDEM, in conjunction with the Department of Labor and URI, should evaluate the effectiveness of existing training programs for employees of operations associated with the storage, handling, or disposal of hazardous materials. If necessary, steps should be taken to expand or improve the programs.

(12) Construction materials -- see Chapter 02-01-04.

(13) Agricultural and turf management operations --see Chapters 02-01-05 and 02-01-06, respectively.

Household Activities

(14) RIDEM, in conjunction with URI Cooperative Extension, environmental and watershed organizations, and other appropriate entities, should continue to implement pollution prevention programs that advocate proper storage, use, and disposal of household hazardous materials. The programs should cover, but not be limited to, the proper storage, use, and disposal of automobile fluids, paints, solvents, and other common household products. The programs should also advocate the use of products that are non-hazardous or have low concentrations of hazardous materials. RIDEM's Pollution Prevention Program should continue to conduct training sessions that address these and other related topics.

(15) RIDEM's Pollution Prevention Program, in conjunction with municipalities, should continue statewide household hazardous waste recycling, collection, and disposal programs. Primary emphasis should continue to be placed on the operation of the Household Hazardous Waste Collection Facility at Fields Point in Providence.

(16) Through the federal Toxic Substances Control Act, concerned parties should pursue the establishment of bans on the sale/purchase/use of certain hazardous materials where they are known to create adverse water quality impacts.

(17) Discharges to OSDS -- see Chapter 02-01-01.

(18) Lawn care -- see Chapter 02-01-06.

02-01-10 Road and Bridge Maintenance

Water Quality Concerns

Many types of nonpoint source pollution may result from inadequate road and bridge maintenance. Excessively applied or improperly stored road salt may leach into drinking water supplies and other ground or surface waters. Snow may mix with a variety of toxic materials on roadways and contaminate waters if improperly disposed. Leftover road sand, eroded materials, and various other debris may accumulate in traps and catch basins, constricting stormwater flow and subsequently flooding roadways. Stormwater may erode the soils of poorly managed roadsides, or transport fertilizers and pesticides from these areas to neighboring waterbodies.

Of particular concern in Rhode Island is the improper storage and handling of road salt, which can result in groundwater contamination. A recent statewide survey by RIDEM's Division of Groundwater and ISDS identified 94 salt storage piles. Measures to prevent groundwater contamination from road salt storage sites include covering the piles, placing them on impermeable surfaces, and containing salt-laden runoff from the sites. Most -- but not all -- salt piles in Rhode Island are now covered and on impermeable surfaces.

Investigations of groundwater contamination associated with several salt storage facilities have determined that private wells have been significantly affected at eight sites in Rhode Island with chloride levels above 250 ppm (federal secondary standard) and sodium levels above 20 ppm (RIDOH-recommended Alert Level for the most salt-sensitive individuals on medically monitored prescription diets) (RIDEM, 1994). Well tests on a national level have shown levels as high as 8,000 ppm of chloride and 300 ppm of sodium in the past (Federal Highway Administration, 1981).

Wherever road salt has been stored improperly for extended periods of time, groundwater is likely to be degraded, the degree of degradation being dependent on the management practices employed at the site. As a result, RIDEM and the RI Department of Transportation (RIDOT) have a cooperative agreement whereby RIDOT has begun constructing enclosed salt storage facilities at locations of salt-owned salt piles pursuant to RIDEM's "Draft Regulations for the Storage of Road Deicing Chemicals." Thus far, RIDOT has constructed eleven such facilities; nine remain uncovered.

With regard to road salt application, steps can be taken to reduce the amount of sodium chloride applied to roads without compromising winter travel safety. These measures include the use of alternatives to sodium chloride and equipping trucks with the latest technology for efficient salt spreading.

Policies and Recommendations

POLICY 10.1 Minimize the impacts of runoff and associated pollutants from roads and bridges by undertaking proper operation and maintenance activities.

RECOMMENDATIONS:

General

(1) Ensure that all roads and bridges in the state are operated and maintained in accordance with the requirements of the Rhode Island Coastal Nonpoint Pollution Control Program, developed pursuant to Section 6217 of the Coastal Zone Act Reauthorization Amendments.

Road Maintenance

(2) Working through a broad-based, ad hoc technical review committee, RIDEM, in conjunction with the RI Department of Transportation (RIDOT), should develop a road maintenance and operations manual geared toward water quality protection. In addition, an associated training and education program should be developed and implemented for all state, municipal, and contractual road maintenance personnel. This effort should be coordinated with the training programs and workshops administered by the RI Technology Transfer Center and URI Cooperative Extension.

(3) RIDOT and municipalities should continue to ensure that sand and sediment on state and local roads are removed annually by street sweeping. If practicable, the number of street sweepings should be increased to two or three times a year. RIDOT and municipalities should ensure that all sand and sediment collected from roadways is properly managed in accordance with RIDEM's Street Sweepings Management Policy, issued by RIDEM's Division of Waste Management. RIDOT, RIDEM's OSCAR Program, and municipalities should also continue to remove roadside litter and debris, on a regular basis, via roadside clean-up programs.

(4) RIDOT and Rhode Island's municipalities should establish comprehensive maintenance programs for the cleaning of catchment basins and other runoff conveyance and treatment structures. The accumulated sediments should be properly disposed of, in accordance with state and federal regulations.

(5) In accordance with existing policy, the RI Solid Waste Management Corporation (SWMC) should continue to accept from RIDOT and municipalities, at no charge, sand and sediment collected from roadways, provided that the material is properly screened. Individual municipalities, groups of municipalities (acting on a regional basis), and/or SWMC should consider obtaining appropriate screening mechanisms to facilitate the implementation of this no-cost disposal option.

(6) Municipalities should be notified that the construction of drainage ditches for flood control on roadways requires RIDEM approval if such activity results in a stormwater discharge to a waterbody or wetland, and/or Coastal Resources Management Council approval if the activity occurs within the coastal zone.

(7) For all road repavement projects, soil erosion should be addressed using appropriate techniques, as described and illustrated in the Rhode Island Soil Erosion and Sediment Control Handbook.

Bridge Maintenance

(8) Where applicable, RIDOT and municipalities should require maintenance contractors to use techniques such as suspended tarps, vacuums, or booms to limit the delivery of pollutants (paint, solvents, scrapings, etc.) to surface waters during bridge maintenance projects.

Road Salt Application and Storage

POLICY 10.2 Minimize adverse impacts to drinking water supplies by properly storing and applying de-icing materials.

RECOMMENDATIONS:

(9) All road salt storage piles within watersheds and aquifers of public drinking water supplies and other sensitive areas should be properly maintained and managed to mitigate any water quality impacts due to the storage and handling of salt. Specifically:

A) Salt storage piles should be completely covered to protect salt from wind and rain, especially during handling procedures.

B) Salt should be stored and handled on an impervious, curbed surface.

C) All runoff from storage surfaces should be directed to containment areas.

D) Loading areas should be swept clean of all residue after handling operations.

E) All salt residues should be returned to a covered pile.

(10) RIDEM and municipalities should pursue sources of funding for construction of salt storage sheds. RIDEM should also develop and adopt performance standards -- including, but not limited to, those set forth in Recommendation (9) above -- governing the operation and management of salt storage facilities. RIDEM's "Draft Regulations for the Storage of Road Deicing Chemicals," developed in 1985, should be used as a starting point.

(11) RIDOT should continue to require all drivers, loaders, and handlers of road salt to participate in training sessions.

(12) All trucks operating in watersheds and groundwater aquifers of public drinking water supplies should be equipped with ground-speed sensors, which automatically control the spread rate of deicing materials in relation to the speed of the vehicle. Use of this technology will allow for more efficient application of materials and greater accuracy in record keeping.

(13) RIDOT and municipalities should consider equipping trucks that operate in watersheds and groundwater aquifers of public drinking water supplies with infrared electronic sensors, similar to those used on airport runways, to provide accurate data on pavement temperatures. As with ground speed sensors, use of this technology can lead to more efficient application of materials and better results, as well as long-term cost savings.

(14) RIDOT should continue testing and/or using any economically feasible deicing alternative to sodium chloride that shows promise of being effective and environmentally safe.

(15) In the event that road salting causes the concentrations of sodium or chloride in a water supply to rise to a level approaching a maximum safe drinking water standard, as determined by the RI Department of Health, RIDOT and municipalities should take actions to reduce road salt application rates, use a deicing alternative, or implement other protective measures.

(16) Municipalities should work with other users of deicing materials (such as commercial, industrial, and institutional land users) to ensure that these materials are used appropriately.

Snow Dumping

(17) If it is determined that water quality is being impacted by snow dumping practices, RIDEM, in conjunction with RIDOT, the Coastal Resources Management Council, and municipalities, should evaluate current snow dumping practices and explore practicable alternatives. At a minimum, snow dumping practices should include, but not be limited to, best management practices to control sedimentation.

02-01-11 Marine Boating Facilities and Activities

Water Quality Concerns

Boating is a major recreational and commercial activity in Rhode Island. Over 32,000 boats are registered in the state, and another 18,000 are estimated to visit Rhode Island waters each year. Although boating activities take place in many freshwater areas of the state, the most significant nonpoint source pollution concerns associated with boating activities and facilities involve the state's coastal waters. As such, the policies and recommendations in this chapter specifically target marine-related facilities and activities. However, some of these policies and recommendations may also be applicable to freshwater systems, particularly surface drinking water supplies.

Marinas, mooring fields, and launch ramps are the primary types of facilities used by boaters to access Rhode Island's coastal waters. As of 1988, there were over 160 private marinas, yacht clubs, boat yards, town docks, and launching ramps operating in Narragansett Bay, including Mount Hope Bay. These facilities provided in excess of 15,000 berths, slips, and moorings for recreational and commercial vessels, not including storage on land.

Nonpoint source pollution problems associated with marine boating facilities and activities include: poorly sited or designed marinas and mooring areas; pollutants transported in stormwater runoff from marina parking lots, maintenance areas, and storage facilities; fuel leaks and spills; solid waste, hazardous waste, and fish waste disposal; solvents, paints, antifreeze, cleaning agents, petroleum derivatives (oil and grease), and other pollutants released during boat maintenance; discharges of sewage, fuel, and debris during regular boat operations; and disruption of sediment and habitat by boat propellers, boat wakes, mooring chains, and dredging operations.

From a public health standpoint, the greatest threat to water quality from boating facilities and activities is the discharge of untreated or partially treated sewage from boat toilets. These discharges are of particular concern in poorly flushed or shallow waters in the vicinity of sensitive or potentially productive habitat areas, shellfish harvesting areas, and bathing beaches.

Policies and Recommendations

Siting and Design of New and Expanding Marinas and Mooring Fields

POLICY 11.1 Minimize adverse water quality and habitat impacts resulting from new or expanding marinas and mooring fields in waters suitable for the development and\or expansion of such facilities.

RECOMMENDATIONS:

(1) Ensure that all new and expanding marinas and mooring fields are sited and designed in accordance with applicable Coastal Resources Management Council (CRMC) and RIDEM regulations and policies, including the requirements of the Rhode Island Coastal Nonpoint Pollution Control Program (RICNPCP), developed pursuant to Section 6217 of the Coastal Zone Act Reauthorization Amendments (CZARA).

(2) To ensure consistency and coordination in the State's efforts to protect its marine waters from impacts associated with new or expanding marinas and mooring areas, RIDEM and the CRMC should continue their efforts to resolve the various inter- and intra-agency inconsistencies in their water use classes and categories.

Operation and Maintenance Activities

POLICY 11.2 Minimize adverse water quality impacts resulting from the operation and maintenance of boats and boating facilities by ensuring that proper operation and maintenance practices are followed.

RECOMMENDATIONS:

Operation and Maintenance of Marinas and Mooring Fields

(3) The CRMC should require marina operators to develop and implement operation and maintenance programs for boating facilities that are consistent with the requirements of the RICNPCP and the Environmental Guide for Marinas: Controlling Nonpoint Source and Stormwater Pollution in Rhode Island (hereinafter referred to as the RI Environmental Guide for Marinas).

(4) URI's Coastal Resources Center (URI/CRC) should facilitate the implementation of the RI Environmental Guide for Marinas by conducting public education/outreach/training programs for marina operators that

are based on the guide and targeted toward pollution prevention.

(5) RIDEM, URI/CRC, the RI Department of Economic Development, and the CRMC should continue to promote and facilitate the use of innovative technologies for conducting boat maintenance operations at marinas. Initiatives such as the RI Marine Assistance Collaborative should continue to provide advice and support to marina operators, particularly in the area of technology transfer.

(6) The RI Environmental Guide for Marinas should be periodically evaluated and updated or revised as needed by URI/CRC within the framework of a broad-based technical review committee.

(7) Through combined efforts, RIDEM, the CRMC, URI/CRC, and individual marina operators should monitor the implementation and evaluate the effectiveness of the management practices employed by marinas pursuant to their operation and maintenance programs.

(8) The CRMC should require all coastal municipalities, through their Harbor Management Programs, to develop and implement operation and maintenance programs for municipal mooring fields that are consistent with the requirements of the RICNPCP.

(9) The CRMC and/or URI/CRC should provide technical assistance to municipalities to assist them with the incorporation of nonpoint source pollution control measures into municipal Harbor Management Plans.

(10) The CRMC and RIDEM should require implementation of appropriate best management practices at boating facilities not covered under the RICNPCP or the RI Pollution Discharge Elimination System (RIPDES) Program, if such facilities are found to be causing water quality impacts.

(11) With guidance and assistance from EPA and NOAA, RIDEM and the CRMC should continue to coordinate their stormwater runoff programs for marinas, developed pursuant to the Clean Water Act (RIPDES) and Section 6217 of CZARA. Any and all changes to these programs should be reflected in revisions to the RI Environmental Guide for Marinas.

Boat Operations

(12) The CRMC should require all marina owners and all municipalities, through their Harbor Management Programs, to develop and implement operation and maintenance programs for boaters that are consistent with

the requirements of the RICNPCP and the RI Environmental Guide for Marinas.

(13) Working through various agencies and organizations, public education/outreach/training programs, targeted toward pollution prevention, should be instituted for boaters. Information and educational materials should be made available through various sources, including RIDEM's Boat Registration Program, municipal Harbor Management Programs, CRMC, URI, the RI Marine Trades Association, Save The Bay, and individual marinas. The materials and programs should address a range of issues, including but not limited to:

A) The discharge of sewage.

B) The discharge of fuel and oil from boat bilges and fuel tank air vents during fueling operations, and the discharge of fuel and oil from boat engines during regular in-water operations.

C) The use of 4-stroke engines versus 2-stroke engines.

D) Proper oil/fuel spill reporting and clean-up procedures.

E) The discharge of harmful cleaners and solvents.

F) The use of "environmentally friendly" products, such as non-toxic antifreeze.

G) The discharge of hull paint resulting from scraping, sanding, or cleaning.

H) The discharge of litter, debris, and other pollutants.

I) Proper dry land waste disposal practices.

(14) RIDEM, CRMC, municipal harbor masters, URI/CRC, and marina operators, among others, should continue to work together to promote and enforce all rules and regulations relating to boater discharges.

(15) Through combined efforts, RIDEM, CRMC, URI/CRC, and individual marina operators should monitor the implementation and evaluate the effectiveness of management practices employed by boaters pursuant to operation and maintenance programs and any other education/outreach/training programs that are instituted.

(16) EPA's National Headquarters should be called upon to develop and distribute a list of potentially harmful chemicals that are inappropriate for use within the boating and marine trades industry, as well as a list of "environmentally friendly" products and materials that are recommended for use.

Boat Sewage

(17) RIDEM should pursue the attainment of a federal No Discharge Zone designation for all marine waters of the State by ensuring that a sufficient number of pumpout facilities are installed, where needed, to meet the criteria for designation, and by instituting an appropriate education and enforcement program.

(18) RIDEM's Division of Water Resources, in conjunction with RIDEM's Narragansett Bay Project, and with funds provided through the federal Clean Vessel Act and other applicable sources, should continue efforts aimed at implementing RIDEM's Marina Pumpout Facility Siting Plan. Specifically, RIDEM should continue providing guidance on the number and location of pumpout facilities needed to meet the No Discharge Zone designation criteria, and continue to provide grants to marina operators and/or municipalities to help them install the facilities.

(19) RIDEM and the CRMC should seek to ensure that all pumpout facilities are designed to allow ease of access, and posted to promote use by boaters.

(20) To facilitate use of pumpout facilities, marina operators and/or municipalities should seek to provide mobile pumpout vessels in combination with shore-based facilities.

(21) RIDEM and the CRMC should coordinate on the development and maintenance of an inventory of all boats registered in the state and their areas of concentration. To achieve this objective:

A) RIDEM's Boat Registration Program should continue to maintain an inventory of all boats registered in the State and consider expanding this data base to include information on the types of marine toilets installed on all registered boats.

B) The CRMC should also seek to develop an inventory of all boat slips and docks in the State.

C) Coastal municipalities, working through their municipal Harbor Management Programs, should develop inventories of all moorings located in their adjacent tidal waters.

D) Coastal municipalities, working through their municipal Harbor Management Programs, in conjunction with RIDEM, should conduct field assessments of selected marinas and mooring areas to verify and augment the above-described data bases with regard to the actual number of boats (transient and nontransient) using the sites, and the actual types of marine toilets used by these boats.

(22) The information gathered via Recommendation (21) above should be used as a basis for identifying sites for additional pumpout facilities.

(23) Once the federal No Discharge Zone designation is attained, RIDEM and the CRMC, working through a Marina and Boating Management Committee (see Recommendation (31) below), should maintain the designation by maintaining the appropriate ratios of boats-to-pumpout facilities in coves, harbors, and other vessel concentration areas.

(24) Through combined efforts, RIDEM, CRMC, URI/CRC, and individual marina operators should monitor the use and evaluate the effectiveness of shore-based and mobile pumpout facilities.

(25) Through combined efforts, RIDEM, CRMC, URI/CRC, Save The Bay, and the RI Marine Trades Association, among others, should pursue further initiatives aimed at educating boaters and pumpout facility operators regarding the use, availability, and importance of pumpout facilities and the prevention of sewage discharges.

(26) RIDEM's Office of Boating Safety, in conjunction with the U.S. Coast Guard and local Harbormasters, should undertake inspections and/or other forms of enforcement to ensure compliance with regulations governing marine toilets and sewage discharges.

(27) Municipalities, through their Harbor Management Programs, should establish penalties for violations of boat sewage discharge regulations.

(28) Once the federal No Discharge Zone designation is attained, RIDEM should evaluate its effectiveness in protecting water quality. If necessary, RIDEM should consider tightening the regulations by increasing the ratio of boats-to-pumpout facilities in nontransient harbors from 600:1 to a more conservative level, such as 300:1.

(29) Pursuant to the RI Coastal Resources Management Program, the municipal Harbor Management Programs, and the implementation of the RI Environmental Guide for Marinas, the CRMC, in cooperation with RIDEM, should seek to phase-in a retrofit program involving the upgrade of dump stations, restrooms, and shower facilities at marinas.

Fueling Operations

(30) RIDEM should ensure that boat fueling operations conducted by fuel trucks are subject to appropriate environmental controls, akin to those governing fixed fueling stations at marinas. RIDEM should consider adopting requirements that fuel truck operators receive proper training, and that fuel truck owners carry insurance sufficient to cover any spills.

Statewide Coordination

(31) The existing Marina Nonpoint Source Advisory Committee should rename itself the Marina and Boating Management Committee and continue to meet regularly to review and evaluate key environmental issues pertaining to the boating industry. These issues should include but not be limited to: compliance with all applicable statutes and regulations (e.g., Section 6217 of CZARA, RIPDES); coordination of state programs; revisions to state laws and regulations; implementation of the RI Environmental Guide for Marinas; public outreach; siting and operation of pumpout facilities; establishment of No Discharge Zones; and all relevant funding proposals.

02-01-12 Surface Mining Activities

Water Quality Concerns

Surface mining activities in Rhode Island are generally limited to sand and gravel operations and stone quarrying. There are some 50 to 60 gravel pits in the state. Some of these sites are no longer active but still a concern since they were never properly closed and restored.

Sand and gravel operations are of particular concern with regard to potential impacts to groundwaters, though the operations may adversely affect surface waters as well. By nature, sand and gravel deposits are often associated with groundwater recharge areas. Removal of topsoil eliminates the filtering capacity of the overburden and renders the underlying groundwaters highly vulnerable to contamination. As sand and gravel deposits are removed, the depth-to-groundwater steadily decreases, often leading to exposure of the water table. Since mining operations typically use trucks, bulldozers, conveyer belts, and other machinery to extract sand and gravel, groundwater contamination by diesel fuel, motor oil, hydraulic fluids, and solvents may occur as a result of routine machinery maintenance, cleaning processes, and refueling operations.

Sediments and other contaminants carried off-site by wind or runoff can also degrade nearby surface waters and wetlands. Runoff problems tend to be exacerbated by a failure to establish adequate buffers prior to commencing operations, or by failing to limit areas of disturbance. Any washing or other type of processing conducted on site adds significantly to the water quality concerns associated with mining operations.

Abandoned or improperly restored mining pits pose additional problems. Sand and gravel operations are too often planned and carried out with little regard for post-production reclamation needs, such as regrading, restoring topsoil, and revegetating. Exposed sites that are not properly restored may continue to erode over the course of many years. Abandoned mining pits also tend to become the targets of illegal dumping and disposal of wastes, such as junk automobiles, tires, and garbage.

Policies and Recommendations

POLICY 12.1 Minimize adverse impacts to surface and ground waters from pollutants associated with resource extraction operations.

RECOMMENDATIONS:

(1) RIDEM should review existing statewide enabling legislation authorizing municipalities to adopt ordinances governing sand and gravel operations

and, if necessary, pursue new or revised enabling legislation. This legislation should be aimed at complementing RIDEM's authority, under its RIPDES Program, to require controls for discharges from sand and gravel operations. Issues to be addressed by local ordinances should include but not be limited to: planning and siting, operation and maintenance, and closure/reclamation. Particular emphasis should be given to groundwater protection.

(2) The RI Conservation Districts, RI Resource Conservation and Development Area, RIDEM, RI Department of Administration's Division of Planning, industry operators, and municipalities should continue to work together on the development of a model local ordinance to prevent water quality impacts from surface mining operations. Draft ordinances already developed by the towns of West Greenwich and Glocester (among others) should be used as guides.

(3) The RI Conservation Districts, in conjunction with RIDEM, should assist municipalities with the development and adoption of ordinances governing sand and gravel operations and with the implementation of best management practices to reduce water quality problems associated with new, existing, and closed/abandoned/reclaimed sand and gravel operations.

(4) For proposed, existing, and closed sand and gravel sites, the RI Conservation Districts should continue to offer technical assistance to industry operators. Such assistance should include but not be limited to: site plan and reclamation plan reviews, site surveys, identification of existing and potential problems, and recommendation of appropriate best management practices.

(5) URI Cooperative Extension (URI/CE), along with other organizations, should continue to research the use and development of appropriate best management practices to reduce water quality problems associated with sand and gravel operations, with an emphasis on vegetative treatment systems.

(6) The RI Resource Conservation and Development Area, in conjunction with URI/CE and the RI Conservation Districts, should continue to provide information and training to local officials and industry operators on the various aspects of managing sand and gravel operations. Issues to be covered should include but not be limited to: local ordinances, siting and design, operation and maintenance, and reclamation. A handbook should be developed and distributed through workshops or training sessions.

02-01-13 Landfills

Water Quality Concerns

Landfills contain a vast array of contaminants that have the potential to pollute ground and surface waters. As rain or snowmelt seeps through or runs off of landfill sites, it can collect contaminants produced by the deposited waste materials. This contaminated liquid (leachate) can be produced by active or inactive landfills. Leachate is typically high in dissolved and suspended solids, including metals, as well as numerous organic constituents, and it tends to have a relatively high chemical oxygen demand.

The pathway of leachate through a landfill is normally downward to the water table. Within the groundwater system, the leachate forms a plume and flows with the groundwater to surface water discharge points such as nearby streams or ponds. Where an impermeable surface such as hardpan or bedrock is present, the leachate may reach underground waters through fractures, or it may migrate laterally to discharge points.

The production of leachate is closely related to the amount of precipitation and groundwater infiltration at a given landfill. Leachate will not leave the site until saturation conditions are reached. Consequently, a large site with a large volume of refuse may not produce leachate for months or possibly years, while a smaller area with small volumes of refuse may produce leachate in a matter of days.

The potential environmental impact of the leachate generated from a landfill depends upon the contaminant levels and the extent of the plume, as well as the potential human/ ecological receptors. The contaminant levels of the leachate are determined by such factors as: the types of waste deposited at the landfill; the landfill's size and design; and the length of time the refuse has been, or continues to be, subject to leaching conditions. The extent of contamination is determined by the volume and hydrogeological conditions of the groundwater flow in the area.

As leachate migrates from a landfill, it also undergoes certain physical, chemical, and biological reactions. These reactions alter and may decrease contaminant levels over time. Depending on the location and type of receptors, however, the potential exists for serious impacts to ground and surface waters.

Rhode Island currently has four municipal solid waste (MSW) landfills in operation, five MSW landfills at various stages of closure, and approximately 50 closed, former landfills. The four landfills still operating are in Johnston (Central), Bristol, Charlestown, and Tiverton. The five MSW landfills proceeding with closure plans are in Burrillville, Hopkinton, No. Providence, Prudence Island (Portsmouth), and Richmond. The former landfill sites were each closed under standard practices in use at the time of closure. The conditions of closure and the environmental monitoring required at each of these sites vary considerably.

Policies and Recommendations

POLICY 13.1 Minimize the need for additional landfills by placing increased emphasis on source reduction, recycling, and pollution prevention.

RECOMMENDATION:

(1) RIDEM's Ocean State Clean-up and Recycling Program, the RI Solid Waste Management Corporation, municipalities, and other appropriate entities should continue and, where appropriate, expand their source reduction, recycling, and pollution prevention programs.

POLICY 13.2 Minimize adverse water quality impacts resulting from landfills by ensuring that new or expanding landfills are properly sited, designed, and constructed and that existing landfills are properly operated.

RECOMMENDATIONS:

(2) Continue to prohibit the siting and expansion of landfills in areas that are unsuitable, particularly GAA groundwater sources and surface water supply watersheds.

(3) Continue efforts aimed at reducing or eliminating the amount of hazardous materials sent to landfills.

(4) Continue to ensure that proper operation and maintenance procedures are followed at all landfills, in accordance with RIDEM's Rules and Regulations for Solid Waste Management Facilities.

(5) Continue to ensure that proper stormwater management and erosion and sediment control practices are employed at all landfills, in accordance with all applicable state requirements.

(6) At all existing landfill sites, monitoring wells should continue to be installed and tested regularly for signs of contamination. If monitoring reveals the existence of any contamination problems, steps should be taken to mitigate the problems.

POLICY 13.3 Minimize adverse water quality impacts resulting from existing landfills by ensuring that, upon reaching capacity, all landfills are properly closed.

RECOMMENDATIONS:

(7) Continue to ensure that, upon reaching capacity, all landfills are closed in accordance with RIDEM's Rules and Regulations for Solid Waste Management Facilities.

(8) The State Revolving Fund should be used as a possible means of financial assistance to Rhode Island's municipalities for non-Superfund landfill closure projects. RIDEM's priority list of landfills in Rhode Island to be closed, and the estimated costs of these closures are as follows:

Bristol (Phases I-IV)	$8,600,000
Burrillville	1,500,000
Charlestown	1,000,000
Hopkinton	1,500,000
North Providence	2,000,000
Prudence Island	450,000
Richmond	500,000
Central Landfill (Phases I-III)	24,000,000
Tiverton	2,700,000

(9) At all former landfill sites, monitoring wells should continue to be installed and tested regularly for signs of contamination. If monitoring reveals the existence of any contamination problems, steps should be taken to mitigate the problems.

02-01-14 Domestic and Wild Animals

Water Quality Concerns

Pet droppings have been found to be important contributors of nonpoint source pollution in some areas. The Soil Conservation Service in the Nassau-Suffolk region of New York collected data indicating that domestic animals contribute biological and chemical oxygen demand, bacteria, nitrogen, and phosphorus to ground and surface waters (Nassau-Suffolk Regional Planning Board, 1978).

Curb laws, requiring that dogs be walked close to street curbs, are intended to ensure that street sweeping operations collect the droppings and prevent them from entering runoff. However, street sweeping typically occurs only once or twice a year in most areas. Thus, dog droppings are routinely washed into storm sewers and delivered to surface waters. It has been estimated that for a small bay watershed (up to 20 square miles), two to three days of droppings from a population of 100 dogs can contribute enough bacteria, nitrogen, and phosphorus to temporarily close a bay to swimming and shellfishing (USEPA, 1993). High bacteria populations have been found in sheet flow samples from sidewalks, roads, and some bare ground, collected from locations where dogs would most likely be "walked" (Pitt et al., 1994). Commercial domestic animal operations, such as pet stores and kennels, may also be sources of animal waste problems if proper control and disposal practices are not followed.

Domestic or semi-wild ducks also contribute to nonpoint source pollution where their populations are particularly high. The common practice of feeding waterfowl tends to increase their concentrations in certain areas and convert migratory populations into year-round residents. A recently completed study on pollution problems affecting the Narrow River in Narragansett and South Kingstown, Rhode Island found that in addition to failing on-site sewage disposal systems and pet droppings, wildfowl droppings are a primary source of bacterial contamination (SAIC Engineering, Inc., 1994).

As more people move to suburban communities and begin to keep horses or other large animals on their property, pollution control for non-agricultural (backyard) livestock waste becomes an issue of increasing concern. On small lots, the handling and disposal of animal manure and bedding can be quite difficult. What's more, the stabling of large animals on small pieces of property tends to result in waste accumulations that are highly concentrated. Another environmental concern for backyard livestock owners is that, regardless of the amount of supplemental feed provided, large animals will generally continue grazing until all palatable vegetation is gone. On especially small lots (e.g., one or two acres), animals that are allowed free and continuous access to vegetation will quickly graze-out and trample pasture grasses. The resulting bare ground is more subject to erosion and the loss of sediment (USEPA, 1994).

Policies and Recommendations

POLICY 14.1 Manage domestic animal excrement to minimize runoff into surface waters.

RECOMMENDATIONS:

(1) In areas where the density of dogs, the predominance of impervious areas, and/or the sensitivity of receiving waters suggests that pet droppings may pose a threat to water quality, municipalities should consider repealing curbing ordinances and adopting ordinances that require pet owners to clean-up after their pets when they are walked in public areas and properly dispose of the droppings.

(2) Efforts should be made to discourage the feeding of ducks and other waterfowl, particularly in critical areas.

(3) Domestic animal operations, such as pet stores and kennels, should be encouraged or required to implement best management practices for the control and proper disposal of animal excrement.

(4) Backyard livestock owners should be encouraged to implement best management practices for animal wastes and erosion control. Such practices should include but not be limited to: correct siting and design of barns, corrals, and other high-use areas; proper collection, storage, and disposal or use of animal wastes; and pasture care. Consideration should be given to requiring implementation of best management practices in critical areas.

(5) Municipalities should be encouraged to institute zoning ordinances to limit the density of livestock, in accordance with animal management practices and the capacity of the land to sustain livestock operations. The U.S. Department of Agriculture has established an animal unit index, which attempts to estimate the number of a given livestock type that a given parcel (on a per acre basis) can reasonably accommodate. Municipalities may use this index as a guide in developing appropriate zoning ordinances.

(6) URI Cooperative Extension, along with RIDEM's Division of Agriculture, environmental and watershed organizations, and other appropriate entities, should continue to develop and implement public education programs that include coverage of all non-agricultural animal waste problems (particularly, the need to clean-up and properly dispose pet wastes, to not feed waterfowl, and to implement best management practices for backyard livestock).

02-02 LAND USE MANAGEMENT

02-02-01 Relationship Between Land Use and Water Quality

It has been firmly established that water quality is strongly related to land use (RIDOP, 1990). Without effective growth management controls, expanding residential, commercial, and industrial land uses will inevitably degrade the quality of our surface and groundwaters.

The Pawtuxet River exemplifies this concept. The headwaters of this river occur within the Scituate Reservoir watershed and, along with other Class A waters, have the highest water quality in the state. The tributaries that flow into the Scituate Reservoir drain some of the most rural areas of Rhode Island. After the relatively pristine water spills over the Gainer Dam, it flows downstream through a progressively more urban environment where it is subjected to a number of contamination sources directly related to the adjacent land uses. The quality of the water gradually deteriorates to the point that, when the river reaches Pawtuxet Cove and discharges into Narragansett Bay, it is one of the most contaminated waters in the state (RIDOP, 1990).

From the perspective of water quality protection, the optimum land use within any watershed is forest land or undeveloped open space. Any conversion of this natural cover type to a more intensive use can disrupt the natural hydrological cycle, increase stormwater runoff, and promote the scouring of stream channels. A moderately developed watershed may produce 50 percent more runoff volume than a forested watershed during the same storm (Schueler, 1987). Intensive land uses can lead to erosion and sedimentation problems, destruction of wildlife habitat, and degradation of water quality through the introduction of contaminants. Such contaminants may include bacteria and viruses from septic system effluent, heavy metals and petroleum products from automobiles, pesticides and fertilizers from lawns and agricultural areas, and contaminant-laden sediments that wash from paved areas. These pollutants have been shown to have serious ecological impacts on Rhode Island's water resources (Penniman et al., 1991a, 1991b).

The water quality impacts from a single residential subdivision, shopping center, or industrial park may not always, by themselves, be of serious concern. However, the cumulative impacts from all development (past, present, and future) throughout a watershed pose a very serious threat to water quality. Since it is virtually impossible to prevent the conversion of undeveloped open space to more intensive uses by simply capping growth, it becomes crucial to manage existing and future development in a manner that will minimize impacts on water quality.

The key to water quality protection is prevention. It is much more sensible and cost-effective to prevent a new pollution source than it is to mitigate an existing water quality problem. Once a contamination problem occurs, it can be extremely difficult, expensive, and sometimes impossible to restore water quality. Since water quality is strongly related to land

use, the first step in prevention is to identify land uses that have a high potential to contaminate water. The next step is to either prohibit these uses in critical areas or to require appropriate development standards or management practices that will minimize negative impacts on water quality.

Despite increased federal and state attention aimed at protecting water resources, primary control over land use remains with cities and towns by virtue of state zoning and subdivision enabling acts. State agencies do have limited authority relative to land use, such as the authority to require setbacks from waterbodies and to impose development standards to protect water quality. And, pursuant to the RI Coastal Resources Management Program, the Coastal Resources Management Council does have the authority to control the density of development or intensity of land uses permitted in certain coastal areas. But municipalities have direct control over the management of land-use patterns, building densities, and lot sizes through local zoning regulations. This strong level of local authority underscores the important role played by cities and towns in helping to protect the quality of the state's water resources. The following sections are aimed at recommending ways in which municipalities can use the land use management techniques available to them to prevent and control nonpoint source pollution problems, as well as ways that state agencies can assist cities and towns with these efforts.

02-02-02 Growth Management Planning

The history of growth management in Rhode Island (and throughout much of the United States) has been generally reactive, rather than proactive. Communities have too often allowed growth to proceed without regard for the availability of supporting infrastructure such as public water and sewers. As a result, water and sewer lines have often been installed after land use patterns are established, in many instances to respond to crisises such as failed septic systems or contaminated wells. To compound this problem, state environmental regulatory programs are generally not authorized to consider the cumulative impacts from new development or the availability of water and sewer facilities when rendering permit decisions. Consequently, land use has exceeded the carrying capacity of the land in certain areas, impacting water quality and other critical resources. This trend is destined to continue without better growth management policies.

Land Use 2010, the land use element of the State Guide Plan (RIDOP, 1989a), recommends that communities establish growth centers, based on land capabilities, and provide the needed infrastructure in those places. The plan calls for phased growth to keep pace with the availability of infrastructure. The plan also recommends that infrastructure not be extended outside of designated growth centers, unless necessary to protect public health. Another element of the State Guide Plan, the Scituate Reservoir Watershed Management Plan (RIDOP, 1990), recommends that public water and sewerage systems should not be extended into the watershed except to address an existing public health threat or to accommodate compact or cluster development. The plan stresses that infrastructure should

not be used to promote land development that could impact the Scituate Reservoir, one of the state's most fragile resources.

The Comprehensive Planning and Land Use Regulation Act of 1988 (RIGL 45-22.2) requires all Rhode Island cities and towns to adopt comprehensive plans, consistent with the State Guide Plan. Guidelines under the act require communities to consider water and sewer needs in view of their land use plan. The act establishes a state review process to insure compliance. The act is more fully described below.

The Rhode Island Coastal Nonpoint Pollution Control Program, developed pursuant to Section 6217 of the Coastal Zone Act Reauthorization Amendments (CZARA), addresses 56 management measures set forth by the USEPA. One such measure, the watershed protection measure, is intended "to provide general goals for States and local governments to use in developing comprehensive programs for guiding future development and land use activities in a manner that will prevent and mitigate the effects of nonpoint source pollution" (USEPA, 1993). As a means for ensuring compliance with the Section 6217 requirements that relate to land use management, the state is relying on municipal implementation of the comprehensive planning, zoning, and subdivision acts. Apart from the Section 6217 requirements, the state is also calling upon municipalities to pursue enhanced growth management policies, in accordance with the State Guide Plan, for the purpose of protecting the state's water resources.

Comprehensive Planning

A comprehensive plan describes the entire physical environment of a municipality and its program for orderly growth and development. It serves as a framework for articulating citizens' goals and suggests options for achieving those goals.

The Comprehensive Planning and Land Use Regulation Act of 1988 (RIGL 45-22.2) requires that a Comprehensive Plan be approved by the city or town planning board, adopted by the city or town council, and approved by the state. The Plan serves as the basis for all local land use decisions. It must be updated at least every five years. All community land use ordinances, regulations, and land use decisions must be consistent with the Plan. The RI Department of Administration, Division of Planning (RIDOP) has prepared guidelines for communities to follow in preparing Plans. The Department's authority under the Act enables it to review and approve local Plans for consistency with agency guidelines and the State Guide Plan. After state approval of the local Plan, each community has eighteen months to conform its zoning ordinance and zoning map to the Plan. The Plans and zoning ordinances are expected to address the effect of existing and future growth on local and shared natural resources, including drinking water supplies, aquifer recharge areas, surface waters, wetlands, and significant natural and cultural resource areas.

A community's Comprehensive Plan is a planning document designed to guide future

growth and development. The Plan outlines short- and long-term goals and presents policies to direct present and future land management activities. Comprehensive Plans are key to ensuring, among other things, that a community retains its natural resources and preserves its character, while accommodating planned growth.

With respect to natural resources, the Act states that a Comprehensive Plan "shall provide an inventory of the significant natural areas such as water, soils, prime agricultural lands, natural vegetation systems, wildlife, wetlands, aquifers, coastal features, floodplains, and other natural resources and the policies for the protection and management of such areas." Since all subsequent community land use decisions must be in accordance with the local Comprehensive Plan, it is crucial that natural resources be clearly mapped, with appropriate policies and implementation techniques identified to prevent future development from creating adverse impacts.

Several sources of information can be used to assist communities with the inventory and mapping of natural resources. The Rhode Island Geographic Information System (RIGIS), which is a configuration of computer hardware and software tools used for computer mapping and analysis, has data on many aspects of Rhode Island. To assist with preparation of Comprehensive Plans, the RIGIS maps listed in Appendix E have been made available to cities and towns by RIDOP.

In addition, RIDOP prepared a Data Catalogue for the Local Comprehensive Plan (RIDOP, 1989b). This handbook provides cities and towns with sources of information -- agency, contact person, telephone number, etc. -- for each element and topic that should be addressed in a Comprehensive Plan. Included is a brief description of the type of data available and its format. No data base is infallible, but communities can use the RIGIS and other available data as a starting point to identify and map critical resource areas.

Policies and Recommendations

POLICY 2.1 Through municipal land use management programs, carefully plan for and manage new growth to minimize land use impacts on water quality.

RECOMMENDATIONS:

(1) Communities should use the RIGIS data base provided for the comprehensive planning process (see Appendix E) as a starting point to identify, map, and develop protection strategies for critical resource areas in their Comprehensive Plans, as required by the Comprehensive Planning and Land Use Regulation Act. However, communities should seek to augment the RIGIS data base with other applicable data and information to ensure that all critical resource areas are properly identified and appropriate protection strategies are established.

(2) Communities cannot implement effective land use programs if they are not aware of what critical resources need to be protected and where these are located. Accordingly, RIDEM, in conjunction with the RI Division of Planning (RIDOP), should continue to identify and map critical resource areas and continue to develop clear policies for the protection of these resources. Successful efforts by state agencies to develop Special Area Management plans, map groundwater aquifers/wellheads, and establish policies for the Scituate Reservoir watershed should be expanded to other critical resources.

(3) Communities should clearly identify and map areas that can accommodate new growth without adverse impact on critical resources. To prevent the nonpoint source impacts associated with scattered development patterns, communities should guide new development into growth centers designed to minimize nonpoint source pollution impacts, while also preserving the character of the community. For example, rural communities could focus growth in villages where housing can be interspersed with other uses. Such a development pattern also supports open space preservation and alternative modes of transportation. These areas must have adequate infrastructure for new development.

(4) Communities should collaborate on regional or watershed/aquifer approaches to growth management, as envisioned in the Comprehensive Planning and Land Use Regulation Act.

(5) RIDOP, or any successor group to the Land Use Commission, should examine options to uphold State Guide Plan growth management policies by requiring or, through incentives, encouraging new development, wherever possible, to be concentrated in growth centers that will be adequately served by public water, sewer facilities, and other appropriate infrastructure. Proposed growth centers should avoid areas with land development constraints and where growth could adversely affect water quality or critical areas. To lend further support to infill development policies, increased efforts should be made to promote and facilitate the reclamation of abandoned urban sites, or "brown fields," with appropriate development.

(6) State regulatory programs should assess cumulative impacts from development in permit decisions, when possible. If an area is currently experiencing contamination problems or if there is strong evidence to document future environmental impacts from new development, the cumulative impacts should be considered and appropriate development standards or alternative designs required.

(7) The state should use financial incentives to encourage communities to comply with State Guide Plan growth management policies. For example, under funding programs for municipal water, sewer, and transportation/road construction, priority should be given to projects that will promote compact development and avoid the expansion of development into critical areas.

(8) Areas that are currently served by public water and sewers, and can support additional development without adversely impacting water quality and critical resources, should be required to accommodate compact development in accordance with the Comprehensive Planning and Land Use Regulation Act.

(9) Local Comprehensive Plans should give more attention to the need to relate water supply and sewage disposal to land use.

(10) All applicable state agencies should continue to review revised Comprehensive Plans to ensure consistency with the State Guide Plan and other agency policy documents.

02-02-03 Creative Land Management Techniques

Zoning

Zoning is the primary tool a community can use to regulate the use of private land. The authority to zone is a police power that has been given by the State of Rhode Island to local municipalities. Prior to 1991, Rhode Island had a zoning enabling act dating from 1921. It did not explicitly give municipal governments the authority to use zoning techniques for the purpose of protecting critical resource areas, including water quality. Several Rhode Island communities attempted to adopt more innovative ordinances, but some of these efforts failed when contested in court. The Rhode Island Supreme Court has ruled that local zoning ordinances cannot exceed the authority conferred by the state enabling act.

The passage of the Rhode Island Zoning Enabling Act of 1991 (RIGL 45-24-27 et seq.) gave cities and towns significantly more authority to develop ordinances that can protect natural resources. Pursuant to the Act, municipalities may now exercise their zoning power to provide for the proper management and protection of surface and groundwaters, to provide for the control or abatement of soil erosion and sedimentation, and to provide for the management of stormwater runoff. Accordingly, the Act has established the necessary legal foundation for local zoning ordinances to address land use impacts on water quality.

The Act requires the community zoning ordinances to include a statement of consistency with the Comprehensive Plan and further holds that any future changes in the Plans must

be reflected in changes to the local zoning ordinance.

The extension of zoning authority to the protection of natural resources allows communities to put the objectives and policies articulated in their Comprehensive Plans into effect. For example, if one of the goals of a community includes the protection of water-bodies from nonpoint source pollution, then a zoning ordinance can be developed to establish standards, setbacks, or other criteria that achieve this goal.

The Act provides municipalities with new authority to use innovative land use controls to protect and manage natural resources. In the past, many communities did not consider natural constraints to development and the need for environmental protection when establishing land use districts and densities. As a result, the typical zoning or subdivision ordinance of the past was not adequate to protect water quality and critical resources. Until recently, most local governments had conventional zoning and subdivision ordinances that were inflexible, impeded or prohibited creative development, and actually promoted damage to critical resources.

For example, a technique commonly used in Rhode Island, supposedly to preserve open space and to protect on-site wells from septic system contamination, has been large-lot or low-density zoning. It is necessary to maintain a low density in areas not served by public water or sewers. However, uniform large-lot zoning and conventional subdivision regulations, due to their inflexibility, require builders to consume large expanses of open space, build more roads, and carve out "cookie cutter" house lots without regard for constraints of the land, while increasing housing costs. In addition, conventional ordinances have done little to promote cooperation among the building community, the state, and local officials. The end result has been a monotonous land use pattern that has failed to recognize natural landscape features, preserve large tracts of open space, or protect critical resources.

This process also created conflicts between those who want new growth and those who want to protect critical resources. The goals of growth and environmental protection can coexist more harmoniously if more innovative land use planning and management techniques are utilized.

Special Purpose Programs

Municipalities can adopt a number of regulatory tools to help prevent nonpoint source pollution problems. Some of these measures are authorized by the Rhode Island Zoning Enabling Act of 1991; others are authorized by specific enabling statutes. Communities may elect to incorporate these measures directly into their zoning and/or subdivision ordinances or develop separate ordinances/programs. These local measures may include, but are not limited to:

- Wastewater Management Districts

- Stormwater Management
- Soil Erosion and Sediment Control
- Underground Storage Tanks
- Earth Removal
- Overlay Districts
- Development Plan (Site Plan) Reviews
- Cluster Zoning/Flexible Zoning/Planned Unit Development
- Phased Growth Controls
- Transfer of Development Rights
- Land Trusts

The first five measures listed above are covered in Chapter 02-01 of this Plan. Specifically, wastewater management districts are covered in Chapter 02-01-01; stormwater management is covered in Chapter 02-01-02; erosion and sediment control is covered in Chapter 02-01-04; underground storage tanks are covered in Chapter 02-01-08; and earth removal is covered in Chapter 02-01-12. One of the measures listed above -- overlay districts -- is reviewed below. The remaining five measures listed above are briefly described in Appendix F. For more information regarding innovative land use techniques, two good sources are The Growth Management Handbook (Massachusetts Executive Office of Communities and Development and the Pioneer Valley Planning Commission, 1988) and the Rhode Island Community Nonpoint Source Pollution Management Guide (RIDEM, 1994b). Another useful guide will be the *Rural Design Manual*, slated for publication by the RI Nonpoint Source Pollution Management Program in the fall of 1995.

An overlay district is a land management technique that allows additional restrictions or conditions to be placed on activities in designated areas without changing the current zoning. As authorized by the Rhode Island Zoning Enabling Act of 1991, municipalities can use overlay districts to achieve control over land use and development densities within a community and to help prevent cumulative impacts on surface waters, groundwaters, and/or wetlands. (Generally, state regulations do not address cumulative development impacts.) Overlay districts can also be used to protect a group of critical resources within greenway corridors or to establish natural resource protection districts. Environmental protection purposes for overlay districts include, but are not limited to:

- Water supply resources (surface and ground)
- Stream and river corridors
- Floodplains
- Critical habitats
- Open space
- Wetlands
- Hydric soils
- Agricultural lands
- Greenways

Land Development and Subdivisions

Through the passage of the Rhode Island Land Development and Subdivision Review Enabling Act of 1992 (RIGL 45-23-25 et seq.), the State of Rhode Island updated and expanded the authority of local communities to develop regulations that apply to all new development. Rhode Island's enabling legislation states that the regulations shall, among other things: promote safety from floods, secure adequate drainage and provide erosion controls to mitigate stormwater runoff, and conserve natural beauty and other natural resources. Along with Comprehensive Plans and zoning ordinances, the new development review regulations also address: street lengths, widths, and grades; sidewalks, curbs, and gutters; and landscaping.

Through development review regulations, communities can achieve a great deal of environmental protection. Too often in the past, local regulations have allowed generic development patterns (a conventional, geometric arrangement of housing units) to overwhelm and disrupt natural patterns of forest and farmland. These patterns also interfere with natural functions of watersheds and wetlands. Generic development patterns may be appropriate for flat, rectangular pieces of land without significant natural resources or physical constraints. However, when land is hilly, rocky, or close to the coastline, surface waters, or wetlands, or if it has other unique features or constraints, this arrangement becomes economically and environmentally costly.

Development review regulations are another mechanism for implementing the resource protection goals set forth in Comprehensive Plans. Some Rhode Island communities have designed development review regulations to:

- Encourage road designs that conform to existing land contours, helping to retain natural drainage patterns.
- Regulate the use of steep, rocky, or wet areas and preserve open space.
- Require avoidance of unstable, highly erodible, or hydric (wet) soils.
- Stipulate the distance between septic systems and critical resources.
- Require state-of-the art stormwater management systems that protect water quality.
- Order the installation of soil erosion and sediment controls.
- Stipulate the rate of development.

A community's development review regulations must conform to the policies and goals outlined in its Comprehensive Plan and reflect the standards incorporated in its zoning

ordinance. The Act also requires that all land developments (not just residential developments) be subject to review for their impact on the community. This review procedure must proceed in a regulated process similar to subdivision review.

Policies and Recommendations

POLICY 3.1 Enhance growth management, protect water quality, and preserve other critical resources by adopting and implementing innovative and effective land use management techniques as part of municipal land use management programs.

RECOMMENDATIONS:

Zoning

(1) Municipalities should adopt more innovative, flexible land use management techniques to accommodate new growth without damaging critical resources (see Appendix F for examples). Municipalities should not adopt any unfamiliar techniques without consultation with a professional planner and the city or town solicitor. For more information regarding innovative land use techniques, good sources are The Growth Management Handbook (Massachusetts Executive Office of Communities and Development and the Pioneer Valley Planning Commission, 1988) and the Rhode Island Community Nonpoint Source Pollution Management Guide (RIDEM, 1994b).

(2) Municipalities should adopt appropriate standards in zoning ordinances and implement a Development Plan Review procedure (formerly known as a site plan review) to ensure that development allowed by right or substandard "grandfathered" lots are sited properly and comply with minimum standards to protect water quality, wetlands, and other critical areas. This review procedure should include but not be limited to the following standards: stormwater runoff, soil erosion, vegetated setbacks, and hazardous materials. See Chapters 02-01-02, 02-01-04, and 02-01-09 of this Plan for further discussion of these issues.

(3) In order to identify potential impacts of a proposed development project and any conflicts between local and state jurisdiction, municipalities should establish a pre-application conference procedure. Early in the design process, the builder and appropriate local and state officials should meet, so that their concerns can all be addressed. Such a review can identify and encourage innovative designs, technologies, and construction techniques, avoid critical resources and, possibly, the need for

certain state permits. Such a program has been available in coastal communities since the mid-1980s and appears to be working well when all of the officials participate.

(4) In recognition that any ordinance is only as good as its implementation and enforcement, municipalities should encourage local officials -- namely, zoning enforcement officers, zoning board members, and planning board members -- to participate in ongoing training programs addressing zoning and land use regulations. This training should help to ensure that local officers and board members are equipped with the knowledge, skills, and qualifications necessary to provide equitable and uniform decisions. The municipal training programs administered by URI Cooperative Extension (URI/CE) and URI's Coastal Resources Center should continue to be used as a vehicle for enhancing local officials' knowledge and understanding of land use regulations. If necessary, consideration should be given to institutionalizing the URI training programs by developing a "basic training" curriculum that could be easily used by state agency/private sector planners to conduct regular training in basic planning and nonpoint source pollution management issues for new board members. URI/CE should take the lead in developing this curriculum, with support from RIDOP, the RI Chapter of the American Planners Association (RI/APA), RIDEM, and others.

(5) The R.I. Bar Association should be encouraged to develop a continuing legal education program that specifically addresses land use law in Rhode Island and its relation to environmental resources. It is imporatnt for city and town solicitors who have proficiency and practical experience in land use law.

(6) The R.I. Division of Planning (RIDOP), in conjunction with RIDEM and RI/APA, should continue to serve as the clearinghouse for innovative land management techniques that protect critical resources while accommodating balanced growth. This consortium should enhance efforts to develop technical handbooks, workshops, and model ordinances to make local planning officials aware of new land use techniques and the "how to's" of implementation. These efforts should be closely coordinated with the municipal training programs administered by URI/CE and URI's Coastal Resources Center (see Recommendation (4), above).

(7) The R.I. Conservation Districts should consider broadening the scope of their community technical assistance program to include a full development plan review service, on a contractual basis.

(8) A minimum average residential density of two acres per housing unit

should be established and maintained within watersheds and aquifers used for public drinking supplies, areas served by on-site wells, and other critical areas. However, this recommendation is based on the assumption that other appropriate land use and pollution control recommendations cited in this plan are implemented. Since there is no guarantee that such recommendations will in fact be adopted, and since there may be existing development that is not consistent with water quality protection, a minimum average density in excess of two acres may be necessary in some critical areas.

(9) For the purpose of protecting high-quality waters, municipalities should consider utilizing the land use classification system and mitigative measures, described in Appendix G, as a guide in future revisions to local Comprehensive Plans and zoning ordinances.

(10) In accordance with the land use classification system described in Appendix G, municipalities should consider prohibiting or limiting Class C.2 (medium-density residential), D.2 (high-density residential), D.3 (high-risk commercial), D.4 (light industrial), and E (severe risk) land uses within watersheds and aquifers of public water supplies, if possible. If any of these uses are to be considered within aquifers or watersheds, they should be subjected to a site plan review process, including professional review, to determine the most appropriate mitigative measures to protect water quality. The mitigative measures listed for the B.1 classification should be used as a starting point for the site plan review. RIDOP and RIDEM's Nonpoint Source Pollution Management Program can provide more specific information regarding mitigative measures to accommodate development.

Special Purpose Programs

(11) Where appropriate, municipalities should adopt the following special-purpose environmental ordinances, as authorized under existing state law:

A) Wastewater management districts.

B) Stormwater management ordinances.

C) Soil erosion and sediment control ordinances.

D) Underground storage tank ordinances.

E) Earth removal (sand and gravel) ordinances.

F) Overlay districts.

(12) The State should adopt enabling legislation to authorize municipalities to implement stormwater utility districts to mitigate existing land use impacts on critical resources.

(13) Municipalities and the State should seek to establish sustainable and dependable funding sources to support land acquisition, preservation, and other activities undertaken by community land trusts, as well as other local actions undertaken in accordance with A Greener Path ... Greenspace and Greenways for Rhode Island's Future (RIDOP, 1994). Consideration should be given to the establishment of park enhancement districts and/or special park districts.

Land Development and Subdivisions

(14) Communities should carefully evaluate their existing subdivision/development review regulations and reduce or eliminate any requirements that are not necessary for public safety and that may be contributing to environmental impacts. For example, many rural and suburban towns have excessive subdivision road requirements, including curbs and widths that can be twice the size of existing town roads. A 36-foot wide subdivision road, which is not an uncommon requirement, will generate greater stormwater runoff volume than a 28-foot road. (Minimum lane width for a residential street is 10 feet.) To avoid the need for costly structural drainage collection devices, the requirement for curbs should be relaxed whenever side-of-the-road drainage is feasible. Wide roads, curbs, and structural drainage systems are also very costly for local governments to maintain. Guidelines should be developed for use by municipalities in determining the lowest minimum road widths practicable, given local needs for on-street parking and access by fire trucks, other emergency vehicles, and buses. In addition, local parking requirements should be reexamined, with guidelines developed for realistic minimum standards and with recommendations for creative alternatives such as shared parking arrangements or gravel overflow parking areas.

(15) Communities should include provisions in their new development review regulations that better protect water resources from nonpoint source pollution, while accommodating development in a more creative way and streamlining the development review process.

02-03 PROGRAMMATIC AND POLICY ISSUES

02-03-01 Administration, Coordination, and Enhancement of Nonpoint Source Pollution Management

Given the long list of federal, state, and local agencies, university programs, and private sector groups that are actively involved with nonpoint source (NPS) pollution management in Rhode Island (see Chapter 02-04), as well as the number and diversity of projects funded by the RI NPS Program, program coordination and administration are key components of the statewide NPS pollution management framework. As such, there is an ongoing need to thoroughly coordinate and integrate the multitude of NPS programs and projects, share resources, promote interdisciplinary projects, and avoid duplication of efforts.

As federal laws governing NPS pollution control -- particularly the Clean Water Act and Section 6217 of the Coastal Zone Act Reauthorization Amendments -- are reauthorized and potentially modified, the RI NPS Program will need to stay abreast of any such changes and coordinate any required revisions to state programs. Likewise, the program will need to assess any proposed revisions to existing state laws, policies, and regulations governing NPS pollution control.

Apart from any statutory or regulatory changes, the field of NPS pollution management will no doubt continue to evolve and expand as new best management practices are identified and found to be effective. Accordingly, the RI NPS Program will need to stay informed of current trends and new technologies to be capable of incorporating these advances into regulatory programs and subsequent NPS control projects, and revise this plan as needed.

Finally, an ongoing concern associated with the RI NPS Program has been the exclusive reliance on federal 319 monies and state matching funds and the lack of a dedicated state revenue source for NPS pollution management. The program will therefore need to continue its efforts to seek new or alternative funding sources to address NPS pollution issues throughout the state.

02-03-02 Policies and Recommendations

(1) Continue to oversee the implementation and administration of all Section 319 projects.

(2) Continue to evaluate regulatory programs for their effectiveness in addressing nonpoint source pollution problems. Continue to assist with any necessary revisions to existing RIDEM regulations relating to NPS pollution management and/or the development of any new laws, policies, or regulations relating to NPS pollution management.

(3) Continue to evaluate and assess innovative technologies and new or improved best management practices that address NPS pollution control. Where appropriate, seek to incorporate these technologies and practices into revised regulatory programs and/or subsequent NPS pollution control projects.

(4) Pursue enhanced coordination and integration of NPS pollution management efforts throughout the state. Particular attention should be focused on coordinating the development of work plans and project proposals to promote interdisciplinary cooperation and avoid duplication of effort.

(5) Ensure that the RI NPS Program remains consistent with all applicable federal statutes, including any changes made to Section 319 of the Clean Water Act or Section 6217 of the Coastal Zone Act Reauthorization Amendments.

(6) Continue to explore options for establishing a dedicated state revenue source, or some other alternative funding mechanism, for NPS pollution management.

(7) Continue to revisit and update or revise the RI Nonpoint Source Pollution Management Plan as needed.

02-04 AGENCIES, PROGRAMS, AND FUNDING SOURCES

Due to the range and complexity of nonpoint pollution sources that must be managed to protect and restore water quality, the involvement of many different programs is crucial to the health of the state's water resources. All levels of government -- federal, state, and local -- as well as the private sector and the general public, have important roles to play. No single agency, program, or level of jurisdiction is adequately equipped to carry out the multitude of tasks associated with nonpoint source (NPS) pollution management.

It therefore follows that Rhode Island's Section 319 Program does not serve as the only means for addressing NPS pollution in the state. Many other agencies, groups, and organizations, drawing from a variety of funding sources, play important roles. In fact, the efficacy of the 319 Program is largely dependent on its ability to dovetail with other programs and build on other sources of funding.

The chart that begins on the following page identifies and characterizes the key public sector agencies, groups, and organizations in Rhode Island that carry out programs relating to NPS pollution management. Basic agency functions, as they relate generally to NPS pollution management, are provided in this chart; specific roles and responsibilities, as they relate to individual projects and activities, are noted in Chapters 02-01, 02-02 and 02-05.

While state agencies play a lead role in NPS pollution management, they are nonetheless dependent on local authorities for implementation of many protection and restoration measures and for managing growth and land use activities. The chart that follows does not include descriptions of municipal functions. However, it is important to recognize that cities and towns are very important participants in the statewide NPS pollution management scenario.

Finally, it should be re-emphasized that while the focus here remains on public sector agencies, groups, and organizations, a variety of private sector groups -- such as watershed organizations, citizen monitoring programs, environmental groups, and local businesses -- will no doubt continue to play very significant roles in the state's overall NPS pollution management efforts. Indeed, a number of the source-specific recommendations set forth in Chapter 02-01 of this Plan include references to various private sector groups. The omission of these groups from the following chart is due, first, to the primarily public sector orientation of this Plan and, second, to the practical difficulty of identifying and characterizing *all* applicable groups.

State Agency/Organization	Program	Governing Federal or State Statutes (if applicable)	Function	Source(s) of Funding
RIDEM - Division of Groundwater & ISDS Groundwater Section	Groundwater Protection Program	Groundwater Protection Act, 1985 (RIGL 46-13.1)	-coordination of departmental activities regarding groundwater protection -development/implementation of comprehensive groundwater protection program	EPA/State
RIDEM - Division of Groundwater & ISDS Groundwater Section	Groundwater Classification System	Groundwater Protection Act, 1985 (RIGL 46-13.1)	-development/implementation of statewide groundwater classification system and ambient groundwater quality standards	EPA/State
RIDEM - Division of Groundwater & ISDS Groundwater Section	Underground Injection Control (UIC) Program	Federal Safe Drinking Water Act	-regulation of nonsanitary subsurface disposal activities -maintenance of statewide UIC inventory -analysis of discharges from active or previously active sites -oversight of injection well closure activities	EPA/State
RIDEM - Division of Groundwater & ISDS Groundwater Section	Wellhead Protection Program	Federal Safe Drinking Water Act	-delineation of wellhead protection areas (WHPA) -identification of known and potential sources of groundwater contamination within the WHPAs -development of management approaches by the local governments and suppliers to protect the groundwater within WHPAs from contamination sources	EPA/State
RIDEM - Division of Groundwater & ISDS Groundwater Section	Well Drilling	Drilling of Drinking Water Wells (RIGL 46-13.2)	-regulation of drilling of private drinking water wells -licensing/registration of well drillers and pump installers -construction standards for private wells	State
RIDEM - Division of Groundwater & ISDS Groundwater Section	Technical Assistance	Groundwater Protection Act, 1985 (RIGL 46-13.1)	-public information -technical evaluations, review of ordinances -investigation of nonpoint contamination of private wells -technical assistance to municipalities for wellhead protection	EPA/State
RIDEM - Division of Groundwater & ISDS Individual Sewage Disposal System (ISDS) Section	ISDS Programs	RIGL 42-17.1-2 & RIGL 23-19.45	-regulation of the location, design, construction, alteration and maintenance of ISDSs -additional regulation of cumulative impacts of subdivision systems	Permit Fees
RIDEM - Division of Water Resources Construction Assistance Section	Construction Assistance Program	Federal Clean Water Act, Title VI; RIGL 46-12	-technical support to the RI Clean Water Finance Agency for administration of the State Revolving Loan Fund (SRF) -SRF grants available to fund nonpoint source projects consistent with this Plan, including landfill closures	State Bonds/EPA

State Agency/Organization	Program	Governing Federal or State Statutes (if applicable)	Function	Source(s) of Funding
RIDEM - Division of Water Resources Permits Section	RI Pollutant Discharge Elimination System (RIPDES) Program •Stormwater permitting program	Federal Clean Water Act, Section 402 RIGL 42-12, 42-17, 42-35	-regulation of stormwater discharges, either from a point source to waters of the state or indirectly through a separate stormwater system	EPA
RIDEM - Division of Water Resources Water Quality Section	Water Quality Programs •Water quality planning	Federal Clean Water Act, Section 604(b)	-policy development, water quality data assessment, monitoring needs determination. -regulation revision -oversight of statewide Clean Lakes Assessment grants	EPA
		Clean Lakes Section 314	-statewide Clean Lakes Assessment grants available to DEM for the assessment of lake water quality	EPA
	•Water quality certification Program	Federal Clean Water Act, Section 401 RIGL 46-12, 42-17.1, 42-17.6, 42-35	-certification that any proposal resulting in a discharge to state waters, including wetlands, is in compliance with RI Water Quality Regulations for Water Pollution Control	EPA
	•Aqua Fund	RIGL 42-106	-urban runoff prevention programs grants and loans	State Bonds
RIDEM - Division of Water Resources Narragansett Bay Project	Narragansett Bay Project	Federal Clean Water Act, Section 320 "National Estuary Program"	-development/implementation of the comprehensive conservation and management plan, an element of the state guide plan, recommending restoration and protection strategies for Narragansett Bay -development/implementation of Marina Pumpout siting plan -revision/update of state individual sewage disposal system regulations for improved pollution prevention	EPA 320 National Estuary Program EPA Section 104B Program
RIDEM - Office of Environmental Coordination	Nonpoint Source Pollution Management Program	Federal Clean Water Act, Section 319	-implementation of Rhode Island Nonpoint Source Pollution Management Plan, which is aimed at preventing and mitigating nonpoint sources of pollution -technical and financial assistance to agencies and organizations, with emphasis on implementation activities in high-priority watersheds and groundwater areas	EPA

State Agency/Organization	Program	Governing Federal or State Statutes (if applicable)	Function	Source(s) of Funding
RIDEM - Office of Environmental Coordination	Pollution Prevention Program	Hard to Dispose of Materials Control & Recycling Acct (RIGL 15.1) Used Oil Recycling Act (RIGL 19.6)	-establishment of a household hazardous waste collection facility -implementation of a used oil collection system -education and outreach	User fee on hard to dispose of materials User fee on hard to dispose of materials Department of Energy
RIDEM - Office of Environmental Coordination	Litter and Recycling Program	RI Litter Control and Recycling Act (RIGL 37-15)	-financial and technical assistance to municipalities for litter collection programs -financial assistance to the Department of Corrections for highway cleanup -school and public educational programs	Annual fees on sale of carbonated beverages/ fast foods
RIDEM - Division of Freshwater Wetlands	Freshwater Wetlands Program	RI Freshwater Wetlands Act (RIGL 2-1-18-2-1-24)	-permitting and enforcement -regulation of activities in or near freshwater wetlands to avoid or minimize impacts to functions and values of wetlands, as defined by the rules and regulations	Permit Fees; State General Funds
RIDEM - Division of Agriculture	Integrated Pest Management Program (IPM)	RI Pesticide Control Act, 1976	-technical and financial assistance to encourage alternatives to traditional pesticides use	State pesticide registration fees
RIDEM - Division of Agriculture	Pesticide Program	Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), 1976; RI Pesticide Control Act, 1976	-enforces laws regulating private, commercial and residential sale, use and application of pesticides for the purpose of protecting the environment and human health	State/EPA
RIDEM - Division of Agriculture	Pesticide and Fertilizer Groundwater Protection Program	FIFRA, 1976; RI Pesticide Control Act, 1976	-technical assistance, monitoring, and coordination of responses to point and nonpoint sources of pollution from pesticides and nitrogenous fertilizers for the purposes of preventing, regulating, and remediating groundwater contamination	EPA/State
RIDEM - Division of Agriculture	Agricultural Ecology Program	RI Freshwater Wetlands Act, 1971 (RIGL 2-1-18-2-1-24)	-assistance to farmers in avoiding impacts on the environment, particularly waterbodies and wetlands, from agricultural operations, including composting, through educational outreach/ regulation	State

State Agency/Organization	Program	Governing Federal or State Statutes (if applicable)	Function	Source(s) of Funding
RIDEM - Division of Waste Management		RIGL 23-18.9, 23-19, 43-17.1	-regulation of facilities that provide for the disposal of solid waste, medical waste, and hazardous waste -regulation of all generators of hazardous waste	
	Underground Storage Tank Registration Program		-regulation of petroleum products and hazardous materials stored underground	State/ Federal
	Hazardous Waste Manifest Program		-regulation of the transport of hazardous waste	State/ Federal
	Landfill Groundwater Monitoring Program		-detection of nonpoint source pollution threats to groundwater quality and adjacent to the landfill	State
RIDEM - Division of Forest Environment	Forestry Program	RI Protection of Trees and Plants Generally, 1938 (RIGL 2-15-8)	-provision of technical assistance to loggers to reduce nonpoint source pollution -provision of technical support/education on urban reforestation and land preservation	State (no funding specifically for nonpoint source pollution management)
Coastal Resources Management Council (CRMC)	RI Coastal Resources Management Program •Permit Program	1972 Coastal Zone Management Act (CZMA) RIGL Section 46-23	-regulation of activities in or near coastal features to protect, preserve, and, where possible, to restore coastal resources	Permit Fees/ State and Fed. (NOAA) Appropria-tions
	•Consistency Review	1972 Coastal Zone Management Act, Section 307	-review of federal activities and federal licensing and permitting for consistency with the enforceable policies of RICRMP	NOAA
	•Municipal Harbor Management Plan Program	1972 Coastal Zone Management Act	-assistance to municipalities in developing Harbor Management Plans & Ordinances to address problems including water quality and marine litter	NOAA
	•Special Area Management Plans	Coastal Zone Management Act Section 303(3)	-development/implementation of watershed based management plans to protect specific natural resource areas	NOAA
	•Coastal Nonpoint Pollution Control Program	Coastal Zone Act Reauthorization amendments of 1990	-development/implementation a coastal nonpoint pollution program for coastal water via enforceable policies -coordination with coastal zone management and other nonpoint source management programs	NOAA

State Agency/Organization	Program	Governing Federal or State Statutes (if applicable)	Function	Source(s) of Funding
RI Rivers Council	RI Rivers Program	RI Rivers Council 1991 (RIGL 46-28)	-preparation of state rivers policy and classification plan for rivers -recognition of local watershed councils -promotion of public involvement river use planning/decision making	
RI Department of Health Office of Drinking Water Quality	Public Water System supervision Program Private Well Surveillance Program	RIGL 46-13 and Federal Safe Drinking Water Act	-regulation and monitoring of public drinking water supplies -monitoring of private wells vulnerable to contamination -public education and technical assistance	
RI Water Resources Board	RI Public Drinking Water Protection Program	Public Drinking Water Protection Act of 1987 (RIGL 46-15.3)	-aminister Water Quality Protection Funds, which provide for the acquisition of property by water suppliers, per each supplier's approved Water Quality Protection Plan	Water Quality Protection charge, paid by suppliers and augmented by investment of funds in revenue bond market
RI Department of Administration Division of Planning State Planning Council	Statewide Planning Program Planning Assistance	Statewide Planning Program 1978 (RIGL 42-11-10) Comprehensive Planning and Land Use Regulation Act 1988 (RIGL 45-22.2)	-preparation of strategic plans -adoption of State Guide Plan Elements -lead agency for RI Geographic Information System -review of local comprehensive plans -provision of handbooks and information on local planning and land use	State/Federal State

State Agency/Organization	Program	Governing Federal or State Statutes (if applicable)	Function	Source(s) of Funding
University of Rhode Island Cooperative Extension; Department of Natural Resources	Cooperative Extension, Water Quality Programs • Land & Water Resource Management Training • Nutrient, Animal Waste, Pesticide, & Irrigation Water Management • Environmental Education • Volunteer Citizen Water Quality Monitoring	Smith Lever Act, 1914	-assistance to land owners and municipal officials in preventing water quality degradation from residential and agricultural practices -education of decision makers on nonpoint source pollution management strategies -education of public to identify/reduce nonpoint source pollution -administration of volunteer water quality monitoring program, including volunteer training and support, data analysis and evaluation, research, and public education -technical assistance to agricultural producers and landscape professionals in nutrient and pesticide management	U.S. Department of Agriculture/ State •Nat'l Water Quality Initiative •Nat'l Estuary Program •Hydrologic Unit Area Project •RREA
University of Rhode Island Coastal Resources Center				

State authorized Agency/Organization	Program	Governing Federal or State Statutes (if applicable	Function	Source(s) of Funding
State Conservation Committee		RI Soil Conservation Act, 1943 (RIGL 2-4)	- provision of leadership and coordination to the RI Conservation Districts and cooperating agencies regarding the preparation and implementation of natural resources conservation programs	State legislative appropria-tion/RIDEM (1995)
Conservation Districts		RI Soil Conservation Act, 1943 (RIGL 2-4-7 et seq.)	-assistance to municipalities in implementing natural resource protection ordinances -assistance to municipalities in designing and implementing water quality improvement projects -environmental education	dues, fund raising, grants
	Site Plan Review Program		-technical assistance to municipalities and land owners to further conservation and preservation of soil, water and forest resources -technical review of site development proposals for municipalities and post-construction site inspection	federal in-kind services fees

Federal Agency/Organization	Program	Governing Federal or State Statutes (if applicable)	Function
Natural Resources Conservation Service (NRCS)	Water Resources Program	Federal Soil Conservation Act, 1935 (PL74-46) Watershed Protection and Flood Prevention Act of 1954 (PL 83-S66) Agricultural Reorganization Act, 1994 (PL 103-354)	-provision of technical and/or financial assistance to communities for watershed planning, surveys and investigations -provision of technical assistance to address impacts on water quality from agricultural irrigation -provision of technical assistance for cooperative efforts in river basin
Natural Resources Conservation Service	Soils Program	Federal Soil Conservation Act, 1935 (PL 74-46) Agricultural Reorganization Act, 1994 (PL 103-354)	-distribution and maintenance of the Soil Survey of RI -on-site soil investigations -soil education programs
Natural Resources Conservation Service	Wetlands Program	Food Security Act, 1985, as amended Federal Clean Water Act Agricultural Reorganization Act, 1994 (PL 103-354)	-wetlands determinations on agricultural land for US Department of Agriculture program needs and the Clean Water Act
Natural Resources Conservation Service	Conservation Planning	Federal Soil Conservation Act, 1935 (PL 74-46) Agricultural Reorganization Act, 1994 (PL 103-354)	-assistance to landowners to install conservation practices that control erosion, reduce runoff and manage wastes -inventory of natural resources and management planning
Consolidated Farm Service Agency (CFSA)	Consolidated Farm Service	Soil Conservation and Allotment Act, 1935 Agriculture Adjustment Act, 1938 Agricultural Reorganization Act, 1994 (PL 103-354)	-administration of US Department of Agriculture cost-share programs, including some soil and water conservation practices
US Army Corps of Engineers (ACE)	Section 22 Program Water Resources Planning Assistance to States	Water Resources Development Act of 1974 (PL 93-251, as amended)	-planning and technical assistance to states, local governments, and regional organizations -eligible activities include engineering and environmental studies for water and related land resources, on topics such as navigation, environmental restoration, water supply, water quality, combined sewer overflows, stormwater management, support to coastal zone management, and others -requesting agency must pay 50 percent of the cost
US Army Corps of Engineers	Flood Plain Management Services	Flood Control Act of 1960, Section 206	-technical assistance to states and local governments -eligible activities include technical assistance in the area of flooding, flood damage mitigation, flood plain management, and the like -studies are 100 percent federally funded
US Army Corps of Engineers	Section 404 Dredge and Fill Permit Program	Federal Clean Water Act, 1972	-regulation of discharges of dredged material or fill to the waters of the United States, including nonpoint discharges of sediment/dredged material

US Army Corps of Engineers	Defense Environmental Restoration Account (DERA)	PL 98-212	-environmental restoration of facilities formerly used by the Department of Defense
US Army Corps of Engineers	Section 1135	Water Resources Development Act of 1986 (33 U.S.C. 2294 et seq)	-restoration of wetlands/waters used by the ACE for dredged material disposal

Federally Authorized Agency/Organization	Program	Governing Federal or State Statutes (if applicable)	Function	
RI Resource Conservation and Development Council Inc. (RC&D)	Resource Conservation and Development	Agriculture and Food Act, as amended, 1981 (PL 9S-217)	-assistance to communities, state agencies and non-profits on natural resource management, land use planning and economic development issues -preparation of site specific environmental assessments and management plans for communities and non-profits -preparation of natural resource inventories -technical and financial assistance -environmental education	**Local, State, Federal private foundation**

02-05 IMPLEMENTATION SCHEDULE

This chapter provides a generalized implementation schedule for addressing the recommendations set forth in Chapters 02-01 and 02-02. It is important to emphasize that priorities, strategies, applicable parties, and funding opportunities may shift over time and thus lead to various schedule changes. This chapter is therefore not intended to serve as a specific blueprint; rather, it should serve as a general outline to help guide implementation activities over the next four years.

All of the recommendations listed in the following tables are condensed versions of the same recommendations that appear previously in the Plan, and they are numbered accordingly. The tables include four columns -- one for each of the next four federal fiscal years -- signifying when the recommendations will likely be pursued. Codes are also used to indicate funding source projections and applicable parties. The key for the three codes pertaining to funding source projections is as follows:

1	The recommendation relates to an ongoing/programmed activity, for which funding is available.
2	The recommendation relates to a prospective activity, not yet programmed, for which funding is, or likely will be, available.
3	The recommendation relates to a proposed or suggested activity, the implementation of which will be wholly dependent on the availability of additional funds, including but not limited to Section 319 funds.

With regard to applicable parties, the following abbreviations are used:

CE - University of Rhode Island/Cooperative Extension
CRC - University of Rhode Island/Coastal Resources Center
CRMC - RI Coastal Resources Management Council
DFE - RIDEM's Division of Forest Environment
DOA - RIDEM's Division of Agriculture
DOH - RI Department of Health
DOP - RI Department of Administration, Division of Planning
DOT - RI Department of Transportation
DSR - RIDEM's Division of Site Remediation
DWM - RIDEM's Division of Waste Management
DWR - RIDEM's Division of Water Resources
FWW - RIDEM's Division of Freshwater Wetlands
GW - RIDEM's Division of Groundwater & ISDS (Groundwater Section)
ISDS - RIDEM's Division of Groundwater & ISDS (ISDS Section)
MCP - Municipalities

NBP - RIDEM's Narragansett Bay Project
NPS - RIDEM's Nonpoint Source Pollution Management Program
NRCS - USDA/Natural Resources Conservation Service
OBS - RIDEM's Office of Boating Safety
OEC - RIDEM's Office of Environmental Coordination
OSCR - RIDEM's Ocean State Cleanup & Recycling Program (OSCAR/OEC)
PP - RIDEM's Pollution Prevention Program (OEC)
RCD - RI Resource Conservation and Development Area
RICD - RI Conservation Districts
SWMC - RI Solid Waste Management Corporation
UST - RIDEM's Underground Storage Tank Program (Div. of Waste Mgmt.)

Category: **On-Site Sewage Disposal Systems**

Activities	FY96	FY97	FY98	FY99
(1) Continue to reevaluate OSDS regulations	1 (ISDS)	3 (ISDS)	3 (ISDS)	3 (ISDS)
(2) Pursue enhanced use of scientific methods for predicting siting factors	1 (CRC)	1 (CRC) 3 (ISDS)	1 (CRC) 3 (ISDS)	1 (CRC)
(3A) Pursue development and implementation of soils-based site evaluation system	3 (NRCS) 3 (ISDS) 3 (CE)	3 (NRCS) 3 (ISDS) 3 (CE)	3 (NRCS) 3 (ISDS) 3 (CE)	3 (NRCS) 3 (ISDS) 3 (CE)
(3B) Develop training handbook for designers		3 (CE)		
(3C) Establish training/certification program for site evaluators	2 (CE)	3 (CE)	3 (CE)	3 (CE)
(3D) Pursue funding source to cover program costs		3 (CE)	3 (CE)	3 (CE)
(4) Pursue development of improved mechanisms for assessing cumulative impacts; prepare guidance materials	1 (CRC)	1 (CRC) 2 (NPS)	1 (CRC) 2 (NPS)	1 (CRC)
(5),(22) Pursue increased use of effluent filters	1 (CE) 1 (ISDS)	2 (CE) 2 (ISDS)	2 (CE) 2 (ISDS)	
(6) Consider expanding reserve leachfield requirements	1 (ISDS)			
(7) Pursue increased use of alternating systems with reserve leachfields	1 (ISDS)			
(8),(24) Pursue ban on/discourage use of garbage disposals		2 (NPS)		
(9),(23) Continue to require use of low-volume plumbing fixtures	1 (MCP)	1 (MCP)	1 (MCP)	1 (MCP)
(10) Pursue increased use of alternative OSDS technologies	1 (ISDS) 1 (CRMC) 1 (CE)	1 (CRMC) 2 (ISDS) 2 (CE)	1 (CRMC) 3 (ISDS) 3 (CE)	1 (CRMC) 3 (ISDS) 3 (CE)
(11) Update and revise OSDS regulations to allow for new technologies	1 (ISDS)	3 (ISDS)	3 (ISDS)	3 (ISDS)
(12) Develop standardized mechanism for reviewing, approving, and tracking permit proposals involving alternative OSDS technologies; develop baseline data on performance of new OSDS technologies	3 (ISDS)			
(13) Pursue linking of permits for alternative OSDS to maintenance/monitoring requirements and other guarantees	1 (ISDS)	2 (ISDS)	2 (ISDS)	2 (ISDS)
(14),(18),(32),(36) Continue providing field training on design, installation, operation, and maintenance of alternative OSDS technologies; consider extending this training program to include septage pumpers and haulers; pursue funding source to cover program costs	1 (CE) 1 (ISDS) 3 (NRCS)	2 (CE) 2 (ISDS) 3 (NRCS)	3 (NRCS) 3 (ISDS) 3 (CE)	3 (NRCS) 3 (ISDS) 3 (CE)
(15) Establish a certification or licensing requirement for OSDS designers	3 (CE) 3 (ISDS)	3 (CE) 3 (ISDS)		
(16) Evaluate and pursue enhanced treatment requirements for large-scale OSDS	1 (ISDS)	2 (ISDS)		
(17) Consider changes to OSDS regulations allowing good soils to be kept in place rather than removed	1 (ISDS) 2 (NRCS)	2 (ISDS) 2 (NRCS)		

(19) Continue to ensure proper inspections of OSDS installations	1 (ISDS)	2 (ISDS)	2 (ISDS)	2 (ISDS)
(20) Pursue mechanism to require OSDS designers to play bigger role during OSDS installations; ensure adequate training of installers		3 (ISDS) 3 (NPS)	3 (ISDS) 3 (NPS)	
(21) Pursue mechanism for protecting leachfields during on-site landscaping and construction activities	1 (ISDS)	2 (ISDS)		
(25) Pursue ban on/discourage use of phosphate detergents				3 (NPS)
(26) Continue to enforce ban on use of harmful OSDS additives and cleaners; pursue ban on advertising and sale	1 (ISDS)	1 (ISDS)	1 (ISDS) 3 (NPS)	1 (ISDS)
(27),(38) Pursue means for ensuring that OSDS are regularly inspected	1 (NPS) 1 (CRC)	1 (CRC) 2 (NPS)	1 (CRC) 2 (NPS)	1 (CRC) 2 (NPS)
(28) Pursue adoption and implementation of wastewater management districts	1 (NPS)	2 (NPS)	2 (NPS)	2 (NPS)
(29) Develop computer program for administration of wastewater management districts		2 (NPS)		
(30) Require state grant/loan recipients to accept septage from unsewered communities	1 (DWR)	2 (DWR)	2 (DWR)	2 (DWR)
(31) Pursue use of operating permits as means for requiring maintenance of certain types of OSDS	1 (ISDS)	3 (ISDS)	3 (ISDS)	3 (ISDS)
(33),(46),(47) Conduct enhanced public education and outreach programs addressing OSDS care, maintenance, and repairs	1 (NPS) 1 (CE)	2 (NPS)		
(34) Pursue public education initiative targeting prospective homebuyers		3 (CE)		
(35) Index and computerize historical OSDS records for use by public				3 (ISDS)
(37) Develop checklist covering proper procedures for OSDS inspections	2 (CE)	2 (CE)		
(39) Pursue targeted inspection/enforcement projects in priority areas		3 (ISDS)		
(40),(43),(44) Pursue mechanisms to ensure that failing/malfunctioning/substandard cesspools/OSDS are repaired/replaced/modified	1 (ISDS)	2 (ISDS)	2 (ISDS)	2 (ISDS)
(41) Strengthen OSDS repair policy	1 (ISDS)	2 (ISDS)	2 (ISDS)	2 (ISDS)
(42) Evaluate alternatives for replacement of failed OSDS	1 (ISDS)	2 (ISDS)	2 (ISDS)	2 (ISDS)
(45) Provide technical assistance, and pursue financial assistance, to help landowners rectify failing cess pools/OSDS	2 (NPS) 3 (MCP)	2 (NPS) 3 (MCP)	2 (NPS) 3 (MCP)	2 (NPS) 3 (MCP)
(48) Establish centralized data base for tracking and evaluating OSDS failures		3 (ISDS)		

Category: **Surface Runoff**

Activities	FY96	FY97	FY98	FY99
(1) For new development projects subject to state review, ensure that appropriate stormwater management measures are employed	1 (CRMC) 1 (DWR)	1 (CRMC) 1 (DWR)	1 (CRMC) 1 (DWR)	1 (CRMC) 1 (DWR)
(2) Pursue adoption of municipal stormwater runoff ordinances	3 (MCP)	3 (MCP)	3 (MCP)	3 (MCP)
(3),(16) Assist municipalities with review of stormwater plans and designs; conduct site visits for compliance with stormwater runoff ordinances; provide guidance and technical assistance to municipalities on stormwater management issues	1 (RICD) 2 (NPS)	1 (RICD) 2 (NPS)	1 (RICD) 2 (NPS)	1 (RICD) 2 (NPS)
(4),(5) Pursue enhanced coordination of state and local regulatory programs governing stormwater; explore possibility of combing all state regulatory reviews for stormwater into single division	2 (NRCS) 2 (DWR) 2 (CRMC) 2 (NPS) 2 (RICD)	2 (NRCS) 2 (DWR) 2 (CRMC) 2 (NPS) 2 (RICD)	2 (NRCS)	
(6) Encourage applicants seeking approval for tie-ins to state drainage systems to use appropriate BMPs	2 (DOT)	1 (DOT)	1 (DOT)	1 (DOT)
(7) Evaluate and, if necessary, revise Stormwater Manual		3 (CRMC) 3 (DWR) 3 (RICD)	3 (CRMC) 3 (DWR) 3 (RICD)	
(8) Encourage use of innovative designs and techniques for treating stormwater	2 (NPS) 3 (RICD) 3 (NRCS) 3 (CRMC) 3 (DWR)	2 (NPS) 3 (RICD) 3 (NRCS) 3 (CRMC) 3 (DWR)	2 (NPS) 3 (RICD) 3 (NRCS) 3 (CRMC) 3 (DWR)	2 (NPS) 3 (RICD) 3 (NRCS) 3 (CRMC) 3 (DWR)
(9),(10) Employ streambank/shoreline stabilization techniques, and/or establish or enhance buffers/greenways along waterbodies, where appropriate	1 (CRMC) 1 (DWR) 2 (NPS) 2 (NRCS) 2 (MCP)	1 (CRMC) 1 (DWR) 2 (NPS) 2 (NRCS) 2 (MCP)	1 (CRMC) 1 (DWR) 2 (NPS) 2 (NRCS) 2 (MCP)	1 (CRMC) 1 (DWR) 2 (NPS) 2 (NRCS) 2 (MCP)
(11),(22) Ensure that proper operation, maintenance, and inspection procedures are instituted for new/existing stormwater treatment systems, and that such issues are addressed in all appropriate forums	3 (CRMC)	3 (RICD) 3 (CRMC) 3 (DWR) 3 (MCP)	3 (RICD) 3 (CRMC) 3 (DWR) 3 (MCP)	3 (RICD) 3 (CRMC) 3 (DWR) 3 (MCP)
(12) Develop and distribute a standard inspection checklist for proper installation, operation, and maintenance of stormwater management measures		3 (RICD) 3 (DWR)	3 (RICD) 3 (DWR)	
(13) Provide technical assistance and outreach to subdivision homeowners' associations regarding operation and maintenance of stormwater BMPs and associated drainage systems		3 (NBP) 3 (RICD)	3 (NBP) 3 (RICD)	
(14) Develop tracking system to determine frequency and location of stormwater management measure inspection			3 (RICD) 3 (DWR)	
(15) Pursue adoption and implementation of municipal stormwater utility districts	3 (MCP)	2 (NPS) 3 (MCP)	2 (NPS) 3 (MCP)	3 (MCP)
(17) Encourage use of innovative techniques and maintenance strategies for controlling and treating stormwater runoff from existing development	1 (RICD) 2 (NPS) 2 (CE) 3 (NRCS) 3 (CRMC)	2 (NPS) 3 (RICD) 3 (NRCS) 3 (CE) 3 (CRMC)	2 (NPS) 3 (RICD) 3 (NRCS) 3 (CE) 3 (CRMC)	2 (NPS) 3 (RICD) 3 (NRCS) 3 (CE) 3 (CRMC)

(18) Conduct storm drain surveys	3 (MCP)	3 (MCP)	3 (MCP)	3 (MCP)
(19) Assess tie-ins to existing drainage networks to eliminate illegal connections	1/3 (DOT) 3 (MCP)	1/3 (DOT) 3 (MCP)	1/3 (DOT) 3 (MCP)	1/3 (DOT) 3 (MCP)
(20) Pursue watershed-based solutions to stormwater management, where appropriate	1 (NPS) 1 (NRCS) 2 (CRMC) 2 (CE)	1 (NRCS) 2 (NPS) 2 (CRMC) 3 (CE) 3 (RICD)	1 (NRCS) 2 (NPS) 2 (CRMC) 3 (CE) 3 (RICD)	1 (NRCS) 2 (NPS) 2 (CRMC) 3 (CE) 3 (RICD)
(21) Provide technical assistance to commercial facilities and other private sector entities not subject to RIPDES to assist with the prevention and mitigation of stormwater impacts	1 (RICD) 3 (NRCS)	3 (RICD) 3 (NRCS) 3 (NPS) 3 (PP)	3 (RICD) 3 (NRCS) 3 (NPS) 3 (PP)	3 (RICD) 3 (NRCS)
(23),(26) Pursue use of federal highway funds/state gas tax funds/ state matching funds for retrofitting/maintaining stormwater treatment systems associated with state roads	2 (DOT)	2 (DOT)	2 (DOT)	2 (DOT)
(24),(25) Identify priority sites for stormwater retrofits and new stormwater treatment systems; pursue the design and installation of retrofits and new treatment systems at priority sites	1 (NPS) 1 (RICD) 3 (NRCS) 3 (MCP)	2 (NPS) 2 (RICD) 3 (NRCS) 3 (MCP)	2 (NPS) 2 (RICD) 3 (NRCS) 3 (MCP)	2 (NPS) 2 (RICD) 3 (NRCS) 3 (MCP)
(27) Develop and implement training and education programs for professionals involved with the siting, design, installation, operation, maintenance, and inspection of stormwater treatment systems	2 (CE)	2 (RICD) 3 (CE)	3 (RICD) 3 (CE)	3 (RICD) 3 (CE)
(28) Develop and implement public education programs focusing on the reduction/elimination of discharges to stormdrains and other runoff conveyances	2 (CE)	3 (CE)	3 (CE)	3 (CE)
(29) Consolidate existing committees into central Stormwater Management Committee, and continue to meet regularly	1 (NRCS) 2 (RICD) 2 (DWR) 2 (CRMC) 2 (NPS)	1 (NRCS) 2 (RICD) 2 (DWR) 2 (CRMC) 2 (NPS)	1 (NRCS)	1 (NRCS)

Category: **Underground Discharges**

Activities	FY96	FY97	FY98	FY99
(1),(6),(13) Revise the UIC regulations; evaluate the need to restrict siting of new high-risk UICs in high-priority groundwater areas; incorporate requirements for implementing BMPs and proper system maintenance at UIC sites	1/2 (GW)			
(2) Update and refine a statewide stormwater policy regarding locations where different types of stormwater disposal practices should be utilized	2 (NRCS)	2 (NRCS)		
(3) Conduct targeted inventories of UIC sites in high priority groundwater areas	1 (GW)	2 (GW)		
(4),(16) Develop and implement incentive programs to encourage the closure of high-risk UICs in high-priority groundwater areas	3 (GW)	3 (GW)	3 (GW)	3 (GW)
(5) Update and enhance the tracking of UIC locations within GIS; establish mechanisms to provide this information to communities	1/3 (GW)			
(7) Continue to enforce the UIC regulations	1 (GW)			
(8) Conduct research to characterize the pollution potential of certain nonsanitary wastewaters		3 (GW)	3 (GW)	3 (GW)
(9) Encourage EPA to improve its compilation and distribution of data and information about subsurface disposal practices	1 (GW)	1 (GW)		
(10) Research/evaluate the design, maintenance, and operating effectiveness of oil-water separators		3 (GW)	3 (GW)	3 (GW)
(11) Enhance the computer tracking system for the UIC program	2 (GW)			
(12) Maintain an effective level of compliance activity and oversight of registered facilities	2 (GW)	2 (GW)	2 (GW)	2 (GW)
(14A) Prepare an updated information packet on UIC BMPs geared to small business operators, and conduct workshops	1 (GW)			
(14B) Provide technical assistance to small business operations regarding implementation of BMPs	1/2 (GW)	2 (GW) 3 (PP)	3 (GW) 3 (PP)	3 (GW)
(14C) Encourage local outreach and assistance projects targeted to UIC facility operators	1 (GW)	3 (GW) 3 (PP)	3 (GW) 3 (PP)	3 (GW)
(15) Target underground discharges in high-priority groundwater areas for inspection and enforcement to insure compliance with state requirements	1 (GW)	1/2 (GW)	3 (GW)	3 (GW)
(17) Evaluate the need for developing/expanding financial assistance or incentives for small businesses to overcome obstacles to closures of high-risk discharges		3 (PP)	3 (GW)	3 (GW)
(18) Coordinate with RIDEM/Site Remediation concerning UIC closures on sites also conducting other remedial activities	1 (GW)	1 (GW)	1 (GW)	1 (GW)
(19) Coordinate with RIDEM/Water Resources to ensure closure of UIC sites does not result in water quality impacts	1 (GW)	1 (GW)	1 (GW)	1 (GW)

Category: **Construction Activities**

Activities	FY96	FY97	FY98	FY99
(1) For construction projects subject to state review, ensure that appropriate soil erosion and sediment control measures are employed	1/2 (DWR) (FWW) (CRMC) (DOT)	1/2 (DWR) (FWW) (CRMC) (DOT)	1/2 (DWR) (FWW) (CRMC) (DOT)	1/2 (DWR) (FWW) (CRMC) (DOT)
(2) Pursue adoption of municipal soil erosion and sediment control ordinances	3 (MCP)	3 (MCP)	3 (MCP)	3 (MCP)
(3),(4) Assist municipalities with the review of soil erosion and sediment control plans and associated site visits, where appropriate; coordinate local and state reviews of soil erosion and sediment control plans	1 (RICD) 1 (DWR) 1 (FWW) 2 (MCP)	1 (RICD) 1 (DWR) 1 (FWW) 2 (MCP)	1 (RICD) 1 (DWR) 1 (FWW) 2 (MCP)	1 (RICD) 1 (DWR) 1 (FWW) 2 (MCP)
(5) Explore the possibility of combining all state regulatory reviews for stormwater and soil erosion control into a single division	1 (CRC) 2 (DWR) 2 (FWW) 2 (CRMC) 2 (NPS)	1 (CRC) 2 (DWR) 2 (FWW) 2 (CRMC) 2 (NPS)		
(6) Require projects using state funds to comply with soil erosion/ sediment control handbook	2 (CRMC) 1 (DWR) 1 (FWW)	2 (CRMC) 1 (DWR) 1 (FWW)	2 (CRMC) 1 (DWR) 1 (FWW)	2 (CRMC) 1 (DWR) 1 (FWW)
(7) Develop a soil erosion and sediment control measure inspection checklist	1 (RICD) 3 (DWR) 3 (FWW)	1 (RICD) 3 (DWR) 3 (FWW)	1 (RICD)	1 (RICD)
(8) Ensure that state contract provisions specifying the installation and maintenance of soil erosion and sediment control measures are properly managed, and that sites are routinely inspected				
(9) Explore the use of innovative designs and techniques for controlling erosion and sedimentation	1 (RICD) 2 (CE) 3 (NRCS) 3 (CRMC)	1 (RICD) 3 (NRCS) 3 (CE) 3 (CRMC)	1 (RICD) 3 (NRCS) 3 (CE) 3 (CRMC)	1 (RICD) 3 (NRCS) 3 (CE) 3 (CRMC)
(10) Evaluate and, if necessary, revise the soil erosion/sediment control handbook		3 (DWR) 3 (FWW) 3 (NRCS) 3 (CRMC)	3 (DWR) 3 (FWW) 3 (NRCS) 3 (CRMC)	3 (NRCS)
(11),(16) Develop and implement training programs for professionals involved with the control of erosion and sedimentation at construction sites	1 (RICD) 2 (CE)	1 (RICD) 3 (CE)	1 (RICD) 3 (CE)	1 (RICD) 3 (CE)
(12) Ensure that all regulatory programs governing the control of soil erosion and sedimentation are well-coordinated	1 (CRC) 2 (DWR) 2 (FWW) 2 (CRMC) 2 (MCP)	1 (CRC) 2 (DWR) 2 (FWW) 2 (CRMC) 2 (MCP)	1 (CRC) 2 (DWR) 2 (FWW) 2 (CRMC) 2 (MCP)	1 (CRC) 2 (DWR) 2 (FWW) 2 (CRMC) 2 (MCP)
(13) Address the need for proper maintenance in all BMPs, training seminars, and updates of the soil erosion/sediment control handbook	2 (RICD) 2 (CE)	2 (RICD) 2 (CE) 2 (DWR) 2 (FWW) 2 (NRCS) 2 (CRMC)	2 (RICD) 2 (CE) 2 (DWR) 2 (FWW) 2 (NRCS) 2 (CRMC)	2 (RICD) 2 (CE)

(14) Ensure that all chemicals, solid wastes, and other potential pollutants used during construction activities are properly used, stored, and disposed	3 (CRMC) 2 (DWR) 2 (FWW)	3 (CRMC) 2 (DWR) 2 (FWW)	3 (CRMC) 2 (DWR) 2 (FWW)	3 (CRMC) 2 (DWR) 2 (FWW)
(15) Identify and promote the use of non-harmful alternatives to harmful building/construction materials, where appropriate		2 (CRMC) 3 (NPS)	2 (CRMC) 2 (NPS)	2 (CRMC)

Category: **Agriculture**

Activities	FY96	FY97	FY98	FY99
(1) Pursue the development and implementation of integrated farm system plans, on a site-specific basis	1/3 (DOA) 1 (NRCS) 2 (CE)	1 (NRCS) 2 (CE) 3 (DOA)	1 (NRCS) 3 (CE) 3 (DOA)	1 (NRCS) 3 (CE) 3 (DOA)
(2) Develop and distribute a BMP source guide for agricultural operations	2 (NRCS) 3 (DOA) 3 (CE)	2 (NRCS) 3 (DOA) 3 (CE)	2 (NRCS) 3 (CE)	2 (NRCS) 3 (CE)
(3) Update the field office technical guide	1 (NRCS) 1 (DOA) 3 (CE) 3 (CRMC)	1 (NRCS) 1 (DOA) 3 (CE) 3 (CRMC)	1 (NRCS) 1 (DOA) 3 (CE) 3 (CRMC)	3 (CE)
(4) Pursue a targeted approach to on-site remediation efforts where there are known or suspected problems; develop procedures to address cases in which voluntary approaches prove ineffective and water quality threats or impacts persist	1/3 (DOA) 1 (NRCS)	1/3 (DOA) 1 (NRCS)	1/3 (DOA) 1 (NRCS)	1/3 (DOA) 1 (NRCS)
(5) Pursue a targeted approach to agricultural management in high-priority watersheds and aquifers	1 (NRCS) 1 (CE) 1 (DOA)	1 (NRCS) 1/3 (DOA) 2 (CE)	1 (NRCS) 1/3 (DOA) 3 (CE)	1 (NRCS) 1/3 (DOA) 3 (CE)
(6) Provide various forms of technical assistance and outreach to the agricultural community	1 (DOA) 1 (NRCS) 1 (CE)	1/3 (DOA) 1 (NRCS) 2 (CE)	1/3 (DOA) 1 (NRCS) 2 (CE)	1/3 (DOA) 1 (NRCS) 2 (CE)
(7) Implement the Management Plan for the Protection of Ground Water from Pesticides and Nitrogenous Fertilizers	1 (DOA)	1/3 (DOA)	1/3 (DOA)	1/3 (DOA)
(8) Promote the development and use of new technologies and innovative methods for controlling nonpoint source pollution from agricultural sources	1 (NRCS) 2 (CE) 3 (DOA)	1 (NRCS) 3 (CE) 3 (DOA)	1 (NRCS) 3 (CE) 3 (DOA)	1 (NRCS) 3 (CE) 3 (DOA)
(9) Research and analyze the production and effect of pathogens by animal operations in high-priority watersheds	2 (NRCS) 2 (DOH) 3 (DOA) 3 (CE)	2 (NRCS) 2 (DOH) 3 (DOA) 3 (CE)	2 (NRCS) 2 (DOH) 3 (DOA) 3 (CE)	3 (DOH) 3 (DOA) 3 (CE)

Category: **Lawn and Grounds Management**

Activities	FY96	FY97	FY98	FY99
(1) Develop and implement pollution prevention, education, and training programs for homeowners	1/3 (DOA) 1 (CE) 2 (OSCR) 3 (CRMC)	2 (CE) 2 (OSCR) 3 (DOA) 3 (CRMC)	2 (CE) 3 (OSCR) 3 (DOA) 3 (CRMC)	2 (CE) 3 (OSCR) 3 (DOA) 3 (CRMC)
(2) Incorporate lawn care and gardening practices into applicable school curricula	3 (DOA) 3 (RICD)	3 (DOA) 3 (RICD)	3 (DOA) 3 (RICD)	3 (DOA) 3 (RICD)
(3) Conduct training and certification programs for pesticide applicators	1 (DOA) 1 (CE)	1/3 (DOA) 2 (CE)	1/3 (DOA) 2 (CE)	1/3 (DOA) 2 (CE)
(4) Amend state law to include all commercial lawn care professionals under training and certification requirements; add training and certification process to current programs	3 (CE)	3 (CE) 3 (DOA)	3 (CE) 3 (DOA)	3 (CE) 3 (DOA)
(5) Develop and implement programs addressing pollution from turf management on golf courses and other non-residential landscaped areas; develop an environmental guide for golf courses and an associated training program, and once established, expand guide and program to cover turf management on other non-residential landscaped areas	2 (CE) 3 (DOA) 3 (NRCS)	2 (CE) 3 (DOA) 3 (NRCS)	3 (CE) 3 (DOA) 3 (NRCS)	3 (CE) 3 (DOA) 3 (NRCS)
(6) Ensure that new golf courses are properly sited, designed and constructed; develop appropriate guidelines, incorporating recommended BMPs	3 (DOA) 3 (DWR) 3 (FWW)	3 (DOA) 3 (DWR) 3 (FWW)	3 (DOA) 3 (DWR) 3 (FWW)	3 (DOA) 3 (DWR) 3 (FWW)

Category: **Silviculture**

Activities	FY96	FY97	FY98	FY99
(1) Uphold registration and intent-to-cut filing requirements for loggers	1 (DFE)	1 (DFE)	1 (DFE)	1 (DFE)
(2) Advise loggers to conduct their operations in accordance with BMP manual	1 (DFE)	1 (DFE)	1 (DFE)	1 (DFE)
(3) Print and distribute copies of the BMP manual	3 (DFE)			
(4) Conduct training and education workshops relating to the BMP manual	3 (DFE)	3 (DFE)	3 (DFE)	3 (DFE)
(5) Enforce wetlands permit requirements, where applicable	1 (FWW)	1 (FWW)	1 (FWW)	1 (FWW)
(6) Conduct workshops for local officials regarding the benefits of preserving land under the Farm, Forest, and Open Space Act and the Forest Legacy Program	3 (DFE)	3 (DFE)	3 (DFE)	3 (DFE)

Category: **Storage Tanks**

Activities	FY96	FY97	FY98	FY99
(1) Target compliance and enforcement activity in high-priority groundwater areas; initiate leak detection compliance inspections and focus on water supplies in which petroleum-related contaminants have been detected; coordinate with the wellhead protection program to respond to potential compliance concerns at sites reported via local pollution source inventories	1 (UST) 1 (GW)	2 (UST) 2 (GW)		
(2) Maintain an effective level of enforcement activity to ensure that leak detection requirements and other important operating practices are followed; enforce siting restrictions in wellhead protection areas and consider the need for additional protective requirements	1/3 (UST)	1/3 (UST)	1/3 (UST)	1/3 (UST)
(3) Improve and enhance the capabilities of the UST database to support program activities and allow linkage of critical UST data to GIS; update the UST and LUST coverages in GIS to reflect current information	1/2 (GW)	2 (GW)		
(4) Expand technical assistance and outreach activities to address the needs of UST facility owners; prepare written and other materials for distribution to target audiences of UST owners; conduct workshops to encourage understanding of UST regulatory requirements; publicize and explain the upgrading deadline applicable to motor fuel USTs	1/3 (UST)	1/3 (UST)	1/3 (UST)	1/3 (UST)
(5) Pursue a program to provide greater opportunities for providing financial assistance to UST owners		3 (UST)		
(6) Encourage local communities dependent on ground-water resources to exercise their existing legal authority to address the threat that may be associated with home heating oil tanks; provide technical assistance to communities to assess and mitigate concerns with home heating oil tanks in high-priority groundwater areas	2/3 (UST)	2/3 (UST)	2/3 (UST)	2/3 (UST)
(7) Develop a mechanism to ensure statewide identification of home heating oil tanks	1 (GW)			
(8) Develop and implement incentive programs to encourage the removal and, where necessary, replacement of underground heating oil tanks	3 (UST)	3 (UST)	3 (UST)	3 (UST)
(9) Conduct education and outreach activities directed at owners of home heating oil tanks in wellhead protection areas; develop specific education materials	1/2 (GW)			
(10) Incorporate into regulation a leak detection requirement for large heating oil USTs that have reached their expected life		2 (UST)		
(11) Develop and promulgate rules to implement the LUST Trust Fund Program		2 (UST)		
(12) Respond to suspected and confirmed leaking USTs located in critical areas	1/3 (UST)	1/3 (UST)	1/3 (UST)	1/3 (UST)
(13) Develop a program to identify and address abandoned USTs; seek a source of funding to execute the proper closure of USTs on properties that have been abandoned and seek reimbursement from the property owner if applicable		3 (UST)		

(14) Update and revise the Oil Pollution Control Regulations with respect to larger-scale AST facilities; consider siting restrictions on certain new facilities and development of a program that parallels the UST program	1 (DSR)	1 (DSR)		
(15) Inventory, inspect, and review the compliance status of larger-scale ASTs per the provisions of the state oil pollution control regulations; target inspection and enforcement activities in high-priority resource areas		2/3 (DSR)	2/3 (DSR)	
(16) Update and maintain the GIS data layer for larger-scale ASTs and incorporate this information into ongoing wellhead protection and surface water protection programs		2/3 (DSR) 2/3 (GW) 2/3(DWR)	2/3 (DSR) 2/3 (GW) 2/3(DWR)	
(17) Assist local entities in efforts to inventory residential and other small ASTs that pose a potential pollution threat				3 (GW)
(18) Conduct education and outreach activities targeted to the owners of small ASTs; support development of local incentive programs that facilitate the removal of improperly located ASTs or the installation of BMPs at these sites			3 (GW)	
(19) Support the design and construction of projects that demonstrate improved or more effective controls of stormwater runoff from AST facilities	2 (NPS)	2 (NPS)	2 (NPS)	2 (NPS)
(20) Ensure that spill response plans and capabilities are adequate at larger-scale AST facilities; participate in training exercises to maintain spill response readiness	1/2 (DSR)	1/2 (DSR)	1/2 (DSR)	1/2 (DSR)
(21) Continue the coordinated site investigation and remedial efforts aimed at assessing and mitigating the impacts of AST facilities along the Providence River and Upper Narragansett Bay	1/2 (DSR)	1/2 (DSR)	1/2 (DSR)	1/2 (DSR)

Category: **Hazardous Materials**

Activities	FY96	FY97	FY98	FY99
(1) Require new commercial/industrial operations that use or store hazardous materials to develop a storage, handling, and disposal plan and comply with BMPs; encourage municipalities to prohibit the siting of certain high-risk operations in critical areas	2 (CRMC) 3 (MCP)	3 (CRMC) 3 (MCP)	3 (CRMC) 3 (MCP)	3 (CRMC) 3 (MCP)
(2) Develop a BMP manual for operations not governed by existing state regulatory programs that are involved in the storage, handling, and disposal of hazardous materials			3 (PP)	3 (PP)
(3) Encourage municipalities to link the granting of commercial licenses for facilities that use or store hazardous materials with requirements to implement appropriate BMPs; encourage municipalities to deny requests for license renewals from any commercial operation found to be not in compliance with BMP requirements	3 (MCP)	3 (MCP)	3 (MCP)	3 (MCP)
(4) Assist municipalities with pollution source inventories for existing commercial/industrial operations that use hazardous materials; recommend appropriate mitigative measures to address any pollution problems found to be present	1 (GW) 3 (MCP)	3 (PP) 3 (MCP)	3 (PP) 3 (MCP)	3 (PP) 3 (MCP)

(5) Pursue the development of guidance or a model ordinance for local officials on the regulation of commercial/industrial operations associated with hazardous materials			3 (NPS)	
(6) Update and revise state regulations governing commercial/industrial operations associated with hazardous materials; consider establishing regulations for currently unregulated operations that pose pollution threats		3 (CRMC) 3 (DWM)	3 (CRMC) 3 (DWM)	
(7) Expand existing pollution prevention and education programs for commercial/industrial operations associated with hazardous materials, particularly those not governed by RIPDES	3 (PP)	3 (PP)		
(8),(9) Encourage and participate in local education and outreach programs aimed at promoting BMPs and pollution prevention for commercial/industrial facilities and small businesses		3 (PP)		3 (PP)
(10) Require implementation of BMPs as part of permitting process for authorizing active UIC discharges or closing existing systems	1 (GW)	1 (GW)	1 (GW)	1 (GW)
(11) Evaluate the effectiveness of existing training programs for employees of operations associated with hazardous materials; if necessary, expand or improve these programs		3 (PP)	3 (PP)	
(14) Implement pollution prevention programs advocating the proper storage, use, disposal of household hazardous materials and conduct associated training sessions	2 (PP) 2 (CE)	3 (PP) 3 (CE)	3 (PP) 3 (CE)	3 (PP) 3 (CE)
(15) Conduct statewide household hazardous waste recycling, collection, and disposal programs, with primary emphasis on the new state collection facility	2 (PP)	3 (PP)	3 (PP)	3 (PP)
(16) Pursue the establishment of bans on the sale/purchase/use of certain hazardous materials where they are known to create adverse water quality impacts			3 (PP) 3 (DWM)	3 (PP) 3 (DWM)

Category: **Road and Bridge Maintenance**

Activities	FY96	FY97	FY98	FY99
(1) Operate and maintain roads and bridges in accordance with the requirements of Section 6217 of CZARA	2 (CRMC)	2 (CRMC)	2 (CRMC)	2 (CRMC)
(2) Develop a road maintenance and operations manual and an associated training and education program	3 (DOT) 3 (NPS) 3 (CE) 3 (DWR)	3 (DOT) 3 (NPS) 3 (CE) 3 (DWR)	3 (DOT) 3 (CE)	3 (DOT) 3 (CE)
(3) Ensure that sand and sediment on state and local roads is removed annually by street sweeping; increase the number of sweepings to two or three times a year if practicable; continue to carry out roadside clean-up programs	2/3 (DOT) 2 (MCP) 2 (OSCR)	2/3 (DOT) 2 (MCP) 3 (OSCR)	2/3 (DOT) 2 (MCP) 3 (OSCR)	2/3 (DOT) 2 (MCP) 3 (OSCR)
(4) Establish comprehensive maintenance programs for the cleaning of catchment basins and other runoff conveyance and treatment structures	2 (DOT) 3 (MCP)	2 (DOT) 3 (MCP)	2 (DOT) 3 (MCP)	2 (DOT) 3 (MCP)

(5) Continue to provide for proper disposal of sand and sediment collected from roadways; obtain screening mechanisms to facilitate disposal	1 (SWMC)	1 (SWMC) 2/3 (MCP)	1 (SWMC) 2/3 (MCP)	1 (SWMC)
(6) Notify municipalities that the construction of drainage ditches for flood control on roadways requires state approval if within state jurisdiction	2 (DWR) 2 (FWW) 2 (CRMC)	2 (DWR) 2 (FWW) 2 (CRMC)		
(7) For all road repavement projects, address soil erosion using appropriate techniques from the soil erosion/sediment control handbook	1 (DOT) 1 (MCP)	1 (DOT) 1 (MCP)	1 (DOT) 1 (MCP)	1 (DOT) 1 (MCP)
(8) Require maintenance contractors to use appropriate techniques to limit the delivery of pollutants to surface waters during bridge maintenance projects	1 (DOT) 1 (MCP)	1 (DOT) 1 (MCP)	1 (DOT) 1 (MCP)	1 (DOT) 1 (MCP)
(9) Properly maintain and manage all road salt storage piles within watersheds and aquifers of public drinking water supplies and other sensitive waters	1/3 (DOT) 1/3 (MCP)	1/3 (DOT) 1/3 (MCP)	1/3 (DOT) 1/3 (MCP)	1/3 (DOT) 1/3 (MCP)
(10) Pursue sources of funding for salt storage sheds; develop and adopt performance standards for salt storage facilities		3 (MCP) 3 (NPS) 3 (GW) 3 (DWR)	3 (MCP) 3 (NPS) 3 (GW) 3 (DWR)	
(11) Require all drivers, loaders, and handlers of road salt to participate in training sessions	1 (DOT)	1 (DOT)	1 (DOT)	1 (DOT)
(12),(13) Equip trucks operating in watersheds and aquifers of public drinking water supplies with ground-speed and/or infrared electronic sensors	1/2 (DOT) 1/3 (MCP)	1/2 (DOT) 1/3 (MCP)	1/2 (DOT) 1/3 (MCP)	1/2 (DOT) 1/3 (MCP)
(14) Test and pursue the use of safe, effective, and economically feasible deicing alternatives to sodium chloride	2/3 (DOT)	2/3 (DOT)	2/3 (DOT)	2/3 (DOT)
(15) Reduce road salt application rates or use a deicing alternative if and when sodium or chloride concentrations approach the maximum safe drinking water standard	1 (DOT) 1 (MCP)	1 (DOT) 1 (MCP)	1 (DOT) 1 (MCP)	1 (DOT) 1 (MCP)
(16) Encourage municipalities to work with other users of deicing materials to ensure that these materials are used properly		3 (MCP)	3 (MCP)	
(17) Evaluate current snow dumping practices and explore practicable alternatives, if and when it is determined that water quality is being impacted by snow dumping practices			3 (DWR) 3 (CRMC) 3 (MCP)	3 (DWR) 3 (CRMC) 3 (MCP)

Category: **Marine Boating Facilities and Activities**

Activities	FY96	FY97	FY98	FY99
(1) Ensure that new and expanding marinas are sited and designed	1 (CRMC) 1 (DWR)	1 (CRMC) 1 (DWR)	1 (CRMC) 1 (DWR)	1 (CRMC) 1 (DWR)
(2) Seek to resolve inter- and intra-agency inconsistencies regarding water use classes and categories	1 (CRMC) 1 (DWR) 1 (CRC)	1 (CRMC) 1 (DWR) 3 (CRC)	3 (CRC)	3 (CRC)
(3) Require marina operators to develop and implement operation and maintenance programs for boating facilities	2 (CRMC)	2 (CRMC)	2 (CRMC)	2 (CRMC) 3

(4) Conduct public education/outreach/training programs for marina operators	3 (CRMC)	3 (CRMC) 3 (CRC)	3 (CRMC) 3 (CRC)	3 (CRMC) 3 (CRC)
(5) Promote and facilitate the use of innovative technologies for conducting boat maintenance operations at marinas	2 (PP)	3 (PP) 2 (CRC)	3 (PP) 3 (CRC)	3 (PP) 3 (CRC)
(6) Evaluate and, if necessary, revise the environmental guide for marinas			2 (CRC)	2 (CRC)
(7) Monitor the implementation and evaluate the effectiveness of management practices employed by marina operators pursuant to operation and maintenance programs	2 (CRMC)	2 (CRMC)	2 (CRMC) 3 (DWR) 3 (CRC)	2 (CRMC) 3 (DWR) 3 (CRC)
(8) Require municipalities to develop and implement operation and maintenance programs for municipal mooring fields	2 (CRMC)	2 (CRMC)	2 (CRMC)	2 (CRMC) 3
(9) Provide technical assistance to municipalities to assist with the incorporation of nonpoint source pollution control measures into municipal harbor management plans	2 (CRMC)	2 (CRMC) 3 (CRC)	2 (CRMC) 3 (CRC)	2 (CRMC)
(10) Where necessary, pursue implementation of appropriate BMPs for boating facilities not covered under Section 6217 or RIPDES			3 (CRMC) 3 (PP)	3 (CRMC) 3 (PP)
(11) Coordinate state stormwater runoff programs for marinas	3 (CRMC) 3 (DWR)	3 (CRMC) 3 (DWR)	3 (CRMC) 3 (DWR)	3 (CRMC) 3 (DWR)
(12) Require marina owners and municipalities, through their Harbor Management Plans, to develop and implement operation and maintenance programs for boaters	2 (CRMC)	2 (CRMC)	2 (CRMC)	2 (CRMC)
(13) Implement public education/outreach/training programs for boaters	1 (CRC) 3 (CRMC)	3 (CRC) 3 (CRMC)	3 (CRC) 3 (CRMC)	3 (CRC) 3 (CRMC)
(14) Promote and enforce all rules and regulations relating to boater discharges	1 (DWR) 1 (CRMC) 1 (MCP) 3 (CRC)	1 (DWR) 1 (CRMC) 1 (MCP) 3 (CRC)	1 (DWR) 1 (CRMC) 1 (MCP) 3 (CRC)	1 (DWR) 1 (CRMC) 1 (MCP) 1 (CRC)
(15) Monitor the implementation and evaluate the effectiveness of management practices employed by boaters pursuant to operation and maintenance programs and any other education/outreach/training programs that are instituted	3 (CRMC)	3 (CRMC)	3 (CRMC) 3 (DWR) 3 (CRC)	3 (CRMC) 3 (DWR) 3 (CRC)
(16) Develop and distribute a list of potentially harmful chemicals that are inappropriate for use within the boating and marine trades industry, as well as a list of environmentally friendly products and materials that are recommended for use		3 (PP)	3 (PP)	
(17) Pursue the attainment of a federal no discharge zone designation; ensure that a sufficient number of pumpout facilities are installed where needed; institute an appropriate education and enforcement program	1 (CRMC) 1 (DWR)	1 (CRMC) 2 (DWR)	1 (CRMC) 3 (DWR)	1 (CRMC) 3 (DWR)
(18) Implement the marina pumpout facility siting plan; continue providing guidance on the number of pumpout facilities needed to meet the no discharge zone designation criteria; continue to provide grants to marina operators/municipalities to help install the facilities	1 (DWR) 2 (NBP)	2 (DWR) 3 (NBP)	3 (DWR) 3 (NBP)	3 (DWR) 3 (NBP)
(19) Ensure that all pumpout facilities are designed to allow ease of access and posted to promote use by boaters	2 (CRMC) 2 (DWR)	2 (CRMC) 2 (DWR)	2 (CRMC) 2 (DWR)	2 (CRMC) 2 (DWR)
(20) Seek to provide mobile pumpout vessels in combination with shore-based facilities	3 (MCP)	3 (MCP)	3 (MCP)	3 (MCP)

(21) Develop and maintain an inventory of all boats registered in the state and their areas of concentration	3 (CRMC) 3 (DWR) 3 (MCP)	3 (CRMC) 3 (DWR) 3 (MCP)	3 (CRMC) 3 (DWR) 3 (MCP)	3 (CRMC) 3 (DWR) 3 (MCP)
(22) Identify sites for additional pumpout facilities	1 (CRMC) 2 (DWR)	1 (CRMC) 2 (DWR)	1 (CRMC) 2 (DWR)	1 (CRMC) 2 (DWR)
(23) Maintain the no discharge zone designation by maintaining the appropriate ratios of boats-to-pump-out facilities in vessel concentration areas	2 (CRMC) 2 (DWR)	2 (CRMC) 2 (DWR)	2 (CRMC) 2 (DWR)	2 (CRMC) 2 (DWR)
(24) Monitor the use and evaluate the effectiveness of shore-based and mobile pumpout facilities	3 (DWR) 3 (DWR)	3 (DWR) 3 (CRMC)	3 (DWR) 3 (CRMC) 3 (CRC)	3 (DWR) 3 (CRMC) 3 (CRC)
(25) Pursue initiatives aimed at educating boaters and pumpout facility operators regarding the use, availability, and importance of pumpout facilities and the prevention of sewage discharges	2 (DWR)	3 (DWR) 3 (CRMC) 3 (CRC)	3 (DWR) 3 (CRMC) 3 (CRC)	
(26) Undertake inspections and/or other forms of enforcement to ensure compliance with regulations governing marine toilets and sewage discharges	1/3 (OBS) 1/3 (MCP)	2/3 (OBS) 2/3 (MCP)	2/3 (OBS) 2/3 (MCP)	2/3 (OBS) 2/3 (MCP)
(27) Establish penalties for violations of boat sewage discharge regulations		3 (MCP)	3 (MCP)	
(28) Evaluate the effectiveness of the no discharge zone designation in protecting water quality; tighten the regulations by increasing the ratio of boats-to-pumpout facilities, if necessary		3 (DWR)	3 (DWR)	
(29) Phase-in a retrofit program involving the upgrade of dump stations, restrooms, and shower facilities at marinas	3 (CRMC)	3 (CRMC) 3 (DWR)	3 (CRMC) 3 (DWR)	3 (CRMC)
(30) Ensure that boat fueling operations conducted by fuel trucks are subject to appropriate environmental controls; pursue adoption of training requirements for fuel truck operators and spill insurance requirements for fuel truck owners			3 (DWM)	3 (DWM)
(31) Consolidate existing committees into central Marina and Boating Management Committee, and continue to meet regularly	3 (CRMC) 3 (CRC)	3 (CRMC) 3 (CRC)	3 (CRMC)	3 (CRMC)

Category: **Surface Mining Operations**

Activities	FY96	FY97	FY98	FY99
(1) Pursue statewide enabling legislation authorizing municipalities to adopt ordinances governing sand and gravel operations			3 (DWR) 3 (RICD)	3 (DWR) 3 (RICD)
(2) Develop a model local ordinance to prevent water quality impacts from surface mining operations		3 (RICD) 3 (RCD) 3 (DWR) 3 (DOP)	3 (RICD) 3 (RCD) 3 (DWR) 3 (DOP)	
(3) Assist municipalities with development and adoption of ordinances governing sand and gravel operations and with implementation of applicable BMPs	1 (RICD)	3 (RICD)	3 (RICD) 3 (NPS)	3 (RICD) 3 (NPS)
(4) Provide technical assistance to industry operators	3 (NRCS) 3 (RICD)	3 (NRCS) 3 (RICD)	3 (NRCS) 3 (RICD)	3 (NRCS) 3 (RICD)

(5) Research the use and development of appropriate BMPs to reduce water quality problems associated with sand and gravel operations	3 (NRCS) 3 (CE)	3 (NRCS) 3 (CE)	3 (NRCS) 3 (CE)	3 (NRCS) 3 (CE)
(6) Provide information and training to local officials and industry operators on managing sand and gravel operations	1 (RICD) 3 (RCD) 3 (CE)	3 (RICD) 3 (RCD) 3 (CE)	3 (RICD) 3 (RCD) 3 (CE)	3 (RICD) 3 (RCD) 3 (CE)

Category: **Landfills**

Activities	FY96	FY97	FY98	FY99
(1) Continue and, where appropriate, expand source reduction, recycling, and pollution prevention programs	2 (OSCR) 2/3 (MCP)	3 (OSCR) 3 (MCP)	3 (OSCR) 3 (MCP)	3 (OSCR) 3 (MCP)
(2) Prohibit the siting and expansion of landfills in areas that are unsuitable	1 (GW)	1 (GW)	1 (GW)	1 (GW)
(3) Reduce/eliminate the amount of hazardous materials sent to landfills	2 (PP) 2/3 (MCP)	3 (PP) 3 (MCP)	3 (PP) 3 (MCP)	3 (PP) 3 (MCP)
(4) Ensure that proper operation and maintenance procedures are followed at landfills	1 (DWM)	2 (DWM)	3 (DWM)	3 (DWM)
(5) Ensure that proper stormwater management practices are employed at landfills	1 (DWR)	2 (DWR)	3 (DWR)	3 (DWR)
(6),(9) Install and test monitoring wells at existing and former landfills; if contamination problems are detected, take steps to mitigate the problems	1 (GW) 1 (DWM) 1 (DSR)	2 (GW) 2 (DWM) 2 (DSR)	3 (GW) 3 (DWM) 3 (DSR)	3 (GW) 3 (DWM) 3 (DSR)
(7),(8) Ensure that, upon reaching capacity, all landfills are properly closed; use the State Revolving Loan Fund as a possible means of financial assistance to municipalities for landfill closure projects	1 (DWM) 1 (DWR)	2 (DWM) 2 (DWR)	2 (DWM) 2 (DWR)	2 (DWM) 2 (DWR)

Category: **Domestic and Wild Animals**

Activities	FY96	FY97	FY98	FY99
(1) Repeal municipal curbing ordinances and adopt "pooper scooper" laws where necessary and appropriate	3 (MCP)	3 (MCP)	3 (MCP)	3 (MCP)
(2) Discourage the feeding of waterfowl in critical areas	3 (MCP)	3 (MCP)	3 (MCP)	3 (MCP)
(3) Encourage/require commercial domestic animal operations to implement appropriate BMPs	1 (NRCS) 3 (DOA)	1 (NRCS) 3 (DOA)	1 (NRCS) 3 (DOA)	1 (NRCS) 3 (DOA)
(4) Encourage/require backyard livestock owners to implement BMPs for animal waste and erosion control	1 (NRCS) 3 (DOA)	1 (NRCS) 3 (DOA)	1 (NRCS) 3 (DOA)	1 (NRCS) 3 (DOA)
(5) Encourage municipalities to institute zoning ordinances to limit the density of livestock, in accordance with the capacity of the land to sustain livestock operations	3 (MCP)	3 (MCP)	3 (MCP)	3 (MCP)
(6) Develop and implement public education programs that include coverage of non-agricultural animal waste problems	2 (CE) 3 (DOA)	3 (DOA) 3 (CE)	3 (DOA) 3 (CE)	3 (DOA) 3 (CE)

Category: **Growth Management Planning**

Activities	FY96	FY97	FY98	FY99
(1),(2) Use RIGIS and other applicable data and information to identify, map, and develop protection strategies for critical resources	1 (CRMC) 1 (CE) 1 (CRC) 1 (DOP) 1 (MCP)	1 (CRMC) 1 (DOP) 2 (CE) 2 (MCP) 3 (CRC)	1 (DOP) 3 (MCP) 3 (CE) 3 (CRC)	1 (DOP) 3 (MCP) 3 (CE) 3 (CRC)
(3),(5) Identify and map areas that can accommodate new growth without adverse impacts on critical resources; at the local level, guide new development into growth centers	1 (CRMC) 1 (CRC) 1 (DOP) 1 (MCP)	1 (CRMC) 2 (MCP) 3 (CRC)	3 (CRC) 3 (MCP)	3 (CRC) 3 (MCP)
(4) At the local level, collaborate on regional or watershed/aquifer approaches to growth management	1 (CRMC) 1 (CE) 1 (CRC) 1 (MCP)	1 (CRMC) 2 (CE) 2 (MCP) 3 (CRC)	1 (CRMC) 3 (MCP) 3 (CE) 3 (CRC)	1 (CRMC) 3 (MCP) 3 (CE) 3 (CRC)
(6) Assess cumulative impacts from development. If necessary, require appropriate development standards or alternative designs.	1 (CRMC)	1 (CRMC)	1 (CRMC)	1 (CRMC)
(7) Use financial incentives to encourage municipalities to comply with State Guide Plan growth management policies	1 (DOP) 1 (DWR)	1 (DOP) 2 (DWR)	1 (DOP) 2 (DWR)	1 (DOP) 2 (DWR)
(8) At the local level, require areas that are currently served by public water and sewers and can support additional development without adversely impacting water quality and critical resources to accommodate compact development	1 (CRC) 2 (MCP)	3 (CRC) 3 (MCP)	3 (CRC) 3 (MCP)	3 (CRC) 3 (MCP)
(9) In local comprehensive plans, give more attention to the need to relate water supply and sewage disposal to land use	1 (CRMC) 1 (CRC) 1 (MCP)	1 (CRMC) 2 (MCP) 3 (CRC)	1 (CRMC) 3 (MCP) 3 (CRC)	1 (CRMC) 3 (MCP) 3 (CRC)
(10) Review revised comprehensive plans to ensure consistency with the State Guide Plan and other agency policy documents	1 (DOP) 2 (CRMC) 2 (NPS)	1 (DOP) 2 (CRMC) 2 (NPS)	1 (DOP) 2 (CRMC) 2 (NPS)	1 (DOP) 2 (CRMC) 2 (NPS)

Category: **Creative Land Management Techniques**

Activities	FY96	FY97	FY98	FY99
(1) At the local level, adopt more innovative and flexible land use management techniques to accommodate new growth without damaging critical resources	1 (CRC) 3 (MCP)	3 (CRC) 3 (MCP)	3 (CRC) 3 (MCP)	3 (CRC) 3 (MCP)
(2) At the local level, adopt appropriate standards in zoning ordinances and implement a development plan review procedure	3 (MCP)	3 (MCP)	3 (MCP)	3 (MCP)
(3) At the local level, establish a pre-application conference procedure	3 (MCP)	3 (MCP)	3 (MCP)	3 (MCP)
(4) Conduct training programs for local officials on zoning and land use regulations; encourage local officials to participate in these programs	1 (CE) 3 (DOP)	2 (CE) 3 (CRC) 3 (DOP)	2 (CE) 3 (CRC) 3 (DOP)	2 (CE) 3 (CRC) 3 (DOP)

(5) At the local level, select solicitors who have proficiency and practical experience in land use law	1 (MCP)	1 (MCP)	1 (MCP)	1 (MCP)
(6) Maintain a clearinghouse for innovative land management techniques; develop technical handbooks, workshops, and model ordinances on an as-needed basis	1 (DOP) 1 (CE)	1 (DOP) 2 (CE)	1 (DOP) 2 (CE)	1 (DOP) 2 (CE)
(7) Broaden community technical assistance programs to include a full development plan review service, on a contractual basis	1 (RICD)	1 (RICD)	1 (RICD)	1 (RICD)
(8) At the local level, establish and maintain a minimum residential density of two acres per housing unit within the watersheds of critical areas	1 (CRC) 3 (MCP)	3 (CRC) 3 (MCP)	3 (CRC) 3 (MCP)	3 (CRC) 3 (MCP)
(9),(10) At the local level, utilize the land use classification system and mitigative measures as guides in future revisions to local comprehensive plans and zoning ordinances	1 (CRC) 3 (MCP)	3 (CRC) 3 (MCP)	3 (CRC) 3 (MCP)	3 (CRC) 3 (MCP)
(11) At the local level, adopt special-purpose environmental ordinances, where appropriate	1 (CRC) 3 (MCP)	3 (CRC) 3 (MCP)	3 (CRC) 3 (MCP)	3 (CRC) 3 (MCP)
(12) Pursue adoption of state enabling legislation authorizing municipalities to implement stormwater utility districts		3 (NPS)	3 (NPS)	
(13) At the local level, seek to establish funding sources to fund land acquisition and preservation activities	3 (MCP)	3 (MCP)	3 (MCP)	3 (MCP)
(14) At the local level, evaluate subdivision regulations and reduce or eliminate any requirements that are not necessary for public safety and that may be contributing to environmental impacts	3 (MCP)	3 (MCP)	3 (MCP)	3 (MCP)
(15) At the local level, include provisions in new subdivision regulations that better protect water resources from nonpoint source pollution, while accommodating development in more creative ways and streamlining the development review process	3 (MCP)	3 (MCP)	3 (MCP)	3 (MCP)

PART 731.03:
WATERSHED MANAGEMENT STRATEGIES

03-01 THE WATERSHED MANAGEMENT PROCESS

03-01-01 Definition of Watershed Management

Watershed management is the use, regulation, and treatment of land and water resources within a hydrologic unit to accomplish stated objectives. The watershed management approach recognizes that watersheds, or sub-basins within watersheds, serve as the most suitable hydrologic unit within which actions should be taken to restore and protect water quality. The term *watershed* refers to a geographic area, also known as a *drainage basin*, which, because of its topography, soil type, and drainage patters, acts as a collector of raw waters. Within a watershed, most precipitation soaks into the soil and becomes part of the groundwater system. Precipitation that does not soak into the soil runs off the land as surface water. Eventually, all water in a watershed drains to a common point, such as a groundwater aquifer, a stream or river, a wetland, pond or lake, or an estuary or coastal water area.

By focusing on hydrologically defined drainage basins, the watershed management approach encompasses not only the water resource, such as a stream, river, lake, estuary, or aquifer, but all the land from which water drains to that resource. This is particularly important, because as water seeps through the soil or drains off the land it collects sediments, dissolved materials, and other pollutants, and thus carries with it the effects of human activities throughout the watershed.

In Rhode Island, there are fourteen major watersheds and twenty-two stratified drift aquifers. Most of these are very large areas that, because of their size, do not lend themselves to the types of targeted watershed management projects envisioned by this Plan. Thus, the term "watershed management" actually involves sub-units within watersheds and aquifers -- namely, sub-basins and wellhead areas.

The many challenges associated with water quality protection and restoration require innovative solutions and, in a time of dwindling public resources, cooperation among many parties. The watershed management approach provides the necessary framework for meeting these challenges. The approach emphasizes the involvement of all affected stakeholders and stresses the need for integrated actions on the part of government agencies and others at all levels to achieve the greatest improvements with the resources available.

The watershed management approach provides a framework to design the optimal mix of water quality management strategies by integrating and coordinating across program and agency boundaries. Integrated solutions implemented by watershed management commit-

tees use limited resources to address the most significant water quality problems. Integration through the watershed management approach provides a means to achieve the short- and long-term goals for the watershed by allowing resource application both in a timely and geographically targeted manner. For example, rather than have each program decide independently the watershed objectives on a different schedule, the watershed receives the combined resources and attention of all water quality program components and other participating agencies simultaneously. This helps to ensure that problems representing, say, 20 percent of the impact on or threat to water quality receive roughly 20 percent of the management resources. Integrated solutions are possible because of a framework that encourages an interdisciplinary and interagency team approach to developing the most appropriate strategies.

The watershed management approach, in its broad application, addresses both point and nonpoint sources of pollution. The nonpoint source component of the watershed management approach is hereby presented as the centerpiece of the Rhode Island Nonpoint Source Pollution Management Program. This approach is not a new program designed to compete with or replace existing programs; rather, it is a flexible framework for focusing and integrating current efforts and for exploring innovative methods to achieve maximum efficiency and effect.

03-01-02 Principles of Watershed Management

The following is a broad outline of the steps involved in watershed management. These steps fall into five broad categories: organization, assessment, planning, implementation, and evaluation. Specific activities will vary from one watershed to the next and depend on such things as the size and location of the watershed, the nature of its water quality problems, the status of efforts that have already been taken to address water quality, and the roles assumed by participating parties.

By way of example, in watersheds where little is known about actual or potential nonpoint source impacts, it may well be advisable to follow the watershed management process from beginning to end, in a step-by-step fashion. Whereas in watersheds where the problems and solutions are obvious, or where many of the recommended steps under the assessment and planning stages have already been completed, it may be appropriate to move more or less directly to the implementation stage in the management process.

Despite this variability, the basic principles of watershed management are fairly generic, and the following steps should therefore serve as useful guidelines for carrying out watershed management programs throughout the state.

STEP 1: Organization

Objective: Establish a Watershed-Based Management Framework

1. Utilizing the Priority Watershed Ranking System, set forth in Chapter 03-02 of this plan, select a manageable watershed or groundwater area (hereinafter referred to as "watershed").

2. Form a watershed management committee.

   A. The primary role of each management committee should be to guide and coordinate the overall management process for each watershed.

   B. Draw upon existing groups and organizations where appropriate. Seek to consolidate and build on existing efforts. Avoid duplication and overlap. Provide ample opportunity for comment and participation by all stakeholders.

   C. The membership of each committee should include, but not be limited to, representatives from:

      - all municipalities within the watershed;
      - applicable state, regional, and federal agencies (and, for interstate watersheds, representatives from neighboring states)
      - applicable schools, colleges, and universities;
      - applicable watershed organizations (such as those recognized by the Rhode Island Rivers Council) and citizen monitoring programs;
      - applicable water suppliers;
      - other groups or organizations with significant interests in the protection and improvement of water quality in the watershed.

   D. Each committee will need to exercise the leadership and commitment necessary to bring the overall watershed management process to fruition. Each committee should designate one person or organization to serve as watershed coordinator.

   E. Where appropriate, establish subcommittees for various aspects of the work.

STEP 2: Assessment

Objective: Evaluate Watershed Conditions

1. Delineate and map watershed/sub-basin/aquifer boundary(s).

   A. Utilize RIGIS for major watershed boundaries (and whatever sub-basin information that might be available).

   B. Utilize USGS maps for small sub-basin delineations.

   C. Incorporate wellhead protection areas, groundwater reservoirs, and the critical portions of their recharge areas.

2. Compile and assess relevant information on watershed characteristics.

   A. Rely on existing plans, studies, and reports, wherever possible.

   B. Organize by sub-basin, if appropriate.

   C. Items to be inventoried and mapped should, where appropriate, include but not be limited to:

      - waterbodies, and natural and man-made water/stormwater drainage, conveyance, and storage systems (see local comprehensive plans);

      - constraints to development, particularly wetlands, hydric soils, resource areas subject to protective setback distances, and ledges/rock outcrops (see the Rhode Island Community Nonpoint Source Pollution Management Guide, pp. 29-31 [hereafter referred to as the "RI NPS Guide"], available from the RI Nonpoint Source Pollution Management Program);

      - physical constraints to development, particularly steep slopes and floodplains (see RI NPS Guide, p. 32, for further information);

      - critical resource areas, particularly: watersheds of public drinking water supplies, groundwater aquifers and their recharge areas, wellhead protection areas, wetlands, fishery habitat and other important habitat resources, areas that support rare or diverse plant or animal communities, nutrient-sensitive waters, coastal features, outstanding

resource waters, and high-value recreational waters (see RI NPS Guide, pp. 33-40, for further information);

- unique resources, particularly farmland, forest land, scenic vistas, and archaeologic/historic sites (see RI NPS Guide, pp. 41-42, for further information);

- infrastructure, namely sewers and water supply lines, existing and proposed (see local comprehensive plans);

- land use (see local comprehensive plans); ideally, this should be done as a function of nonpoint source impacts (see RIDEM's Surface Water Supply Watershed Management Plans, available from the RI Nonpoint Source Pollution Management Program);

- zoning (see local comprehensive plans);

- publicly owned lands (see RI Outdoor Recreation, Conservation and Open Space Inventory (RIDOP, 1989c), and municipal land evidence records);

- other special purpose ordinances to prevent/control nonpoint source pollution, such as those addressing erosion, stormwater, wastewater management districts, etc.

D. Collect and analyze all existing relevant information on water quality, namely:

- water quality classifications and status (see RI Water Quality Regulations and RI 305(b) report);

- chemical, biological and sediment data, including citizen monitoring data from recognized programs (see RI 305(b) report and other relevant studies and reports);

- socio-economic indicators, such as growth and development trends and changes in land use (see SCS' Water Quality Indicators Guide);

- subjective information on problems, such as newspaper articles, citizen complaints, etc.

3. Identify known and suspected pollution sources (point and nonpoint) in the watershed/sub-basin/aquifer.

   A. Rely on existing plans, studies, and reports, wherever possible.

   B. Organize by sub-basin, if appropriate.

   C. Utilize pollution source inventory mapping available from RIDEM's Groundwater Section.

   D. Estimate pollution loadings based on present and future land uses (see RI Stormwater Manual).

   E. Evaluate shoreline surveys, sanitary surveys for septic tanks, etc.; consider subjective information on problems, such as newspaper articles, citizen complaints, etc.

4. Determine additional information needs; collect whatever additional information is needed to properly assess watershed conditions.

   A. Fill any gaps in the list of items and data bases given above.

   B. If water quality data is lacking, initiate new or enhanced chemical and/or biological monitoring efforts.

   C. If pollution sources are not readily apparent, initiate new or enhanced shoreline surveys or other forms of visual observation.

   D. Place particular emphasis on the identification of pollution source "hotspots."

STEP 3: Planning

Objective: Develop a Watershed Management Strategy

1. Establish watershed management goals.

   A. Set management target(s) in terms of water quality standards, attainment and preservation of beneficial uses, known problems in the watershed that need to be solved, or other local resource management objectives, including potential future water supply sources, open space, and habitat goals.

B. Attention should be directed the mitigation of existing nonpoint source pollution problems, as well as the prevention of future problems.

C. Ensure that the goals provide a well-defined direction that can be followed by a clear course of action.

D. Allow goal establishment to be an open-ended, iterative process, whereby redefined or new goals may emerge at any time during the watershed management process as more information becomes available.

E. Provide ample opportunities for public and stakeholder involvement.

2. Set priorities.

A. Identify and prioritize critical issues (e.g., drinking water supply protection, shellfish harvesting, recreational activities, aquatic habitat, etc.) within the watershed/sub-basin/aquifer.

B. Determine pollution reduction/pollution prevention needs.

C. Prioritize pollution concerns/sources (e.g., septic systems, stormwater runoff, etc.).

D. Pursue risk-based targeting, whereby the nonpoint sources having the largest impact on water quality or posing the greatest risk to the integrity of the resource receive the most attention in the development of management strategies.

E. Determine total maximum daily loads, where appropriate and feasible.

F. Organize by sub-basin, if appropriate.

3. Develop and evaluate management options.

A. See source-specific recommendations in Chapter 02-01 of this Plan; also see management practices presented in the "Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters," available from the USEPA.

B. Consider a range of mechanisms, including but not limited to:

- site remediation/restoration projects;
- education and training initiatives;
- site-specific pollution prevention (or operation & maintenance plans);
- local land use controls/ordinances;
- enforcement actions.

C. Consider general feasibility and suitability of mechanism(s); consider relationship to watershed management goals/priorities, potential effect on other resources (e.g., fish and wildlife, cultural), cost-effectiveness, operation and maintenance requirements, land ownership issues, etc.; take into account local, political, economic, and regulatory realities.

D. Identify costs and available sources of funding.

4. Select management practices/programs.

5. Review strategies with stakeholders and other members of the public to ensure that selected options are acceptable.

6. Develop action plan and schedule; designate responsible parties; include a marketing strategy and/or an informational/educational component.

STEP 4: Implementation

Objective: Implement the Watershed Management Strategy

1. Design management practices for site-specific application; obtain any and all required permits.

2. Develop management programs for general application in watershed/sub-basin/aquifer.

3. Develop inspection and maintenance schedules for management practices.

4. Secure funds to implement management practices/programs.

5. Conduct implementation activities.

STEP 5: Evaluation

Objective: Evaluate the Watershed Management Strategy

1. Evaluate the effectiveness of management practices/programs that have been implemented via chemical, biological, or visual monitoring.

2. Evaluate the acceptability of the programs/practices through contacts with stakeholders and other members of the public.

3. Periodically re-evaluate, and if necessary adjust, the watershed management priorities and practices/programs to reflect changes in water quality conditions, pollution sources, or critical issues.

03-01-03 Roles and Responsibilities

Just as the watershed management process will vary somewhat from one watershed to the next, so too will the parties who carry out the process. Each watershed will differ in terms of what needs to be done and who should do it. These differences may be tied to the location of the watershed (e.g., coastal vs. inland), the water type (e.g., surface vs. ground), and/or the nonpoint source pollution issues that need to be addressed (e.g., highway runoff vs. failing on-site sewage disposal systems vs. runoff from home lawns, marina facilities, abandoned landfills, etc.). As such, this plan does not attempt to delineate precise roles and responsibilities vis-a-vis watershed management.

This plan does, however, identify a range of agencies, groups, and organizations which are likely to have some role in the watershed management process (see Chapter 02-04), as well as a broad outline of the basic steps involved in the process (see Chapter 03-01-02, above). As indicated in Chapter 03-01-02, the first steps in the process involve targeting individual watersheds, forming committees, and identifying major issues. At this early stage, the basic characteristics of each watershed, coupled with the identification of any agencies, groups, or organizations that have already been focusing on specific water quality issues in the watershed, should lead readily to the identification of a core group of key players who are best-suited to guide and direct the overall watershed management process. As the process moves along and specific nonpoint source issues arise, other agencies, groups, and organizations will be called upon to help address these issues, namely by targeting their resources, authority, and/or expertise to specific actions or projects in the watershed.

The RI NPS Program will be dedicating one full-time staff person to serve as watershed coordinator. This person will be able to track ongoing watershed management activities, maintain intra- and inter-agency coordination, and provide guidance and assistance (and, where necessary, leadership) to watershed management committees. Depending on the availability of funds and staff time, representatives from other divisions and agencies may

also be able to assume this type of lead role.

By way of example, if a targeted watershed drains directly to Narragansett Bay, the lead role in coordinating and implementing the overall watershed management strategy might be taken on by RIDEM's Narragansett Bay Project. Other key participants would probably include the Coastal Resources Management Council, URI's Coastal Resources Center, and applicable municipalities. For the purposes of assessing watershed conditions, RIDEM's Division of Water Resources might be able to lend assistance, perhaps in conjunction with URI's Department of Civil and Environmental Engineering. Once a management strategy is devised, RIDEM's NPS Pollution Management Program might be able to team up with the RI Conservation Districts in an effort to assist with the design and implementation of some stormwater treatment systems; URI's Coastal Resources Center, perhaps in conjunction with URI Cooperative Extension, might take on the role of administering education and training programs, both to municipal officials and members of the general public; RIDEM's Narragansett Bay Project might be able to provide technical assistance to municipalities in developing land use controls or special purpose environmental ordinances; and the Natural Resources Conservation Service might be able to assist private landowners with the development and implementation of pollution prevention plans.

Depending on the type of issues that arise in the watershed, the specific expertise of other agencies, groups, or organizations might come into play. If, for example, pesticide or other agriculture-related issues are identified, RIDEM's Division of Agriculture might be able to lend assistance; or if leaking storage tanks are thought to be a concern, RIDEM's Division of Waste Management might have an important role to play.

For surface water supplies and other inland watersheds, RIDEM's NPS Pollution Management Program might take on the lead role in coordinating and implementing the overall watershed management processes. For aquifers and other groundwater resources, RIDEM's Division of Groundwater and ISDS will likely assume a major role. In all cases, affected municipalities will certainly be involved.

The above examples are by no means intended to dictate how each agency, group, or organization should function in each watershed. Nor do the examples necessarily identify all key players in the watershed management process. Roles and responsibilities will undoubtably vary as a function of watershed characteristics, funding limitations, and many other factors. As a case in point, while URI Cooperative Extension has established itself as a key player in the state with respect to public education programs, other entities, such as the RI Conservation Districts, RIDEM's NPS Pollution Management Program, and RIDEM's Narragansett Bay Project, have also spearheaded successful public education initiatives. This sharing of responsibility will likely continue. Moreover, it does not necessarily pose a problem since there is clearly more than enough work to go around. One agency, group, or organization might be particularly well-suited to undertake a targeted public education campaign directed at homeowners in one watershed, while another entity might be well-positioned to launch a broad-based public education initiative involving local schools

in another watershed. The key objective is to avoid duplication of effort within individual watersheds.

In pursuing this watershed-based approach, there appears to be little or no need to change the focus of existing programs. Indeed, most of the functions associated with watershed management are currently being carried out in Rhode Island. The problem is that these efforts are largely scattered across many different watersheds, resulting in poorly coordinated, piecemeal approaches to addressing water quality problems in the state. What's needed -- and what's called for in this Plan -- is a team approach, whereby all key agencies, groups, and organizations contribute their individual resources and expertise in collaborative efforts directed at specific watersheds.

Finally, it is important to note that while the focus of this watershed management chapter relates primarily to public sector agencies, groups, and organizations, a variety of private sector groups -- such as watershed organizations, citizen monitoring programs, environmental groups, and local businesses -- as well as the general public, will clearly have very significant roles to play in the overall watershed management process. To be sure, the involvement of the private sector is recognized as being critical to the success of this Plan, and every effort will be made to coordinate watershed management activities with applicable private sector entities.

03-02 A SYSTEM FOR THE SELECTION OF HIGH PRIORITY WATERSHEDS

03-02-01 The Need for a Priority System

Rhode Island's diverse water resources face many threats from nonpoint source pollution. The Ocean State has 1,103 miles of streams and rivers; 17,316 acres of lakes and ponds; 139 square miles of estuaries, harbors and bays; 65,154 acres of freshwater and tidal wetlands; and 21 stratified drift groundwater reservoirs. These water resources are prized for their drinking water value, for the wide array of other public benefits -- namely, recreational and commercial uses -- that they provide, and for their unique natural/ecological value.

Most of the state's waters are either threatened or impaired by pollution, and there are simply not enough resources (staff, funds, etc.) to address all of the complex water quality problems throughout the state simultaneously. What's more, the overextension of limited resources across numerous watersheds at the same time tends to dilute the effectiveness of actions taken to protect or restore water quality. Therefore, a priority system is needed to focus and integrate management programs to achieve the greatest water quality improvements with the resources available.

A priority system is also needed to select specific watersheds for targeted management projects. Although all of the state's waters are important, some have certain attributes that make them more important than others. The most important waters are generally considered to be those that are particularly crucial to the maintenance of public health, primarily drinking water supplies. Following closely in terms of relative importance are those waters that provide the most public benefit (e.g., the most popular swimming and fishing waters) and/or ecological value (e.g., the most significant aquatic habitats). These concerns tend to overlap. For example, public health issues pertain not just to waters that are used as drinking supplies, but also to waters that are used for swimming and the harvesting of fish and shellfish. But for the purpose of comparing and ranking the state's diverse water resources, value criteria relating to public health, public benefit, and ecological value are useful parameters. By incorporating these criteria into a priority system, management efforts can be directed toward the most valuable waters, and a balanced approach can be maintained among efforts to address waters with different values.

The factors governing the selection of top candidates for watershed management go beyond the basic physical and resource value characteristics of individual watersheds. Much of the success of watershed management programs depends on the feasibility of taking actions -- e.g., the extent to which problems have been identified and the likelihood of achieving demonstrable water quality improvements -- and the degree to which there is public support for management programs within each watershed. Accordingly, a priority system is needed that takes these factors into account and targets restoration and protection efforts toward those watersheds where there is a high likelihood of success.

Finally, a priority system is needed to bring together and integrate the various other water quality priorities and priority-setting procedures that have been developed in Rhode Island. These include the State Clean Water Strategy Priority List, the Section 303(d) Priority List, the Narragansett Bay Project's List of Critical Areas, the GreenSpace 2000 List, the Groundwater Classification System, the Outstanding Natural Resource Waters List, and the Section 6217 Critical Areas List. In some cases, the priorities established through these lists mesh well, but all too often they diverge. This happens mainly because priorities are established pursuant to different statutes, or because they address similar but slightly different objectives. The need to address varying programmatic priorities can hinder collaborative efforts and the effective sharing of resources.

The Nonpoint Source Priority Watershed Selection System, set forth in the following section, is designed to coordinate, to the extent possible, RIDEM priorities and the priorities of other state and federal environmental agencies. Coordinated management priorities will focus funds and technical resources, leading to increased efficiency and effectiveness in addressing nonpoint source pollution in targeted watersheds. The systematic approach to developing coordination is intended to both integrate Rhode Island's water quality management programs and draw public support.

03-02-02 The Selection System

The Nonpoint Source Priority Watershed Management System has three primary objectives:

To clean up and protect the waters of the state that are most important for:

1. maintaining public health;
2. providing public benefit; and
3. providing ecological value.

The system is designed to target high-priority watersheds by uniting these three primary objectives with an approach for building consensus and coordination.

As a starting point, all of the state's waterbodies are divided into four broad categories:

1. Surface water drinking supplies
2. Groundwater drinking supplies
3. Other freshwaters (non-drinking)
4. Estuarine waters

These categories are based on physical and resource value characteristics. A basic premise of the system is that waterbodies with different physical and resource values should not compete with one another. Therefore, priority watersheds will be selected from each of the four

broad waterbody types and will compete only within their category.

Each of the four waterbody types is assessed using two divergent sets of criteria that address value characteristics on the one hand, and management feasibility on the other. The first-set or first-tier criteria rank threatened or impaired waterbodies based on public health, public benefit, and ecological value. The second-set or second-tier criteria address the management feasibility and public and financial support for water quality improvements. Since the second-tier criteria pertain to very practical issues, they will be given more consideration in determining priorities. Since some programs have strict limitations on the type of waters they can manage, three to five watersheds will be selected from each of the four waterbody categories. The Nonpoint Source Pollution Management Program will use the selection process to develop a preliminary list of watershed priorities. A Technical Advisory Committee consisting of applicable RIDEM Divisions and other agencies and organizations that are involved with watershed management, will further evaluate the preliminary list of priorities and make a recommendation to the RIDEM Director, who will make the final decision. The watershed priority list will be reexamined on an annual basis to evaluate the management process in high-priority watersheds and to determine if new watersheds are ready to be selected for management.

This priority selection process is designed to dovetail into the watershed management approach described in Chapter 03-01 of this plan. Therefore, the intent is to develop a priority system that can be used by all applicable water quality management agencies in a team approach that will use other funds and resources to complete the necessary watershed management steps and reach the point where the design and implementation of best management practices can be achieved by the Nonpoint Source Pollution Management Program with Section 319 funds, as well as other applicable funding sources.

First-Tier Criteria

The first tier of criteria is applied to the four categories of waterbodies. Since each category has distinct resource values and divergent physical attributes, specific criteria are used for each of the four waterbody categories as shown in Table 731-03(1).

Table 731-03(1)
Waterbody Categories and Evaluation Criteria

Waterbody Categories	Surface Water Drinking Supplies	Groundwater Drinking Supplies	Other Freshwaters (Non-Drinking)	Estuarine Waters
Evaluation-criteria	• Service Capacity • Primary or Secondary Source • Alternate Source Availability	• Service Capacity • Primary or Secondary Source • Alternate Source Availability	• Public Access • Recreation: Swimming Boating Fishing • Natural Habitat	• Public Access • Recreation: Swimming Boating Fishing • Commercial Habitat • Natural Habitat

All surface and groundwaters in the state that are either threatened or impaired, as determined by RIDEM, are evaluated using the criteria listed in Table 731-03(1). Lists of threatened and impaired waters are drawn from the most recent State of the State's Waters Report (305(b)) for Rhode Island. As of 1994, threatened waters are considered to be those waters that support their designated uses but are threatened by pollution, primarily coming from nonpoint sources. Impaired waters are considered to be those waters that either do not support or partially support their designated uses. A waterbody that is considered fully supporting -- i.e., neither threatened nor impaired -- may still be evaluated, particularly if its designated uses are intolerant of pollution. Such waters may include, but are not limited to, public drinking water supplies. However, a higher priority will be given to threatened and impaired waters.

Drinking Water Value Criteria

Since the contamination of a drinking water supply may carry severe public health ramifications and loss of a drinking water supply may be catastrophic, all public drinking waters are considered highly valuable resources that must be maintained and protected. This system devotes two of four priority categories -- surface water drinking supplies and groundwater drinking supplies -- to the protection and improvement of drinking water resources. Surface and groundwater drinking supplies are evaluated based on service capacity (number of people to whom water is supplied), whether they are primary or secondary supplies, and the availability of an alternate drinking supply to serve the public in the event of contamination. The entire watershed of surface drinking water supplies will be the management area of concern, while priority groundwater management areas will primarily focus on community

wellhead protection areas.

Recreational Value Criteria

The recreational analysis of the first-tier selection process relies on beach and boat launching capacity in addition to sport fishing value, which are strong indicators of public usage. Rhode Island's Comprehensive Outdoor Recreation Plan (RIDOP, 1992) provides the indicators for the amount of recreation supplied. The indicators for fresh and salt water beaches, and boat slips and ramps, are listed in Table 731-03(2).

Table 731-03(2)
Supply Indicators for Swimming and Boating in Surface Water Resources

Activity	Activity Units	Service Standard	Daily Turnover Rate	Daily Capacity
Boating (all types)	Slips Ramps	4 persons/boat 3 persons/boat	1 boat/slip 20 boats/ramp	4 persons/slip 60 persons/ramp
Freshwater Swimming	Linear Feet of Beach Front	0.75 persons/foot	1.5	1.125 persons/foot
Saltwater Swimming	Linear Feet of Beach Front	1 person/foot	1.5	1.5 persons/foot

Daily capacity in persons served per day -- see column five of Table 731-03(2) -- is used as the basis for determining the relative value of different types of recreational facilities. The Rhode Island Outdoor Recreation, Conservation, and Open Space Inventory (1989c) provides activity-unit data on recreational facilities (see column two of Table 731-03(2)). The Inventory lists each beach facility and its linear frontage, as well as each boat launching area and the number of public ramps and slips it provides. This activity unit data, in combination with supply indicators, may be used to calculate the total daily capacity of a waterbody's recreational resources.

In the Nonpoint Source Priority Watershed Selection System, state and federal facilities are given twice the weight of other facilities to account for the greater use and public access opportunities that state and federal facilities provide. In the Inventory, recreational facilities are classified by ownership -- federal, state, municipal, and private. In the priority system, this classification data is used to weight total daily capacities and develop rankings.

Waters with valuable sport fishing resources are evaluated using best professional judgement and information provided by RIDEM's Division of Fish, Wildlife and Estuarine Resources. Strongest consideration is given to those waters that are stocked, support fishery restoration efforts, or have important populations of sport fish.

Fresh non-drinking waters and estuarine waters exhibit very different daily capacities for

recreation and therefore do not compete with one another. Estuarine waters have beaches with a linear frontage up to 10,000 feet. Most estuarine waters have more than 2,000 feet of beach frontage. On the other hand, no fresh waterbody has more than 1,500 feet of frontage and most have less than 1,000 feet. Moreover, few freshwaters have more than one boat ramp, while most estuarine waterbodies have several ramps or dozens of slips.

Recreational resources are not classified as highly, with respect to public health and benefit, as drinking water supplies or waters supporting commercially important fisheries.

Commercial Habitat Value Criteria

Rhode Island's marine fishing industry harvests millions of dollars worth of fish each year. Because of their potential effect on the public health and the economy, all estuarine/coastal waters with important commercial fishing resources are considered to be important candidates for priority selection, based on first-tier criteria. While this does not necessarily ensure their selection as priorities, it does ensure that estuarine waters with important commercial fishing resources receive first consideration in the second-tier analysis (i.e. before those with just high recreational and/or natural habitat values).

The most important commercial fishing grounds are identified based on information provided by RIDEM's Division of Fish, Wildlife and Estuarine Resources. Waters important for commercial fishing may include important spawning areas where minimal harvesting occurs; any commercially important water resource that includes or is part of a state management area, whatever its productivity; as well as any area that provides commercially valuable harvests.

Natural Habitat Value Criteria

Harm to a special habitat may unbalance the ecology and indirectly injure public health. However, these effects are not as severe as those resulting from impairment to a drinking water or commercial fishing grounds. Therefore, within the natural habitat first-tier criteria category, waters are only considered to have priority natural habitat value if they support a federally listed endangered or threatened species, or a state-listed endangered species. Best professional judgement -- in part giving consideration to habitat diversity and productivity -- is used to differentiate between the relative value of these.

Second-Tier Criteria

The second-tier criteria focus on management feasibility and public and financial support.[1] Each second-tier criterion is listed by these categories and defined with a method of measurement. While watersheds need not meet all secondary criteria to be listed as a priority, watersheds that meet these criteria closely should receive the highest ranking. The committee should meet annually to reevaluate priorities and determine if new watersheds are ready to be targeted for management.

Public Support Criteria

Municipal Support:

Communities may show support for water quality management by adopting or pursuing appropriate land use controls, ordinances, or other mechanisms for controlling nonpoint sources, or by taking appropriate nonpoint source pollution mitigation actions, such as wastewater management district implementation, sewering, and/or the initiation of watershed assessment studies. Therefore, municipal support is measured by commitment to develop applicable mechanisms for nonpoint source control. These mechanisms may include, but need not be limited to:

- Soil erosion and sediment control ordinances
- Stormwater management ordinances
- Appropriate land-use ordinances
- Wastewater management districts
- Financial commitment to mitigate existing nonpoint sources
- Water quality protection plans

Advocacy Support:

Advocacy support refers to support from individuals who have organized to further water quality management in their area. Where active watershed associations or other watershed advocacy groups exist, the associated watershed is a better candidate for priority selection. For a watershed advocacy group to be considered active, it should be currently involved in some activity, including, but not necessarily limited to:

- Public education and outreach that target water quality issues;
- Active water quality monitoring, with particular emphasis on organized programs, such as those associated with URI's Watershed Watch; and
- Support for state, municipal, or other efforts to manage water quality.

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[1]Watersheds may be selected that rank with very high levels of second-tier criteria but do not receive a very high rank using the first-tier criteria. However, all priority watersheds must be selected in a manner consistent with the three primary management objectives.

Interagency Commitment:

A watershed effort that enjoins interagency commitment will have broad-based consensus and well-defined direction. As a result, it will enjoy faster and greater success. Therefore, higher priority must be given to watersheds where applicable agencies have committed to pooling resources to achieve more effective water quality management. Interagency commitment can be shown by the existence of formal and informal agreements between agencies and by other types of cooperative efforts, such as:

- Memorandums of Understanding regarding watershed efforts;
- Recent projects aimed at water quality management; and
- Management plans with clearly identified solutions to water quality problems.

Financial Commitment:

Financing from several sources not only demonstrates support but can address more management issues. Watersheds where funds and resources are available from several sources are better candidates for priority selection. This criterion can be measured by the availability of resources, including but not limited to:

- Dedicated funds or staff support through non Section 319 funds

Management Feasibility Criteria

Identifiable Problems:

The first step in developing a management project or watershed implementation management strategy is to identify the sources and extent of water quality problems -- both point and nonpoint -- in the watershed. Once the problems have been identified, best management practices can be designed to manage water quality effectively. Demonstrable water quality problems must exist for a watershed to be selected as a priority. Water quality problems from known sources or from suspected sources will receive higher priority than those from unknown sources. However, the need for further assessment of water quality impacts, sources of pollution, and corrective measures will be appropriate criteria for a waterbody to be selected as a priority.

Management Area Size & Project Time Frame:

Renewed and increased support for water quality management hinges on demonstrable water quality improvements. Two recurrent traits in projects that exhibit nonpoint source water quality improvements are small management area size and short project time frame, i.e., one to three years. Watersheds where projects can occur over short periods and in areas of manageable size are better candidates for priority selection.

Comprehensive Implementation Management Strategy:

A comprehensive implementation management strategy refers to a plan that proposes specific best management to control all aspects of water quality degradation, and a method

for evaluating project results. Where plans exist, watersheds should be considered better candidates.

Technical Advisory Committee

To initiate the selection process, staff from RIDEM's Nonpoint Source Pollution Management Program will use the two sets of criteria to develop a preliminary list of priority watersheds. Three to five waterbodies will be selected for each of the four broad waterbody categories. This preliminary list will be submitted for further evaluation to a Technical Advisory Committee consisting of applicable RIDEM Divisions and other agencies/organizations that are also involved with watershed management. The RIDEM Divisions will include: Agriculture; Environmental Coordination; Fish, Wildlife and Estuarine Resources; Groundwater and ISDS; Water Resources; and Water Supply Management. Other agencies will include:

- Rhode Island Coastal Resources Management Council
- Natural Resource Conservation Service
- State Conservation Committee
- Rhode Island Department of Administration, Division of Planning
- Rhode Island Department of Health
- University of Rhode Island, Cooperative Extension
- University of Rhode Island, Coastal Resources Center
- Rhode Island Rivers Council
- Executive Committee of the Rhode Island Water Works Association

The task of the Technical Advisory Committee will be to refine the preliminary list by adding or deleting waterbodies based on whether or not they comply with the criteria. A manageable number of waterbodies (three to five) will then be recommended for each waterbody category. The recommendations of the Technical Advisory Committee will be submitted to the RIDEM Director, who will make the final decision.

The watershed priority list will be reexamined by this advisory committee on an annual basis to evaluate the management progress in priority watersheds and to determine if new watersheds are ready to be selected for management.

03-03 RESTORATION OF AQUATIC HABITATS

03-03-01 Water Quality Concerns

Efforts to meet the goals of the federal Clean Water Act have traditionally focused on measures to restore and maintain the *chemical* integrity of the Nation's waters. But there is growing recognition that further progress in restoring and maintaining the overall ecological integrity of surface waters will require enhanced consideration of the *physical and biological* properties of aquatic ecosystems.

Many types of surface waters have suffered from biological and physical habitat degradation, as well as chemical contamination, as a result of point and nonpoint sources of pollution and various land use impacts. A 1992 report by the National Research Council (NRC, 1992) concluded that habitat degradation is a primary factor limiting attainment of beneficial uses of the nation's surface waters. The NRC also concluded that an accelerated effort toward restoration of aquatic ecosystems is needed, and that failure to restore aquatic ecosystems promptly will result in sharply increased environmental costs later, in the extinction of species or ecosystem types, and in permanent ecological damage. Improvements in the physical and biological habitats of surface waters can lead to improvements in water quality by increasing the capacity of aquatic ecosystems to process contaminants (i.e., restore assimilative capacity). Restoration of the biological and physical habitat of waters can also produce large improvements in the structure and function of biological communities beyond those gained by improving water quality alone (Creager et al., 1994).

The watershed management approach, set forth above in Chapter 03-01, provides the framework for pursuing integrated solutions that address all elements of water quality restoration -- chemical, physical, and biological. What's more, EPA calls upon the states to include a Watershed Resource Restoration Element in their annual workplans. According to the "Section 319 Nonpoint Source Pollution Control Management Program and Work Plan Guidance for Fiscal Year 1995 State & Tribal Grants," issued by EPA/Region, "Watershed Resource Restoration activities are intended to benefit the broad range of functions to the aquatic system and physically restore aquatic habitat for the diverse and historic flora and fauna associated with the resource." The guidance further states that projects will generally be located in, on, or directly bordering impaired waters.

Based on the above, this chapter sets forth a broad range of potential aquatic habitat restoration activities that should be considered for the purpose of implementing broad-based watershed management initiatives.

03-03-02 Policies and Recommendations

POLICY 3.1 Restore impaired aquatic habitats in priority areas, to the extent possible.

Recommendations:

(1) The existing Habitat Restoration Team, comprised of representatives from the U.S. Fish and Wildlife Agency, RIDEM, Audubon Society of Rhode Island, and Ducks Unlimited, among others -- should establish high priority aquatic habitat restoration sites in freshwater and estuarine/marine environments. To the extent possible, high priority aquatic habitat restoration sites should be located within high priority watersheds (see Chapter 03-02 for a description of the priority watershed ranking system). In addition, high priority should be given to sites that are in public ownership or have appropriate public access.

(2) The Habitat Restoration Team should work in concert with applicable RIDEM officials to establish a watershed priority list for future restoration of impaired aquatic habitats located within other watersheds.

(3) Detailed restoration assessments should be conducted by federal or state fish and wildlife biologists, in conjunction with university representatives with special expertise in this area, prior to initiating any aquatic habitat restoration project. Such assessment work should be aimed at ensuring that potential projects can be implemented successfully, in a manner consistent with all applicable federal and state regulatory programs, and in a manner that addresses habitat restoration goals while considering impacts on ecological systems.

(4) Innovative/alternative habitat restoration techniques or methodologies should be used, where applicable, as demonstration projects.

(5) Preference should be given to the use of non-structural habitat restoration techniques that will require minimal oversight and maintenance following implementation.

(6) All habitat restoration projects should include an effective monitoring component to measure implementation results. Monitoring may include chemical, biological, or visual observations, as appropriate.

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APPENDIX A

Rhode Island Water Quality Classifications

Each of the state's surface waters is assigned to one of the Classes listed below. It should be noted that, as of 1994/1995, draft revisions to the RI Water Quality Regulations propose to reclassify the waters of the state such that the water quality standard/goal of all RI waters meets the swimmable/fishable goal of the federal Clean Water Act.

Waterbodies Suitable For:	Are Classified As:
Fresh Waters	
(Drinking) Water Supply	Class A
Public Water Supply With Appropriate Treatment, Agricultural Uses, Bathing, Other Primary Contact Recreational Activities, Fish and Wildlife Habitat	Class B
Boating, Other Secondary Contact Recreational Activities, Fish and Wildlife Habitat, Industrial Processes and Cooling	Class C
Salt Waters	
Shellfish Harvesting for Direct Human Consumption, Bathing and Contact Recreation, Fish and Wildlife Habitat	Class SA
Shellfish Harvesting for Human Consumption After Depuration, Bathing and Primary Contact Recreation, Fish and Wildlife Habitat	Class SB
Boating, Other Secondary Contact Recreation, Fish and Wildlife Habitat, Industrial Cooling, and Good Aesthetic Value	Class SC

APPENDIX B

Criteria for Designated Use Support[1]

EVALUATED WATERS

Those waterbodies for which the use support decision is based on dated (> 5 years old) site-specific chemical/biological data or infrequently collected data (< quarterly sampling frequency). Assessments are based on this limited water quality data or on other information, such as land use data, known nonpoint and point source locations, citizen complaints, citizen monitoring data, etc.

Fully Supporting

-No known impairment of the waterbody designated water quality standard (goal). Absence of known significant pollution sources indicate waterbody uses are fully supported. If available, in-stream concentration estimates from Discharge Monitoring Report data predict no exceedence of water quality criteria.

Fully Supporting, But Threatened

-Citizen monitoring data or other evaluated data indicate possible exceedences of chronic criteria, or presence of potential pollution sources exists (e.g., input from storm drains or other nonpoint sources). Waters fully support their designated uses but may not fully support uses in the future because of anticipated sources or adverse pollution trends.

Partially Supporting

-Verified citizen complaints on record, or known sources of pollution are present and one or more uses are considered to be impaired while remaining uses are fully supported, using Best Professional Judgement (BPJ), estimated in-stream concentrations, etc.

Not Supporting

-Based on BPJ, significant sources of pollution are present, and dilution calculations indicate consistent exceedence of water quality criteria in-stream, or significant impairment of designated use(s) is likely, or citizen monitoring data with adequate QA/QC indicate repeated violations of water quality criteria, or data collected at less than quarterly sampling frequency exceeds acute aquatic life criteria for more than 50% of the samples (for minimum of four samples over two years).

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[1] Source: The State of the State's Waters -- Rhode island - A Report to Congress, R.I. Department of Environmental Management, Division of Water Resources, November 1994. The report notes that the criteria are based on EPA Guidance.

MONITORED WATERS

Those waterbodies for which extensive data bases are available and for which the use support decision is principally based on current (< 5 years old) site-specific ambient data with adequate QA/QC and a minimum quarterly sampling frequency, including: fixed-station USGS data or in-stream/> 24-hour survey sampling data, artificial substrate or Rapid Bioassessment Protocols measuring invertebrate community diversity, and/or calibrated and verified mathematical modeling data.

Fully Supporting

-For all pollutants, no violations of acute aquatic life criteria. Artificial substrate data (if available) shows no evidence of community modification.

Fully Supporting, But Threatened

-Citizen monitoring data or other evaluated data indicate possible exceedences of chronic criteria, or presence of potential pollution sources exists (e.g., input from storm drains or other nonpoint sources). Waters fully support their designated uses but may not fully support uses in the future because of anticipated sources or adverse pollution trends.

Partially Supporting

-Non-toxic (conventional) pollutants are causing only partial impairment of designated uses; total and fecal coliform levels for shellfish monitoring program require conditional closure of shellfish beds, but other uses (swimming, etc.) are not impaired, or artificial substrates indicate possible slight modification of the invertebrate community.

Not Supporting

-Non-toxic pollutants are causing significant impairment of designated uses, and mean values exceed water quality criteria. For priority pollutants, one or more of values exceed acute aquatic life criteria (using 50 mg/l hardness). Uses such as swimming are impaired, or permanent shellfish closures (SA waters) occur, or artificial substrates indicate significant modification of the invertebrate community.

APPENDIX C

Rhode Island Nonpoint Source Pollution Management Program: Overview of Major Projects Completed/Initiated Between 1992-1994

- **Nonpoint Source Pollution Management Plans for Ten (10) Surface Water Supply Watersheds (RIDEM, 1993)**

These plans were completed for the water supply watersheds of Block Island, Woonsocket, Pawtucket, Jamestown, Sneech Pond, Kickemuit River, Stafford Pond, Maidford/Lawton Valley, Bailey Brook, Nonquit/Watson, and Wallum Lake watersheds. The Scituate Reservoir Watershed was not done due to the extensive study that was completed by the RI Division of Planning with assistance from RIDEM in 1990.

The purpose of these plans is to provide the communities and water suppliers with data and recommendations that can assist with the protection of these surface water reservoirs via enhanced management of land use within the reservoir watersheds.

The plans contain a brief description of the reservoir watersheds and a brief overview of existing water quality conditions within the reservoirs. The plans also contain an inventory, classification, map, and assessment of existing land uses in the watershed relative to their potential as nonpoint source pollution threats to water quality.

Constraints to new development in the watersheds are also mapped to assist planners from the watershed communities with guiding new growth away from sensitive areas. In addition, recommendations are given to help mitigate existing nonpoint source pollution problems and to help prevent future nonpoint source pollution problems from arising.

- **Rhode Island Community Nonpoint Source Pollution Management Guide (RIDEM, 1994)**

This handbook was developed to aid local board, commission and council members in making informed decisions about the quality of proposed developments and potential nonpoint pollution problems. It is designed to complement the planning review process and provide guidance in preventing serious impacts to valuable local resources; however, the handbook is not meant to be a guide through any permit or site plan review process.

Part One - How to Identify and Prevent Nonpoint Pollution Problems, offers information on the general principles underlying nonpoint pollution management and describes how to locate areas that are sensitive to this kind of pollution. It also supplies specific information to use when evaluating development proposals. A glossary has been included at the

beginning of this section for easy access by readers unfamiliar with nonpoint source pollution definitions. Chapter One provides background information on how land use relates to nonpoint source pollution. Chapter Two examines common sources of nonpoint pollution and suggests practices communities can adopt to address these problems. Chapter Three presents information on areas of concern, and Chapter Four discusses the use of map resources. Finally, Chapter Five provides readers with a series of questions and a checklist for evaluating development proposals.

Part Two - State and Community Roles in Preventing Nonpoint Source Pollution, outlines the state regulatory programs addressing nonpoint pollution problems (Chapter Six) and furnishes information on the local authority that communities can exercise in preventing or controlling existing problems (Chapter Seven). The Available Resources section, located at the back of this guide, offers information on more detailed publications, agencies, and organizations to contact for technical assistance. This section includes a wide variety of no-cost or low-cost programs available to assist Rhode Island communities in planning and resource-protection activities.

Communities need clear, yet flexible policies and good planning to manage land use in order to prevent pollution impacts. Balancing the use and protection of natural resources while developing or maintaining a prosperous community is an ambitious, but achievable goal. New growth and environmental protection can co-exist harmoniously, if enhanced planning and more innovative land use management techniques are used. This manual is used by URI Cooperative Extension and URI's Coastal Resources Center in their training sessions for local officials.

- **Rhode Island Stormwater Design and Installation Standards Manual (RIDEM and CRMC, 1993)**

This manual has been prepared to assist property owners, developers, engineers, consultants, contractors, municipal planners and others in planning and designing effective stormwater best management practices. The material contained within the manual is provided as guidance to those persons involved in the development of properties,many of which will be subject to state and local regulatory permit requirements. This manual should be used by applicants to:

- Coastal Resources Management Council (CRMC);
- Department of Environmental Management (DEM); and
- Local municipalities that have stormwater ordinances.

Municipal officials, including planners and engineers, can use the manual to support local stormwater management programs. This may include incorporating or referencing the manual into local ordinances.

This manual is the culmination of a multi-year effort by the NPS Pollution Management Program to develop effective peer reviewed best management practices for the control of soil erosion and stormwater runoff. A revised Rhode Island Soil Erosion and Sediment Control Handbook was published in 1989. The NPS Program funds the R.I. Conservation Districts to conduct statewide workshops on the use of the stormwater manual.

- **Environmental Guide for Marinas: Controlling Nonpoint Source and Storm Water Pollution in Rhode Island (RI Sea Grant/Coastal Resources Center, 1994)**

This manual was funded with Section 319 funds to provide guidance to boat owners and marina operators regarding practical best management practices (BMPs) to prevent nonpoint source pollution from marinas. All BMPs are consistent with applicable requirements set forth by Section 6217 of the Coastal Zone Act Reauthorization Amendments in addition to RI Pollution Discharge Elimination System (RIDES) regulations. The manual contains chapters covering such topics as hazardous material handling and storage, fueling techniques, and proper wastewater disposal. With subsequent financial support from the Nonpoint Source Program, the Coastal Resources Center will provide technical assistance to selected marinas to develop operation plans that comply with the manual, and conduct a workshop for marina operators on the use of the manual.

- **Community Wastewater Management Guidance Manual (University of Rhode Island, 1994)**

The Nonpoint Source Program funded the URI Civil and Environmental Engineering Department to prepare a guidance manual for use by communities to determine the least costly, most environmentally sound, socially and legally acceptable wastewater treatment alternatives, given the development pattern, site conditions, and environmental constraints. The manual presents a two-step process: step 1 explains the process and procedures for determining the extent and severity of the failing septic system problem, and step 2 describes the procedure for determining the most feasible wastewater treatment alternatives.

The manual includes procedures for evaluating the following wastewater treatment alternatives: on-site-retrofit (conventional and alternative designs, such as sand filtration and pressure dosed mound systems); small community septic systems to handle clusters of homes (2-10); package treatment facilities; and conventional sewering. A screening procedure was developed to determine the technical feasibility of the various alternatives. A procedure for estimating the present worth value of each option was developed and includes evaluation of the costs associated with land/property acquisition, construction cost, labor, power costs, routine operation and maintenance costs, equipment repair and replacement costs, and septage pumping, hauling and treatment costs.

The manual was tested for its utility using the village of Hope Valley as a case study

with specific recommendations to attenuate failed septic systems in this area. The manual was closely coordinated with RIDEM's Division of Groundwater and ISDS to ensure consistency with the most recent revisions to Rhode Island's ISDS regulations.

- **Greenwich Bay Nonpoint Source Pollution Mitigation**

Section 319 funds are being used to support a coordinated effort to mitigate nonpoint source impacts to Greenwich Bay including:

- An ISDS enforcement program that has inspected over 600 homes in the Greenwich Bay watershed. This effort will continue for at least another year.
- The NPS program is partially supporting a Greenwich Bay Coordinator in the Narragansett Bay Project. This important position will coordinate the on-going efforts of the watershed communities, environmental groups, and state agencies.
- The construction of innovative septic systems to replace existing failed systems. These systems will serve as a demonstration of new wastewater treatment technology.
- Approximately 160 homes will be tied into the existing sewer system in the Oakland Beach neighborhood
- Shoreline surveys by Save the Bay volunteers for the entire Oakland Beach neighborhood will be done which can lead to the identification of illegal tie-ins to storm drains and other nonpoint problems.
- All storm drains will be stenciled, by Save the Bay, to educate people not to dump hazardous materials in these drains.
- Marina operational plans will be prepared by URI's Coastal Resources Center for sites in Greenwich Bay

- **Technical Assistance to Communities**

Several projects are targeted to helping towns prevent future nonpoint source pollution through the adoption and implementation of innovative zoning or specific nonpoint source control ordinances. Some examples follow:

- Funded the R.I. Conservation Districts to provide community soil erosion and stormwater runoff plan review and inspection services. Twenty communities

currently use this service which is now a self-supporting program through user fees.

- Providing technical planning assistance to the communities of Scituate, Foster, and Glocester to help them implement the nonpoint source pollution prevention requirements established in the Scituate Reservoir Watershed Management Plan.

- In conjunction with the Narragansett Bay Project and the R.I. Chapter of the American Planners Association, developing nonpoint source prevention ordinances and associated educational workshops.

- Reviewed all community comprehensive plans for consistency with the Rhode Island's Nonpoint Source Management Plan and offered suggestions to communities to enhance the nonpoint source pollution prevention aspects of these plans.

- **Technical Support for Revisions to ISDS Regulations**

The NPS program funded the preparation of two technical reports to help support the proposed revisions to the ISDS Regulations including: "Impact of Individual Sewage Disposal Systems on Water Quality - a Literature Review" and "Financial Sources and Technical Assistance for Non-Sewered communities."

- **ISDS Demonstration and Training Program**

The Nonpoint Source Program provided primary funding and assisted with the coordination of an ISDS demonstration and training facility at URI. Septic systems were constructed above ground to help train state agency personnel, local officials, and members of the private sector in the design and proper installation of conventional as well as alternative individual sewage disposal systems. Completion of training course at the facility will be a prerequisite for certification in the design and installation of alternative ISDS that are proposed in revisions to the ISDS regulations.

- **Construction Projects**

The Nonpoint Source Program is providing financial and technical support to the City of Newport to construct a stormwater runoff retention pond in the Bailey Brook Watershed. Measurable water quality improvements are anticipated. The Nonpoint Source Program is also funding and coordinating the mitigation of several stormwater inputs to Watchaug Pond in Burlingame State Park.

APPENDIX D

Implementation Methods and Best Management Practices

The following is a representative sampling of some of the major sources from which applicable best management practices will be selected for the purpose of implementing nonpoint source pollution control projects.

- Rhode Island Soil Erosion and Sediment Control Handbook (RIDEM, USDA/SCS, RI State Conservation Committee) 1989.
- Rhode Island Stormwater Design and Installation Standards Manual (RIDEM, CRMC) 1993.
- Environmental Guide for Marinas: Controlling Nonpoint Source and Storm Water Pollution in Rhode Island (RI Sea Grant/Coastal Resources Center) 1994.
- Rhode Island Community Nonpoint Source Pollution Management Guide (RIDEM) 1994.
- Wastewater Management Guidance Manual for Non-Sewered Communities (RIDEM, URI) [Under preparation].
- Best Management Practices Manual for Timber Harvesting, Forest Protection, and Water Quality (RIDEM) [In press].
- Rhode Island Field Office Technical Guide (USDA/NRCS) [Under revision].
- Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters (USEPA) 1993.
- Fundamentals of Urban Runoff Management: Technical and Institutional Issues (Horner et al., Terrene Institute/USEPA) 1994.
- Stormwater and Nonpoint Source Pollution Control: Best Management Practices Manual (NJ DEP/DOA) 1994.

APPENDIX E

RIGIS Maps and Data Packages Available to Cities and Towns

BASE MAP
- City/town boundaries
- Highways
- Rivers and streams
- Lakes and ponds

CONSTRAINTS TO DEVELOPMENT
- Soil type restrictions
- Presence of wetlands

LAND USE
- 1988 land use

UTILITIES
- Public water systems
- Public sewer systems

SENSITIVE NATURAL AND COMMITTED AREAS
- Open space lands
- Historic sites
- Archaeological sites
- Floodplains
- Rare and endangered species
- Prime agricultural land

HYDROGRAPHICALLY SENSITIVE AREAS
- Groundwater reservoirs
- Groundwater recharge areas
- Public wells
- Drainage basins of public water supplies

APPENDIX F

Summary of Innovative Land Use Management Techniques

Flexible Zoning - Allows variation in lot size and frontage within a development, to work with constraints of the land and avoid environmental impacts, while maintaining overall density in accordance with minimum lot size requirements. Unlike cluster zoning, there is no open space dedication requirement.

Open Space or Cluster Zoning - Allows for smaller lot size and frontage requirements while maintaining overall density, but requires a dedication of open space in direct proportion to the lot size reduction. Method for avoiding environmental impacts, preserving open space, and reducing cost of development. Can be used with density bonuses to encourage developers to provide community needs such as affordable housing.

Planned Unit Development - Similar to cluster zoning, but allows a mix of land use types. Good means of diversifying land uses in a community while protecting sensitive environmental areas. Requires considerable planning.

Development Plan (Site Plan) Review - Requires that new development be reviewed for specific design criteria, which may include environmental, drainage, traffic, architectural, and landscaping standards. Standards must be objective, reasonable, and consistent with comprehensive plan. Good way to avoid poorly planned development that can result in environmental and other impacts.

Phased Growth Controls - Regulates number of building permits issued annually, in order to provide for adequate public services and facilities. Developers can exceed cap by preserving open space, protecting environmentally sensitive areas, and/or meeting housing needs. Growth limits must be based on actual capacity and rate of expansion of community facilities and services, to withstand court challenges.

Transfer of Development Rights (TDR) - Directs development away from environmentally sensitive sites, to areas that can accommodate greater intensity of development due to availability of adequate infrastructure. Allows a landowner in a sensitive site (sending zone) to transfer his/her development rights to a site that can support development (receiving zone). Communities must identify sending and receiving zones. Difficult technique to establish and administer; may not be practical without professional planning staff.

Land Trusts - Non-profit organizations dedicated to preserving open space. Can be established as municipal agency. Work cooperatively with private landowners to preserve significant natural, scenic, or historic areas. Methods include donation, purchase, conservation easements, leases, bequests, remainder interests, and partnerships with business or government agencies.

APPENDIX G

Land Use Classification System

The Land Use Classification System, presented below, is an adaptation of the system set forth in the Scituate Reservoir Watershed Management Plan (RIDOP 1990). Where appropriate, references are made to sections of the plan that provide additional information relating to the nature and implementation of specific mitigative measures.

CLASS A - MINIMAL RISK

These land uses have minimal potential to cause surface (or groundwater) contamination problems. Thus, they are the most desirable in terms of providing protection to a surface drinking water supply.

A.1 Open Space

- Lands owned and managed by a water utility for a public drinking supply (no passive recreation).
- Publicly owned open space (forest, shrub, or abandoned field cover types) with passive recreation permitted but no permanent facilities (e.g., rest rooms, bath houses, etc.).
- Privately owned and managed wildlife refuges.
- Privately owned and managed forest lands.

Mitigative Measures

1. Require land-clearing operations to comply with best management practices (BMPs) as described in the R.I. Soil Erosion and Sediment Control Handbook (RIDEM 1989).
2. Maintain undisturbed vegetated buffers, at a minimum of 100 feet, between cleared areas and any body of water.
3. Prohibit below-ground fuel storage.

CLASS B - SLIGHT RISK

These land uses are potential contamination sources, but their impacts can be mitigated if development standards are instituted. Since these uses provide substantial economic returns to landowners without posing a major risk to drinking water supplies, it would be unreasonable to prohibit these uses within the entire watershed.

B.1 Low Density Residential

- Two acres or more per dwelling unit.

Mitigative Measures

1. Require undisturbed septic system setbacks from the groundwater table and all surface waters (see section 4.2 of the Scituate Plan).

2. Require vegetated buffer strips (see section 4.2 of the Scituate Plan).

3. Establish mandatory septic system maintenance programs (see Waste Water Management Districts -- A Starting Point (RIDOP 1987)).

4. Prohibit below-ground fuel storage, and require BMPs for above-ground fuel storage (see Oil Pollution Control Regulations (RIDEM 1990b)).

5. Establish erosion and stormwater runoff controls (see section 2.2.2 of the Scituate Plan).

6. Set limits for impervious areas (no greater than 10 percent).

7. Require fertilizer/pesticide BMPs (see sections 2.2.9 and 2.2.10 of the Scituate Plan).

8. Develop educational programs on hazardous materials, septic systems, irrigation, fertilizers and pesticides. (RIDEM is a good source for brochures on these topics).

B.2 Field Crops

- Permanent pasture
- Hay crops
- Turf

B.3 Utility Rights-of-Way

B.4 Golf Courses

Mitigative Measures

1. Require BMPs for mowing, vegetative cover establishment and maintenance, fertilizing, and pesticide/herbicide use. BMPs should be developed with assistance from the USDA Natural Resources Conservation Service (NRCS), URI Cooperative Extension Program, and local Conservation Districts (see section 2.2.9 of the Scituate Plan).

2. Require vegetated buffer strips and controlled outlet basins.

3. Prohibit below-ground fuel storage, and require BMPs for above-ground fuel storage (see Oil Pollution Control Regulations (RIDEM 1990b)).

B.5 Developed Recreation

- Developed active recreation sites with permanent structures (e.g., rest rooms), including public parks and playfields, but excluding golf courses.

- Rod and gun clubs and similar uses that include sanitary facilities.

Mitigative Measures

1. Require land-clearing operations to comply with BMPs as described in the R.I. Soil Erosion and Sediment Control Handbook (RIDEM 1989).

2. Maintain undisturbed vegetated buffers, at a minimum of 100 feet, between cleared areas and any body of water.

3. Require contained pump-out, composting, or waterless toilets, where appropriate.

4. Prohibit below-ground fuel storage.

CLASS C - MODERATE RISK

The contaminants generated by these land uses are similar in nature to those in Category B. However, the density and/or intensity of use can contribute greater pollutant loadings to surface (and ground) waters. These uses will therefore require regulatory oversight and strict adherence to applicable mitigative measures to prevent contamination problems.

C.1 Agricultural Production

- Livestock - dairy, poultry, beef cattle, etc.
- Nurseries and orchards.
- Corn.
- Fruit and vegetable crops.

Mitigative Measures

Develop site-specific BMPs with assistance from the NRCS and URI Cooperative Extension. Require and enforce applicable BMPs (see section 2.2.3 of the Scituate Plan.).

C.2 Medium Density Residential

- Between one-quarter and two acres per dwelling unit.

Mitigative Measures

Prohibit new development at this density within the watershed. Existing areas should be a high priority for septic system maintenance programs and for educational programs on hazardous materials, fertilizers, pesticides, and water conservation. Lots of record should be subject to applicable mitigative measures for low density residential development (B.1).

C.3 Low Intensity Commercial and Institutional

- Churches, government offices.
- Professional office buildings.
- Restaurants.

- Junk and salvage yards.
- Automobile dealers.
- Appliance repair shops.
- Motels and hotels.
- Car washes.
- Sand and gravel mining.

D.4 Light Industrial

- Any process that does not require a wastewater discharge other than domestic sewage and does not use, store, or dispose of significant quantities of hazardous materials.

Mitigative Measures

1. All of these uses should be located outside of the watershed if possible.
2. Any use that must be located within the watershed should be subjected to a site plan review process to determine the most appropriate mitigative measures. The mitigative measures listed for Category B.1 land uses should be considered as a starting point.
3. Development standards such as specific stormwater runoff controls, limits on impervious surfaces, set-backs from waterbodies, and hazardous material controls need to be established for these uses. The burden to prove that any use will not contaminate surface (or ground) waters must be the responsibility of the applicant.

CLASS E - SEVERE RISK

These uses should not be permitted in the watershed since they have the highest potential to contaminate water quality. In addition, these uses generate, store, or produce hazardous materials/wastes that can be leaked, spilled, or washed into surface (or ground) waters.

E.1 Any use that would generate a wastewater discharge other than domestic sewage

- Photo processors.

- Food and convenience stores with parking lots less than one acre in size.

- Other such uses that would not produce wastewater discharges or stormwater runoff at a higher level than would be expected from medium density residential development.

Mitigative Measures

The primary concerns with these uses are stormwater runoff generated from parking lots and other impervious surfaces, and large-capacity septic systems. Development standards for stormwater runoff abatement and septic system setbacks and maintenance must be complied with prior to permitting this type of development (see sections 2.2.1 and 2.2.2 of the Scituate Plan). The other mitigative measures cited for Category B.1 land uses also apply.

CLASS D - HIGH RISK

Land uses within this category can pose substantial risks to a drinking water supply due to the high density and activity levels associated with them. There is always a threat of spills, leaks, or unauthorized discharges of domestic wastewater or hazardous materials associated with these uses. For example, wastewater discharges from high schools can contain toxic chemicals from laboratories or degreasing agents from automotive and shop classes. Some of these uses (D.1) provide important community services and thus may be difficult to prohibit in the watershed.

D.1 Institutional

- Schools, colleges.

- Hospitals.

- Medical offices.

- Nursing homes.

D.2 High Density Residential

- One-quarter acre or less per dwelling unit

D.3 Commercial Uses

- Shopping centers with parking lots greater than one acre in size.

- Furniture strippers.
- Laboratories.
- Dry Cleaners.
- Laundromats.

E.2 Any use that would store, use, or process a hazardous material

- Gas stations.
- Landfills.
- Oil distributors.
- Printers.
- Fertilizer, pesticide, herbicide warehouses.
- Auto body and repair shops.
- Airports.

Mitigative Measures

1. Municipal zoning ordinances should prohibit these uses in the watershed.

2. If these uses are to be allowed, the mitigative measures recommended for Category B.1 land uses should apply as a starting point. In addition, the applicant must prove that a proposed use will not impair water quality.

APPENDIX H

PUBLIC PARTICIPATION

Pursuant to Section 319(b)(1), of the Clean Water Act, states, in developing their Nonpoint Source Management Programs, must provide for public notice and the opportunity for public comment. With regard to this provision, EPA's national Nonpoint Source Guidance (December 1987) sets forth the following criteria:

- Have other groups with water quality and resource interests been actively involved in the process of developing the State Management Program?

- Has the State issued a public notice on the availability of the State management Program for public review and provided an opportunity for public comment prior to submitting the report to the EPA? (pp. 17-18)

The following is a synopsis of the steps taken to involve applicable groups and members of the general public in the development of the revised RI Nonpoint Source Pollution Management Plan.

1) On April 23, 1993, RIDEM's Office of Environmental Coordination convened a Nonpoint Source Pollution Management Workshop. Representatives from all applicable federal and state agencies who administer programs involving the control or prevention of nonpoint source pollution participated in the workshop. The workshop covered a range of issues, with a central theme being the need to enhance interagency coordination. Several sessions were devoted to both federal and state perspectives regarding the development of Rhode Island's Coastal Nonpoint Pollution Control Program (RICNPCP), required pursuant to Section 6217 of the Coastal Zone Act Reauthorization Amendments, and the update of Rhode Island's Nonpoint Source (NPS) Pollution Management Plan, required pursuant to Section 319 of the Clean Water Act.

As a result of discussions that took place at the workshop, it was decided that a single advisory group would be convened and utilized for both the development of the RICNPCP and the update of the NPS Plan. It was further agreed that this advisory group -- dubbed the Interagency Nonpoint Source Advisory Committee (INSAC) -- would be co-chaired by RIDEM, the RI Coastal Resources Management Council, and the RI Department of Administration, Division of Planning. The Committee was comprised of representatives from the following agencies and divisions:

RIDEM, Office of Environmental Coordination, Nonpoint Source Program
RI Coastal Resources Management Council
RI Department of Administration, Division of Planning
RIDEM, Division of Water Resources

RIDEM, Division of Freshwater Wetlands
RIDEM, Division of Groundwater & ISDS
RIDEM, Division of Agriculture
RI Department of Transportation
RI Department of Economic Development
RI Department of Health
Office of the Governor
USDA, Natural Resources Conservation Service
University of Rhode Island, Cooperative Extension
University of Rhode Island, Coastal Resources Center
RI League of Cities and Towns

The individuals who served as representatives from these agencies and divisions are listed on pages H-4 and H-5.

2) The first INSAC meeting was held on September 14, 1993. At this meeting, it was decided that the majority of the work involved in developing the 6217 program and updating the NPS Plan would be handled by several Technical Advisory Subcommittees, and that all final work products developed by the subcommittees would be brought before the full Committee for final review and approval. It was further decided that the Subcommittees should be comprised of key officials from federal, state, and local governments, as well as members of nongovernmental organizations, industry representatives, and the general public. Accordingly, the full Committee established eight Technical Advisory Subcommittees, six of which ultimately came to fruition. The six Subcommittees and their memberships are listed on pages H-6 through H-14.

3) During the early part of 1994, the various Subcommittees were convened. At each initial meeting, the Subcommittees were briefed on Section 6217 and Section 319 requirements. Subsequent meetings, running through July 1994, were devoted primarily to the development of the 6217 Threshold Review Document, which was submitted to EPA and NOAA in August 1994.

4) Between August 1994 and February 1995, four Subcommittee meetings were held for the sole purpose of reviewing draft chapters for the revised RI NPS Plan. In addition, between January and April 1995, four meetings of the full Committee were held to review and approve the various components of the Plan.

5) Throughout the entire INSAC process, Committee and Subcommittee members were repeatedly encouraged to submit comments on the various chapters of the Plan as they were developed. In response, dozens of comments were received, and the vast majority of these were directly incorporated into the Plan.

6) In April 1995, a final draft of the entire Plan was distributed to the more than sixty people who had served on the full Committee and the various Subcommittees, and a final

invitation was extended to submit final comments.

7) In May 1995, after incorporating all final comments received from the INSAC participants, the draft Plan was submitted to The Technical Committee of the State Planning Council. Over the course of two meetings, the Committee reviewed the draft Plan and made a number of comments, all of which were all incorporated into a revised draft Plan. On 4 August 1995, the revised draft Plan was approved by The Technical Committee and forwarded to the State Planning Council.

8) On 10 August 1995, the State Planning Council authorized a public hearing on the Plan. On 17 August 1995, a Notice of Public Hearing was published in the Providence Journal-Bulletin. In addition, the Notice of Public Hearing was mailed directly to over 400 local officials, interest groups, and others thought to be interested in the Plan. Pursuant to the Notice, a Public Hearing was held on 11 September 1995. No comments were presented at the meeting. On 14 September 1995, the State Planning Council extended the public comment period to 5 October 1995. Also on 14 September 1995, all water suppliers and all local chief executives in the state were notified about the extended comment period via separate memos issued, respectively, by the State Planning Council and the RI League of Cities and Towns. During the extended public comment period, written comments were submitted by representatives of the Town of South Kingstown, Town of East Greenwich, RI Water Works Association, and Save The Bay.

On 12 October 1995, the four sets of written comments received during the comment period, as well as a series of proposed revisions to the Plan (based on the comments), were submitted to the State Planning Council. After a brief discussion, the Council voted unanimously to adopt the Plan, as amended by the proposed revisions, as an Element of the State Guide Plan.

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APPENDIX I

ATTORNEY GENERAL CERTIFICATION

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RI Department of Environmental Management
Office of Environmental Coordination
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APPENDIX J

LIST OF ABBREVIATIONS AND ACRONYMS

ACE	(US) Army Corps of Engineers
APA	American Planners Association
AST	Above-Ground Storage Tank
BMP	Best Management Practice
CE	(URI) Cooperative Extension
CRC	(URI) Coastal Resources Center
CRMC	(RI) Coastal Resources Management Council
CSGWPP	Comprehensive State Groundwater Protection Program
CZARA	Coastal Zone Act Reauthorization Amendments
DFE	(RIDEM) Division of Forest Environment
DOA	(RIDEM) Division of Agriculture
DOH	(RI) Department of Health
DSR	(RIDEM) Division of Site Remediation
DWM	(RIDEM) Division of Waste Management
DWR	(RIDEM) Division of Water Resources
EPA	(US) Environmental Protection Agency
FWW	(RIDEM) Division of Freshwater Wetlands
FOTG	Field Office Technical Guide
GIS	Geographic Information System
GW	(RIDEM) Groundwater Section
INSAC	Interagency Nonpoint Source Advisory Committee
ISDS	Individual Sewage Disposal System
LUST	Leaking Underground Storage Tank
MCPL	Municipalities
MSW	Municipal Solid Waste
NBP	(RIDEM) Narragansett Bay Project
NOAA	National Oceanic and Atmospheric Administration
NPS	Nonpoint Source
NRC	National Research Council
NRCS	(USDA) Natural Resources Conservation Service
NURP	National Urban Runoff Program
OBS	(RIDEM) Office of Boating Safety
OEC	(RIDEM) Office of Environmental Coordination
OSCAR	Ocean State Cleanup and Recycling
OSDS	On-Site Sewage Disposal System
PAP	Physical Alteration Permit
PP	(RIDEM/OEC) Pollution Prevention (Program)
QA/QC	Quality Assurance/Quality Control

RC&D	(RI) Resource Conservation and Development Area
RCRA	Resource Conservation and Recovery Act
RICD	Rhode Island Conservation Districts
RICNPCP	Rhode Island Coastal Nonpoint Pollution Control Program
RIDEM	Rhode Island Department of Environmental Management
RIDOH	Rhode Island Department of Health
RIDOP	Rhode Island Department of Planning (Dept. of Administration)
RIDOT	Rhode Island Department of Transportation
RIGIS	Rhode Island Geographic Information System
RIGL	Rhode Island General Law
RIPDES	Rhode Island Pollution Discharge Elimination System
UIC	Underground Injection Control
URI	University of Rhode Island
USDA	US Department of Agriculture
USGS	United States Geological Service
UST	Underground Storage Tank
VOC	Volatile Organic Compound
WHPA	Wellhead Protection Area
WWMD	Wastewater Management District