R E G I O N I

ENVIRONMENTAL MANAGEMENT REPORT

REGION I

May 1983

EXECUTIVE SUMMARY

"DRIVING FORCES" AT WORK IN NEW ENGLAND

To assess current and emerging environmental problems in New England, one must understand the region's unique demographic, social and economic characteristics, or "driving forces," which influence how the area's natural resources are used and affected by human activity. The region can be understood best in the context of the five most critical "driving forces" discussed in detail in this part of the EMR: Population, Industrial Mix, Energy, Land Use, and Recreation and Tourism. (page 2)

Population—New England's population is growing. Expected population growth in the next few years is estimated to be 0.5% per year compared to an expected national growth rate of 0.9% per year. While most of the region's growth is occurring in the rural northern states, none of the states have lost population over the past 10 years. The region's population is also shifting from metropolitan to non-metropolitan areas. (page 2)

Industrial mix—New England experienced one of the earliest shifts from a heavy manufacturing industrial base to a services and light manufacturing high-technology economy. The high-technology industry has significant implications for the region's industrial base and environment. High-tech facilities tend to be smaller, more geographically dispersed throughout the region, and lower volume chemical uses, but users of a greater variety of both common and exotic chemicals. The high-tech industry also supports a substantial secondary high- and medium-tech industrial sector and significant research and development activities in the region. (page 3)

Energy—Since the second oil crisis in 1978, New Englanders have used their costly fossil fuels more efficiently, aggressively pursued renewable sources of energy, switched from conventional to renewable fuels, and reduced overall energy consumption dramatically. (page 5)

Land use—The presence of farming and open land provide New England with the rural aesthetics that have always made the region appealing. Although farming is only a small part of the regional economy it provides valuable indirect lifestyle and cultural characteristics which attract high-technology and service oriented industries. For the first time in over one hundred years the area devoted to farmland actually increased and the area of forest land decreased, reflecting a shift of population to non-metropolitan areas, increased development in rural areas and absolute population increases. (page 7)

Recreation and tourism—Recreation and tourism are significant sectors in northern New England economies and are noteworthy portions of southern New England economies. This sector attracts other industries to the area and influences the general population's attitude towards New England environmental quality. (page 7)

INTER MEDIA SECTION

Toxic substances—Toxic substance contamination in New England is a complex, intermedia problem with serious environmental, economic and potential public health impacts. Toxic substance contamination presents the Region with sensitive public relation and complicated technical issues, especially when the displacement of toxic pollutants across environmental media occurs as a result of remedial and clean-up actions at hazardous waste sites. (page 12)

Long range transport of acid deposition and toxic metals—Acidic material and toxic metals are deposited in New England mainly because of long range transport. The result is acidification of fresh water ecosystems, a reduction in visibility and an increase in human exposure to toxic metals. New England and eastern Canada are particularly vulnerable to these pollutants because the bedrock and soils have low buffering capacity. (page 14)

New Bedford Harbor—New Bedford Harbor and the surrounding environment is extensively contaminated with PCBs. Technically and environmentally the New Bedford situation is extraordinarily complex. Multi-media contamination and exposure pathways include: ambient air, surface and ground waters, soils, sediments, food chain, and industrial plant sites. New Bedford is a National Priority List (NPL) site for Superfund action. (page 18)

Ground water contamination—Approximately 20% of New England's population depends on ground water as their sole or principal water supply; and 77% of the region's water supplies rely upon ground or combined ground and surface water sources. Sixty-two community water systems in New England are known to have one or more wells contaminated by organic compounds. All 38 Superfund NPL sites have known or potential ground water contamination problems. As a result, ground water contamination is one of the region's most significant environmental problems. (page 19)

Ground water contamination source: solid and hazardous waste disposal—Leachate from land disposal facilities entering the groundwater poses an actual or potential danger because of the nature of the wastes which typically have gone into these facilities. Many land disposal facilities have accepted or are currently accepting hazardous wastes from small quantity generators. In addition, commercial and household wastes deposited in land disposal facilities often contain small quantities of hazardous materials (insecticides, paint, dry cleaning solvents, paint remover, etc.) which, in aggregate, can be significant. Disposal facilities designated to handle hazardous waste, which are required to monitor ground water, are virtually all unlined. Even where hazardous wastes are not a concern, leachate can cause odor, taste or other water quality problems in a previously suitable drinking water source. (page 20)

Ground water contamination source: uncontrolled hazardous waste sites—New England has 38 sites on the National Priority List (NPL) developed for Superfund. The ranking process used to develop this list assesses groundwater as one critical pathway. All 38 NPL sites have known or potential ground water impacts. (page 21)

Ground water contamination source: non-point sources—Although not as dramatic as industrial lagoon, landfill or uncontrolled site contamination, non-point source contamination is the most pervasive threat to ground water quality in New England. Contamination of individual wells and public water sources by road salts, septic effluent and leaks from underground storage tanks is widespread in the region, and the potential for future problems with these diffuse, hard-to-regulate sources is enormous. (page 22)

Ground water contamination source: naturally occurring contamination—Arsenic and radon, two naturally occurring substances, are appearing in public and private water supply sources in New England. Elevated levels of gross alpha radiation, another emerging ground water contamination concern, are appearing in some regional public water supplies. (page 24)

Energy issues—New Englanders responded to rapid rises in oil prices in the 1970s with dramatic conservation measures, diminished consumption rates and shifts to alternative, cheaper and more available fuel sources. These changing behavior patterns pose environmental problems for the region. (page 24)

Energy: coal conversions—Region I has a number of oil burning utility powerplants that have converted, or are planning to convert, to coal. These conversions can cause a variety of temporary and permanent air and water impacts. (page 27)

Energy: sulfur relaxations—The rising cost of oil has caused many states to seek relaxations in their sulfur in fuel regulations to allow industries to burn lower cost, higher sulfur oil. These relaxations will cause an increase in SO_2 emissions. (page 28)

Energy: hydroelectric power development—The development of hydroelectric power on breached or new dams involving significant diversions of streamflow and/or increased impoundments, can create conflicts with competing uses of these water resources —such as anadromous fisheries, inland coldwater fisheries, white water recreation and protection of scenic river systems. (page 29)

Energy: fuelwood—Wood is an increasingly popular fuel for residential heat in Region I yet there is little definitive data on the magnitude and importance of potential air pollution problems posed by wood burning emissions. Throughout New England, as many as 50% of the owner-occupied households are now using wood for heat, causing an increase in a variety of criteria and non-criteria emissions. (page 30)

Energy: miscellaneous energy impacts—Higher energy prices have generated interest in a variety of other energy related projects. Miscellaneous energy sources addressed in this section include—waste oil, synthetic fuels, coal-oil mixtures, and purchased power. (page 31)

WATER SECTION

Status and trends—Dramatic progress in restoring rivers and lakes occurred in New England in recent years. In 1982, some 66% of the region's major rivers and streams met the fishable/swimmable (Class B) standards of the Clean Water Act, while in 1976 only 52% of New England's waters met this standard. More than $2.5 billion of federal, state and local funds were expended over the last decade to construct municipal water pollution control facilities in the region. New England's water supply and delivery systems continue to provide high quality drinking water. While violations of federal standards occur, progress is being made by targeting efforts at persistent violators. (page 35)

Point source pollution—Municipal and industrial point source discharges have historically been responsible for a significant portion of the violations of water quality standards criteria for bacteria and dissolved oxygen, and for chemical pollution. Despite significant improvements in the region's water quality in the past few years, more than one-third of New England's major stream miles and coastline waters do not meet the fishable/swimmable goals of the Clean Water Act. Since the areas with remaining violations pose the most complex water quality problems, additional improvements will be more difficult to achieve and will be more costly. The 1982 EPA Needs Survey estimates that $5.8 billion of additional construction grants funds are required to construct the remaining wastewater treatment plants and interceptor sewer projects needed in New England. (page 40)

Combined sewer overflows—Most major cities in New England have combined storm and wastewater sewer systems. During periods of high precipitation, the sewers overflow and discharge untreated wastewater into rivers, lakes and coastal waters. Combined sewers represent a difficult and important water quality problem for the Region since they prevent the full attainment of the water quality standards and beneficial uses of many water bodies. (page 44)

Nonpoint source pollution—Nonpoint sources of pollution impair high quality drinking, fishing and recreation waters in New England. Lakes, streams and reservoirs are especially vulnerable to these sources of pollution. Although nonpoint problems are generally localized or sporadic in contrast to gross, widespread point source pollution loadings, they are nonetheless significant. (page 45)

Filling of wetlands—Our nation's wetlands are an irreplaceable natural resource. Although wetlands comprise only approximately 3% of this country's surface area, they are essential to the survival of our fish and wildlife populations and are increasingly recognized as important in maintaining water quality. Two-thirds of the commercial fish species harvested on the Atlantic coast depend on coastal estuaries and wetlands for food and spawning grounds, and at least 76 threatened and endangered species require wetlands for habitat.

Despite their value and relative scarcity, our wetlands continue to be destroyed at an alarming rate. There are tremendous pressures from developers to build on coastal islands and in wetland areas. The unregulated discharge of dredged and fill material results in impairment of water quality and habitat loss. Of greatest concern to the region are the recently issued U.S. Army Corps of Engineers "nationwide permits," which exempt large geographical areas from regulation and increase the potential for further wetlands loss. (page 47)

Lake eutrophication—Lakes are among New England's most valuable aesthetic, recreational and economic assets. Many of the lakes in New England are showing signs of accelerated, man-induced eutrophication. (page 49)

Exploratory oil and gas drilling on Georges Bank—The second round of Georges Bank leasing for oil and gas drilling was delayed by court action on March 28, 1983. As soon as legal proceedings on Sale No. 52 are completed, EPA will proceed expeditiously with issuance of NPDES permits for operational discharges. The complexity of the existing permit procedures, heightened public interest, and the need to consider all relevant information and research when making permit decisions makes the permit issuance process time-consuming and difficult. (page 49)

Ocean dumping—New England coastal waters have been used for disposal of dredged soils, industrial and chemical wastes, and low-level radioactive materials. Presently ocean dumping is limited to dredged soils. Increasing pressures to dispose of other materials at sea and an apparent emerging national policy change to consider this alternative will subject the New England's coastal and ocean waters to greater environmental risk. (page 51)

Quality of drinking water—Continued maintenance of New England's high quality drinking water is threatened by resource reductions and increased occurrence of unregulated contaminants. The New England states have indicated that at current funding levels they will be unable to continue to effectively implement all aspects of their drinking water programs. In some areas of New England drinking water has been rendered unsuitable for consumption because of organic chemical contamination. Since these organic chemicals are not covered by federal standards it is difficult, if not impossible, to correct the problems through enforcement actions. (page 51)

Boston Harbor—The Metropolitan District Commission (MDC) operates two out-moded and over-loaded primary treatment plants which discharge 450 million gallons of wastewater and 90 dry tons of digested sludge to Boston Harbor every day. In addition, the local tributary combined sewer system overflows untreated wastes at 110 locations along the Harbor's edge. This wasteload obviously has negative effects on water quality and inhibits full recreational and economic use of the Harbor. (page 53)

Narragansett Bay, Rhode Island—Upper Narragansett Bay, Rhode Island has suffered from man-made pollution problems since the 1800s. Industrial wastes from metal platers, chemical industries and oil terminal activities, municipal wastes and 120 combined sewer overflows have all contributed to current pollution levels. The cumulative effect of these pollutants resulted in the degradation, i.e., high bacterial and suspended solids levels and very low dissolved oxygen levels, of the upper five miles of a 15-mile estuary. (page 55)

Salem Harbor (South Essex Sewer District), Massachusetts—The South Essex Sewer District (SESD) operates a primary wastewater treatment plant that is designed to treat 41 million gallons per day of flow from the five surrounding communities of Salem, Beverly, Peabody, Danvers and Marblehead. The treatment plant discharges into the Salem Harbor, a Class SB watercourse used for fishing, swimming and recreational boating. The plant has been shut down since 1980 because the ash produced by incinerating the waste sludge contained high levels of hexavalent chrome, a hazardous material. The untreated discharge has flowed into the Harbor for over two years and is causing serious environmental problems. (page 56)

Housatonic River, Massachusetts / Connecticut—The Housatonic River suffers from two critical but distinct water pollution control problems: 1) phosphorus-induced algae growth problems in the river impoundments; and 2) PCB contamination of river sediments and resulting high concentrations of PCBs in the River's fish and aquatic life systems. Both problems have adversely affected the recreational potentials of the river and have caused economic losses. These problems are particularly complex because they involve an inter-state stream. The ultimate impacts of some of the pollution sources are not experienced in the originating state but are often most serious far downstream, in another state. (page 57)

LAND SECTION

Status and trends—Hazardous waste is rapidly becoming the most important environmental issue in New England. The region's geologic, industrial and political characteristics complicate the clean-up of abandoned and uncontrolled hazardous waste sites, the management of operating TSD facilities, and the planning for future use and disposal of all hazardous materials, including radioactive wastes and pesticides. There are approximately 5,200 hazardous waste handlers in Region I. Sixty-five percent of the TSD facilities in the region are required to conduct ground water monitoring. (RCRA, page 62)

New England has 38 uncontrolled hazardous waste sites on the Superfund National Priority List; the second highest concentration of NPL sites per square mile of any Region in the nation except Region II. There are currently over 700 hazardous waste sites in the regional site inventory. (CERCLA, page 65)

New England generates approximately 13% of the nation's annual total low-level radioactive waste and disposes all of it outside the region. Local opposition to siting a radioactive waste disposal site within the region is organized and strong, which will make compliance with the siting requirements of the Low-Level Radioactive Waste Policy Act difficult. (RADIATION, page 67)

Improper use and disposal of pesticides may result in serious environmental problems in New England. A recent survey of wells in eastern Maine indicated that two-thirds of the tested wells were contaminated with aldicarb; and about 10% of the contaminted wells exceeded the EPA Drinking Water guidelines of 10 ppb. (PESTICIDES, page 67)

Siting of new hazardous waste facilities—Inadequate hazardous waste management capacity in Region I may have both environmental and economic impacts. When the cost of shipping waste out of the region is high, some firms may be tempted to dispose of their wastes improperly to save money. Firms which behave responsibly may be hurt by high transportation costs, resulting in a competitive disadvantage. New England's many small generators are especially vulnerable to this threat. If the region is not served by an adequate network of hazardous waste facilities, firms making decisions on where to locate plants may not select New England. (page 67)

Small quantity generators of hazardous waste—When EPA promulgated the hazardous waste management regulations in May 1980, a decision was made to exempt generators that produced less than 1,000 kg/month from most of the regulations. For waste considered to be acutely hazardous the exclusion level is 1 kg/month. While the 1,000 kg/month exemption may be appropriate for most hazardous waste generators, it may not be appropriate for small quantity generators, which are highly concentrated in some areas of New England (page 70)

Abandoned and uncontrolled hazardous waste—New England's strong industrial base has generated millions of tons of hazardous waste since the turn of the century. In the past, disposal practices were haphazard and subject to little regulation. Only during the past several years have we come to realize that these disposal practices result in significant hazardous waste contamination problems that may affect human health and contaminate the environment. (page 71)

Pesticides residue in water—Residues of pesticides have been found contaminating some ground water supplies even though they were applied properly. For example, aldicarb residues in the wells of eastern Maine suggest that environmental and soil conditions existing in the area may favor residue accumulation. Additional monitoring may demonstrate that, although properly applied, other pesticide uses can contribute to harmful residue accumulations. (page 74)

Pesticides classifiction—Some pesticides uses that were cancelled because of adverse environmental impacts are still available for use by the general public. Because these uses were not classified "restricted use," their widespread availability and possible misuse appears to be a source of increasing public concern and potential health risks. (page 74)

Low-level radioactive wastes—Low-level radioactive wastes are generated as a by-product of a variety of commercial processes. Both an increasing amount of waste generated and a shortage of disposal sites make this an important emerging problem in New England. (page 75)

AIR SECTION

Status and trends—Available data suggest that overall air quality in New England is continuing to improve. However, Region I is becoming increasingly concerned with non-criteria pollutant problems, including indoor air pollution and hazardous air pollutants. The results of a five year air quality trends study (1977–1981) for four criteria pollutants indicates significant improvements in Total Suspended Particulates (TSP) levels, no general change in Sulfur Dioxide (SO_2) levels, significant decreases in Carbon Monoxide (CO) levels and fewer violation days for Ozone (O_3). (page 78)

Indoor air pollution—A number of studies have pointed to indoor residential air quality as a cause of adverse health effects. A variety of common sources may contribute to the problem, but there is insufficient information available to characterize the degree of risk to the general public and very little legislative authority to allow EPA or states to help solve the problem. (page 80)

Nonattainment areas—Region I has a number of areas that have been designated as primary or secondary nonattainment as a result of a violation of one or more National Ambient Air Quality Standards (NAAQS). The sources of these violations vary from pollutant to pollutant and from state to state, including interstate transport of pollutants in some states. (page 83)

Emissions from significant violators—Although the vast majority of major stationary sources of pollution are complying with air pollution control requirements, a small percentage remain delinquent. These violators constitute approximately 5% of the major source inventory at any given time. The most important of these sources are classified as 'significant violators' since they either are emitting greater than 100 tons per year of a criteria pollutant and are located in a non-attainment area or are violating a PSD, NSPS, or a NESHAPS standard. Their continued non-compliance creates a potentially serious public health problem as well as a major resource drain for the federal and state agencies (EPA, DOJ) involved in pursuing corrective action. Region I identified certain management and resource problems which affect our major source enforcement effort. (page 85)

CONTENTS

PART I / OVERVIEW

"DRIVING FORCES" AT WORK IN NEW ENGLAND

To assess current and upcoming environmental problems in New England, one must first understand the region's unique demographic, social and economic characteristics or "driving forces" which influence how the area's natural resources are used and affected by human activity. A quick look at these forces reveals that the region, although geographically compact, has complex natural and social systems that make its environmental problems far from simple to manage.

New England is an area of marked contrasts. The southern states of Rhode Island, Connecticut and Massachusetts are among the most urbanized in the country (surpassed only by New Jersey), yet fully three-quarters of the region is forested. The northern states of Maine, New Hampshire and Vermont retain a largely rural character and have relatively low population densities. Dramatic contrasts also exist in patterns of personal income. Fairfield County, Connecticut contains some of the richest communities in the country, while many areas in northern Maine are among the nation's poorest.

Despite these contrasts, New England exhibits a stronger sense of regional identity than any other federal EPA region. New Englanders share a closely linked history and many common economic, cultural and political bodies which together make the region politically cohesive. They also share a jealously guarded sense of local autonomy which makes issues such as hazardous waste facility siting a thorny problem.

As the nation's oldest urbanized and industrialized region, New England has often realized environmental, social and economic problems earlier than other parts of the country. Today, for example, New England's municipal infrastructure (sewers, water lines, treatment plants, etc.) has aged and is in need of repair and upgrading. The region also lost its original industrial base to foreign competition during the early and middle part of the century. In an effort to recover from its loss, New England shifted to high-tech and service industries faster than other regions. With these changes have come adjustments in residential and business settlement patterns, energy demands, and expectations for environmental quality.

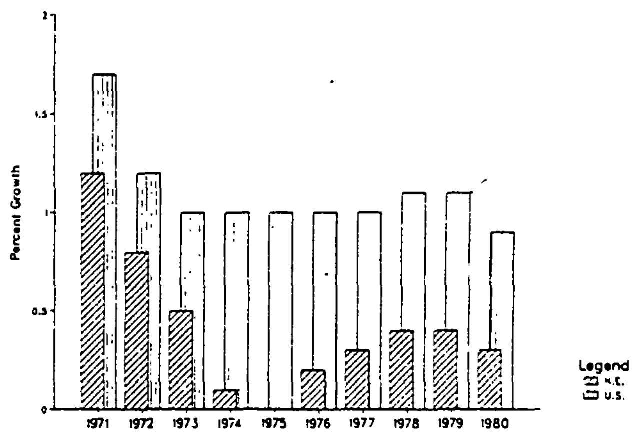
The region can be understood best in the context of the five most critical "driving forces" discussed is detail below:

1. Population
2. Industrial Mix
3. Energy
4. Land Use
5. Recreation and Tourism

POPULATION

New England's population has grown more slowly than the nation's population as a whole, but the region is growing nonetheless. This pattern is expected to continue over the next few years with the region gaining approximately 0.5% per year compared to an estimated national growth rate of 0.9% per year (Figure A).

FIGURE A
ANNUAL POPULATION GROWTH FOR N.E. AND U.S. 1971-80



Source: U.S. Bureau of Census, Census of Population and Housing, 1980

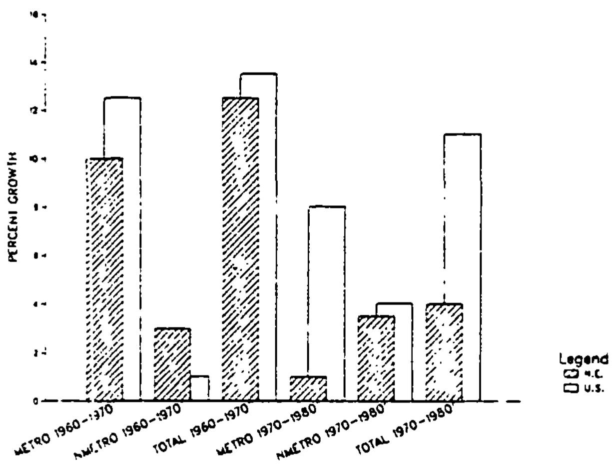
Most of the nation's population growth has occurred in the rural northern states—New Hampshire's population is about 16% larger today than it was in 1970, Vermont grew 14% and Maine 12%. The heavily urbaninzed southern states of Massachusetts, Connecticut and Rhode Island have remained almost constant in population size. None of the states, however, have lost population over the past 10 years.

TABLE 1
PERCENT OF TOTAL POPULATION IN NON-METROPOLITAN AREAS (1970-1980)

	% of Total Population in Non-Metro Areas 1970	1980	% Change 1970 to 1980
New England	20.9	23.4	+2.5
United States	24.4	25.2	+0.8

New England's population is also shifting rapidly from metropolitan to non-metropolitan areas (Table 1). This shift is due partly to greater growth in non-metropolitan areas vs. metropolitan areas (Figure B), but also to an absolute movement away from some of the region's older cities (e.g., Worcester, Massachusetts). Some of the urban exodus is offset by the recent resettlement of the urban core of cities such as Boston, Portland and Providence, but the predominant trend is clearly toward less urbanized areas. This pattern is expected to continue over the next few years.

FIGURE B
POPULATION GROWTH FOR N.E. AND THE U.S. — 1960-1980



Source: U.S Bureau of Census, Census of Population and Housing, 1980

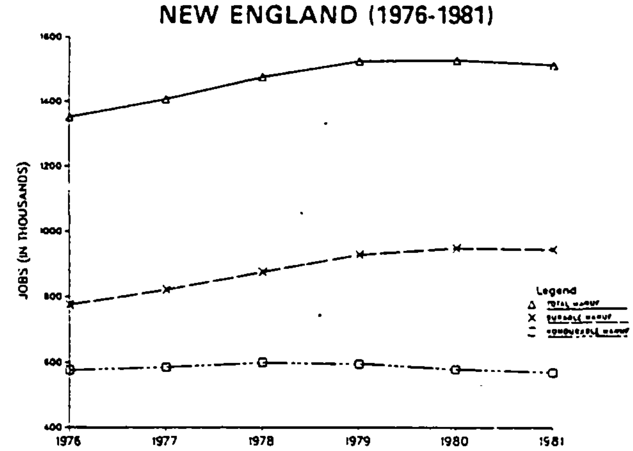
The implications of the shift toward non-metropolitan areas are threefold: 1) abandonment of decaying infrastructures; 2) increased construction of new roads and infrastructures; and 3) new and altered air pollution problems. As people move out of older cities, less capital remains for needed repairs to aging sewer and water systems. The result is often persistant water pollution problems. On the other hand, new roads and infrastructures are needed to accommodate new development in low population density centers. Finally, with more diffuse settlement patterns and longer commutes, air pollution will probably spread over a larger geographic area, without diminishing in total volume. A concern for the immediate and near future is that existing air quality monitoring stations are located in high population density areas only. Unless stations are established in new, lower density areas, the region may be showing a false improvement in overall air quality.

INDUSTRIAL MIX

New England experienced one of the earliest shifts from a heavy manufacturing industrial base to a services/light manufacturing high technology economy. This transition, which occurred since the end of World War II, created 2.2 million new non-agricultural jobs in the region.

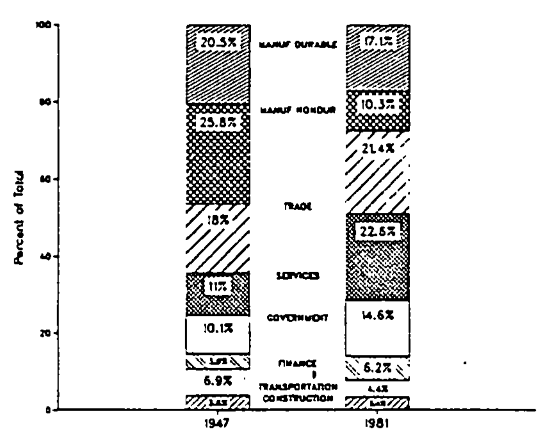
While the lion's share of these new jobs are in service industries, the number of jobs in durable goods manufacturing increased as a proportion of total manufacturing employment by 51 percent (Figure C). This reshuffle of manufacturing jobs occurred in response to the larger shift to a new high-tech economy.

FIGURE C
NONAGRICULTURAL EMPLOYMENT IN NEW ENGLAND (1976-1981)



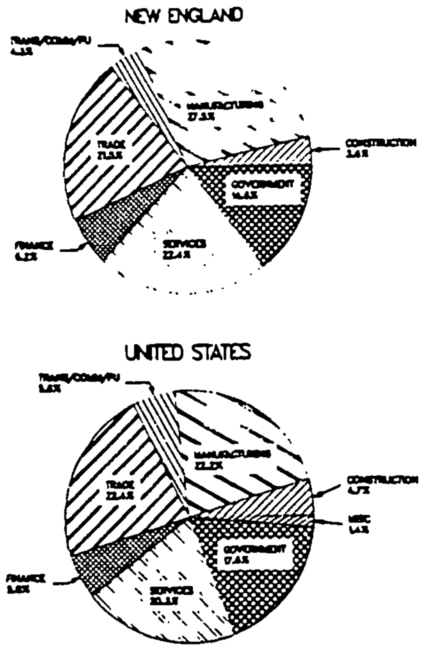
The decline in non-durable manufacturing jobs was absorbed by the growth in the service sector, which increased from only 15 percent of the region's gross employment in 1947 to a dominant 29 percent in 1981 (Figure D). Figure E illustrates that although contracted, New England's manufacturing industry continues to account for a larger share of total regional employment than it does nationally.

FIGURE D
DISTRIBUTION OF EMPLOYMENT BY INDUSTRY IN N.E., 1947 AND 1981



Source: U.S. Department of Labor, Bureau of Labor Statistics

FIGURE E
NONAGRICULTURAL EMPLOYMENT FOR 1981



Source: Anthony J. Ferrara, Structural Charge in New England, 1947-1981. (Boston: U.S. Department of Labor, BLS. [1982]]), p. 23

Nurtured by the strong educational institutions and research facilities in New England the non-manufacturing sector, particularly services, knowledge, and information industries, claims 73 percent of the gross non-agricultural employment. This part of the regional economy has experienced impressive growth throughout the post-war period and has added to its employment rolls every year since 1947. (Table 2)

TABLE 2
EMPLOYMENT GROWTH IN NON-MANUFACTURING INDUSTRIES—NEW ENGLAND (1947-1981)

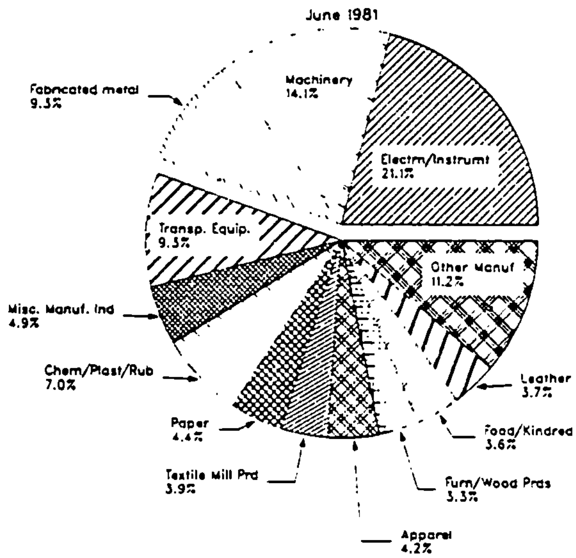
Industry Sector	Percent Change	Employment Change
TRADE (whlsale/retail)	+ 97%	+ 580,000 jobs
FIN/INSUR/ REAL ESTATE	+ 166%	+ 213,000 jobs
SERVICES	+ 237%	+ 877,000 jobs

A traditionally significant northern New England heavy industry, pulp and paper, has also experienced similar growth patterns. The industry has hedged its future growth on the development of fewer larger and more efficient mills, and the modernizing of older ones. The result has been a 30 percent increase in the production of standard cords in the last five years.

The new and modern Jay and Scott Paper mills in Maine are examples of the industry's commitment to investment for continued growth. The Jay Mill is the largest lumber mill in the country and the second or third largest in the world.

The post World War II economic transition in New England has other significant dimensions. During this period the region experienced: 1) growth in the number of smaller volume industrial facilities and a decline in number of larger volume ones; 2) diffusion of new high- and medium-tech industrial facilities throughout rural New England, breaking the historic pattern of dense industrial concentration in urbanized areas; 3) decreases in aggregate quantities of chemicals generated in region and at the same time an explosion in the use of new chemicals and manufacturing processes related to high- and medium-tech industries; and 4) dramatic expansion of secondary high- and medium-tech manufacturing industries, including electronic and electrical equipment, instruments and fabricated metals (Figure F).

FIGURE F
NEW ENGLAND
MANUFACTURING EMPLOYMENT



The transition to services and high-technology manufacturing is expected to continue throughout the decade (Table 3). Strong economic performers, including medical and business services, tourism related industries, electronic and chemical production will continue their growth patterns. Development of widely dispersed smaller industrial and service facilities will continue because the growing economy will require expansion, and workers seem to prefer the rural lifestyle in New England.

TABLE 3
INDUSTRIES PROJECTED TO GROW MOST RAPIDLY IN THE UNITED STATES, 1978-1990
(Minimum 1978 National Employment of 1 Million)

Industry Group	Projected 1978-1990 Employment Growth	June 1981 New England Employment	Rank of Regional Employment
1. Health Services	64%	474,000	2
2. Business Services	57	204,000	6
3. General Merchandise Stores	46	122,000	14
4. Banking	45	103,000	17
5. Hotels and Lodging Places	45	56,000	32
6. Restaurants	29	300,000	3
7. Machinery, Except Electrical	29	217,000	5
8. Miscellaneous Retail Stores	27	136,000	11
9. Miscellaneous Professional Services	26	69,000	24
10. Food Stores	26	166,000	7
11. Chemical and Allied Products	24	45,000	39
12. Insurance	22	125,000	12
13. Electrical/Electronic Equipment	22	218,000	4
14. Fabricated Metal Products	21	143,000	10

Meanwhile, older, larger, and urban industrial facilities will be abandoned or converted to other uses, i.e., housing, commercial, and retail services.

These patterns of growth have several significant implications for the regional environment and public health.

1. Although the total volume of industrial pollution is likely to decine, the incidence of contamination will be more widespread.
2. The introduction of new chemicals and manufacturing process, many exotic, can lead to problems that are beyond the understanding and capabilities of current environmental protection technology.
3. Past problems created by the once dominant non-durable manufacturing sector remain even though the industry is in decline.
4. The needs of a continuously expanding high-technology industry demand strong sustained research and development activities. Investigations into new frontiers of science may pose environmental problems, e.g., biotechnology research and radioactive materials related research.
5. Growth in the economy is likely to come from the development of new, at first small, companies scattered throughout the hinterland. Many of these industries will generate small amounts of hazardous waste and as a result escape the current federal RCRA regulations. Although the individual amounts of waste may be small, the aggregate can be substantial and may pose serious air and water pollution problems as well as threaten public health.
6. Larger, more efficient paper mills that are increasingly using coal, wood wastes and spent pulping liquors may create point source air pollution problems.

ENERGY

Since the second oil crisis in 1978 New Englanders have used their costly fossil fuels more efficiently, aggressively pursued renewable sources of energy, switched from conventional to renewable fuels, and reduced overall energy consumption dramatically. Significant declines in energy consumption were accompanied by equally remarkable economic growth.

Total energy use in New England dropped by 6.5 percent between 1978 and 1980 (US declined only 2.3 percent), while real personal income increased by 4.2 percent. Moreover, there was a dramatic shift from conventional energy resources to renewables, which increased by 17 percent (Table 4).

New England's ability to both reduce gross energy consumption and expand economic capacity dispels the commonly held beliefs that there must be a direct relationship between economic growth and energy consumption. The growing regional economy, dominated by high-tech/light manufacturing industries and services is likely to continue to

TABLE 4
GROSS ENERGY CONSUMPTION IN NEW ENGLAND
1978 and 1980

Sources	1978 Trillion BTU	1978 % of Total	1980 Trillion BTU	1980 % of Total
1) CONVENTIONAL	3146.4	94.6	2914.2	93.7
—petroleum	2530.7	76.1	2266.4	72.9
—natural gas	267.0	8.0	285.0	9.2
—nuclear power	301.8	9.1	241.8	7.8
—coal	23.6	0.7	53.7	1.7
—purchased electricity	23.3	0.7	67.3	2.1
2) RENEWABLE	178.4	5.4	195.6	6.3
—wood products	114.1	3.4	141.5	4.6
—hydro-power	62.6	1.9	49.3	1.6
—other renewables	1.7	0.1	4.8	0.1
GROSS ENERGY CONSUMPTION	3324.8	100.0	3109.8	100.0

expand with only modest growth in energy consumption.

Renewable energy sources in New England provided 195.6 trillion British Thermal Units (BTUs) in 1980, up 10 percent over 1978. Wood, hydropower, biomass, solar and wind systems are projected to increase significantly in the region by 1985.

In 1971, less than one percent of the total residential space in the three northern New England states was heated by wood. While in 1980, over 25% of this space was heated by this renewable resource. Further, indications are that wood consumption increased another 5 percent just in 1981.

New Englanders are better conservers of energy compared with other Americans. Between 1978 and 1980, per capita consumption of energy in New England declined by 7 percent to 252 million BTUs/capita, only 75 percent of the national average. Part of the reason for this dramatic decline is due to the increase in cost placed on consumers that already pay higher than national average energy costs, and the decline in heavy industry. "Tighter" insulated homes, more energy efficient cars and higher relative growth of lower energy using high-tech and light manufacturing, and service industries also contributed to falling demand for energy.

New England is more dependent on petroleum than the U.S. However, oil's share of the region's total energy demand dropped 80 percent in 1974 to 72.9 percent in 1980. Although natural gas and coal are proportionately less significant, the region's reliance on these sources is growing. Natural gas consumption grew 7 percent between 1978 and 1980, and now accounts for almost 10 percent of the region's gross energy use (Table 4).
1980, and now accounts for almost 10 percent of the region's gross energy use (Table 4).

Consumption of coal, which was declining up to the mid 1970s, rebounded by the end of the decade. Coal consumption more than doubled between 1978 and 1980, and now accounts for 1.7 percent of the region's gross energy use (Table 4).

Conversion of electric utilities and industrial plants to coal has intensified. Since 1976, four oil-fired electric utility power plants were converted to burn coal. Recent projections indicate that another six converions are likely by 1985. If the six new conversions occur, then approximately 30 percent of electric power plants in New England will be burning coal by 1985.

The major regional shift from petroleum to wood and coal consumption, and lower residential demand resulting from conservation measures have three implications for public health in New England: 1) exacerbation of combustion related environmental problems; 2) sludge and ash disposal problems from combustion of solid fuels and 3) indoor air pollution.

Despite declines in demand for electricity, the proportional increases in the consumption of coal by regional electric power plants may cause additional air pollution problems (e.g., TSP and SO_2), and exacerbate current ones. Serious new air pollution problems have developed in New Hampshire, Vermont and Maine as a result of increased residential wood and coal burning. Of particular concern are polycyclic organic materials (POMs) including carcinogens, emitted in relatively large quantities from airtight woodstoves.

Disposal of ash, from wood and coal combustion, will become an increasingly significant environmental management problem as coal consumption increases. Proper disposal of this toxic waste is required to prevent future water contamination and public health problems.

Finally, increased wood and coal combustion and more tightly sealed and insulated homes in New England have created serious indoor air pollution problems. Poor installation and construction of some coal and wood stoves result in leaks of harmful pollutants in homes. Structures, designed to reduce air exchange, effectively contain increasing levels of harmful smoke that combine with other indoor sources to create potentially serious public health hazards. Other sources of indoor air pollution include poorly vented gas stoves and hot water heaters, radon gas emissions from rock foundations, emissions of formaldehyde from building and furnishings, and smoking.

LAND USE

The presence of farming and open land provide New England with the rural aesthetics that have always made the region appealing. Although farming employs less than one percent of the region's workforce it is vital to the long term social and economic health of the region.

Although New England is unlikely to be agriculturally self-sufficient again, farming provides many values that contribute to the rural character of the region. The intangible lifestyle and cultural characteristics have attracted the high-tech, lower polluting industries that increasingly form the base of the regional economy. If farming and open land disappear, the economy may suffer tremendous long-term negative consequences.

The amount of active farmland and the number of part-time farmers are increasing. From 1870 to 1970, New England's farmland continuously declined. However, historic changes occurred in mid-1970s when the total area of harvested cropland actually increased (Figure G).

Over 75 percent of New England is forested. Until about 1970, as farmers abandoned their farms, the amount of forested land increased. However, after 1970 the amount of forest land in New England dropped as farms were recouped and the number of forests cut for development increased.

Absolute population increases and movement to non-metropolitan areas quickened the reduction of forest land. Although over three-quarters of the region is forested, forest land losses are important because they occurred

FIGURE G
AREA OF HARVESTED CROPLAND
IN NEW ENGLAND

Source: U.S. Bureau of Census, Census of Agriculture, 1978

mostly in the fringe areas around urban centers.

In addition, land development has occurred unevenly throughout the region. For example, southern New Hampshire, southern Maine and Chittenden County, Vermont have suffered severe loss of open land to residential and business land development while much of northern Maine and New Hampshire remain rural and undeveloped.

Loss of farmland and open space near cities, loss of wildlife habitats, more rapid runoff problems, loss of aquifer recharge areas, and aesthetic and lifestyle changes are all problems related to land use in New England and are significant for long-term environmental planning.

RECREATION AND TOURISM

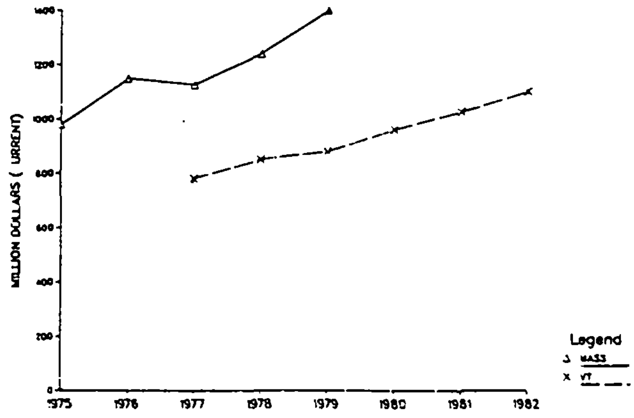
Recreation and tourism are very important industries in the three northern states and constitute noteworthy portions of the southern states' economies as well. These industries attract other industries into the area and influence the general population's attitude towards New England environmental quality.

In terms of gross product, recreation and tourism are second only to durable products in New Hampshire and Vermont and to forest products in Maine. Tourism also supports important seasonal economies at Cape Cod, Massachusetts and shore communities in Rhode Island and Connecticut. The U.S. Census of Selected Industries shows a strong increase in dollars collected from lodging recreation receipts in New England (Figure H). Likewise, records of tourist dollars spent in Massachusetts and Vermont coroborate a steady growth in the market. (Figure I)

Recreation and tourism's indirect contributions, however, are far more important to New England's overall economy. The presence of commercial (e.g., skiing, boating) and non-com-

FIGURE H
LODGING, RECREATION RECEIPTS:
NEW ENGLAND

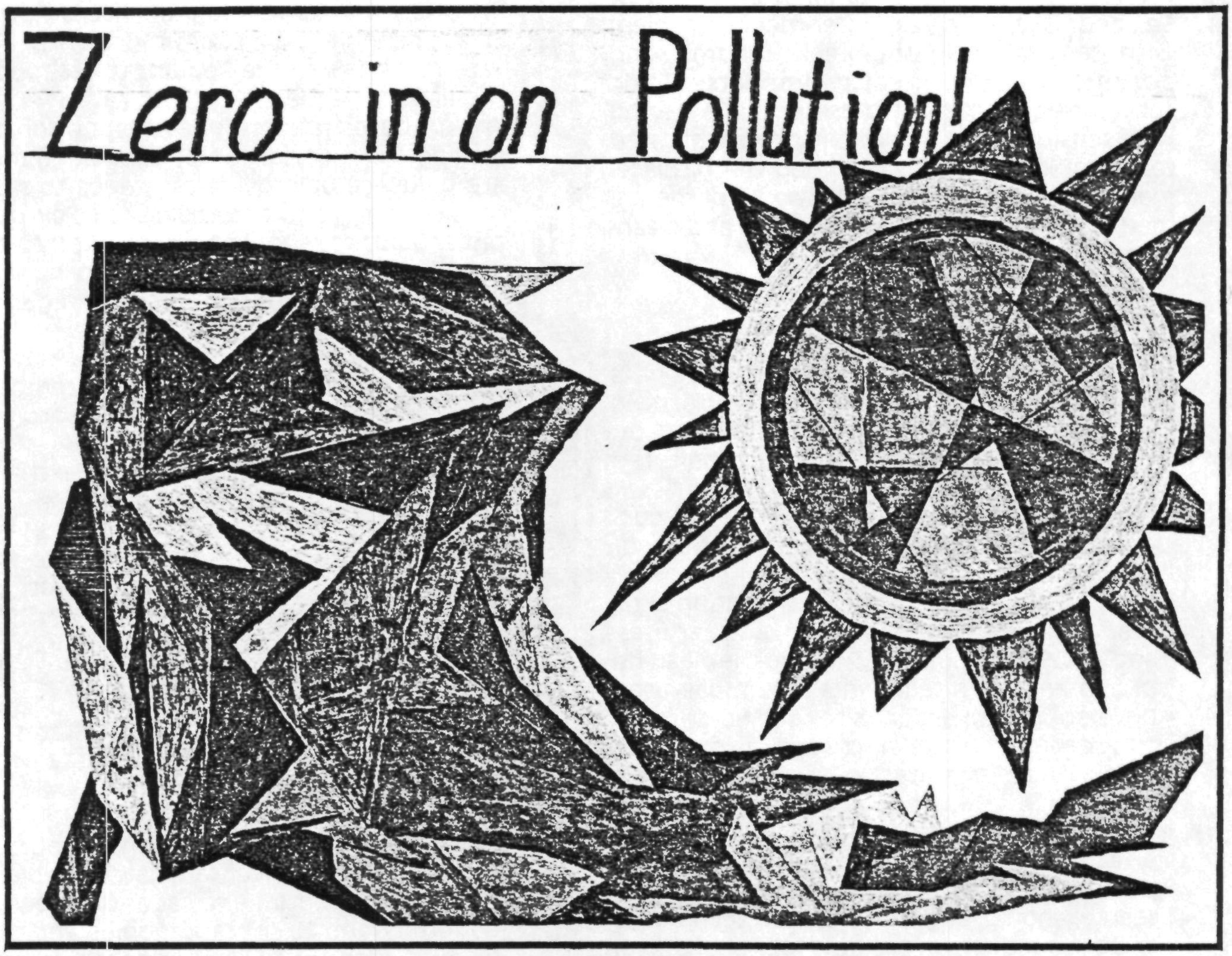
FIGURE I
TOURIST DOLLARS SPENT,
MASS AND VT



mercial (e.g., parks, forests) recreational opportunities as well as scenic areas and country charm have helped attract high-tech and service industries into the region. Since these industries are not dependent on geographic proximity to raw materials, they have the luxury of locating where their executives and employees can take advantage of life style amenities which New England has to offer. The growth of these companies throughout the region has helped offset some of the local impacts of national unemployment problems. Finally, recognizing the economic and social importance of the region's environmental quality, most New Englanders feel very strongly about preserving that quality.

PART II

INTER-MEDIA



KEVIN PSONAK - Blueberry Hill School, Longmeadow, Massachusetts - Grade 4

PROBLEM STATEMENT: Toxic Substances

Toxic substance contamination in New England is a complex, inter-media problem with serious environmental, economic and potential public health impacts. Toxic substance contamination presents the Region with sensitive public relation and complicated technical issues, especially when the displacement of toxic pollutants across environmental media occurs as a result of remedial and clean-up actions at hazardous waste sites.

RECOMMENDATIONS

Headquarters Actions

- Provide resources for regional toxicologists to evaluate toxic related health effects in every medium. Provide guidance on evaluating health effects of monitored ambient levels.
- Provide adequate funding to states to conduct appropriate surveys and analyses of toxics in water.
- Develop allowable toxic contamination sediment concentrations for various water uses, and develop options for funding the clean-up of contaminated sediments that impair uses.
- Develop guidance for "site-specific criteria" and develop national criteria information that will assist states in their site-specific work.
- Direct and/or sponsor research on the health effects of commonly detected organics and their possible synergistic effects. Other research should address bioassay techniques and procedures for developing control strategies and permit limits, based on bioassays.
- Develop federal regulations and/or guidance to control or eliminate organic contamination in drinking water. Without the involvement of the federal government, there is no consistent program to protect the public from exposure to toxic organics. Develop Health Advisories for: a) organics that are frequently found in contaminated drinking water; and b) dermal exposure to organic compounds in drinking water used for bathing.
- Develop control measures for: a) the use of septic tank degreasing agents; and b) the installation and maintenance of underground petroleum products storage tanks. Monitoring underground storage tank leakage must be included as the part of the maintenance program.
- Act as a regional clearinghouse for the exchange of air toxics information and activities.
- Provide more complete guidance on protocols for ambient air toxics monitoring. Allocate resources to the Regions to respond to monitoring requests.
- The proposed process for evaluating and controlling air toxics does not provide immediate guidance or provide assistance to states for evaluating and controlling toxic air pollutants. Guidance should be developed to provide assistance to states in dealing with chemicals which are not currently regulated at the federal level.

Regional Actions

- Establish a multi-media toxics integration mechanism in Region I that will coordinate toxics activities in all divisions.
- Act as a state clearinghouse for the exchange of air toxics information and activities.
- Provide technical assistance to state Health Advisory Programs.
- Provide contaminated source treatment technical assistance.
- Provide technical and resource support to states in gathering information on toxic substances in water and sediments.
- Provide technical assistance to states on bioassay procedures and coordinate workshops in the region.

Other Actions

- States should commit laboratory support for the investigation of contaminated problems.
- States should continue to set aside adequate Section 106 and 205(j) grant monies, and state funds to identify toxic substance problems and develop priorities and programs for abatement.
- States should establish funding sources to "match" EPA funds for sediment cleanup.
- States should develop bioassay priorities and programs to supplement traditional water quality chemistry surveys.
- The region should develop a network of toxicologists to share information, experience and ideas.

DISCUSSION

Background

Although there are a variety of terminologies, regulatory approaches, and interpretations of toxic substances, the goal of all programs is to control these substances and protect public health and the environment. Toxic substances are addressed in a number of national environmental laws, including:

- Clean Air Act — authorizes EPA to research and set standards for hazardous air pollutant emissions (NESHAPS).
- Clean Water Act — prohibits discharge of significant pollutant amounts into the navigable waters of the United States.
- Safe Drinking Water Act — authorizes EPA to set maximum contaminant levels for public drinking water systems.
- Federal Insecticide Fungicide, and Rodenticide Act — authorizes EPA to regulate registration, treatment, disposal, and storage of all pesticides, including labelling requirements.
- Toxic Substances Control Act — authorizes EPA to obtain data on health effects of chemical substances and to regulate the manufacture, use, and disposal of a chemical substance or mixture when warranted.
- Resource Conservation and Recovery Act — controls hazardous waste from point of generation through treatment, storage, and ultimate disposal via transportation manifests, recordkeeping, and reporting.
- Comprehensive Environmental Response Compensation and Liability Act — authorizes EPA to clean-up abandoned and uncontrolled hazardous waste sites that threaten public health and the environment.

Authorizing legislation and EPA regulations address the control of toxic substances in specific environmental medium, even though it is clear that a single source of toxic contamination impacts multiple media. (Table A-1 on page 90 of the Appendix)

Many solutions to toxic contamination simply transfer the incidence of impact from one medium to another without solving the net pollution problem. For example, a regional high-tech industry recently requested a water discharge NPDES permit. In the past, the company spilled several chemicals on its property that migrated into the ground water and were headed toward a nearby stream. The company proposed to pump the ground water out, aerate it to volatilize the organic chemical contaminants, and then discharge the water to the nearby stream.

Although aeration is a highly efficient method of removing organics from water, the facility abuts a residential area. Thus, both EPA and the state agency are highly concerned about potential health effects of the toxics emitted in the ambient air. The Region is also concerned about what impact trace amounts of toxic pollutants in discharge water will have on the nearby stream and its uses.

Past Responses

- **Controlling toxic substances** — This has generally been environmental medium specific. The response is usually implemented by the medium which has the greatest or the most obvious impact. The assessment of specific toxic pollutant impacts has been conducted on a case-by-case basis.
- **NESHAPS and NPDES** — Under the NESHAPS program, EPA has listed 7 pollutants and set emission standards for four of them. Twenty additional pollutants are actively being assessed for health effects. The NPDES Permits program is a means of regulating discharged toxic pollutants via effluents guidelines.
- **Monitoring** — As noted in the background, Region I has conducted a small number of ambient monitoring studies for non-criteria pollutants. Monitoring or investigation of a contamination problem, especially in the case of drinking water, is generally prompted by public inquiries.

TABLE 1
RECENT AIR MONITORING ACTIVITIES RELATED TO AIR TOXICS

	SITE	COMMENTS
1.	Upjohn Chemical Co. North Haven, CT	Major report now undergoing peer review.
2.	Ceiba Geigy Co. Cranston, RI	One day VOC screening study.
3.	Londonderry Landfill Londonderry, NH	One day VOC study.
4.	Gilsen Road Site Nashua, NH	Intensive one year VOC study.
5.	Interstate Uniform Co. Nashua, NH	One day VOC study.
6.	Picillo Farm Coventry, RI	One day VOC study.
7.	New Bedford, MA	PCB and VOC monitoring.
8.	East Woburn, MA	Year long VOC study.
9.	Nyanza Chemical Ashland, MA	Monthly VOC and mercury sampling.
10.	Londonderry Apts. Londonderry, NH	One day VOC study.
11.	General Electric Pittsfield, MA	Short-term PCB study.
12.	Kement Landfill E. Windsor, CT	One day characterization of vented gases.
13.	Norwalk Harbor Norwalk, CT	One day VOC study.
14.	McKin Site Grey, ME	One day VOC study.

- **Asbestos** — The asbestos school inspection program has been one EPA's most comprehensive programs to eliminate a toxic substance transmitted by air.
- **Support for State Programs** — Recently, Region I has begun to support state hazardous air pollutant programs. Part of this support consisted of 2 workshops on the regulatory and technical aspects of hazardous air pollutant control. For regional programs, support includes providing technical assistance, such as health advisories, and recommendations for treatment techniques to the states. In several incidences, the Regional Office has also provided laboratory support for the investigation of problems associated with toxic pollutants.

Barriers to Overcome

- **Lack of standards** — Without specific guidance or standards, regions and states cannot establish any kind of comprehensive regulatory program to control air toxics. There are also insufficient health advisories and guidance for the assessment of organic chemicals co-existing in drinking water. Currently, there are no criteria for toxic substances in sediments.
- **Lack of Information** — There is insufficient information available to assess the extent of the air toxics problem (number and kinds of sources, extent of emissions, severity of health effects, etc.). This is particularly critical for states that are attempting to develop priorities for new air toxics programs. There is also a lack of adequate data on extent and severity of toxic substance contamination of surface water and associated sediments. Much of the data available for the assessment of exposure is chemical specific. Data on the possible additive or synergistic effects of chemical and multi-chemical exposure by different routes are not available. Where data does exist, such as bioassays, the impediment may be insufficient understanding and use of bioassay techniques in establishing the nature of the toxicity problem and appropriate site specific criteria.
- **Lack of Resources** — Air media workload models do not provide sufficient resources for a regional air toxics program. There is also a lack of technical expertise and staff in the federal, state and local agencies to cope with contamination problems associated with toxic substances. In some incidences, where resources are available, there exists lack of coordination between programs.

Expected Environmental Results

An increased understanding of the toxic pollutants problems in the various environmental media and provision of additional resources will have two impacts. As monitoring and data analysis improves, it will appear as if the toxic pollutant situation is worsening since new problem areas will be discovered and publicized. While this information will be troublesome, it is the necessary first step in counteracting decades of improper toxic waste disposal into the environment. State initiatives under the new water quality standard regulations, particularly concerning water quality criteria development, will provide scientifically based and defensible NPDES permits and restore water uses. In addition, reduction of toxic pollutants is expected in the ground water and air media as specified barriers are overcome.

Improved assessments of contamination problems will result as the agency conducts more research and issues more guidance. This may also result as internal coordination betwen program activities strengthens.

PROBLEM STATEMENT: Long Range Transport of Acid Deposition and Toxic Metals

Acidic material and toxic metals are deposited in New England mainly because of long range aerial transport. The result is acidification of fresh water ecosystems, a reduction in visibility and an increase in human exposure to toxic metals. New England and Eastern Canada are particularly vulnerable to these pollutants because the bedrock and soils have low buffering capacity.

RECOMMENDATIONS

Headquarters Actions

- Accelerate the completion of the National Acid Rain Assessment Plan (NARAP)
- Develop a regulatory framework to address acid rain.
- Establish direct liaison with the regions and the state environmental agencies, universities, and research community. Translate research findings into control strategies and actively solicit research concerns for integration into the national program.
- Devise a national and regional strategy to reduce acidic and toxic metal deposition through a reduction in SO_2 and NO_x emissions.
- Develop an interim policy to limit the increase of SO_2 emissions while a permanent national strategy for acidic and toxic deposition is being developed.
- Strive for more equity in SO_2 emission regulations among the states.
- Provide for additional legal remedies for states to deal with interstate pollution.

Regional Actions

- Coordinate with HQ in developing the acid rain control program.

- Recommend strategies to relieve local contributions to acidic and toxic metals deposition.
- Maintain familiarity with acid rain research conducted under provisions of the NARAP. Inform interested state and local personnel of research results that can mitigate acid rain impacts.
- Supply trend data to EPA HQ which can provide a basis for further judging the effectiveness of national strategies.
- Support state acid deposition programs in negotiating the Sections 105 and 106 grants by participating in the Northeast Acid Rain Task Force, and by exchanging technical information among states, the region, and HQ.

DISCUSSION

Background

This section discusses two related problems involving the long range transport of atmospheric pollutants into New England. The first, acid precipitation, has generated a great deal of publicity and recently has been the focus of major public and private research efforts. The second, long range transport of toxic metals, is in the early stages of research, and little is known of its impacts.

Acid Deposition Transport — Acid deposition is one of the most significant environmental problems in Region I. It results from the transformation, transport and removal of gases and particles either through wet (rain or snow) or dry deposition processes. Its major constituents are sulfuric and nitric acids created from sulfur dioxide and nitrogen oxides. These gases are converted to sulfates and nitrates over a period of from several days to weeks as they are carried by prevailing wind patterns. See countour maps of concentrations of critical pollutants on page 97 of the Appendix.

In Eastern North America, sulfur compounds (primarily from mid-west utility coal combustion and Canadian non-ferrous smelters) contribute nearly 60% of the acidity in precipitation while nitrogen compounds from motor vehicles, industry, and power plants make up about 30%. The relative contribution of nitrogen has been and is expected to continue to increase significantly. Although numerous studies throughout many parts of the world have shown that transport of these pollutants does occur, information is not sufficient at present to quantitatively link specific upwind emissions sources in the mid-west to downwind receptor points in New England.

Numerous acid precipitation monitoring activities sponsored by federal, provincial and state governments are underway, supplemented by projects of university and industry researchers. Typical results from these studies show that the Northeastern U.S. and Eastern Canada receive large amounts of acid precipitation.

The abundance and acidity of precipitation, bedrock geology, soils and water chemistry are all important when assessing the relative sensitivity of an area to acidification. High levels of precipitation subject the area to high loadings of atmospheric pollutants. Rain, with an average pH of 4.1 to 4.3 (40-50 times more acid than "normal"), is occurring in all the New England states. To compound the problem, the buffering capacity of the bedrock and soils is low in much of New England, the Adirondacks, and the Canadian Shield. This type of terrain cannot handle the current acid deposition loadings.

At the present time transport has two well documented effects in Eastern Canada and New England: acidification of freshwater ecosystems and a reduction in visibility. Other, less well documented effects include impacts on terrestrial ecosystems (especially high-alpine forests), increased corrosivity of water supplies, and potential links to human health.

Impacts on Freshwater Systems — A region-wide survey of headwater lakes and streams shown on page 97 of the Appendix indicates that every New England state has at least some areas that are extremely sensitive; and except for Vermont, very few areas that are not sensitive. Separate lake surveys in each of the New England states confirm the region-wide survey.

The following examples are typical of the problems that are occurring throughout New England.

- Acidic lakes (pH less than 5) occur in every New England state. For the majority of these lakes, organic acids are believed to be responsible for this acidity.
- Acids which control the pH in the Hubbard Brook experimental forest streams and elsewhere are sulfate and nitrate, rather than the usual weak carbonic or organic acids. Other evidence indicates that the major strong acids in some acidified lake waters are the same mineral acids (sulfuric and nitric) found in acid precipitation.
- Studies in the White Mountains of New Hampshire and the Adirondacks of New York indicate that soil leaching and mineral weathering by acid precipitation lead to comparatively high concentrations of dissolved aluminum in surface and ground water.
- The present rate of acid deposition in Maine lakes (average 4.4 pH) could consume all of the bicarbonate alkalinity in less than 20 years (assuming a typical lake has a depth of 10 meters, an average bicarbonate alkalinity of 10 mg/1 and minimal additional buffering capacity of the watershed.).
- A study of remote lakes in New Hampshire

shows that those lakes have experienced significant decreases in alkalinity and pH over the past 40 years.

- In Vermont, 17 lakes sometimes drop below pH 5: 14 of these are termed "critically acidified" and are showing negative alkalinity; another 22 are "endangered," with alkalinity less than 2 mg/L; another 60 are "potentially susceptible," with alkalinity less than 10 mg/L.
- In a study of three Maine rivers, significant acidity was measured in spite of an abnormally small snowpack during the winter of 1980. Even though spring snowmelt was not a major hydrologic event, the pH of two major rivers declined to 6.0 (from a summer value of over 7.0). The pH of a small tributary decreased to less than 5.0. All sites had very low alkalinity at this time, so that any major increase in acid, as from melting of a heavy snowpack, could have severe consequences for salmon fry in these streams.
- Water column sulfate levels in Quabbin Reservoir in Central Massachusetts have increased from 1 mg/L in 1970 to 7 mg/L in 1979.
- A rise in sulfate concentration of 2 to 3 mg/L has been noted in a large reservoir in Rhode Island from before 1965 to the present.

As a result of this acidification, the abundance, production and growth of bacteria, algae, fish, and amphibians has been reduced and sensitive species have died off. Valuable commercial and recreational fisheries have been lost in certain areas, and more widespread losses are anticipated if acidic precipitation continues.

Examples of typical impacts on fisheries follow.

- Headwater tributaries of at least five Atlantic salmon rivers in New England are apparently already sufficiently acidic to affect the survival of salmon fry (the most sensitive stage).
- Native brook trout in Maine have ceased reproducing in small lakes over 2,000 feet in elevation.
- A survey of seven alpine New Hampshire lakes in 1980 documented the absence of fish in stocked ponds with critically low pH.
- Fifteen years ago, the need for liming certain stocked trout ponds on Cape Cod was recognized in late winter and early spring. Although natural population of yellow perch were able to cope with springtime drops in pH, acid sensitive trout were not able to survive.
- Declines in spotted salamander populations have been witnessed in eastern Massachusetts; egg mass mortality increased as pond pH decreased. Embryonic mortality of both spotted and Jefferson salamanders in conjunction with acidification was noted in the Connecticut River Valley of Massachusetts.

Visibility — Another well documented effect of transport is the regional reduction in visibility. The transport of fine sulfate particles reduces dispersion of light. This haze is further aggravated by the naturally high relative humidity of the region.

Examples of these problems follow.

- Visibility reduction in the Northeast is strongly linked to regional episodes of high sulfate concentrations, especially during the summer.
- In non-urban locations in the Northeast, long term studies have shown that visibility has decreased 10-40% between 1953-55 and 1970-72, with 25-60% reductions occurring during the summer. These results are supported by another study showing a 10-20% decrease in northern New England's summer visibility during the same period (a reduction in visibility from 12 to 8 miles).

Terrestrial Impacts — Preliminary studies have demonstrated effects of acid deposition on soils which could in turn affect forest growth. Some scientists feel that certain soils may experience at least a short-term benefit from the addition of anthropogenic nitrogen compounds deposited from the atmosphere (and some agricultural soils might benefit from the addition of sulfur compounds). However, scientists in both the U.S. and Canada are concerned about the potential loss of forest productivity resulting from prolonged nutrient leaching, and the accumulation of certain toxic metals from atmospheric deposition.

Some observations on declines in forest productivity and accumulation of toxic metals in soils and forest ecosystems are as follows:

- Atmospheric sulfates overwhelm the natural leaching processes of some New Hampshire soils, causing perhaps a threefold increase in the natural rate of nutrients and aluminum leaching.
- The accelerated leaching of Ca, Mg, K, Mn, and Zn has been documented along a transect running from southern Vermont to the Gaspe Peninsula, and correlates positively with the acidity of precipitation in the area.
- Morbidity of red spruce (50 percent) and a decrease in Vermont forest productivity over the past 14 years have been associated with acid and metal deposition. Lead, copper, and zinc increased by 50 to 100 percent between 1965 and 1979. Higher increases were observed in the higher altitudes.
- Research in Germany has associated damage to 2½ million acres of Central European forest to impacts of acid deposition on the productivity of forest soils and on plant tissues.

Water Supplies — Acid rain also has the potential for dissolving harmful elements in soils and the water supply distribution system. An EPA-funded study of the northeast has found that many surface and groundwater supplies are highly aggressive and capable of dissolving metals from lead and copper distribution systems if not treated. Metals from water supply sources have not been shown to pose health risks. One potential exception concerns persons undergoing kidney dialyses, in which case high aluminum levels may be of concern.

Transport of Toxic Metals

In addition to sulfates and nitrates, a variety of other materials reach New England through the mechanism of long range transport. There has been growing concern over the transport and deposition of toxic metals into New England, but little information is available on the extent of the problem or potential impacts.

Until recently, chemical analysis methods could not accurately measure toxic metal concentrations that often are in the range of billionths of a gram per cubic meter. This has hindered research into the transport of toxic metals. Approximate concentrations of the metals are listed in Table A-4 in the Appendix. The distribution of two of the trace metals are depicted on page 98 of the Appendix.

Historically, the rate of metal deposition has been low because of the low volatility of most metals. However, high-temperature anthropogenic processes (smelting and fossil-fuel combustion) have substantially increased the rate of emission of some metals. Increased emissions have produced increases in metal concentrations in the atmosphere most notably silver, cadmium, copper, antimony, selenium, zinc with smaller increases expected for chromium and vanadium.

Although actual data on these metals in atmospheric deposition are limited, the monitoring data available support these expectations. Zinc, lead, copper, manganese, silver, arsenic and vanadium are 30 to 200 times more concentrated in rural, continental areas than at remote areas such as the South Pole. Other metals, antimony selenium, chromium, and nickel, have concentrations that were 10 to 30 times greater in rural areas than in remote areas.

Only lead and mercury are currently found in some precipitation at levels greater than the drinking water standard. Cadmium, copper, mercury, lead and zinc can be present in precipitation at levels higher than standards deemed safe for other organisms.

Past Responses

- EPA has led an Interagency National Acid Rain Research Program, outlined in the National Acid Precipitation Plan. From FY 1980 to 1983, EPA funding has increased from $5.6M to $12M and the total federally funded program from $11M to $22.5M. Key documents in assessing the problem and proposed solutions are in the EPA-ORD "Critical Assessment Document" and the "US-Canada Memorandum of Intent on Transboundary Air Pollution."
- Region I has been working with the states and interstate agencies under State-EPA Agreements on acid rain related issues and has been participating in the Northeast Task Force on Acid Deposition (state air and water directors and interstate air and water agencies).
- Region I has been furnishing information to the states, research community, and the public from the National Acid Rain Research Program, and, in turn, has been conveying interests and concerns of New England states to the National Research Program.
- The Region has encouraged and funded state programs to monitor acidic deposition and the condition of surface and ground waters.

Barriers to Overcome

- The Clean Air Act does not address long-range transport phenomena.
- Manpower and funding are limited. Authority, funding, and grants are available mainly for research, not operating programs.
- Transport and deposition crisscross international boundaries, without respect for the separate control programs and costs and benefits to sovereign nations.
- Interregional differences over costs and benefits pose equity issues and forestall consensus.

Expected Environmental Results

- Reduce total ambient concentrations and deposition of sulfates, nitrates, and toxic metals. Improve overall visibility and reduce adverse impacts on aquatic and terrestrial ecosystems and health risks.

  To cite some attempts to estimate some dollar costs mitigated, a study done for EPA estimates the benefits from acid deposition control to Minnesota and the 30 states east of the Mississippi River to be approximately $5 billion per year. These costs include: materials - $2 billion, forest ecosystems - $1.75 billion, agriculture - $1 billion, aquatic ecosystems -$250 million, health and water supply $100 million.
- The New England River Basins Commission has estimated the cost of damage to aquatic and terrestrial ecosystems and materials in New England and New York from acid deposition to be $250 to $500 million per year. If other secondary, future, and less quantifiable effects are included, the total may be as much as $2.5 billion per year.

- Reduce global atmospheric risks, posed by cumulative pollution such as changes in global atmospheric temperature.
- Improve international relations.

PROBLEM STATEMENT: New Bedford Harbor

New Bedford Harbor and the surrounding environment is extensively contaminated with PCBs. Technically and environmentally the New Bedford situation is extraordinarily complex. Multi-media contamination and exposure pathways include: ambient air; surface and groundwaters; soils; sediments; food chain; and industrial plant sites. New Bedford is a National Priority List (NPL) site for Superfund action.

RECOMMENDATIONS

Headquarters Actions

- Provide typical program support for Superfund site.

Regional Actions

- Finalize the RAMP and submit funding allocation request to Headquarters. The final RAMP should be completed in April, 1983.
- Conduct remedial investigations and the feasibility study (RI/FS), during the summer of 1983.
- Commence remedial actions at selected subsites in the summer of 1984, based upon RI/FS results.
- Take appropriate enforcement actions against responsible parties if they do not voluntarily participate in the Superfund process.
- Initiate a multi-faceted Community Relations Program to maintain the Agency's credibility, and to inform and involve the public in planned actions. A successful program should minimize opposition to selected remedial alternatives, or at least allow the agency to anticipate opposition and address areas of concern before they become problematic.
- Continue operation and development of data management system developed for New Bedford Harbor.

Other Actions

- Massachusetts Department of Environmental Quality Engineering (MA DEQE) will coordinate the actions of other state agencies involved in the New Bedford cleanup.
- MA DEQE will take the lead in resolving operational problems at the New Bedford Sewage Treatment Facility.

DISCUSSION

Background

Polychlorinated biphenyls (PCBs) were used by two electrical capacitor manufacturers, the Aerovox Company and Cornell-Dubilier Incorporated, in New Bedford, Massachusetts over a period of time spanning several decades up until the late 1970's. As a result of poor disposal practices, PCB contamination in the New Bedford area is widespread.

Upland sites of contamination include Sullivan's Ledge and the New Bedford Municipal Landfill, which received approximately 500,000 pounds of PCBs, mainly as reject capacitors. (Figure A-L on page 98 of the Appendix) PCBs were also directly discharged by the companies to surface waters resulting in high concentrations of PCBs in sediments. (Figures A-M and A-N on pages 98 and 99 of the Appendix) Sediment concentrations in the Aerovox mudflats range from 500 ppm to over 1000 ppm, with a reported maximum value of 190,000 ppm.

Historically, the New Bedford Wastewater Treatment Facility received PCB contaminated waste from the companies via their wastewater discharges to the plant. Currently, an estimated 200 to 700 pounds per year of PCBs are being discharged from the Clark's point outfall because of residual contamination in the sewer lines. An unknown additional amount is contributed from 27 combined sewer overflows which discharge to the Acushnet River and Buzzards Bay.

As a result of direct and indirect discharges of PCBs into the estuary, elevated levels of PCBs in fish tissue have been reported. This led to a fishing ban being imposed on over 18,000 acres of the harbor. The Food and Drug Administration (FDA) has set a maximum limit of 5 ppm in fish for human consumption. Migratory fish taken from the area have levels as high as 16 ppm and bottom feeding fish, excluding eels, up to 57 ppm. Lobster samples have been reported as high as 51 ppm in the inner harbor.

The closing of large areas of commercial fisheries has had an adverse impact on the local fishing industry. Other adverse impacts include delaying proposed harbor development projects, delaying planned maintenance and developmental dredging projects, loss of recreational potential of the harbor, and possible public health and welfare effects. There is also concern for the presence of heavy metal contaminants in the New Bedford area. Although little is currently known about their occurrence and distribution, the history of heavy metals in the area parallels that of PCBs and will, therefore, be included in future Superfund investigations.

Past Responses

- Negotiated a Consent Agreement with Cornell-Dubilier Electric (CDE) to take remedial actions at their facility. CDE has completed the major tasks outlined in the Agreement in a timely fashion.

- Negotiated a Consent Order with Aerovox incorporated to characterize their site, submit a plan for on-site remedial actions, and implement the plan. Aerovox has submitted the plans for remedial actions, which are currently under EPA and MA DEQUE review.
- Conducted a comprehensive multi-media field investigation in the New Bedford area to more clearly delineate the problem areas.

Barriers to Overcome

- Given the extent and complexity of the site, the time needed to investigate and implement remedial actions will probably exceed the average for other Superfund sites. It is likely that the implementation phase may not be complete when the Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA) expires in 1985.
- There could be significant political and community relations problems in selecting disposal sites for highly contaminated dredge spoils, should dredging become a selected remedial alternative. The Massachusetts Department of Environmental Quality Engineering has informally indicated that there are no acceptable upland disposal sites. To date, the community has been silent on this issue, however, if dredging is selected, it is expected that community interest will intensify.
- A recent report by the State of Massachusetts estimates that remedial actions at New Bedford may cost $130 million. Given the requirement for fund balancing in CERCLA, it is possible that some remedial alternatives will exceed the resources available in Superfund and state matching funds.
- The problems of environmental complexity, timing, and to some extent funding can be overcome by dividing the area into specific sub-sites which can be independently managed. Each sub-site can have milestones for remedial investigations, feasibility studies, implementation and funding allocation requests. While completion of all remedial actions taken under this strategy will take several years, the agency will be able to demonstrate steady progress towards an overall "cleanup" of the area.

Expected Environmental Results

A successful resolution of the problems in the New Bedford area will have many positive effects on the area including:

- Protecting the health and welfare of the public.
- The return of commercial fishing to some of the PCB impacted areas.
- Commencing previously proposed maintenance and developmental dredging projects.
- Restoration of the recreational potential of the harbor.

INTRODUCTION TO GROUND WATER CONTAMINATION ISSUES IN NEW ENGLAND

New England's principal ground water resources are contained in glacial deposits of stratified sand and gravel situated primarily in low lying areas adjacent to lakes, streams, and swamps. These "aquifers" are irregularly distributed throughout the region, are relatively thin (usually less than 200 feet thick), and are characterized by considerable variation in their size and potential yield. Because they are commonly overlain by less than 30 feet of permeable sandy soils, they are readily replenished by rainfall and surface runoff and, in turn, feed water into fractures in the underlying bedrock and contribute to the level and flow of nearby lakes and streams.

A substantial number of small public and private water supplies obtain water from fractured bedrock aquifers, which are especially difficult to monitor and reclaim once contaminated.

Approximately 20% of New England's population (nearly 3 million people) depend on ground water as their sole or principal source of water supply. Moreover, 2,026 community water systems (77%) utilize ground or combined ground and surface water sources. Nearly all individual and non-community (e.g., motel, restaurant, factory and campground) supplies rely solely on ground water sources.

Historically, ground water quality in the region has been considered excellent. Despite localized problems with iron, manganese, and corrosivity, underground sources have been the preferred choice for homes, businesses, and small communities seeking a high quality source at modest cost. Over the past 10 years however, there has been steadily mounting evidence that New England's shallow aquifers are vulnerable to contamination, initially by fertilizers and highway deicing salts, and more recently to a broad spectrum of potentially carcinogenic synthetic organic compounds.

To date, 62 community water systems in New England (Figures A-O and A-T on pages 99–101 in the Appendix) are known to have one or more wells contaminated by organic chemicals, and several of these have lost a substantial portion or all of their available supply. Although some monitoring of non-community and individual supplies has been done, insufficient data are available at this time to assess the magnitude of contamination in these systems.

Major sources of ground water contamination in New England are grouped into the following four categories:

- Solid and hazardous waste disposal;
- Uncontrolled hazardous waste sites;
- Non-point sources (road salting, septic sys-

tems, and underground chemical storage); and
- Naturally occurring contamination (arsenic, radon, and gross alpha radiation).

The contamination incidents caused by these sources vary considerably in the frequency of occurrence, duration, extent, and potential to harm human health. In all cases, however, once the resource is contaminated, it is both difficult and expensive to reclaim and may never be restored to its original condition.

PROBLEM STATEMENT: Solid and Hazardous Waste Disposal

Leachate entering the ground water poses an actual or potential danger because of the nature of the wastes which typically have gone into land disposal facilities. Many land disposal facilities have in the past accepted hazardous wastes from small quantity generators. In addition, commercial and household wastes often contain small quantities of hazardous materials (insecticides, paint, dry cleaning solvents, paint remover, etc.) which, in aggregate, can be significant. Disposal facilities designated to handle hazardous waste, and which are required to monitor ground water, are virtually all unlined. Even where hazardous wastes are not a concern, leachate can casue odor, taste, or other water quality problems in a previously suitable drinking water source.

RECOMMENDATIONS

Headquarters Actions

- Strengthen locational standards for land disposal facilities. Current regulations do not address the conditions and uses, or potential uses, of underlying aquifers. Under the current RCRA regulations, it is possible to site a land disposal facility above a drinking water source.
- Increase research on solid waste leachate characteristics and their potential threat to human health and the environment because sanitary landfills may pose a substantial threat to ground water. Design standards should be developed to ensure ground water protection.
- Strengthen delisting regulations. Current regulations do not require testing for all hazardous constituents (HC) in a waste before reaching a delisting decision. Under current regulations wastes containing environmentally significant concentrations of HCs may still be delisted. These wastes may then be disposed of in sanitary landfills.
- Consider banning certain wastes from land disposal facilities when they are found to be non-biodegradable or otherwise remain harmful over long periods of time. Since all wastes will eventually be released into the environment from these facilities, persistently hazardous wastes should not be land disposed.

State Actions

- States should act to protect the ground water where federal regulation is absent or deficient.

DISCUSSION

Background

As defined by the Resource Conservation and Recovery Act (RCRA), there are more than 1,000 solid waste land disposal facilities in New England which are or have been used primarily for the disposal of municipal, commercial and industrial wastes. One hundred and sixty-three sites, roughly 90% of those inventoried, were identified as "open dumps" in an EPA-funded Open Dump Inventory (ODI) conducted in the late 1970s. Of these, 23 in New England were identified as having ground water problems. This number is deceptively low because some states did not include ground water in their inventory since monitoring data and enforceable state ground water regulations were unavailable.

Many additional landfills may contribute to ground water contamination because: a) some Region I landfills are located in abandoned gravel pits. The bases of these sites are usually within a few feet of the water table. Other landfills are in equally unsuitable locations over fractured bedrock; and b) because nearly all these landfills are unlined. As a result, little or nothing exists to prevent leachate from migrating into ground water aquifers.

There are about 100 hazardous waste land treatment, storage, or disposal (TSD) facilities in Region I that are required to monitor ground water. Virtually all existing hazardous waste disposal facilities are unlined. This makes some degree of ground water contamination likely. There are several known cases of storage facilities causing ground water contamination, e.g., solvent reclaimers with spill problems.

Past Responses

Many of the ground water degradation problems are the result of inexperience and lack of information:

- Government officials and the public were not aware that wastes placed in a land disposal facility undergo reactions that affect the potential release of materials to the environment. Common engineering practice relied heavily on a design objective of keeping the facility dry rather than limiting adverse hydrogeologic situations.
- Facilities were often sited without regard to ground water flow. The state-of-the-art for

collection of these data was not fully developed, and the costs of gathering the data were high.

- Virtually no facilities were designed and built with liners or leachate collection systems. Leachate collection and treatment technology is currently under development.
- Existing poorly sited facilities were often used beyond their design capacity because expanding them or siting new facilities is costly and often politically unpalatable.
- Developments in air and water programs created pollution control residues (sludges) that are dumped in land disposal facilities without comparable environmental controls.

Barriers to Overcome

- Ground water clean-up operations are extremely costly and involve technology which is often not well known or developed. In addition, there are no financial requirements that ensure that the facility operator will have funds to pay for the clean-up.
- The scope of a hazardous waste facility permit in accordance with the federal RCRA regulations is not always broad enough to address all the hazardous materials which may threaten ground water (e.g., waste oil, materials recycled for "beneficial use," PCB's, etc.).
- Regulations provide for the use of "Alternate Concentration Limits" (ACL). These are site-specific limits proposed and justified by the owner/operator to obtain a RCRA disposal permit which allow a discharge of hazardous constituents to ground water. Evaluation of ACL's by EPA and the states will be complex, resource intensive, and potentially subject to strong public opposition.
- Some existing hazardous waste disposal facilities may be located in saturated zones, e.g., below the water table. After the facilities are closed, long-term ground water contamination may continue. A leachate plume could persist for a very long period, may extend over great distances and do significant damage.
- Some waste streams could fall outside the scope of a RCRA permit (i.e., be delisted) because they are not "Extraction Procedure Toxic". However, leachate from those wastes may exceed the National Interim Primary Drinking Water Regulation levels. This could be interpreted by the public as inconsistent behavior by EPA.
- Whether or not Superfund sites receive RCRA permits for on-site treatment and disposal is sure to cause considerable public reaction.
- At present, there is virtually no EPA oversight or financial support of state solid waste programs. The phasing out of Subtitle D grants means that there is no federal financial incentive and seriously limits resources available for effective and consistent solid waste management in the states. The likely effect of this resource reduction will be that most landfills in New England will continue to pose a threat to ground water quality.
- Even when an old, substandard dump is closed, problems can persist. Many landfill sites may be as dangerous as uncontrolled sites covered by Superfund, since we do not know what was disposed or the extent of contamination. In fact, many municipal landfills are on the Superfund priority list. Whether these sites will be promptly cleaned up is questionable since municipal sites require at least a 50% cost match by state and local governments. Capping is often not effective because the facility base is below the water table or sufficiently impermeable cover material is not available.

PROBLEM STATEMENT: Uncontrolled Hazardous Waste Sites

New England has 38 sites on the National Priority List (NPL) developed for Superfund. The ranking process used to develop this list assesses ground water as one critical pathway. All 38 NPL sites have known or potential ground water impacts.

RECOMMENDATIONS

Headquarters Actions

- Aggressively pursue research into health and environmental impacts of the hazardous wastes most commonly found in ground water (usually volatile organics).
- Establish criteria on levels of contaminants in ground water which should trigger Superfund involvement.
- A national inventory of types of contaminants found in ground water should also be established and priority compounds identified.
- Establish clear policy on the use of CERCLA funding to provide either temporary or permanent alternative water supplies when primary drinking water is contaminated.
- Establish a national technology transfer program for ground water investigation and restoration.

Regional Actions

- Establish a regional inter-media coordination team to better utilize expertise in various program areas dealing with contaminated ground water. The functions of this team could include: establishment of ground water clean-up goals; technology transfer; assessment of risk; and gathering information from state and local governments.

DISCUSSION

Background

Under the Superfund program, New England is addressing the most critical problems associated with abandoned wastes: contaminated water supplies, soil, air, and surface and ground waters. Because of its glacial geology, New England has soil types especially susceptible to the leaching of hazardous wastes through the surficial geology to the bedrock layer. The soil tends to have high porosity and little coherence. Coupled with soil types that have a predilection towards absorbing liquid hazardous wastes, the ground water table (subsurface water) tends to be high in New England. This feature allows foreign materials such as spent solvents and other industrial contaminants to quickly penetrate the soil layer and reach the ground water.

Contaminated water supplies present one of the most serious threats to human health at uncontrolled sites. A primary focus of Superfund is to identify the most serious sources of contamination and to mitigate the hazard.

Past Responses

- Fourteen of the thirty-eight Superfund NPL sites have contributed to contamination of drinking water supplies.
- A 20-acre slurry wall and clay cap has been installed at the Sylvester site in Nashua, New Hampshire to limit further ground water contamination. A treatment system will be installed to treat the ground water within the contained structure. Using Superfund monies, municipal water has been extended to many area homes with private wells.
- A 9-square mile hydrogeologic study of Woburn, Massachusetts assessed the contamination of an aquifer which once supplied two major municipal wells. Feasibility studies on aquifer restoration are underway.
- Ground water contamination plumes have been studied at more than half of the NPL sites, including:

Solvents Recovery, CT	Ottati & Goss, N.H.
Industriplex-128, MA	Dover Landfill, N.H.
Re-Solve, MA	Auburn Road Landfill, N.H.
Silresim, MA	Picillo, RI
Groveland Wells, MA	Western Sand & Gravel, RI
W. R. Grace, MA	Davis, RI
Wells G & H, MA	Peterson - Puritan, RI
Winthrop Landfill, ME	Forestdale, RI
McKin, ME	L & RR, RI
Sylvester, N.H.	Pine St. Canal, VT

- Emergency water supplies have been provided at Londonderry and Milford, New Hampshire.

Barriers to Overcome

- There is widespread lack of understanding of clean-up technologies and the degree of clean-up attainable in an aquifer restoration program.
- Data currently available on health effects of many hazardous compounds is insufficient to set standards for clean-up and/or aquifer restoration.
- Public response to utilization of drinking water containing any level of hazardous contaminant is usually negative. The public does not trust government's ability to establish "how clean is clean" criteria.

PROBLEM STATEMENT: Non-Point Sources

Although not as dramatic as contamination from industrial lagoons, landfills, and uncontrolled sites, contamination from non-point sources is by far the most pervasive threat to ground water quality in New England. Contamination of individual wells and public water sources by road salts, septic effluent, and leaks from underground storage tanks is widespread in the region, and the potential for future problems with these diffuse, hard-to-regulate sources is enormous.

RECOMMENDATIONS

Headquarters Actions

- Broaden the scope of current ground water monitoring programs to include identification and tracking of non-point source contamination problems.
- Provide increased flexibility in the expenditure of ground water program funds to enable the states to address non-point source problems.
- Expedite release of the proposed Ground Water Protection Policy to support states currently engaged in ground water strategy development.
- Commit additional resources to increasing public awareness of non-point source contamination problems.
- Support additional research on improved technologies for highway deicing, subsurface waste disposal and underground storage of chemicals.

Regional Actions

- Utilize program grants to expand state laboratory and data management capabilities in support of broader ground water monitoring efforts.
- Encourage state ground water programs to direct additional attention and resources to identifying and alleviating non-point source contamination problems.
- Encourage states that do not have comprehensive ground water protection to develop them in cooperation with local officials and interested citizens.

State Actions

- Seek timely delegation of federal ground water protection responsibilities to unify ground water authority in the state program.

DISCUSSION

Background

In Massachusetts alone, 78 public water supplies currently exceed the State drinking water standard for sodium of 20 milligrams per liter (mg/l), and several contain levels above 100 mg/l. The majority of these supplies are obtained from ground water sources. The number of individual wells in New England contaminated by road salts is unknown, however the problem is common enough in New Hampshire that a special unit is maintained in the State Department of Transportation to replace wells rendered unfit to drink by highway deicing salts.

Even less information is available on the number of wells contaminated by the improper design, location, and maintenance of residential and commercial septic tanks. Problems with tastes and odors, elevated nitrate levels, and the presence of organic chemicals used in cleaning agents or septic tank additives occur frequently in areas where homes and/or businesses are located close together over a shallow water table and sandy soils.

In the past two years, 18 incidents of gasoline contamination involving eight community ground water sources and over 75 private wells have been reported to Region I. Even trace amounts of gasoline can render a source aesthetically undrinkable and expose water consumers to organic constituents such as benzene, toluene, and methane derivatives.

It should be apparent from this discussion that very little data are available from which to judge the full extent of non-point source contamination in New England. State water system supervision programs routinely monitor the quality of public (community and non-community) ground water sources and respond to some of the larger-scale problems reported by local officials and property owners. But very few individual supplies are tested regularly, and it would appear that a large number of incidents either go undetected (e.g., low level sodium or septic contamination) or are settled locally (through a Board of Health order or private legal action) without ever coming to the attention of state or federal officials.

Past Responses

Because road salting is under the direct control of state and local governments, some progress has been made in eliminating this source of contamination. As people have become more aware of sodium's adverse health effects and elevated levels have been found in some community water supplies, pressure has increased on state and local highway departments to be more careful in storing and using deicing salts.

All six New England states have taken steps to cover or relocate storage piles situated near public water supply sources and have modified roadside drainage patterns, salt/sand ratios, application rates and procedures, or spreading equipment to reduce the amount of salt getting into underlying aquifers. Research into alternative deicing agents has been conducted, but no cost-effective substitute for salt has yet been developed for widespread use. Several states and regional planning agencies have used water quality management planning funds to assist local officials in identifying and protecting water supply aquifers, with somewhat mixed results. The insistence of drivers and highway officials on maintaining bare pavement during stormy weather and a general lack of appreciation for the possible impacts of salting on local water sources continue to hinder progress in many areas in New England.

Efforts to control contamination from septic systems and underground storage tanks have begun more recently and moved more slowly than those directed at salt contamination. In large part, this is due to local concerns about the legal and political ramifications of imposing restrictions on land use and private property rights.

Five New England states (Connecticut, Maine, Massachusetts, Rhode Island, and Vermont) have used EPA funds to map aquifers and recharge areas, and Connecticut has adopted legislation controlling underground storage of chemicals. Regional planning agencies in all six states have offered assistance to local officials in the form of technical information and model zoning by-laws and health ordinances. To date, however, only a small number of forward-looking communities have implemented and enforced these protection measures.

Barriers to Overcome

The causes of non-point source problems outlined above have a great deal in common. Certainly New England's glacial geology, i.e., its shallow water tables and generally permeable soils, is an important factor, as is the tremendous increase in automobile ownership and use over the past 30 years, with its direct impact on road maintenance procedures, suburban growth, and demand for petroleum products. But the underlying cause of each of these problems is a widespread lack of understanding of the region's geologic limitations and a failure to recognize that many small discharges over a period of time will someday create a problem of sizable proportions.

PROBLEM STATEMENT: Naturally Occurring Contamination

Two naturally occurring substances, arsenic and radon, have appeared in public and private water supply sources in New England with sufficient frequency and at sufficient concentrations to qualify them as emerging ground water contamination problems. Elevated levels of gross alpha radiation in some public supplies are also a matter of increasing concern to state health officials.

RECOMMENDATIONS

Headquarters Actions

- Support research into the nationwide occurrence of arsenic and radon in public and private ground water supplies and the potential impact on public health.
- Consider including a maximum contaminant level for radon in the Revised Primary Drinking Water Regulations.
- Reevaluate the validity of the primary drinking water standard for gross alpha radiation when violations are not attributable to the presence of radium.

State Actions

- Investigate the occurrence of arsenic, radon, and gross alpha radiation in public and private supplies where geologic conditions are suitable for such contamination.

DISCUSSION

Background

During 1981, Region I cooperated with the State of New Hampshire in a study of arsenic levels in over 1300 public and private water supply wells in nine New Hampshire communities. Although very few community water sources were found to be contaminated, 10-12% of the smaller individual sources tested contained arsenic in amounts greater than the 0.05 mg/l national drinking water standard. Some levels ranged as high as 0.37 mg/l, more than seven times the standard. High concentrations of arsenic occurred predominantly in deep bedrock wells, appeared to be randomly distributed throughout the study area, and were also observed in two Massachusetts towns more than 40 miles away. The source of contamination was determined to be arsenic bearing minerals occurring naturally in bedrock fractures supplying water to the affected wells.

From 1978 to 1980, researchers at the University of Maine-Orono conducted an extensive study of the occurrence of radon-222, a radioactive gas, in public and private ground water supplies throughout the state. Data collected from 2,000 water samples showed levels in public water supplies ranging from 200 to 11,000 pico-Curies per liter (pCi/l) and in individual home supplies from 20 to 180,000 pCi/l, values two orders of magnitude greater than any previously reported in the United States. These high levels are of concern because radon is a human respiratory carcinogen, and it has been shown that up to 95% of the radon gas in water used for showering, dish washing, and clothes washing is lost to air in the home.

Both of these problems result from the mineral composition of bedrock into which water wells have been drilled. Arsenic occurs in association with sulfide minerals, such as pyrite and pyrrhotite. Radon is associated with pegmatites found in certain granite formations. Because these contaminants have been reported in ground water supplies at several locations outside New England and because similar geologic conditions are found throughout the country, additional study of both problems is warranted.

The occurrence of gross alpha radiation in concentrations exceeding the 15 pCi/l national drinking water standard is also a problem of unknown dimensions in New England ground waters. The State of Maine has reported at least six community water supplies exceeding the limit, and New Hampshire is believed to have a similar problem. Limited testing has been done to identify the radionuclide(s) causing the contamination without success — though radium, uranium, and radon have been ruled out as possible sources. Preliminary evidence indicates this level of gross alpha exposure may not significantly affect the health of individuals consuming the water. Because considerable trouble and expense is involved in replacing wells which exceed the standard, EPA should re-evaluate the validity of the 15 pCi/l limit when a violation is not related to the presence of radium, and consider modifying the standard in the Revised Primary Drinking Water Regulations.

INTRODUCTION TO ENERGY ISSUES IN NEW ENGLAND

New England's energy situation has changed dramatically since the early 1970s when aggregate energy consumption was projected to rise at 4.4% per year and when almost 80% of the fuel for that energy came from oil. The rapid rise in oil prices during the 70s had a severe impact on New England since almost 80% of its oil was imported, principally from OPEC sources.

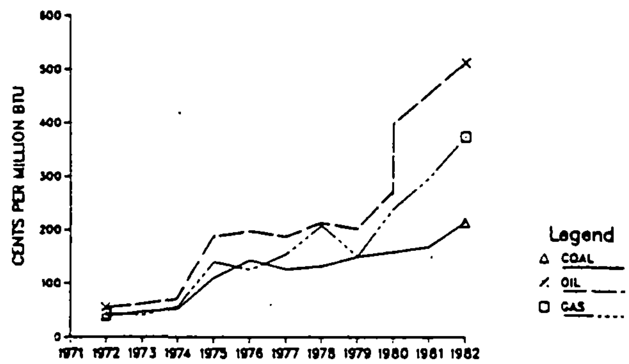
New England has responded by both reducing its energy demand and by switching to less expensive sources of fuel. Studies conducted to date indicate that conservation is occurring far more rapidly than previously expected. Between 1978 and 1980, gross energy demand declined 6.5% from 3325 trillion BTU's to 3110 trillion BTU's; during the same period, real personal income increased by 4.6%. Coal, wood, hydropower, and other non-oil fuels began contributing larger percentages of the energy supply. For example, residential and industrial wood use is estimated to have increased by 24% between 1978 and 1980. Where it has not been possible to eliminate the use of oil completely, consumers are obtaining government approval to switch to lower-cost high sulfur oil, coal-oil mixtures, or "refined" oil.

Of particular importance is the change that has occurred in the pattern of electricity consumption. In the early 1970s annual growth rates for electricity consumption were 7%. (Figure A) In contrast, electricity sales in 1981 totaled 77,959 million kilowatt hours, an increase of less than .5% over 1980 and 1.1% more than in 1979. The peak demand in New England occurs in winter, and the 1981-82 seasonal peak occurred in January with a demand of 15,702,000 kilowatts. New England's generating capacity of 21,653,000 kilowatts provided a reserve margin of 38% of the peak load. This reserve margin is much greater than in the early 70s.

FIGURE A
NET ENERGY GENERATED IN NEW ENGLAND

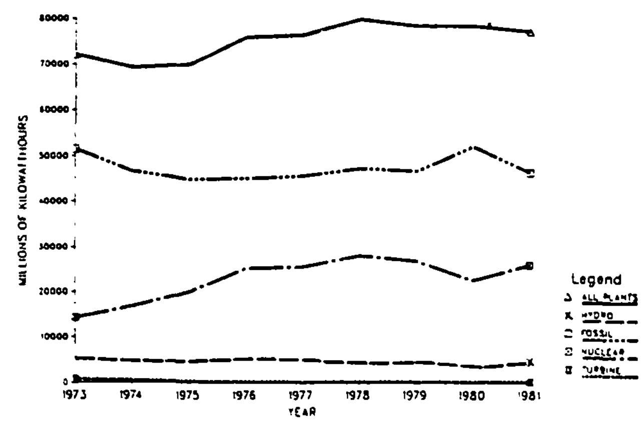
Increased fuel costs account for a large measure of this decreased demand. In 1971, the cost for oil, the primary fuel for electrical generation in New England, was 54.3 cents per million BTU. By 1976, those costs more than tripled to 186.7 cents and by 1981 they were 510.9 cents. Costs of other fuels also increased, but at a much slower rate. (Figure B) Current oil prices are leveling off or decreasing somewhat.

FIGURE B
AVERAGE COSTS OF FOSSIL FUELS CONSUMED



Energy sources for generating electricity have also changed. (Figure C) In the early 70s, oil accounted for between 68%-72% of the electricity generated. In 1981, it had dropped to 53.6%. Nuclear power's contribution increased from 14.4% in 1971 to over 30% by 1981. Coal contributed about 10% of the electricity generated as the 70s began. That figure dropped by more than half as many plants switched to oil, increased and then dropped again as a number of plants received temporary variances to burn coal during the OPEC oil embargo, and then began increasing again in the late 70s as units began permanent conversion to coal. In 1981, coal supplied 5.8% of the fuel used by electrical generation. Other fuel sources include hydro (about 6%) and gas (about 1%).

FIGURE C
ELECTRICITY GENERATED IN NEW ENGLAND



Several initiatives may change the future fuel mix even further. These include:

More Coal Conversions — The trend toward increased reliance on coal will continue as more public utility units receive approval to reconvert. Four plants (nine units) have already converted and another six or so may follow.

Higher Sulfur Oil — One related trend is for utilities to seek relaxations to burn lower cost high sulfur oil. For some units, this is a first step towards a coal conversion.

Purchased Power — New England imports about 5% of its electrical power from Canada. This amount is almost certain to increase in coming years. Hydro-Quebec and the New England Power Pool have entered into a preliminary agreement for sales of 33,000 gigawatt hours over 11 years, starting in 1986.

Nuclear — New England currently has seven operating nuclear units with a combined capacity of about 4,400 MW. Although a number of proposed units have been cancelled in recent years, 3 more are planned to be on line before 1990.

Alternative Fuels — A variety of incentives have fostered interest in alternative fuels, including hydropower and synfuels. The relative contribution of these fuels in the future will depend greatly on the price of oil. The synfuels industry, for example, has all but ended in New England, any resurgence of activity in this area will depend on higher oil prices.

Although all activities directed toward

TABLE 2
ENERGY ACTIVITIES IN NEW ENGLAND

Activity	Description	Impacts
1. Coal Conversion	Conversion of power plants from oil to coal. About 10 plans with up to 3 units each possible.	Air: Possible short term increases in TSP before new control equipment is installed. Increases in SO_2 emissions for plants burning low sulfur oil. Increased fugitive TSP emissions. Water: Possible contamination from ash disposal, particularly with plants using wet sluicing systems. Land: Increased solid waste from ash disposal.
2. Sulfur Relaxations	Relaxed sulfur emission limits for either individual sources or source categories. Some states have linked these relaxations to energy conservation measures.	Air: Increased SO_2 emissions.
3. OCS Exploration	Exploration for petroleum in the Georges Bank area by a small number of exploratory rigs. Potential for oil or gas development.	Water: Possible impacts on fisheries and benthic organisms from discharges. If developed, possible impacts from chronic or acute oil spills.
4. Hydropower Development	Renovation of old dams or construction of new dams to generate hydropower. Generally less than 5 MW.	Water: Possible reduced flows from diversions or impoundments.
5. Wood Combustion	Residential and industrial use of wood as a substitute for other fuels.	Air: Increased particulate, CO and organic emissions. Water/Land: Impacts from increased logging.
6. Miscellaneous	Use of waste oil, coal oil mix, construction of new transmission lines, peat combustion, etc.	Various

energy consumption and production have significant environmental impacts, Region I's activities have been limited to the areas discussed below. However, changes in other patterns of energy use may have significant impacts as well (for example, see indoor air pollution section, page 80).

Table 2 provides an overview of some of the more important environmental impacts of energy use.

PROBLEM STATEMENT: Coal Conversions

Region I has a number of oil burning utility powerplants that have converted or are planning to convert to coal. These conversions can cause a variety of permanent or temporary impacts to the air and water. The region does not have adequate resources to oversee these conversions.

RECOMMENDATIONS

Headquarters Actions

- **CAA Revision** — Evaluate the need to recommend that the current Clean Air Act deadline of December 31, 1985 for delaying compliance under a DCO be extended to permit conversions beyond that date.
- **Sulfur Variability** — Develop a sound and manageable policy for regulating sulfur emissions from coal burning that takes into account the sulfur variability of coal.
- **Resources** — Provide adequate resources for regional issuance and oversight of coal conversion orders.

DISCUSSION

Background

Approximately 40 fossil fuel electric utility powerplants in New England together have a generating capacity of over 12,000 MW. Until recently, almost all burned oil, although many began service as coal burning units. The rapid rise in oil prices in 1973 and 1979 forced many utilities to consider switching back to coal as a primary fuel. Although oil prices are now projected to remain stable for the next few years, the price of oil is still about twice as much as coal, and the financial incentives for conversion are still large.

Non-economic factors also play a role in converting plants from oil to coal. Since 1974, the Department of Energy has had the authority to issue conversion orders to utilities with coal capable plants. The current conversion program is essentially voluntary, but DOE still prepares an environmental impact statement on the conversions for which it issues orders.

Conversion to coal raises a variety of environmental, engineering, and financial problems. One of the main environmental impacts is the large increase in TSP emissions caused by coal combustion, emissions that must be reduced to allowable levels by installation of electostatic precipitators. Large amounts of fly ash are generated which must be stored and disposed of and can impact surface and groundwater quality. Burning coal can also increase sulfur dioxide emissions, particularly if the plant had been burning a a low sulfur oil.

Utilities must address other engineering issues such as coal unloading, storage, and handling, and any boiler modifications that are required. Although these modifications can be expensive, the cost savings to consumers in the form of lower fuel adjustments can be large as well. New England Power Company estimates that conversion of its Brayton Point plant is saving about $169 million and 12 million barrels of oil per year.

EPA's review of these conversions is determined by whether or not the projected emissions using coal exceed the SIP emission limits that apply to oil burning. If a plant can convert "in compliance" with no emissions changes greater than current limits allow, no EPA air review may be required. Many utilities, however, have decided to take advantage of a provision in the Clean Air Act that allows EPA to grant a Delayed Compliance Order (DCO) to certain converting plants. A DCO allows these plants to temporarily exceed emission limits while they are burning coal and before new TSP control equipment (an electostatic precipitator) is installed. Table 3 provides an overview of these emission changes in the plants most likely to convert.

Past Responses

- EPA has issued 4 DCO's for New England powerplants. The largest plant to convert is the New England Electric Power Company's Brayton Point plant in Fall River, Massachusetts, which received a DCO in 1979. Three of Brayton's units, with a total capacity of 1150 MW, are now burning 2.5 million tons of coal/year. Both TSP and SO_2 emissions are averaging well below regulatory limits.

Barriers to Overcome

- The most significant barrier to successfully processing and overseeing these conversions is the lack of regional resources. There are insufficient resources both for issuing orders and for enforcing their conditions once issued.

Expected Environmental Results

- **Air** — DCO's can result in significant short-term increases in TSP emissions. The limited experience so far shows that these emissions can decrease significantly below regulatory limits once new control equipment is installed. SO_2 emissions should average about

TABLE 3
COAL CONVERSIONS IN NEW ENGLAND: EMISSIONS INVENTORY
(TONS OF EMISSIONS/YR.)

PLANT Name (Unit #) Town/State	OIL Allowable Emissions SO_2	TSP	OIL Actual Emissions SO_2	TSP	COAL During DCO Expected Emissions SO_2	TSP	COAL Post DCO Expected Emissions SO_2	TSP
Brayton Point (1,2,3) Somerset, MA	100,950	5,006	68,077	1,608	(16,430) –8 months only –Units 1 + 2 only	(3,466)	59,080	597
Salem Harbor (1,2,3) Salem, MA	30,709	1,523	19,272	494	16,994	2,624	16,994	1,163
Mt. Tom (1) Holyoke, MA	13,803	684	10,576	286	10,192	1,353	10,192	279
West Springfield (3) West Springfield, MA	11,204	556	4,787	72	–	–	–	–
Canal (1) Sandwich, MA	52,604	2,609	31,005	515	–	–	–	–
Mystic (4,5,6) Boston, MA	18,234	1,989	7,536	342	–	–	–	–
Somerset (7,8) Somerset, MA	20,105	997	11,982	747	NA	4,056	NA	811
Bridgeport Harbor (3) Bridgeport, CT	17,124	3,114	NA	273	–	–	–	–
Schiller (4,5,6) Portsmouth, NH	15,213	2,168	6,649	NA	–	–	–	–
South Street (121,122) Providence, RI	7,769	706	2,971	68	–	–	–	–

the same for those plants that had burned high sulfur oil. Converted plants that had burned low sulfur oil will emit more SO_2.

- **Water** — Runoff and leachate from coal piles and ash disposal operations can degrade local ground and surface water quality. These impacts can be reduced by collecting and treating runoff and by installing dry ash handling systems. Ash will still require disposal in landfills.

PROBLEM STATEMENT: Sulfur Relaxations

The rising cost of oil has caused many states to seek relaxations in their sulfur in fuel regulations to allow industries to burn lower cost, higher sulfur oil. These relaxations will cause an increase in SO_2 emissions.

RECOMMENDATIONS

Headquarters Actions

- **Priorities For Modeling** — Develop national priority categories of sulfur relaxations based on their severity, and allow regions to model those relaxations accordingly. This would permit regions to concentrate modeling resources on the most significant relaxations.
- **Resources** — Provide regions with adequate resources for processing sulfur-related SIP revisions.
- **Regional Rulemaking** — Allow regions to approve proposed rulemaking notices and minor final rulemaking notices for sulfur relaxations. Allow regions to handle all SIP revisions in attainment areas (for other pollutants as well). This would shorten the time for approving relaxations.
- **Quantify Emissions** — For all sulfur relaxations, quantify actual and allowable increases in SO_2 emissions. Require all relaxations to be compatible with the acid precipitation policy (see page 14).

Regional Actions

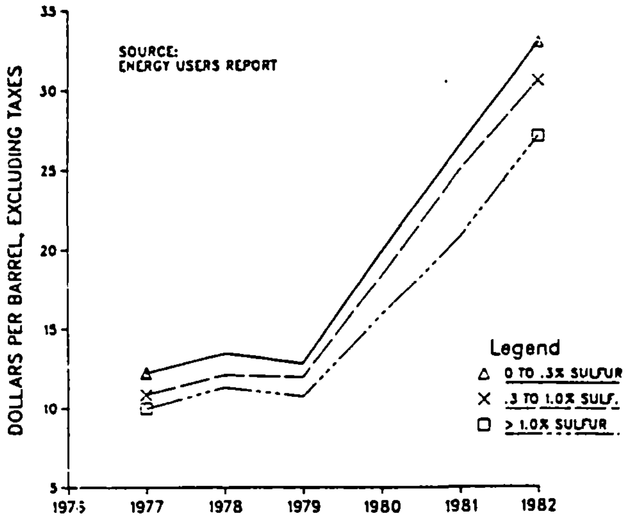
- Track actual and expected emission changes resulting from sulfur relaxations. Ensure sulfur relaxations are consistent with national acid rain policy.

DISCUSSION

Background

The most widespread response to increased oil prices has been for industries to seek relaxations of state sulfur in fuel regulations. These relaxations (in the form of revisions to State Implementation Plans) permit industries to switch from low sulfur oil to cheaper high sulfur oil. While still expensive, the price of high sulfur oil has remained significantly below that of low sulfur oils (Figure D). Although these relaxations require a modeled attainment demonstration that shows ambient standards will not be violated, the result is still an increase in SO_2 emissions from affected sources.

FIGURE D
AVERAGE NUMBER 6
RESIDUAL FUEL OIL PRICES



New England's sulfur regulations vary both among states and among industrial categories and geographic areas within states. Massachusetts, for example, has a number of distinct sulfur emission limits. The metropolitan Boston area has the most restrictive limits, allowing 1% S for sources larger than 2.5 billion BTU/hr (typically, a large power plant with a large stack), and .5% S for other sources. Outside the metropolitan area, large sources are allowed 2.2% S oil while smaller sources are allowed 1%. There are also individual emission limits for certain specific sources.

A number of changes to these regulations occurred in recent years. Some recent revisions and estimated changes in SO_2 emissions are shown on page 101 in the Appendix. Because these changes are revisions to State Implementation Plans, they all require regional and Headquarters EPA review and approval.

Two states, Massachusetts and Connecticut, have received generic approval to process sulfur relaxations to encourage energy conservation. A third state, Rhode Island, is considering a similar measure. One other common variance has been for power plants to receive sulfur relaxations as a first step towards a coal conversion. For example, EPA is reviewing a proposed revision for two Boston Edison plants that would allow them to burn 2.2% S oil. This would be about equivalent to the sulfur emissions from 1.5% sulfur coal. Similar types of source specific and generic sulfur relaxations can be expected in the future.

Past Responses
- In the past, the region has processed a large number of SO_2 relaxations.

Barriers to Overcome
- Unnecessarily duplicative SIP processing requirements.

Expected Environmental Results
- Maintenance of the SO_2 NAAQS. Uncertain local impacts on acid precipitation.

PROBLEM STATEMENT: Hydroelectric Power Development

The development of hydroelectric power on breached or new dams involving significant diversions of streamflow and/or increased impoundments, creates conflicts with other competing uses of water resources, such as anadromous fisheries, inland coldwater fisheries, white water recreation and protection of scenic river systems.

RECOMMENDATIONS

Headquarters Actions
- Develp general policies and criteria for minimum streamflow release downstream of hydroelectric projects.

Regional Actions
- Seek development and maintenance of streamflows adequate to attain and maintain the assigned water quality classification.
- Ensure a stream environment adequate to support stream uses.
- Protect the public investment in wastewater treatment facilities by ensuring flow conditions compatible with the design of these facilities.
- Request site specific instream studies when necessary to determine appropriate flow.

Other Actions

The developer of a hydroelectric project should:
- Provide fish ladders to transport fish around dams.
- Provide screening and changes in turbine design.
- Aerate impounded water before it is released downstream.
- Release impounded water at various levels to downstream receiving waters to improve dissolved oxygen levels downstream.
- Implement land management practices within the impoundment watershed.
- Evaluate alternative sites for constructing hydro facilities with careful analysis and preplanning.

DISCUSSION

Background

Hydroelectric power has become a major source of energy in New England. The Federal

Power Act was enacted to establish firmly the principle of federal regulation of water power projects and to set forth a national policy on the use and development of water power on public lands and in navigable streams. It authorized the Federal Power Commission, now the Federal Energy Regulatory Commission (FERC) to issue licenses to construct and operate hydroelectric facilities in surface waters over which Congress has jurisdiction under its commerce powers.

A study of hydropower expansion conducted by the New England River Basin Commission (NERBC) identified 320 existing or breached dam sites in New England which could be retrofitted to generate hydroelectricity at an estimated cost of $.125 per kilowatt hour or less. These sites, the most economically attractive alternatives from an inventory of over 10,000 dams, were analyzed using a computer model which assumed site development would be privately financed at an interest rate of fifteen percent. Estimates of the total generating capacity which could be developed at these 320 sites ranges from 300 to 600 megawatts and would save 4.5% of current oil consumption.

The study also identified 44 sites, at which no dams currently exist, where power could be generated for an estimated cost of $.115 per kilowatt hour or less. This estimate of generating cost, however, does not include the cost of transmission lines and makes various assumptions. The estimate of total generating capacity which could be developed at the 44 sites ranges from 270 to 475 megawatts and would save an additional 3.5% of currrent oil consumption for a total savings of 9%.

Past Responses

- EPA has required, except as limited by inflow, that all structures capable of modifying flows be required to provide, immediately below the structure, a minimum instantaneous flow equal to the seven consecutive day mean low flow with a ten-year recurrence (7Q10).
- A site specific instream study was recommended where project review indicated that a long-term flow of 7Q10 may have significant water quality impacts.

Barriers to Overcome

- Loss of diversity and stability of aquatic life indigenous to streams on which projects are located.
- Accelerated eutrophication and depletion of the level of dissolved oxygen of impounded waters.
- Release of colder impounded waters with lower level dissolved oxygen downstream to receiving waters affecting its prescribed state water quality standards.
- Periodic discharges that alter downstream flows, providing insufficient water to assimilimate or dilute previously permitted wastewater discharges.
- Entrapment of sediments behind the dam in areas with high erosion making the hydro facility economically infeasible.
- Inundating hundreds of acres of wildlife habitat by impounding water.
- Altering the existing recreation activities of the area.

Expected Environmental Results

- Preserve or enhance the productivity of a valuable wildlife habitat elsewhere to offset wildlife losses at an impounded site. This could be accomplished either through acquisition or purchase of conservation easements.
- Maintain nursery and spawning habitats upstream of the dam site and allow both up and downstream migration of fish.
- Maintain fresh water fisheries in the impounded area and downstream of the project.
- Enhance the recreational uses and aesthetic values by providing canoe portages and access to the river.

PROBLEM STATEMENT: Fuelwood

Wood is an increasingly popular fuel for residential heat in Region I yet there is little definitive data on the magnitude and importance of potential air pollution problem caused by wood burning emissions. Throughout New England, as many as 50% of the owner-occupied households are now using wood for heat, causing an increase in a variety of criteria and non-criteria emission.

RECOMMENDATIONS

Headquarters Actions

- Complete the residential source assessment program, research wood stove emissions and finish development of stove emission factors for EPA's Compilation of Air Pollution Emission Factors (AP-42)
- Integrate the source assessment findings into area source emissions estimates and program guidance.
- Develop strategies to mitigate or prevent ambient degradation due to fuelwood emissions.
- Provide coordination and guidance to state, university and other research efforts by committing to a permanent contact for stove research in EPA's R&D organization.

Regional Actions

- Maintain familiarity with ongoing federal, state, and university research and coordinate responses to public requests.
- Evaluate particulate monitoring information to determine if seasonal or chemical trends

may implicate residential stoves as a significant air pollution source.

- Provide information to the public on operating techniques that improve stove combustion efficiency and decrease emissions. Use information developed for wood stove education programs in Massachusetts, New Hampshire and Maine.

DISCUSSION

Background

Odors and blue morning haze have alerted many New Englanders to potential problems resulting from the change to native grown fuelwood for home heating. The Vermont Energy Office estimates that between 1976 and 1981, the sale of Number 2 heating oil declined 42 percent (approximately 73 million gallons) while wood sales rose 149 percent. This trend is not limited to rural areas; Massachusetts wood use rose 16 percent between the 1977–1978 heating season and the following one, when 815,000 cords were burned. Some early studies have been done at Dartmouth College which examine this growth trend.

Several criteria pollutants are emitted by wood stoves, and the signficant ones include carbon monoxide and particulates. One of the organic particulate components, chemically identified as polycyclic organic materials (POMs) is of special concern because POMs are known carcinogens (see Emissions from Residential Woodburning Stoves in Appendix, page 102). To date, no ambient standards violations in New England have been traced to residential woodburning emissions, but with an average cost saving of nearly 60% over conventional residential fuels, wood burning will be a source of air emissions in the years to come.

Past Responses

- EPA, various universities, states and consultants are studying stove emission and monitoring techniques, and emission reduction strategies. The most comprehensive analysis was completed under contract by Monsanto.
- Region 1 has supported state efforts in this area. In November 1981, the Region co-sponsored a one-day workshop on stove impacts.

Barriers to Overcome

- The latest research shows another trend in our most densely populated areas, an increase in the use of coal. Because coal's emissions are acidic, and coal has a smaller volume and more convenient distribution network than wood, it may ultimately surpass wood as a significant polluter.
- It is difficult to accurately evaluate or compare the emissions, impact, or effects of operating variables of small combustion equipment like stoves.
- Even if specific problems are attributed to stoves, regulating equipment, in private homes, will be difficult.

PROBLEM STATEMENT: Miscellaneous Energy Impacts

Higher energy prices have generated interest in a variety of other energy related projects. There is limited information now available on the scope of these activities and the magnitude of their impacts.

RECOMMENDATIONS

Headquarters Actions

- Continue to fund research on emerging energy-related problems. Coordinate research on the impacts of contaminated fuel and heating oil, and give results more rapidly to regions and states.
- Provide resources for regions to respond quickly to newly developing energy related problems.

DISCUSSION

Background

Other energy-related activities are discussed briefly below.

- **Waste Oil**—State air agencies and the general public have become increasingly concerned over the potential of home heating oil and residual fuel oil to become contaminated with heavy metals and toxic organic compounds. These oils could be burned in inefficient boilers and released contaminants into the ambient air.

  Sources of contamination include waste crankcase oil, improperly rerefined oil, and any liquid toxic waste that can be blended with oil (such as PCB's). No statistically sound sampling program to test this oil has been conducted, but preliminary "spot" samples have found high levels of lead and chlorinated organics.
- **Synthetic Fuels**—Until recently there was extensive interest in synthetic fuel development in New England. This interest has not completely dissipated, but the recent drop in oil prices combined with generally weakened demand for energy make any plant construction in the near future unlikely.

  The synfuels facility most likely to be constructed in New England is the EG&G coal gasification project proposed for Fall River, Massachusetts. The project would gasify high sulfur coal using the Westinghouse process and produce methanol and electricity. The magnitude of the emissions would depend on the final size of the facility.
- **Coal-Oil Mixture**—A few boilers that cannot be economically converted to coal have been considered as candidates for coal-oil mixture.

COM is a liquid mixture of coal and oil that has the advantage of reducing oil consumption and not requiring coal handling facilities. Ratios of coal to oil vary, but most analyses assume less than 50% coal.

COM could cause major increases in TSP emissions that would have to be reduced with additional TSP control equipment.

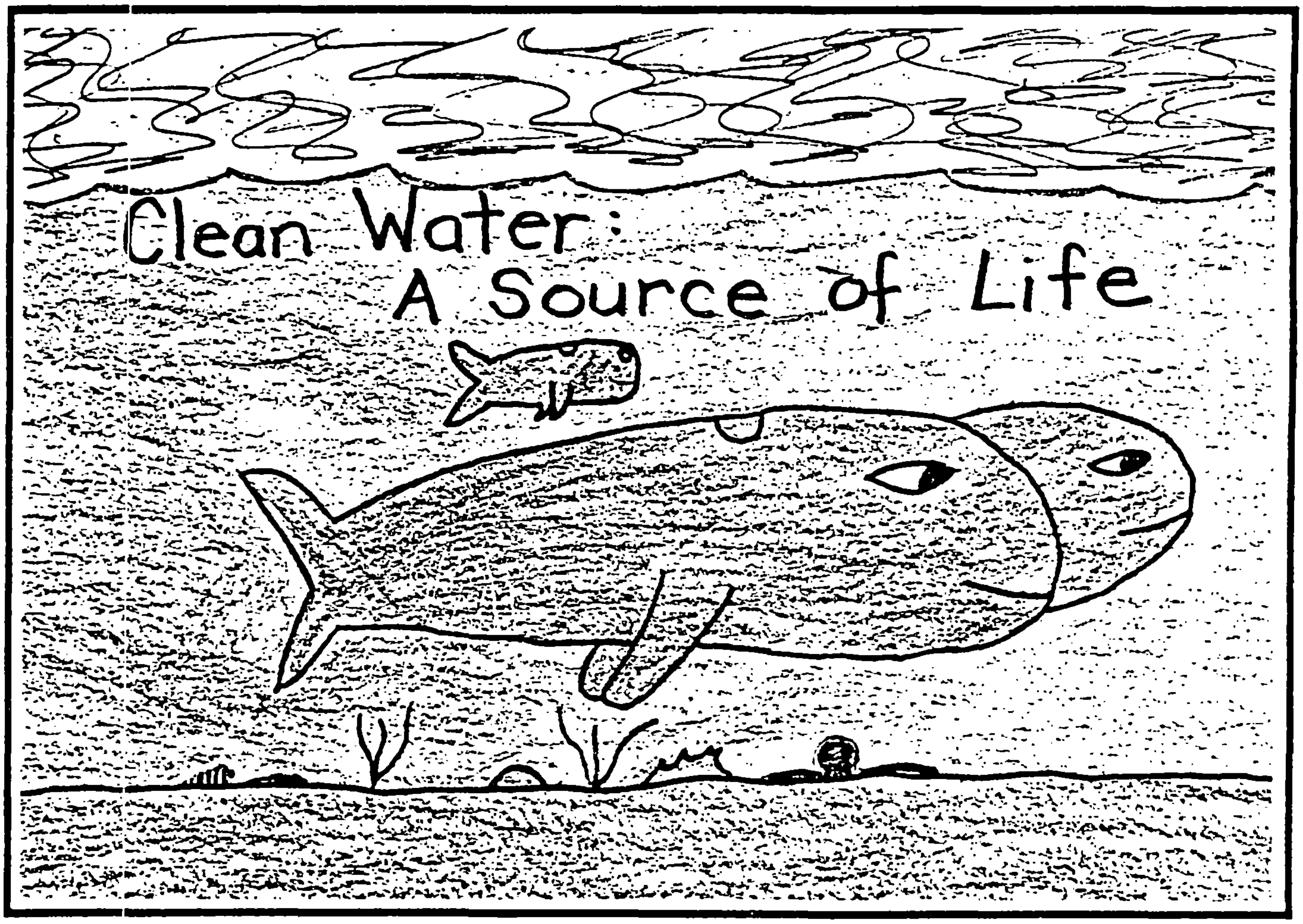
- **Purchased Power-Transmission Lines**—New England Utilities are negotiating with Canada to purchase large amounts of power from the Hydro-Quebec project. New England currently imports about 3,700 GWh/year, and Hydro-Quebec and the New England Power Pool have a preliminary agreement for sales of 33,000 GWh over 11 years beginning in 1986.

  Because existing transmission lines are not adequate to transport this large increase in north-south electricity transmission, new lines would have to be constructed in northern New England. Depending on their route, these lines will affect land uses, water quality, and wetlands.

- **Peat Mining**—Some consideration was given to mining peat resources in Maine as an alternative energy source, including an application to the Synthetic Fuel Corporation for assistance to establish a peat mining operation.

  If these plans are realized, peat mining will have severe adverse impacts on the wetlands from which they are taken.

WATER



TREVAR AKINS · Indian Island School, Old Town, Maine · Grade 2

STATUS AND TRENDS

Surface Water Quality—Fresh Water

A goal of the federal Clean Water Act is to restore the nation's waters to a quality which provides for the protection and propagation of fish, shellfish, and wildlife, and provides for recreation in and on water.

Standards of water quality are established by the states according to the category of use for the surface water involved. Class A waters are suitable for water supply without treatment other than simple disinfection. Class B waters are suitable for swimming and fishing, and Class C waters can be used for fishing, but not swimming. By these definitions, only Class A and Class B waters meet the national fishable/swimmable goals of the Clean Water Act.

During 1981, three of the New England states — Connecticut, New Hampshire, and Rhode Island -- made significant revisions to their water quality standards. Maine and Vermont are currently in the process of modifying their standards. The changes are designed to strengthen the existing provisions of each state's standards. They include measures to ensure that recent water quality criteria for toxic substances published by EPA are considered in state pollution abatement programs. Connecticut has also expanded its water quality monitoring program to continue investigations of sites suspected of having toxics problems.

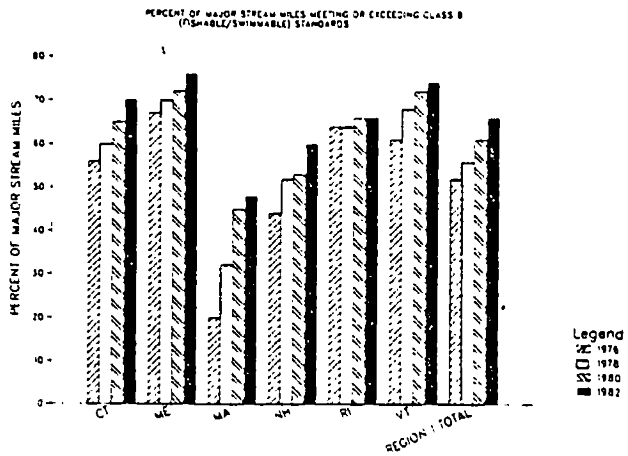
As of 1982, 66% of New England's major stream areas met the fishable/swimmable goals of the Clean Water Act. Some 4,982 miles of the total 7,544 miles of major river mainstems and tributaries assessed were suitable for fishing and swimming. This represents an upgrading of 1,222 stream miles since 1976 (Region I's base data year) when only 3,760 miles or 52% of the region's waters met the goals of the Clean Water Act. Although only the major river mainstems and tributaries were assessed for purposes of this Report, most of New England's thousands of miles of smaller upland tributaries also now meet the fishable/swimmable standard.

The major sources of information on the water quality of the nation's streams and lakes are the states' Water Quality Inventories, required biennially by Section 305(b) of the federal Clean Water Act. Information from the six New England states' latest 305(b) submissions of 1982 was assessed in order to present a region-wide picture of water quality. (See Appendix beginning at pages 104–106, where individual state data are presented)

Point source water pollution problems from municipal discharges are being addressed by two programs — the Municipal Construction Grants Program and the National Pollutant Discharge Elimination System (NPDES) permit program. Hundreds of millions of dollars of municipal wastewater treatment facilities have been built, are under construction, or are coming on line. Nearly all of the major industrial dischargers in the region treat their wastewater. As more and more municipal and industrial discharges are controlled through these programs, we expect to see continued water quality improvement in New England.

Traditionally, water quality has been measured against the Class B, fishable/swimmable goal. Local, state, and federal water pollution control agencies have worked vigorously towards maintaining and improving this high standard of water quality in New England rivers, streams, lakes, and ponds.

FIGURE A
NEW ENGLAND WATER QUALITY
SUMMARY 1976-1982



A majority of the region's waterbodies meet water quality goals, and the water quality problems that remain are increasingly complex and costly to solve. Therefore, states are reassessing their waterbodies to determine both the attainability and costs of achieving the fishable/swimmable goal. This assessment may result in the determination that the appropriate use for some waterbodies may be to provide for uses other than fishing and swimming. Since a significant portion of New England's stream segments are already designated for other uses, we have shown the stream miles meeting the applicable state

TABLE 1
WATER QUALITY SUMMARY IN NEW ENGLAND
Mainstem and Major Tributary Mileage Meeting or Exceeding the Fishable/Swimmable Goals of the Clean Water Act

		Miles Meeting Class "B" Fishable/Swimmable Goals								Change in Percentage	
	Miles	1976		1978		1980		1982			
State	Assessed	Miles	%	Miles	%	Miles	%	Miles	%	80-82	76-82
Connecticut	963	481	56%	519	60%	556	65%	675	70%	+5%	+14%
Maine	2,444	1,603	67%	1,656	70%	1,718	72%	1,863	76%	+4%	+ 9%
Massachusetts	1,611	348	20%	556	32%	772	45%	781	48%	+3%	+28%
New Hampshire	1,309	584	44%	691	52%	702	53%	791	60%	+7%	+16%
Rhode Island	329	211	64%	211	64%	217	66%	217	66%	0%	+ 2%
Vermont	888	533	61%	594	68%	635	72%	655	74%	+2%	+13%
NEW ENGLAND	7,544	3,760	52%	4,227	56%	4,600	61%	4,982	66%	+5%	+14%

NOTE: 1. These figures represent major stream miles assessed or managed by the states. This is only a small portion of the total stream miles, most of which do not have water quality problems and meet Class B Fishable/Swimmable water quality standards.
2. Since the stream miles assessed varied from year to year, there are some discrepancies in comparing past figures to the 1982 "miles assessed."

water quality standard as well as the miles meeting fishable/swimmable standards in the "Status of Water Quality" tables contained in the Appendix to the EMR. The "Water Quality Summary" table and Figure A show the historical progress of water quality towards the goals of the Clean Water Act.

What follows is a brief summary of current water quality conditions and problems in each of the six New England states. Tables in the Appendix describe the current water quality status, the identified problems and sources of the problems.

Connecticut — Of the 963 freshwater stream miles inventoried in Connecticut, 675 or 70% meet the fishable/swimmable goals of the CWA. This represents an improvement of nearly 200 stream miles since 1976 when 56% of the major stream miles were suitable for both contact and non-contact recreation. If all Connecticut freshwater streams (including small upland tributaries) were assessed, over 90% would meet Class B standards.

The water quality problems that remain in Connecticut are primarily the result of combined sewer overflows, municipal wastewater discharges requiring greater than secondary treatment, industrial waste discharges requiring more than "best practical treatment" (BPT), and pollution from nonpoint sources. Other localized water quality violations exist due to such problems as polychlorinated biphenyl (PCB) contamination of sediments in the upper Housatonic River.

Maine — Seventy-six percent of Maine's 2,444 miles of major streams meet the fishable/swimmable standard. This percentage represents 1,863 stream miles in Maine, which has both the most miles of streams in New England and the highest percentage meeting the CWA goals. In the years between 1976 and 1982, Maine has documented significant water quality improvements in the Penobscot River, Haley Pond, Rangeley Lake, the Saint Croix River, and numerous coastal areas. Atlantic salmon and other fish have returned to several rivers, and many previously polluted streams are now supporting swimming and other recreational uses.

Since all major municipal and industrial discharges in Maine are receiving the equivalent of secondary treatment, the largest pollution problems have been abated. This fact, combined with recent reductions in the Federal Construction Grants program funds for wastewater treatment facilities, has slowed the previous dramatic improvements in water quality. Present and future pollution abatement efforts will be aimed at the more complex problems, such as combined sewer overflows from the older urban areas, agricultural and other nonpoint sources of pollution, and the State's water quality limited segments, which require more than the technology-based treatment specified in the Clean Water Act to meet water quality standards.

Massachusetts — Approximately 48% of Massachusetts' 1,611 major river miles now meet or exceed the fishable/swimmable standard. This percentage represents a dramatic improvement over 1976 figures, when only 20% of the State's waters met Class B water quality standards. Although Massachusetts still reports the lowest percentage of major stream miles meeting the fishable/swimmable goals within the region, the State's waters have consistently demonstrated the highest rate of improvement in the region.

In addition to delays in completing the construction of wastewater treatment plants, complex water quality problems caused by combined sewer overflows, inplace sediments, nonpoint source pollution, and low stream flows prevent the attainment of water quality goals in numerous stream segments. For example, heavy metals are present in the sediments of the Blackstone River, and PCB's contaminate sediments of the Houstonic and Hoosic Rivers and marine sediments in New Bedford Harbor. Studies are currently underway to address these situations and the Commissioners of the Connecticut Department of Environmental Protection and the Massachusetts Department of Environmental Quality Engineering, along with the Regional Administrator of EPA, have given the highest priority to the PCB cleanup efforts.

New Hampshire — Sixty percent of New Hampshire's 1,309 miles of major streams meet or exceed fishable/swimmable standards. This reflects over 200 miles of upgraded stream miles since 1976 when 44% of New Hampshire's waters were suitable for swimming as well as fishing. However, major streams represent only 9% of the state's identifiable stream mileage. If total stream mileage, including upland streams were assessed, approximately 96% of New Hamsphire's waterways would meet or exceed Class B standards.

As in the rest of New England, the majority of New Hampshire's water quality improvements have been accomplished by the treatment of municipal and industrial pollutant discharges and the separation of combined sewers in the cities. Further control of pollution will be accomplished by continuing these efforts. As stated in New Hampshire's 305(b) report for 1982, "the resolution of many of these problems hinges on the Construction Grants program, state resources, and local resolve."

Rhode Island — Sixty-six percent of Rhode Island's major stream miles and 91% of the State's estuarine areas meet the Clean Water Act fishable/swimmable standards. Rhode Island's water quality monitoring program has also indicated various degrees of water quality improvement at stations located on the Branch River, Blackstone River, Pawcatuck River, and Fry Brook. These improvements are associated with improved treatment at upstream pollution sources. Major combined sewer overflows and urban runoff problems in Providence, Pawtucket, and Central Falls continue to cause coliform and solids violations in the Providence River, Woonasquatuck River, and Narragansett Bay.

Large municipal and industrial discharges coupled with minimal assimilative capacities result in dissolved oxygen problems in the Pawtuxet River and Mashapaug Brook. The Blackstone River and Mount Hope Bay have dissolved oxygen and coliform problems as a result of combined sewer overflows and municipal and industrial discharges.

Vermont — Seventy-four percent of Vermont's 888 major stream miles are now suitable for both fishing and swimming. Steady improvements to water quality have been achieved in Vermont since 1976 when 61% of the waters met Class B standards. Ninety percent of the State's total stream mileage, including smaller upland streams, is fishable/swimmable.

Continued upgrading and construction of wastewater treatment facilities and implementation of best management practices to control nonpoint source pollution from construction, silviculture and agriculture have resulted in further improvements to Vermont's water quality. Most of the industrial discharges receive adequate treatment and thus are not a source of significant water quality problems. Untreated or inadequately treated municipal discharges and industries violating their pretreatment limits before discharging to municipal treatment facilities are the major causes of water pollution problems. Continued abatement of municipal wastewater pollution will be accomplished through further facilities construction which is dependent upon the availability of local, State and Federal funds. Enforcement actions will be directed against pretreatment violators to bring them into compliance.

MARINE AND COASTAL AREA WATER QUALITY

Since ocean-related issues are not within the immediate purview of EPA, the Agency has limited data on marine water quality. Even among agencies more directly concerned with oceans and marine activities, monitoring typically is restricted to special studies on specific geographic areas. A general assessment on ocean water quality off the New England coast can be drawn from information on shellfishing, ocean dumping, 301(h) waivers, and outer continental shelf (OCS) activities. Each of these issues is discussed later in this EMR.

Based on available information, one may conclude that:

- Water quality along the immediate New England coastline has improved where new or upgraded wastewater treatment facilities (WWTF) have been constructed.

- Some harbors will remain polluted despite secondary treatment and even tertiary treatment because of complex urban runoff, combined sewer overflow, and municipal/industrial discharge problems, or because of the presence of many small residential or boating waste discharges.
- Although past ocean dumping of dredge spoils and other industrial wastes has not resulted in noticeable environmental problems, scientific uncertainty about the long term effects of such practices merits careful attention to continued ocean dumping. Plumes from such sources also represent significant problems.
- Disposal of sewage sludge through outfalls or deep water dumping may be harmful to the marine environment.

Shellfishing, clams, mussels, quahogs, etc., has been an important economic activity in New England for hundreds of years. New England's coastal water quality has improved over the past 10 years as evidenced in the reopening and/or reclamation of many previously closed shellfish harvesting beds. This improvement is due primarily to a) the construction of new and upgraded municipal wastewater treatment plants upstream of estuaries and b) abatement programs controlling individual domestic and industrial discharges at or near shellfish beds. Despite improvements, however, trouble spots still remain, particularly near large cities. Complex pollution from urban runoff, combined sewer overflows, industrial and municipal sources, commercial activities, etc. will prevent some shellfish beds from ever reaching the federal Food and Drug Administration's (FDA) recommended commercial harvesting standards (70 total coliforms/100 ml.), regardless of secondary treatment. Other problem areas could be further improved, at least to the point of conditional and depuration harvesting, if WWTF construction plans and abatement programs are pursued, and if pump stations are upgraded and storm and sanitary sewer separation can be accomplished.

Water quality along the immediate New England coastline has improved where new or upgraded wastewater treatment plants have been constructed. For example, New Hampshire, water quality monitoring has shown an improvement in tidal water quality over the past 10 years. Most of this improvement is due to the construction of new or upgraded WWTFs particularly in Great and Little Bays (Class B to A), the Piscataqua River below the Cocheco River (Class C or less to B or better), and the lower tidal portion of the Piscataqua River around Portsmouth and New Castle.

Connecticut officials have expressed concerns about chemical buildups and plumes in Long Island Sound, a body of water that is comparatively enclosed. These officials have urged that, because of the fact of such enclosure, the Sound should be considered and treated differently from an environmental management standpoint than other, more open ocean coastal areas of New England.

DRINKING WATER QUALITY

EPA's involvement in drinking water quality derives from the federal Safe Drinking Water Act (SDWA), which is designed to assure that water supply systems serving the public meet the EPA-established minimum national standards for the protection of public health. A joint federal/state program exists to assure compliance with these standards and to protect underground sources of drinking water from contamination.

All six Region I states have been granted primary enforcement responsibility under the SDWA. The Regional Office assumes an oversight role and provides technical assistance in support of state program efforts.

As a general matter, the New England population enjoys drinking water that is of high quality, but violations of national standards do occur.

There are in New England some 2,609 community water supply systems providing water to more than 11 million people. Although in the Region there exist many more non-community than community systems, the size of the population served by the non-community systems is substantially smaller than that served by the community systems.

The discussion and tables which follow are limited to community water supply systems. This is because data is available for community systems and because the non-community system program has not been fully implemented.

Table 2 lists the number of community systems in the Federal Reporting Data System which violated any MCL for fiscal years 1980 through 1982. It is evident that the vast majority of systems do not have any contaminant violations. This indicates that, in general, sources of water supply and delivery systems are providing high quality water to the public. Except for turbidity and coliform bacteria parameters, the remaining violations occur in many fewer than 1% of the total number of community water systems. There are no apparent trends noted with respect to these violations.

There was a slight increase from FY 80 to 81 in the total number of water systems with one or more violations of coliform standards, but from FY 81 to FY 82, this figure decreased. There was a significant decrease in turbidity

TABLE 2
PERSISTENT VIOLATIONS* BY COMMUNITY WATER SYSTEMS

Year	Total Number of Systems	Number of Systems in Violation					
		Coliform			Turbidity		
		MCL†	M/R††	MCL & M/R	MCL	M/R	MCL & M/R
FY80	2582	41	125	21	14	48	0
FY81	2572	33	50	37	10	40	0
FY82	2609	23	95	14	8	25	0

*Persistent Violations — 4 or more months in violation or more than one quarter in violation
†MCL — maximum contaminant level
††M/R — monitoring and reporting

violations from FY 80 to FY 81, and no significant change was noted from FY 81 to FY 82. Since most of the coliform and turbidity violations occur sporadically and infrequently in a given system, and because it is therefore felt that such violations are not indicative of a long-term water quality trend within a particular system, the EPA Office of Drinking Water has focused its attention on the persistent violators of these two MCLs. Those systems that are in violation for four or more months or more than one quarter are considered to be persistent violators. These systems are most likely to have serious problems in the source of the supply, treatment or distribution systems or in operation and maintenance. These problems result in the delivery of poor quality water to consumers.

Table 3 lists the number of systems which have persistent violations for coliforms, turbidity, and monitoring and reporting (M/R) in FY 80 through 82. An important point to be made regarding this data is that there appears to be significant decreases in most violation categories during this period. Coliform MCL violations declined from 41 to 23. Because the monitoring and reporting violations fluctuated during these fiscal years, it is difficult to conclude whether there is a significant decrease. Turbidity MCL violations were reduced from 14 to 8 and monitoring and reporting violations from 48 to 25.

Table 4 shows the percent of systems by state with persistent violations (MCL and M/R) during FY 82 for coliforms and turbidity. Rhode Island stands have no persistent violators, while the data for Connecticut, Maine, and Massachusetts reveals very low percentages of violations. Vermont and New Hampshire have, respectively, over 10% and 19% of their systems in persistent violation of the coliform regulations. Turbidity violations show similar patterns.

Table 5 illustrates the problems encountered in northern, rural New England states whose populations are often served by small systems. The great majority of violations occur in the small systems serving populations of between 25 and 500 people. Of a total of 120 systems in persistent violation of the coliform standard, 99 are in systems serving fewer than 500 people. The greatest number of systems with

TABLE 3
COMPLIANCE WITH MAXIMUM CONTAMINANT LEVELS OF NIPDWR* FOR COMMUNITY WATER SUPPLY SYSTEMS

Contaminant	Number of Systems in Violation†		
	FY80	FY81	FY82
Arsenic	2	4	0
Barium	0	0	0
Cadmium	1	0	0
Fluoride	3	0	0
Lead	3	2	1
Mercury	0	0	0
Nitrate	2	4	5
Selenium	0	0	0
Silver	0	0	0
Endrin	0	0	0
Lindane	0	0	0
Methoxychlor	0	0	0
Toxaphene	0	0	0
2, 4-D	0	0	0
2,4,5-TP Silvex	0	0	0
Total Tirhalomethanes	0	0	0
Turbidity	47	27	32
Coliforms	266	277	220
Radium-226	0	1	0
Radium-228	0	0	0
Gross Alpha Particles	0	3	0
Beta Particles	0	0	0
Photon Emitters	0	0	0

*NIPDWR — National Interim Primary Drinking Water Regulations
†Data from the Federal Reporting Data System

TABLE 4
FY82
PERSISTENT VIOLATIONS FOR COLIFORMS AND TURBIDITY BY STATE

State	Total Number of Systems	Percent of Systems in Violation Coliforms	Turbidity
Connecticut	685	0.2	0.2
Maine	380	0.7	0.7
Massachusetts	636	0.9	0.3
New Hampshire	409	19.3	2.9
Rhode Island	113	0	0
Vermont	386	10.8	3.6
NEW ENGLAND	2609	5.6	1.3

TABLE 5
PERSISTENT VIOLATIONS BY SYSTEM SIZE

Population Served	Number of Systems	Number of Systems in Violation Coliforms	Turbidity
25-500	1805	112	17
501-3,300	392	17	13
3,301-10,000	187	2	2
10,001-100,000	212	1	1
Greater than 100,000	13	0	0
TOTAL	2609	132	33

turbidity violations occurs in the next larger population group (i.e. 501-3,300). This difference is a reflection of the fact that the smallest systems tend to use ground water to a greater extent, and groundwater sources, unlike surface waters, are not subject to the turbidity MCL. It should be pointed out that the data indicate that the very large systems serving over 100,000 persons have no persistent violations of either the turbidity or coliform MCLs. These large systems benefit from the economies of scale and can afford the treatment facilities and trained operators needed for the system to be consistently in compliance with drinking water regulations.

SIGNIFICANT WATER QUALITY PROBLEMS IN NEW ENGLAND — GENERIC

This part of the Water Medium section of the EMR discusses the most significant water quality problems in New England on a generic, or problem category, basis. The discussions which follow address both significant causes of pollution (i.e., point sources, nonpoint sources, combined sewer overflows) and specific kinds of problems (i.e., filling of wetlands, lake eutrophication, ocean dumping).

The most significant surface water quality problems in New England, on a generic basis, are:

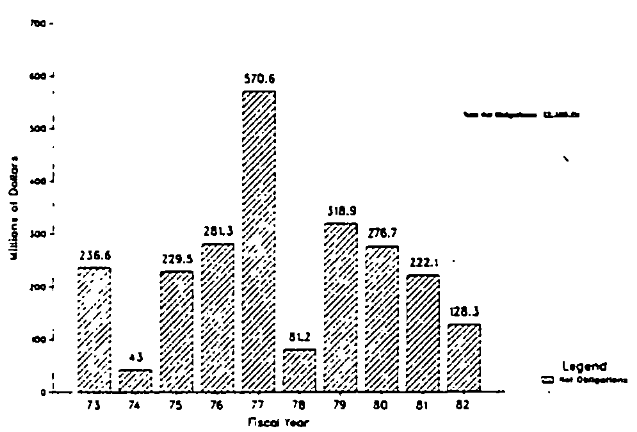
- Point Source Pollution
- Combined Sewer Overflows
- Non-point Source Pollution
- Lake Eutrophication
- Filling of Wetlands
- Exploratory Oil & Gas Drilling on Georges Bank
- Ocean Dumping
- Drinking Water Quality

PROBLEM STATEMENT: Point Source Pollution

Municipal and industrial point source discharges have historically been responsible for a significant portion of the violations of water quality standards criteria for bacteria and dissolved oxygen. Chemical pollution, too, is traceable to such discharges. These point source pollution problems are being addressed by two major elements of the Clean Water Act (CWA) — the Construction Grants program and the National Pollutant Discharge Elimination System (NPDES) permit program. It is because of federal and state efforts in these programs that we have witnessed a significant improvement in the Region's water quality over the past few years.

Despite these successes, more than one third of New England's major stream miles and coastline waters as yet do not meet the fishable/swimmable goals of the CWA. The areas still needing clean up pose the more complex water quality problems, and make further water quality improvements more difficult and costly. The EPA 1982 Needs Survey estimates that $5.8 billion of additional construction grants funds are required to construct the remaining wastewater treatment plants and interceptor sewer projects needed in New England.

FIGURE 8
NET OBLIGATIONS OF
EPA CONSTRUCTION GRANTS FOR WASTE
WATER TREATMENT FACILITIES
CONSTRUCTION



Recommendations

Headquarters Actions

- Work with Congress to increase funding for the Construction Grants program over a longer period of time, in order to deal with the remaining costly and difficult municipal pollution problems.
- Provide an aggressive operational and managerial program for municipal treatment plant operators and managers so that the considerable investments that have been made are protected. Provide sufficient staffing and funds to the Regions to carry out the program.
- Publish National Municipal Policy and Strategy for enforcement of POTW statutory requirements.
- Decide soon whether the "Final Policy for Second Round Issurance of NPDES Industrial Permits" will be continued in FY 84, and advise Regional EPA Offices.
- Maintain the effort to promulgate effluent guidelines on time until all are completed.
- Make final decisions on NPDES permit regulation revisions as soon as possible and publish the regulations. The proposed revisions will allow faster permit processing and reduce paperwork.
- Expedite development of a national policy on uniform approaches to biomonitoring in NPDES permitting to assure that testing requirements are technically valid and legal. Regions should be consulted as policy is being developed.
- Continue national research efforts to determine toxic pollutant levels that are compatible with various water uses.
- Develop guidance and technical assistance on use attainability studies in order to evaluate pollution abatement options and in order to make sound decisions on competing water uses.
- Provide national coordination and guidance so that the regions and states can develop the most effective and cost efficient water quality monitoring networks.
- Place national emphasis on industry cooperation in water quality monitoring activities.

Regional Actions

- Review the Construction Grants priority lists to ensure that beneficial water quality and public health are emphasized in projects.
- Ensure that water quality standards, priority water bodies, and construction grant priority lists are coordinated and mutually supportive.
- Provide treatment plant operation and management training to states and selected municipalities.
- Aggressively mediate interstate and intermunicipal problems to ensure decision-making is not based upon political pressures. Management of funding could be used as leverage.
- Issue the 49 industrial permits included on the priority list for FY 83. These include dischargers of toxic priority pollutants and those for which national effluent standards have been finalized.
- Continue the Environmental Services Division's (ESD) program of bioassay testing of discharges from different industrial processes to develop data on acute toxicity of industrial process effluents.
- Continue development of regional/state approach to toxics evaluations in receiving waters through the New England Interstate Water Pollution Control Commission's Toxics Management Workgroup. State and EPA staff should carry on their evaluations of bioassay and biomonitoring methods to determine suitable procedures for identifying toxics problems and find potential solutions.

- Continue delegation efforts. EPA Region I has made significant progress towards delegation of the NPDES permitting authority to Maine, Massachusetts, New Hampshire and Rhode Island.
- Pursue the Region's vigorous inspection and enforcement program to assure high degree of compliance of municipal and industrial facilities with the implementation schedules and effluent limits contained in their NPDES permits.
- Continue an active Spill Prevention Control and Countermeasure (SPCC) inspection and enforcement program to develop and implement oil spill prevention and control measures.
- Assure that State Water Quality Standards are consistent with attainable water uses and the pollution abatement efforts necessary to achieve them.
- Coordinate and assist in monitoring and wasteload allocation activities to assess water quality problems and evaluate alternative pollution abatement options.
- Assure that effluent and water quality monitoring surveys are coordinated to most effectively assess water quality problems.

Other Actions

- States should develop Construction Grants priority lists giving emphasis to potential water quality improvement criteria.
- States/municipalities should aggressively enforce on-site disposal regulations to lessen the demands for construction grant funding.
- States should assume responsibility for NPDES permit programs wherever possible.
- States should maintain a high level of field presence to help assure treatment facility compliance with permits.
- States should take the lead in enforcement actions wherever possible.
- States should coordinate pollution abatement activities to attain and maintain designated water uses.
- Water quality standards and classifications should be reviewed and refined where necessary to provide for attainable water uses.
- Water quality monitoring programs should be continued, and adjusted where necessary, to provide accurate measurement of the status of water use attainment and degradation, including the impact of toxic pollutants.
- Coordinate, with FDA, hydrographic efforts with respect to discharge sources and treatment facilities. This will help pin-point closure lines and plumes, and determine dilution rates/distances.

DISCUSSION

Background

Because of the importance of water to daily life, New Englanders settled along streams and rivers and adjacent to sheltered bays and harbors. Major population and industrial centers used these waters for a variety of conflicting uses, including recreation and wastewater disposal. As a result of these pressures, water quality rapidly deteriorated.

BOD, suspended solids and bacterial standards for fishable/swimmable waters are the most common CWA parameters violated in New England. These violations have affected over 2,500 miles of New England's coastline and streams. Both municipal and industrial point sources contribute. In some cases, the sheer amount of wastewater, even though treated, makes real improvement difficult when the discharge is to a water body with a low assimilitative capacity.

Many municipal wastewater treatment plants are not being operated, maintained, or managed in the most effective and efficient manner. The Region and the states have no mechanisms to comprehensively address this situation except when non-compliance with NPDES permit conditions can be proven. Many facilities were over-designed, resulting in unnecessary sewering and unused treatment capacity. On-site wastewater treatment options, which would have resulted in smaller direct discharges, and thus, less water quality impact, were not adequately emphasized.

Toxic or "priority" pollutants, found primarily in industrial effluents, are being recognized as causes for water quality impairment in many areas of New England (see the "Toxics" Intermedia Section). As water quality monitoring and analysis techniques for these parameters improves, we are gaining a better knowledge of the nature and extent of the impact of toxics in water quality.

States have developed water quality standards and classified their waters as to the goals, in terms of quality and uses, that the waters should support. As states bring gross point source pollution under control, they are reviewing original standards and criteria to ensure a balance between additional cleanup costs and attainable uses.

"First round" NPDES permits issued to industrial dischargers between 1974 and 1977 have expired and are now being reissued. The emphasis in second round permitting is to identify and control priority pollutant discharges which are impairing water use or causing other kinds of major water quality problems. Second round permitting will also require treatment consistent with national technology-based treatment standards.

Past Responses

- The planning, design and construction of wastewater treatment facilities (WWTF) have been funded by a combination of local, state and federal sources. The federal Construction Grants Program, mandated by the CWA, authorizes grants to cover at least 75 percent of the cost of necessary WWTF.
- This year EPA Region I obligated $128.3 million for the planning, design and construction of WWTF throughout New England (see Figure B on WWTF Construction). This amount includes funding for the construction and/or upgrading and expansion of six wastewater treatment plants. Twenty treatment plants were completed in this fiscal year.
- Since 1973, 140 new and/or upgraded wastewater treatment plants funded by EPA, state and local communities have become operational in this region at a cost more than $2.5 billion.
- The CWA Amendments of 1977 called for management for the Construction Grants Program to be delegated to the individual states. All six New England states have been delegated this authority and are using up to two percent of their construction grants allocations to fund program management activities. This delegation of authority allows the states to be responsible for day-to-day project management and EPA to perform an overview and program management role.
- Another important amendment to the CWA called for increased funding (85%) for innovative and/or alternative projects. Since the inception of the innovative/alternative program in 1979, 59 communities have been awarded grants. The total project costs associated with the innovative and alternative portions of these projects is $114 million.
- Revisions have been made to the Construction Grants Program to minimize burdensome requirements, project delays and high costs.
- Many of the water quality problems posed by industrial discharges have been abated by the construction of industrial wastewater treatment facilities. These actions are required by Section 402 of the CWA, and enforced by the issuance of NPDES permits which specify construction schedules and effluent limits for treated discharges.
- The authority to administer the NPDES program has been delegated to Connecticut and Vermont. Efforts to improve conditions for delegating permitting authority to other states have been made by means of regulatory proposals to streamline the permit program and provide the states with more flexibility in how they meet the requirements for delegation consistent with the Clean Water Act.
- Through major efforts to inspect permitted facilities and to undertake enforcement actions where necessary, Region I has been able to maintain a high level of compliance by the permitted facilities.

Barriers to Overcome

- The state and federal priority setting processes for construction grants have never been able to settle on whether efforts should be expended on the large, often more complex water quality problems first, or on the more numerous, smaller, less complex ones. In general, small town facilities with relatively minor problems received construction grant funds, while those situations that involved the more complex issues were not given sufficient attention.
- Politically motivated decisions concerning treatment facilities' planning have often resulted in inappropriate actions; i.e., two individual treatment plants when one regional facility should have been built. This "home-rule" philosophy is often a barrier to achievement of water quality goals.
- Engineering firms, and state and regional personnel, are reluctant to promote new technologies which often would be cheaper and result in smaller direct discharges. The traditional, high cost, capital intensive, infrastructure-related alternatives tend to be favored.
- A lack of adequate funding at federal, state and local levels is always a problem. This is true not only for capital expenses, but increasingly for operations, maintenance and routine replacement of wastewater facilities.
- Regional NPDES permitting resources remain at levels significantly below those necessary to reissue expiring and expired permits.
- Although EPA seeks to delegate the NPDES permitting program to the states, we have a large backlog of expired permits.
- There is a need to refine technical approaches to evaluating the biological impact from toxic pollutant discharges so that appropriate discharge control levels may be established.
- Financial and other resources necessary to develop and implement suitable monitoring and analytical activities are not readily available.

Expected Environmental Results

- As efforts continue in the Construction Grants Program, the NPDES permit program and in monitoring activities designed to identify and assess water quality, we will make progress in dealing with the problems discussed in the Water Quality portion of this EMR. We can expect water quality to be enhanced and maintained, and an expansion of opportunities for higher level beneficial uses of New England's water bodies.

- If more states in the Region assume NPDES permitting authority and gain additional experience in administering the construction grants program, EPA staff will be able to devote more time to providing the states with specialized technical support in joint efforts to evaluate and solve remaining water quality problems in the region.

PROBLEM STATEMENT: Combined Sewer Overflows

Most major cities in New England have combined sewers. During periods of wet weather, the sewers overflow and discharge untreated wastewater into rivers, lakes and coastal waters. Combined sewers represent a difficult and important water quality problem for the Region since they prevent the full attainment of the water quality standards and beneficial uses of many water bodies.

Among the serious adverse economic and environmental impacts of combined sewer overflows (CSOs) are the following:

a. CSOs result in the closure of shellfish harvesting areas, they can cause the closure of areas for swimming and other recreation uses and they can aesthetically degrade water bodies. New Haven Harbor, the lower Connecticut River, Narragansett Bay, Boston Harbor, the Charles River, Portland Harbor, Lake Champlain and Lake Memphremagog are among the waters where higher uses are precluded or limited because of CSOs. The impact of precluded uses is often quite substantial since the areas most commonly affected are urban where use pressures are most intensive.

b. CSOs prevent final clean up of major rivers and river segments. Oft-times river clean up has proceeded to an advanced stage—major wastewater treatment facilities have been completed, but CSOs produce water quality problems. The Merrimack River is such an example. Although much effort has gone into treating discharges into the River, combined sewer systems in Lawrence, Lowell and Haverhill, Massachusetts and in Nashua, Concord and Manchester, New Hampshire impede the attainment of clean up. The estimated cost of dealing with these overflows is $650 million—based upon the 1980 Needs Survey. In order to achieve fishable-swimmable and/or aesthetically acceptable water quality in the River, CSO controls are required.

The total cost of combined sewer control in New England estimated by the 1982 Needs Survey to Congress is $4.5 billion.

RECOMMENDATIONS

Headquarters Actions

- Establish as a federal priority the control of combined sewer overflows.
- Advocate increased federal funding to implement a CSO control program.

Regional Actions

- Accelerate municipal programs for the operation, maintenance and construction of facilities to control or eliminate combined sewer discharges.

State and Local Actions

- Accelerate municipal planning for combined sewer control.
- Provide increased state and local funding to implement combined sewer control programs.

DISCUSSION

Background

New Haven, Hartford, Bridgeport (CT), Providence (RI), Boston, Springfield, Worcester (MA), Concord, Manchester (NH), Portland, Bangor (ME), and Burlington (VT), are among the major cities in New England that have combined sewer systems that discharge overflows into adjoining water bodies—rivers, lakes and coastal waters. In northern New England a small number of smaller communities are also served by CSOs. Many municipalities have taken limited remedial action to reduce the frequency of the CSOs and several communities have eliminated the overflows by means of sewer separation.

Past Responses

- **Connecticut:** Approximately ten communities (including Hartford, West Hartford, Bridgeport, Greenwich, New Haven and Stamford) have combined sewer systems. Most of these communities have engineering studies completed or near completion. Several of the smaller communities are proceeding with phased separation of their systems. The recommended alternative for the larger systems has been separation, but because of high costs and capital expenditures, water quality improvements will have to occur over many years.
- **Maine:** About fifty communities in Maine have combined or partially combined systems. Although the majority of the systems are small communities with partially combined systems, perhaps fifteen of the larger communities have widespread combined systems. In a small number of communities, limited remedial separation, to reduce overflows has been accomplished in conjunction with the construction of basic wastewater sys-

tems. On a statewide basis, an accurate assessment of the range of the problems and determinations of alternative control measures have yet to be developed.

- **Massachusetts:** Approximately forty municipalities (including such major population centers as Boston, Springfield and Worcester) have combined or partially combined sewer systems. Several small- and medium-sized communities are putting separation programs into place, but definitive studies on the larger systems have only just begun. Alternative control approaches for these larger systems must be evaluated.
- **New Hampshire:** Approximately forty communities have combined or partially combined systems. In many smaller communities separation of the systems has been determined to be the most appropriate solution, and separation projects are underway. In several of larger cities separation has been selected as a remedial alternative, in part, because of deteriorated existing systems. However, limited financial resources and questionable federal eligibility have slowed the pace of separation projects. Alternative engineering solutions for control of combined sewers will be required in light of funding limitations.
- **Rhode Island:** Three major cities (Newport, Pawtucket, and Providence) have combined systems that require control programs. Facilities in all three cities are in the advanced stages of facility planning. Alternative control systems are being evaluated at the present time. (See Section on Narragansett Bay).
- **Vermont:** All of the larger municipalities and a number of smaller towns, representing approximately sixty communities, have combined or partially combined systems with overflows. Remedial action on combined sewers has generally been limited to inflow reduction programs in conjunction with basic wastewater facilities upgrading. Because of funding limitations, no major steps have been taken to deal with combined sewers.

Barriers to Overcome:

- Federal, state and local governments have focused their attention on the task of providing basic collection and treatment of wastewaters. The control of combined sewers has been given secondary priority primarily due to the limited concern placed on them by federal statutes, regulations, guidelines and programs. This reduced priority has resulted in limited implementation of programs to reduce CSOs.
- The technology for control of overflows, within a reasonable financial framework, is available. The application and implementation of the technology is a critical factor.
- The primary barriers to solution of the problem are federal, state and local governmental priority for control of the overflows and governmental financial resources to construct the required CSO control systems.

Expected Environmental Results

- Control of CSOs, when implemented in combination with other basic water pollution control measures, will result in reclamation of the desired uses along the major rivers and many miles of the coastline in New England.
- Shellfish beds may be opened; swimming and recreational areas can be fully utilized; fishing, canoeing and general use and development of the rivers and coastal areas will be substantially enhanced; the aesthetic qualities of the water will be restored.
- Since the New England economy is so closely linked to the environmental quality of the region, significant economic benefits will accrue as a result of the completed cleanup.

PROBLEM STATEMENT: Nonpoint Source Pollution

As illustrated in the state-by-state summaries of water quality, nonpoint sources (NPS) of pollution impair high quality drinking, fishing and recreation waters in New England. Lakes, streams and reservoirs are especially vulnerable. Nonpoint problems are generally localized or sporadic in contrast to gross, widespread point source pollution loadings.

RECOMMENDATIONS

Headquarters Actions

- Involve national organizations and associations to reach the diversity of agencies involved in controlling the sources of nonpoint pollution.
- Involve sister federal agencies administering appropriate programs (agriculture, forestry, construction, and transportation).

Headquarters/Regional Actions

- Provide national and regional leadership, guidance and technical assistance, with "last resort" back-up enforcement.
- Furnish model legislation, guidance and technical assistance to build up state-local-private sector capability.
- Support states and localities in back-up enforcement.

Regional Actions

- Encourage state water quality management agencies to involve sister agencies and to furnish them water quality information.

Other Federal Agency Actions

- Shift priorities to focus funds that are available to address water quality and related environmental quality.

State and Local Agency Actions

- Encourage individual users and operators to adopt and implement best management practices (BMPs) to minimize water quality degradation from potential pollution-generating activities.
- Strengthen education and technical assistance for BMP implementation.
- Strengthen state and local regulatory programs through permits and licenses.

DISCUSSION

Background

All types of NPS pollution occur throughout New England. Certain sources appear more rural in nature, while others are more persistent in urban areas. The major sources of nonpoint pollution can be categorized and described as follows:

Urban runoff: The runoff of rainfall and snowmelt from paved areas, rooftops and lawns of developed areas can cause water problems in receiving waterbodies. Runoff from these surfaces carry sediments, nutrients, pathogens, toxics and debris into streams, ponds, water supply reservoirs and estuaries. The most severe urban runoff problems are concentrated in southern New England because it is more developed and more highly urbanized.

Construction activities: Improper construction practices at particular sites cause erosion and sedimentation in streams and lakes. In a few instances, heavy construction in urban areas accelerates runoff of nutrients and toxic substances. Overall these problems are concentrated in urban centers of southern New England, in southern New Hampshire and Maine, and in the Burlington Champlain Valley, Vermont. They occur in areas undergoing rapid urbanization and large-scale construction for highways, airports, shopping malls, commercial areas and new industry. Large-scale construction has caused erosion and sedimentation in streams and ponds valued for their fisheries/recreation water quality, critical water supply reservoirs, and sensitive wetlands, estuaries, and spawning areas. To a much lesser extent, improperly maintained town road ditches have caused some problems.

Not only does silt and, in some instances, toxic runoff from construction practices directly impair critical waters, sensitive aquatic ecosystems and prime recreation/aesthetic values, but they also are passed on as silt/toxic loads that successively settle and shift with the currents for years to come. Once silt settles in the stream, it disrupts the hydrologic equilibrium—accelerating bank scouring, erosion, and flooding.

On-site waste disposal systems: All of the major cities in New England are served by central sewerage systems; however, many suburban and rural communities continue to rely on individual subsurface disposal systems. Approximately 35% of the region's population utilize subsurface systems to dispose of their domestic wastes. Although land application systems are often the most effective and economical alternatives for waste treatment, they can create water quality problems in both ground and surface waters if they fail.

Agricultural activities: Although agriculturally-related pollution is relatively minor in New England compared to municipal and industrial point sources, it poses significant water quality problems in critical areas. This can occur where animal waste handling, cropping practices, and pesticide/herbicide applications degrade high quality waters prized for their recreation, fish and wildlife, water supply and aesthetic values.

Forest management activities: On a scattered basis, especially in northern New England, improperly designed logging roads and skidding practices likewise impair high quality uses.

Past Responses

- Rural Clean Water Program (RCWP), Small Watershed Projects (PL566), and Agricultural Conservation Program (ACP) fund agricultural and forestry BMP implementation for critical watersheds.
- USDA (SCS) delivery system of technical assistance to local level, coordinated through State Soil and Water Conservation Committees.
- National Urban Runoff Program (NURP) funds selected projects to study stormwater runoff problems and alternative solutions.
- Local adoption of urban runoff pollution control ordinances; assistance and backup from State Water Pollution Control Agencies.
- Section 201 of the CWA is available for the planning, design, and construction or rehabilitation of small-scale on-site wastewater treatment systems.
- State and local health codes promote soils/site evaluation, proper installation, and adequate operation and maintenance of on-site wastewater disposal systems.
- A National Prototype Project and Training Project has studied water quality impacts of forestry and disseminated BMP information.
- State foresters, with assistance and backup from the state pollution control agency, work with operators to utilize BMPs.

Barriers to Overcome

- The diffuse, intermittent nature of NPS sources make it difficult to recognize their water quality impacts and mount effective abatement strategies.

- The diversity of management agencies requires coordinated efforts to develop and implement pollution abatement measures.
- Simple preventive measures are readily slighted or overlooked.
- Since BMPs usually involve changing ingrained habits and operations, long lead times are often required in the adoption process.
- Local autonomy and lack of regional/national consistency make BMP adoption less effective.
- Diminishing support funds make abatement efforts more difficult to implement.

Expected Environmental Results

- Pollutant loads from nonpoint sources can be expected to be reduced by BMP implementation, thus minimizing the water uses now impaired, particularly in otherwise high quality streams and lakes. BMPs will prevent degradation of existing high quality waters, providing insurance against costly, disruptive incidents and need for expensive remedial measures.
- Urban storm runoff: Significant reduction in sediment, nutrients, and metals in urban runoff.
- Construction: Reduced erosion and sedimentation of streams, ponds and estuaries during residential, commercial, and highway construction.
- On-site wastewater disposal: Prevention of pollution to wells, aquifers, streams, and ponds currently contaminated or threatened by improper on-site disposal.
- Agriculture: Reduced soil erosion and sedimentation and reduced phosphorous loadings and lake eutrophication.
- Forestry: Decreased erosion and sedimentation into lakes and streams from improper forest management activities, especially logging roads and skid trails.

PROBLEM STATEMENT: Filling of Wetlands

Our nation's wetlands are an irreplaceable natural resource. Although wetlands comprise only approximately 3% of this country's surface area, they are essential to the survival of our fish and wildlife populations and are increasingly being recognized as important in maintaining water quality through the filtration and uptake of sediment, nutrients, and pollutants. They also act as natural flood storage areas and, along the coast, provide a buffer against storm damage and erosion. Biologically, wetlands are among the most productive and diverse ecosystems on earth. Two thirds of the commercial fish species harvested on the Atlantic coast depend on coastal estuaries and wetlands for food and spawning grounds. Many river and lake fish species depend on inland lakes and wetlands. Wetlands provide habitat and food for furbearers such as muskrat, otter, mink, racoon, and beaver. At least 76 threatened and endangered species require wetlands for habitat.

Despite their value and relative scarcity, our wetlands continue to be destroyed at an alarming rate. There has been tremendous pressures from developers to build on coastal islands and wetland areas. The unregulated discharge of dredged and fill material results in impairment of water quality and habitat loss. Of most concern is that the U.S. Army Corps of Engineers has recently issued several "nationwide permits" which exempt large geographical areas from regulation and increase the potential for wetland loss.

RECOMMENDATIONS

Headquarters Actions

- Rather than exempt large geographical areas, the Corps could issue general permits for those minor activities that commonly occur in these areas. Conversely, they could retain the present regulation but condition the exemptions to exclude projects with a significant potential for impact (e.g., the exemption could authorize a maximum amount of fill such as 1,000 yd^3 in wetland areas). Corps conditions already prohibit the discharge of toxic material into these exempted areas. An additional condition concerning project size would allow closer review of those proposals with a potential to cause significant habitat loss. EPA could negotiate with the Corps to structure the nationwide permits in a more environmentally acceptable manner.

  If negotiations with the Corps are unsuccessful, EPA could consider initiating 404(c) veto proceedings against selected Corps nationwide permits. (This section of the Act allows the Administrator to veto permits issued by the Corps which would have an unacceptable adverse impact.)

Regional Actions

- Work with the New England Division of the Corps to design appropriate regional conditions on nationwide permits.
- Develop procedures with the New England states so that we are informed of significant activities occurring in exempted areas.
- Actively encourage the Corps to exercise its discretionary authority in cases that have the potential for significant habitat loss.
- Instigate 404(c) predesignation actions to safeguard especially valuable wetlands in exempted areas.
- Actively encourage New England states to assume 404 program delegation.

- Provide assistance to New England states to review their programs for adequate regulation of freshwater wetlands.

Other Actions

- The New England states shall insure that their programs adequately regulate areas exempted from federal regulation.
- The states should actively consider assuming the 404 program delegation.

DISCUSSION

Background

Despite their value and relative scarcity, our wetlands continue to be destroyed at an alarming rate. Over 40% of the nation's original wetlands are gone; in an older, more densely populated region such as New England, the loss has probably been greater. Although considerable attention through the years has been focused on chemical water pollution and water quality standards, this is only one aspect of the more general problem of wetlands protection. Undoubtedly, the most critical problem associated with wetland deterioration is loss of habitat. Direct habitat loss usually results from dredging or filling operations. Indirect loss can occur from changes in wetland hydrology or isolation of an area from the full ecosystem. Development activity can increase chemical loads and may also result in increased public exposure to health risks posed by mosquitos as disease vectors.

Other values not as readily apparent are lost when wetlands are filled. For example, nearly 8,500 acres of wetlands in the Charles River Basin in eastern Massachusetts absorb an average annual flood which would otherwise produce damages estimated at over $17 million. According to the Massachusetts Audubon Society, these same wetlands have a waste treatment capacity estimated at $17,000/acre per year. Wetlands such as these also provide real, if difficult to quantify, aesthetic and recreational benefits.

Past Responses

- In response to the concern over the loss of wetlands, Congress enacted Section 404 of the Clean Water Act to regulate these discharges. In addition, many states developed their own programs to regulate and monitor the problem. The combined implementation of the state and federal programs in New England has drastically reduced the unnecessary loss of our coastal wetlands. This is particularly true in Massachusetts and Rhode Island; a slightly higher loss of coastal wetlands continues to occur in Connecticut. Overall, the national 404 Permit Program permits the destruction of 300,000 acres of wetlands per year. Region I, due in part to its small size and long history of settlement, accounts for well under 5% of this annual loss. In fact, within the last two years fewer than 750 acres of wetland filling has been allowed under all individual permits combined.
- Significant problems remain with regard to our inland wetlands, however. These areas are unprotected or not as well protected depending on the particular state program. The federal (404) program jurisdiction reaches to "all waters of the U.S." However, in 1977, the Corps of Engineers — which administers the program — issued regulations which authorized fills in isolated wetlands less than 10 acres, and wetlands above headwaters ("headwaters" is defined as the point where flow of a stream is 5 cfs). In 1982, the Corps expanded this exemption by removing the 10-acre size limitation.
- For the New England region we estimate that approximately 35% of the inland wetlands were covered under the 1977 exemptions and an additional 30% were exempted under the 1982 rules. The effect, then, is to leave only 30% of the inland wetlands subject to federal regulation. The National Wildlife Federation stated in their August 10, 1982, congressional testimony that, "the environmental impact of the nationwide permits will be immense. . . over 48,469 acres of the 87,942 acres of waters in Rhode Island currently regulated by Section 404 [will be] unprotected." Although the figure may be much higher, we can state, with certainty, that over 50% of New England freshwater wetlands are no longer individually regulated under Section 404.

Barriers to Overcome

- Little information is available on the precise environmental impact of these exemptions since there are no reporting or application requirements.
- The Corps appears unwilling to consider making significant meaningful modifications to the nationwide permits of most concern.
- Use of 404(c) is very resource intensive for the Agency.

Expected Environmental Results

- Environmentally acceptable nationwide permits would serve to insure that development in these areas avoids or minimizes degradation of water quality and habitat loss.
- Significant increase in the preservation of wetlands with concommitant benefits to man and wildlife.

PROBLEM STATEMENT: Lake Eutrophication

Lakes are among New England's most valuable aesthetic, recreational and economic assets. Many of the lakes in New England are showing signs of accelerated, man-induced eutrophication.

RECOMMENDATIONS

Headquarters Actions

- Advocate continued financial assistance for the states to develop and implement lake management programs.
- Provide technical publications and financial support for the annual lakes management conference.
- Serve as the clearing house for technical publications involving state-of-the-art techniques for lake management.

Regional Actions

- Continue oversight of regional clean lakes management programs.
- Provide technical assistance to the states on lake management as needed.

State and Local Action

- Attempt to obtain adequate state and local funding for lake restoration projects. A successful example is Massachusetts' recently enacted Clean Lakes program that provides state funding for diagnostic and restoration efforts.

DISCUSSION

Background

Lakes are among New England's most valuable aesthetic, recreational, and economic assets. Eutrophication, or accelerated aging, threatens the usefulness of many of New England's lakes and impoundments. Pollutants — particularly nutrients such as phosphorus and nitrogen from municipal wastewater treatment plants and nonpoint sources — and sediments can contribute to excessive growth of aquatic weeds, thereby reducing a lake's ability to maintain its full recreational potential.

Many of the lakes in New England are showing signs of eutrophication. For example, Maine shows 30 problem lakes, New Hampshire 50, Vermont 55, Connecticut 100, and Massachusetts 1,030.

Past Responses

- In 1975, a Clean Lakes program was initiated under Section 314 of the Clean Water Act to provide for federal participation in lake rehabilitation and preservation programs.
- This program provides funding for lake diagnostic studies at 70% federal share and implementation activities at 50% federal share. A breakdown of funds obligated to date in New England is as follows:

Connecticut	$1,110,135	New Hampshire	$297,686
Maine	$1,889,577	Rhode Island	$ 74,200
Massachusetts	$4,456,303	Vermont	$456,506

- The New England states have expressed concern over EPA's intention to terminate the Clean Lakes program. The states feel that the cost of lake management program is too large for the states to assume. A preliminary list of priority restoration projects for each state and an estimated cost of cleanup appears on page 106 of the appendix.

Barriers to Overcome

- Lack of adequate financial resources to restore impacted lakes in New England.
- Lack of national commitment to lakes restoration program (i.e., financial and technical).
- Need for information exchange on state-of-the-art lake restoration techniques.

Expected Environmental Results

- Upgrade lake water quality to provide for swimmable/fishable uses.
- Increased recreational potential of clean lakes is important to New England economy.

PROBLEM STATEMENT: Exploratory Oil and Gas Drilling on Georges Bank

The second round of leasing areas of Georges Bank for oil and gas drilling was delayed by court action on March 28, 1983. As soon as legal proceedings on this Sale No. 52 are completed, EPA will need to proceed expeditiously with issuance of NPDES permits for operational discharges. Permits cannot be issued beyond July, 1984, unless they incorporate Best Available Treatment (BAT) technology economically achievable. BAT is either established by national guidelines or by the permit writer's best professional judgement. As a result of new regulations, general permits should be issued for Outer Continental Shelf (OCS) activities whenever possible. Rulemaking procedures for general permits require extensive review within and outside of EPA in Washington. The complexity of the existing procedures coupled with the high public interest and the need to consider all applicable information and research in permit decisions makes the permit process complex and time-consuming.

RECOMMENDATIONS

Headquarters Actions

- Although significant steps have been taken to expedite general permit review, the process remains lengthy and very complex. HQ should continue to consider the following alternatives as means of reducing the complexity and time to issue final general permits:

  — Waiver of OMB review at the draft and/or final permit phase;

  — Reconsideration of general permits as rulemaking, thereby not requiring publication in the Federal Register at draft and final stages and no formal OMB review;

— Development of a written position on general permits as permits or rules, and the appropriateness of allowance for formal administrative appeals of permit decisions.

- Development of BAT effluent guidelines for the oil and gas extraction category should be maintained in its high priority status so permit writers can have draft and final guidelines available as soon as possible for permit development. This will aid in developing nationally consistent permits, where appropriate.

Regional Actions

- EPA Region I staff should develop a mutually agreeable format with states for EPA's Coastal Zone Management consistency certification to the states accompanying general NPDES permit issuance.
- Region I will continue with information analysis and drafting of a general NPDES permit and Ocean Discharge Determination for OCS Lease Sale No. 52 in coordination with states, MMS, and Headquarters until the Lease Sale is held and areas to be explored are known.

DISCUSSION

Background

Under OCS Lease Sale No. 42, exploratory drilling for oil and gas began on Georges Bank in July, 1981, and is now suspended because of lack of commercially important finds of oil and gas. A total of eight wells were drilled by five different companies.

The next sale, No. 52, scheduled for March, 1983, has been delayed by a federal court ruling. The area under consideration in Sale No. 52 includes the Sale No. 42 area, deeper tracts along the continental slope and some off the continental shelf. Planning is also underway for Sale No. 82 tentatively scheduled for February, 1984. The Sale No. 82 area under consideration extends from thirty miles offshore of New England to beyond the continental shelf.

Since the issuance of individual permits under Sale No. 42 and in other Regions, EPA policy and regulations have required issuance of general permits for OCS drilling wherever possible to reduce duplicative application requirements and the paper workload in issuing numerous identical permits. However, general permits are considered formal rulemaking which subjects them to review by numerous Headquarters offices and OMB. Completing this process for draft and final permits will be resource intensive and time-consuming for Region I in issuing a general permit(s) for the next lease sale.

In the Georges Bank area, permit development is of great public interest. Development of the next permits will also be of great interest as evidenced by the multiple party law suits filed to halt the Lease Sale itself. Within the Region, the process of analyzing Georges Bank Monitoring Program results, other research and coordination with other agenices and the public will be extensive and time-consuming. Therefore, any measures to reduce EPA Headquarters or OMB review of permits will aid in timely permitting.

At present, there are no BAT effluent guidelines for the oil and gas extraction industry category which specify technology to be applied to control discharge of heavy metals. Without these, permits cannot be issued beyond July, 1984, unless permit writers do so based on their Best Professional Judgement. This places a great technical burden on permit writers and can lead to inconsistency between regions.

Past Responses

- In responding to regional comments on general permit guidance and a proposed Memorandum of Understanding with Department of Interior on NPDES permitting the outer continental activities, Headquarters offices explained that they established procedures to "fast track" procedural reviews within EPA and were seeking to do the same with OMB.
- To address the requirements for BAT treatment of toxic pollutants by July, 1984, the Effluent Guidelines Division is developing BAT and new source performance standards for the Oil and Gas extraction category. These are scheduled to be developed by summer, 1983.

Barriers to Overcome

- To issue timely, appropriate NPDES permits for the next lease sale on Georges Bank the following should occur:
  - — EPA Headquarters needs to find ways to further reduce the time required to issue general permits;
  - — Effluent Guidelines needs to complete the extensive effort of developing BAT and new source performance standards;
  - — Region I needs to complete all technical background work for general and individual permits, if appropriate, for areas leased under the next lease sale at the time the sale is held so that permit coordination and issuance can proceed expeditiously.

Expected Environmental Results

- If these recommendations can be realized further NPDES permitting of operational discharges during exploratory oil and gas drilling on Georges Bank should be completed in timely fashion with all appropriate permit conditions. The permits should meet EPA's requirements under the CWA and associated regulations for permits which do not allow any unreasonable degradation of the marine environment.

PROBLEM STATEMENT: Ocean Dumping

New England coastal waters have been used for disposal of dredged spoils, industrial and chemical wastes and low-level radioactive materials. Presently, ocean dumping is limited to dredged spoil. Increasing pressures to dispose of other materials at sea and an apparent emerging national policy change to consider this alternative will subject the Region's coastal and ocean waters to a greater environmental risk.

RECOMMENDATIONS

Headquarters Action

- Headquarters, the Region and the coastal states should cooperatively work toward development of regulations which are protective of the ocean and coastal environment, and consistent with national policy direction.

Regional Action

- The Region, the states and EPA Headquarters should begin to identify broad ocean areas which may be acceptable for ocean disposal of non-dredged materials in order to channel potential discharges to the most environmentally compatible areas.

Other Action

- Research into the effects of ocean disposal should continue.

DISCUSSION

Background

Approximately 75% (or 19 million cubic yards) of the total amount of material dredged in New England between 1971 and 1980 was disposed in open waters off New England's coast. Of this total, 3,280,843 cubic yards were disposed at two EPA approved interim sites over the past four years. The demand for disposal at these and other open water sites is expected to continue and possibly increase over the next decade because of the need to maintain and enhance regional harbors and ports.

The potential amounts of non-dredged material which may be proposed for ocean disposal is unknown. Two potential sources of non-dredged wastes, sewage sludge from South Essex Sewer District and MDC Boston, alone, contribute over 100 tons/year to the ocean environment. The long term environmental impacts of dredge spoil disposal on the marine environment are still largely uncertain since extensive testing at and near disposal sites has not been conducted. No major problems have been detected along the New England coast to date.

Past Responses

- The Clean Water Act prohibits ocean disposal of sludge. Section 301(h) waiver regulations specifically exclude sludge. The Marine Protection, Research and Sanctuaries Act, however, does regulate the disposal of materials discharged from barges and ships beyond the coastal baseline and establishes environmental criteria used to determine whether a material can be disposed at sea.
- Current EPA ocean dumping regulations have greatly reduced possible environmental risks of disposal by controlling the nature of materials deposited at sea. All spoils must be tested for toxicity, likelihood of bioaccumulation, etc. before they can be dumped. If the material does not meet EPA criteria, permission to dump is denied or, if the material is conditionally acceptable, the material must be "capped" or covered with less contaminated material. Today's dredge spoils are also likely to be "cleaner" than in previous years because of the construction of new and upgraded POTWs.
- EPA's ocean dumping regulations are undergoing revision to comply with a court decision which required EPA to more fully consider the environmental and economic consequences of alternative sludge disposal options before rejecting an ocean disposal option.

Barriers to Overcome

- There is a need to expand our present knowledge of the impacts of material disposal in the marine environment, and to appropriately condition our regulatory framework based on the extent of present knowledge. Where the impacts of ocean disposal are ill defined, the regulatory framework should provide appropriate safeguards which would ensure that ocean disposal could not be utilized.

Expected Environmental Results

- Continued protection of the ocean environment.

PROBLEM STATEMENT: Quality of Drinking Water

Maintaining the high quality of New England's drinking water is resource intensive. The Region I states have indicated that under current funding levels they are unable to continue to effectively implement all aspects of their drinking water programs. It is often difficult to bring persistent violators of drinking water standards into compliance. In some areas of New England drinking water has been rendered unsuitable for consumption because of contamination by certain organic chemicals. Since these organic chemicals are not covered by federal standards, it is difficult, if not impossible, to correct these problems through enforcement actions.

TABLE 6
PUBLIC WATER SYSTEMS IN NEW ENGLAND

State	Total PWS	Community	Non-Community
Connecticut	4424	685	3739
Maine	3022	380	2642
Massachusetts	2102	636	1466
New Hampshire	1399	409	990
Rhode Island	632	113	519
Vermont	1691	386	1305
Region Total	13,270	2,609	10,661

RECOMMENDATIONS

Headquarters Actions

- Provide guidance on ways to continue the effective implementation of the drinking water regulations in a period of reduced resources.
- Research and develop cost-effective methods of treatment for small water supply systems.
- Develop regulations and guidance for the control of organic chemical contaminants.

Regional Actions

- Provide guidance to the states in dealing with persistent violators by developing innovative and effective compliance strategies.
- Provide guidance and assistance to states in assessing their individual program needs.
- Assist the states in developing an improved drinking water surveillance program with emphasis on data handling, sanitary surveys, non-community program, laboratory quality assurance, and technical and administrative matters.
- Render technical assistance to the states by issuing health advisories and advising on treatment techniques, especially with respect to organic chemical contamination problems.

Other Actions

- Initiate regulatory reforms giving the states flexibility in terms of repetitive monitoring requirements presently applicable to certain contaminants that are already regulated under the NIPDWR.
- States should develop effective compliance strategies to bring all their water systems into compliance.

DISCUSSION

Background

Under the authority of the SDWA, EPA has promulgated National Interim Primary Drinking Water Regulations (NIPDWR) which apply to public water systems (PWS). These regulations specify maximum contaminant levels (MCLs) for inorganic and organic chemicals, turbidity, bacteria, and radionuclides. In addition, the regulations require periodic monitoring of public water supplies for the specified contaminants, and public notification if any of the MCLs are exceeded.

In Region I, there are 13,270 public water systems. (Table 6)

Of these public water systems, approximately 23% use surface water sources and 77% draw from the ground water. Fully 80% of New England's population is served by surface water, and 20% by ground water sources.

In New England, there are now 2,609 community water supply systems providing water to over 11,000,000 people. Although there are many more non-community water supply systems, the population served them is substantially less than that served by community water supply systems.

While the reporting data indicates that from FY 80 to FY 82 there was a decrease in the number of violations of the coliform and turbidity MCLs, much work still needs to be done. And, there is a pressing need for innovative and effective compliance strategies so that we may bring more water systems into compliance with the drinking water regulations.

One of the activities state water supply agencies engage in to protect the public health is to conduct sanitary surveys of water supply systems, particularly those that have been in violation in the past. A sanitary survey is an on-site review of the water system's source, facilities, equipment, and operation and maintenance to determine the system's capability of producing and distributing safe drinking water on a consistent basis. Sanitary surveys, however, are resource intensive. For this reason, some states are reluctant to conduct them in the face of other pressing problems. The major concern voiced by all of the New England state water supply officials is their inability to continue to effectively implement all aspects of their drinking water programs with current funding levels.

Another resource-related impediment to meeting current water supply standards is the cost of acquiring new sources of water supply or building new water treatment plants. Nevertheless, several states in New England are now offering grants to assist water systems develop new supplies and plants. Priority should be given to those systems unable to meet current drinking water regulations.

Water supply program responsibilities have increased as federal and state funding has decreased. States are being forced to limit or eliminate important activities such as technical assistance to public water systems, sanitary surveys and the non-community system program. Inadequate funding, then, is an important reason why water supply problems persist in New England.

Past Responses

- All six New England states have been granted primary enforcement responsibility to assure compliance with regulations.
- The EPA Regional Office has assumed an oversight role and provides the states with specialized technical assistance.
- The Regional office has served as a focal point for states' annual compliance data and for generating trends and program priorities.
- The Regional office has provided technical and administrative assistance in program and compliance/contamination issues.

Barriers to Overcome

- Insufficient funding to support all aspects of the drinking water program.
- High cost of acquiring new sources of water supply or building new treatment plants in order to meet current regulations.
- Insufficient resources to assure proper construction of new water systems.
- Insufficient laboratory capabilities and high cost of analytical work.
- Insufficient guidance and regulations to cope with emerging organic chemical contaminations problems.

Expected Environmental Results

- With emphasis on persistent violators, improvement of the water system compliance is expected. Given the limited funding, all of the states' efforts will be assessed in order to assure resources are not being directed toward less important issues than protecting public health. The EPA regional office will also give priority to assisting states in these areas:
  - — Bringing systems into compliance with drinking water regulations
  - — Developing the appropriate laboratory capabilities and support.
  - — In addition to trihalomethane regulations, establishing an approach for controlling organic chemicals in drinking water.

SIGNIFICANT WATER QUALITY PROBLEMS IN NEW ENGLAND — SITE SPECIFIC

This portion provides a more detailed description of some of Region I's more significant site specific water quality problems.

Severe pollution in Boston Harbor and Narragansett Bay caused by inadquate urban wastewater treatment systems and combined sewer overflows adversely affect two of New England's most important water resources. PCB contamination has severely affected the recreational and fishing potentials of the Housatonic River in Connecticut and Massachusetts, and New Bedford Harbor in Massachusetts. Combined municipal and industrial point sources have caused major problems in Salem Harbor, Massachusetts.

PROBLEM STATEMENT: Boston Harbor

The Metropolitan District Commission (MDC) operates two out-moded and over-loaded primary treatment plants which discharge 450 million gallons of wastewater and 90 dry tons of digested sludge to Boston Harbor every day. In addition, the local tributary combined sewer system overflows untreated wastewater at some 110 locations along the Harbor's edge. This wasteload obviously has a negative effect on water quality and inhibits full recreational and economic use of the Harbor.

RECOMMENDATIONS

Headquarters Actions

- Accelerate 301(h) waiver review process and commit to a schedule for a tentative decision.
- Investigate whether 301(h) waivers could be granted for an extended period in instances where substantial capital investments for extended outfalls are necessary.
- Pursue regulatory reforms to address "big city" funding problems through the use of set-aside or carryover accounts.
- Clarify Agency policy on ocean dumping of sludge.

Regional Actions

- Place MDC under a legally-enforceable schedule.
- Create an internal ad-hoc task force to track MDC progress and to communicate problems on a regular basis to senior management.
- Accelerate review of MDC projects and develop time-based project objectives.
- Begin to develop strategy for fast-track review of a potential "second round" waiver application.

Other Actions

- Region/MA DWPC — develop baseline water quality profile of Boston Harbor including compilation of existing information and identification of data gaps.

- MDC — improve operation and maintenance of treatment facilities to increase compliance record and restore credibility with the public.
- MDC — accelerate investigation/decision on ocean dumping of sludge in order to resolve existing uncertainty over MDC's intentions.
- Executive Office for Environmental Affairs (EOEA) — support adequate budget for MDC activities.
- EOEA — pursue special marine CSO funding, at state and federal levels.
- EOEA — pursue reforms to allow set-aside/carry-over funding discussed above.
- MDC — re-examine timing of sewer system relief projects in relation to treatment plant improvements.
- MDC — accelerate development of composting as a partial alternative for sludge management.
- Public and political factions must be persuaded to accept certain levels of impacts from the construction, operation, and maintenance of facilities in order to implement necessary system improvements.
- State Legislature — assure adequate funding and evaluate other funding/organizational mechanisms to assure wastewater treatment facilities are properly funded.
- Member communities such as Boston, Cambridge and Somerville should work closely with the MDC to correct the CSO problem.

DISCUSSION

Background

The MDC is a Massachusetts state agency that provides wastewater treatment/collection to 43 greater Boston communities with a service population of over 2 million (about 40% of the state). It operates two primary treatment plants (Nut Island-1952, Deer Island-1968) and two Combined Sewer Overflow (CSO) treatment facilities (Cottage Farm-1971, Prison Point-1981). In addition, the tributary combined sewer system overflows at some 110 points along the Harbor's edge.

The treatment plant, sludge, and CSO discharges all have an impact on water quality to some degree. The pollutants in these discharges include coliform bacteria, floating materials, oil/grease, suspended/settleable solids, biochemical oxygen demand, nutrients, and heavy metals.

A Nut Island (NI) Site Options Study is essentially complete. It is intended to resolve the future of NI plant in light of Deer Island (DI) needs and 301(h) waiver possibility. In its draft report, MDC recommended upgrading (i.e., good primary) NI at its present location as opposed to abandonment and replacement with a pump station only (the draft EIS recommendation). Lack of a decision on the MDC's waiver application has probably indirectly slowed the progress of this study. Winthrop and Quincy generally oppose full plants at their respective locations and would like to spread the burden to a neutral site such as Long Island, which Boston strongly opposes.

The approximate costs (including sludge management) for the major options are as follows:

Primary/Harbor Discharge	$320M
Primary/Ocean Discharge	$660M
Secondary/Harbor Discharge	$760M

The Nut Island Site Options Study is currently under EPA/MA DWPC review. It is anticipated that some short-term improvements will be under construction by the summer of 1983.

A sludge management study is also essentially complete. The recommended plan calls for construction of three incinerators at DI to handle the primary sludge at a cost of about $70 million. In addition, MDC has found that a sufficient market exists to warrant construction of a demonstration composting facility on DI, and construction should begin this summer with about a 15-month duration for construction/operation/evaluation. At the present time, composting is only being carried as an adjunct to incineration.

There has been strong public pressure to use the Long Island as a neutral and remote site for an incinerator. The MDC is hoping an ocean disposal option will be available. A report is under EPA/DWPC review but progress is slow due to pessimistic outlook.

All four CSO (Inner Harbor, Charles River, Dorchester Bay, Neponset River) facility plans are complete and have been reviewed by EPA. Recommended plans are phased and varied with a total estimated cost of about $280M. Although this element of the MDC's plan has the most broad-based support, it does represent a substantial investment and as such the first group of projects may be limited to low cost/high benefit proposals in beach areas only. Some minor portions of the Neponset River plan have gone to design and are about to go to construction, but on the majority of the project EPA is simply waiting for the MDC and MA DWPC to submit completed environmental reviews. Reaching agreement on ultimate responsibility for CSO correction (i.e., MDC vs. member communities) could be an obstacle in the future.

There are 8-10 projects ongoing to deal with various interceptor/pump station problems throughout the MDC system. A few of these have gone onto design. The aggregate cost of the improvements will probably exceed $100M. Although these projects are straight forward and their need is readily justified, the feasibility of their implementation comes into question if the DI/NI plants are not upgraded, since the projects will obviously deliver more flow to the plants at the expense of the harbor communities.

The Boston Water and Sewer Commission is making excellent progress on their capital improvement program. Over the last two years, EPA has contributed approximately $40 million in support of rehabilitation/replacement of Boston's main interceptor system with almost an equal amount planned for the next two years. This work will address the problems of coastal dry weather and low level wet weather overflows as well as in-land sewer surcharging/flooding.

Past Responses

- An MDC "Master Plan" has been undergoing refinement for 8-10 years.
- Seventeen separate Step I grants have been made but none of the projects has gone to construction yet.
- Two Environmental Impact Statements have been issued with both concluding that more studies are warranted.
- Multiple advisory committees, task forces, and tracking operations have been created to bolster progress, input, and interest.
- Numerous schedules have been negotiated, violated, and renegotiated.

Barriers to Overcome

- Lack of decision on 301(h) waiver application.
- State construction grant allotment inadequate to cover MDC needs in a timely fashion.
- Lack of EPA policy on ocean dumping of sludge.
- No consolidated/current document on harbor water quality.
- MDC track record in operation and maintenance is weak.
- The public and many elected officials are unwilling to accept any impacts associated with potential projects.
- Resolution of CSO correction jurisdiction and responsibility between MDC and member communities.

Expected Environmental Results

- Water quality improvements will occur, depending upon the level of program implementation and 301(h) waiver decisions.
- Elevated dissolved oxygen levels, improved aquatic environment.
- Reduction in coliform levels, elimination of beach closures, reopening of shellfish beds for commerical harvesting.
- Elimination of nuisance conditions and aesthetic problems.
- Reductions in water quality standards violations.

PROBLEM STATEMENT: Narragansett Bay, Rhode Island

Upper Narragansett Bay in Rhode Island has suffered from man-made pollution since the 1800s in the forms of industrial wastes from metal platers, chemical industries and oil terminal activities, and from municipal wastes and 120 combined sewer overflows (CSOs). The cumulative effect of the pollutants has resulted in the degradation of the upper five miles of a 15-mile estuary, as illustrated by high bacterial and suspended solids levels and very low dissolved oxygen levels. At certain times of the year dissolved oxygen values of zero have been reported in certain spots of the Bay.

RECOMMENDATIONS

Headquarters Actions

- Continue a strong and well-funded combined sewer overflow program until the CSO problems are abated.

Regional Actions

- Employ Region-developed conservative substance and coliform dispersion model for the Upper Bay. The model can be used for the development of pretreatment, NPDES permit, and use attainability programs for facilities discharging into the Bay. It should ultimately be used to predict water quality impacts from specific pollution abatement strategies dealing with CSOs and point sources. Through allied funding by Sea Grant and the National Oceanic and Atmosphere Administration (NOAA), data is being generated and incorporated into the model to improve its capabilities.
- Consider Region I funding of a field sampling program to develop pollutant loading functions from CSOs and storm sewers as they relate to land use and rainfall. This can be used in the dispersion model discussed above to assess pollution abatement benefits.

Other Actions

- Increase federal support of marine research. Funding of this work will make possible continued refinement of the data base for the dispersion model.

DISCUSSION

Background

There is presently a very large hardshell clam fishery in the Upper Bay which is being adversely affected by sewage from the Providence area. The estimated value of the resource is several millions of dollars per year.

There has also been a loss of contact recreation areas, most notably in the towns of Warwick and Cranston, which are the most densely populated areas of the state.

Aesthetically, Upper Narragansett Bay is quite valuable. The shoreline right up to the Port of Providence is dotted with private homes, condominiums, parks, abandoned lighthouses, saltmarshes, and tranquil coves. The presence of raw sewage and greaseballs as far as seven miles south of Providence in past years has detracted greatly from the aesthetic value.

As plans for CSO corrections, STP upgradings, nonpoint source controls, sunken refuse removal, park development, and waterfront redevelopment are completed, the Upper Bay will be not only an economic resource but an aesthetic focal point in the state.

Past Responses

- A combination of federal 201 construction grant funds and state money over and above the required matching funds have resulted in the upgrading of the major pollution source in the Upper Bay. Renovation of the Providence sewage treatment facility is near completion.
- Over the past twenty years, the University of Rhode Island has been conducting research on the estuary through funding from EPA, NOAA, and Sea Grant Foundation. The data base resulting from these investigations has helped to establish a priority for pollution abatement.

Barriers to Overcome

- Institutionally, there are no barriers to overcome. Citizens have expressed their overwhelming commitment to cleanup the Bay, as witnessed by the recent 2 to 1 passage of an $87 million bond issue to make money available for cleanup activities in the Providence metropolitan area. Although the bond issue will provide a great amount of money for pollution abatement, it represents less than 33% of what is needed.

Expected Environmental Results

- With the total cleanup of the Upper Bay, primary impacts would include: increased commercial shellfishing and finfishing, and increased contact recreational use of the miles of beaches presently closed to bathing.
- Secondary impacts would include increased property values, a broader tax base and the incentive for recreational development of the Upper Bay.

PROBLEM STATEMENT: Salem Harbor (South Essex Sewer District), Massachusetts

The South Essex Sewer District (SESD) operates a primary wastewater treatment plant (WWTP) that is designed to treat 41 million gallons per day of flow from the five surrounding communities of Salem, Beverly, Peabody, Danvers and Marblehead. The plant discharges into Salem Harbor, a class SB watercourse used for fishing, swimming, and recreational boating. The treatment plant has been shut down since 1980 because the ash produced by incinerating the waste sludge was declared a hazardous material — due to the high level of hexavalent chrome that is created during incineration. The untreated discharge is causing serious pollution problems in Salem Harbor. The District has received a tentative decision on their 301(h) waiver from secondary treatment.

RECOMMENDATIONS

Regional Actions

- Development of joint EPA and state compliance schedule requiring SESD to bring the plant back on line and eliminate raw discharge of sewage to Salem Harbor.
- Review and approve RCRA permit to be ready if construction of ash detoxification facility is deemed necessary.
- Issue NPDES permit with 301(h) waiver.
- Determine if interim alternative sludge disposal options exist and then develop compliance schedule for implementation.

State Actions

- MADEQE should continue to work with EPA and SESD to bring plant back on line.
- MADEQE — assist in coincineration feasibility study, starved air operation, and all other options.

Other Actions

- SESD will pursue interim sludge disposal alternatives.
- SESD will determine feasibility of coincineration with N.E. Power and starved air operation of the incinerators.
- SESD will be ready to construct ash detoxification facility if no other options are feasible.

DISCUSSION

Background

The WWTP is a primary system with mechanical sludge dewatering and incineration followed by landfilling the ash. The facility services a population of 120,000 plus a wide variety of industries. The plant was fully on line in January, 1979 but has been shut down since February 4, 1980, when the Massachusetts Department of Environmental Quality Engineering (MADEQE) declared the ash hazardous.

The ash contained high levels of hexavalent chromium. SESD receives the chrome waste from 18 tanneries. The tanneries discharge a non-hazardous trivalent chromium into the sewers, but is converted to hexavalent when it is burned in the incinerator. Although the

WWTP sludge is non-hazardous, there is no available disposal site at present which could handle the sludge volume generated prior to incineration.

Past Response

EPA and the state have been working with SESD to find a solution to the problem. Presently there are no hazardous waste disposal sites in New England. The District's consultant has designed an ash-detoxification system and an application has been made for a RCRA permit, needed prior to construction of the detoxification facility. The permit is presently being reviewed by EPA. The District is also evaluating the feasibility of ocean disposal of the sludge and coincineration at the coal burning New England Power Plant, adjacent to SESD.

Barriers to Overcome

- State imposed taxation limitation (Proposition 2½) may limit local financial participation in project.

Expected Environmental Results

- SESD wastewater treatment plant will meet NPDES limits.
- Degradation of Salem Harbor will be eliminated.
- All beaches in Salem Harbor will be swimmable at all times.
- Area previously closed for harvesting of clams may be reopened.

PROBLEM STATEMENT: The Housatonic River, Massachusetts-Connecticut

The Housatonic River suffers from two critical but distinct water pollution control problems: Phosphorus-induced algae growth problems in the river impoundments, and PCB contamination of river sediments and the resulting high concentration of PCB in the river's fish and aquatic life systems. Both problems have adversely affected the recreational potential of the river and have caused economic losses. These problems are particularly complex because they involve an interstate stream. The ultimate effects of some of the pollution sources are not uniquely felt in the originating state but are often most serious far downstream in another state.

RECOMMENDATIONS

Headquarters Actions

- Develop options for the funding of remedial actions required for the correction of contaminated instream sediments.
- Continue to support research into the human health effects of PCBs and PCDFs in the aquatic environment.

Regional Actions

- Continue leadership of interstate pollution control efforts through the SEA Working Group on the interstate transport of pollutants to foster cooperation between states.
- Arrange for increased participation of New York and Region II in the study of phosphorous loading to Housatonic Basin from the Ten Mile River.
- After review of GE's Housatonic River PCB study, EPA will have to review and modify the Administrative Order with GE to include the study of possible remedial actions.

State Actions

- Contine state/EPA cooperation in resolving complex interstate waste pollution issues.

DISCUSSION

Background

Water pollution is a serious problem in the Housatonic River and its tributaries, the Still and Naugatuck Rivers, primarily as a result of inadequately treated municipal and industrial wastes and combined sewer overflows. These discharges not only affect river segments immediately downstream of disposal sites but also contribute phosphorus, which accelerates eutrophication, to run-of-river lakes used for recreation (such as Lakes Zoar and Lillinonah). Waste discharges in Massachusetts and possibly in New York adversely affect the quality of the Housatonic River in Connecticut.

PCBs have been found in the water column and in the bottom sediments of the Housatonic River from Pittsfield, Massachusetts south to Derby, Connecticut.

The existing water quality classification of the Housatonic River was downgraded from Class B to Class D when it was discovered that PCB concentrations in Housatonic River fish exceeded limits set by the U.S. Food and Drug Administration (FDA). The PCB concentration varied from more than 40 ppm to less than one part per million in fish. The FDA limit is 5 ppm. In 1977, the Connecticut Department of Health placed a health advisory on eating fish from the Housatonic. PCB contamination will prevent 109 miles of the Housatonic (nearly the entire main stem) from meeting the 1983 fishable/swimmable goals of the CWA.

PCB discharges from the major source, the General Electric Company (GE) in Pittsfield, have been stopped; however, PCBs continue to enter the river from landfills, storm runoff, and contaminated sediments. Also PCBs migrate with river sediments and are transported from Massachusetts to Connecticut. Both Connecticut and Massachusetts have issued health notices warning people not to eat fish taken from the Housatonic River; the Massachusetts health warning also included frogs and turtles.

Past Responses

- In 1979, the EPA established a Working Group on Interstate Transport of Pollutants, composed of representatives from Massachusetts, Connecticut, and New York, to help resolve interstate water quality problems. For the Housatonic basin the Group has coordinated pollution control efforts for phosphorus and PCBs. The Group assumed responsibility for the development of a comprehensive and coordinated strategy for resolving the problems of PCB contamination and for identifying resources available through various agencies to help it carry out its work.
- **PCBs** — In May 1981, EPA and the State of Massachusetts negotiated an agreement with GE relative to PCB contamination of the Housatonic River. Pursuant to this agreement, GE completed in December 1982 an in-depth study of the Housatonic River as an integrated assessment of the environmental intrusion of PCBs into this system. The GE study, combined with studies conducted by the States of Connecticut and Massachusetts, and EPA, are now undergoing an extensive technical review process. The result of the studies and the coordinated review process are intended to: 1) identify the magnitude and extent of PCB contamination of the Housatonic River System; 2) describe the effects of PCBs on Housatonic River fish and wildlife; 3) identify the potential human health effects of PCB contamination; and 4) develop a remedial action plan, if necessary.

  1983 will be a critical period in determining the next stage of effort relative to PCBs in the Housatonic River.
- **PHOSPHORUS** — Connecticut has investigated nuisance algae conditions in the three major Housatonic impoundments — Lake Lillinonah, Zoar, and Housatonic. These studies indicated that the Housatonic River was a major source of phosphorus to the lakes and that Massachusetts discharges constituted about one-half of the phosphorus discharged to the Housatonic River at the beginning of the lakes. The CT DEP recommended that Massachusetts should go forward with plans for phosphorus control at Pittsfield and GE, the two largest phosphorus sources in Massachusetts.

  Massachusetts' water quality surveys found continuing phosphorus induced water quality problems below Pittsfield. While GE had cut its phosphorus by 50%, Pittsfield was not operating its phosphorus removal system and was still discharging large amounts of phosphorus. Eutrophication problems were identified in the Sheffield meanders (about 40 miles downstream of Pittsfield and 10 miles above the Connecticut state line) as well as Woods Pond. At that time, the MA DWPC concluded that phosphorus from the Pittsfield treatment facility was the likely cause of the problem but that the relationship between Pittsfield's phosphorus and the Housatonic's eutrophication problems were not fully understood.

  Resultant bluegreen algal blooms inhibit recreational uses of Connecticut's lakes as well as cause dissolved oxygen depletion. The CT DEP, with the aid of EPA, performed algal assays on Lake Lillinonah, the most upstream recreational impoundment. These studies confirmed CT DEP's suspicions that phosphorus was the limiting nutrient for the nuisance algae. Based on this information and the phosphorus loading data calculated earlier, CT DEP and FMC Corporation conducted a two-year study of phosphorus removal at Danbury — the largest Connecticut point source of phosphorus. This study showed that phosphorus removal was technically feasible on a large scale and concluded that Danbury should seasonally remove phosphorus. Further, the study recommended that additional data be collected on the Massachusetts sources, particularly Pittsfield, since phosphorus removal from only the Connecticut sources might allow nuisance conditions to continue. Massachusetts and Connecticut both agreed that before Pittsfield, or any other source of phosphorus in Massachusetts, could be ordered to remove phosphorus, that the benefits of this removal would have to be firmly established.

CT DEP urged EPA and MA DWPC to study the phosphorus transport from Massachusetts into Connecticut and to develop regulatory actions, where necessary, to control this nutrient and hopefully the eutrophication problems in Connecticut. During the summers of 1981 and 1982 joint water quality surveys of the Housatonic River from its headwaters in Massachusetts through Lake Lillinonah in Connecticut were conducted by EPA, Massachusetts and Connecticut. During the 1981 survey, Pittsfield did not remove phosphorus as opposed to the 1982 survey which was run with phosphorus removal at Pittsfield. These "with" and "without" surveys will be the basis of a phosphorus limitation in the Pittsfield permit which is to be issued in the Spring of 1983.

Recent studies of the Housatonic identified significant short term phosphorus loadings emanating from the Ten Mile River in New York during summer rainstorms. The CT DEP, NY DEC and EPA Region I are presently planning studies to evaluate point and non-point phosphorus sources in the Ten Mile River Basin.

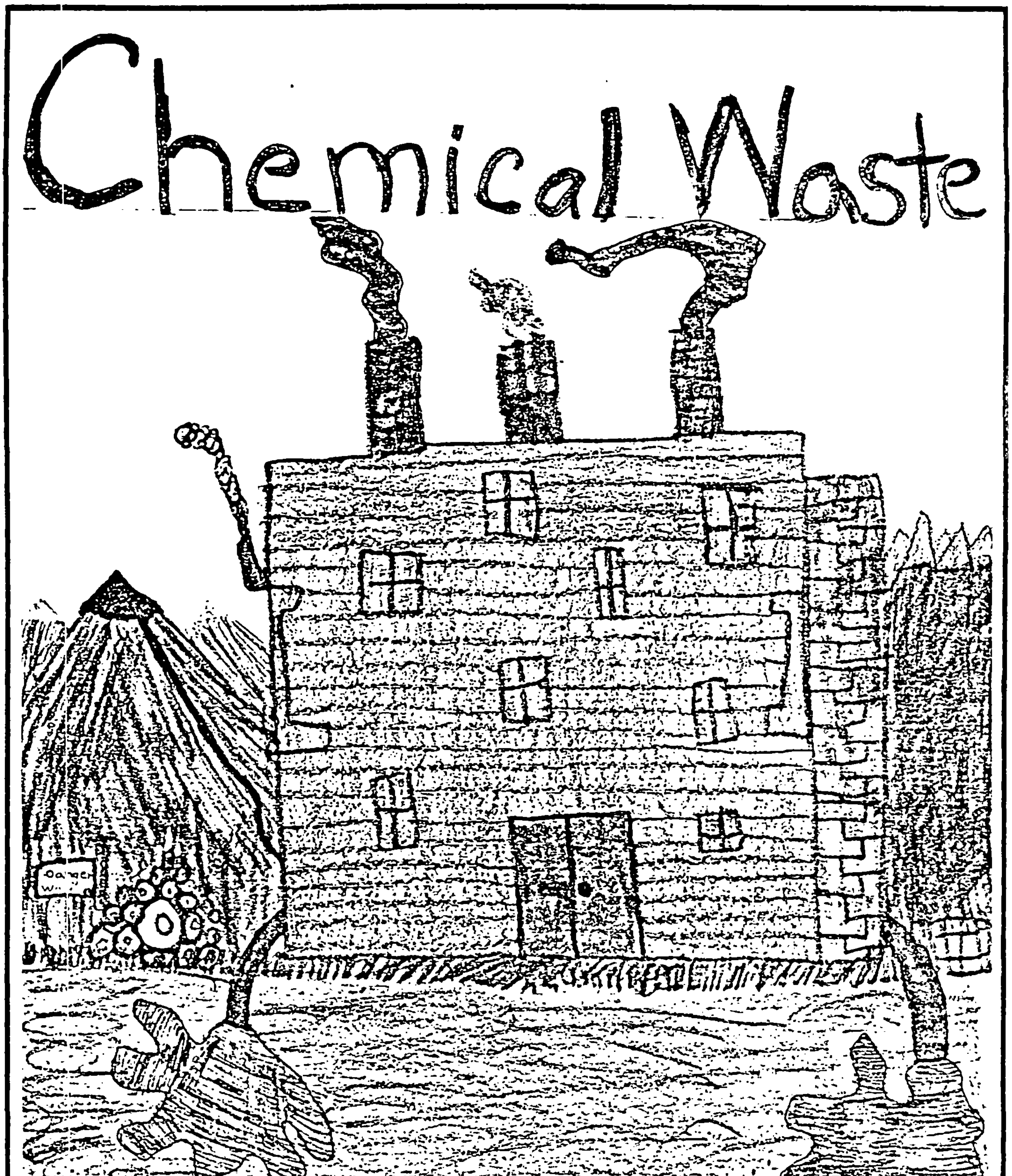
Barriers to Overcome

- Lack of agreement between CT DEP and MA DWPC concerning effects of Massachusetts' sources of phosphorus on Connecticut's eutrophication problems.
- Insufficient data on, and understanding of, the point and non-point sources of phosphorus in the New York portion of the Housatonic Basin.
- Incomplete scientific knowledge on the human health effects of PCBs.
- Potential for requiring very expensive remedial actions for PCBs in sediments.

Expected Environmental Results

- Control of nutrient loading to Housatonic River will reduce eutrophication of instream impoundments. Improved clarity will increase recreation potentials of basin.
- Removal of Health Advisory on Housatonic River fish will improve recreational potential for basin and will have positive economic benefits.

LAND



TIMMY KOSKELA · Woodstock Elementary School, Bryant Pond, Maine · Grade 5

STATUS AND TRENDS

Hazardous waste is rapidly becoming the most important environmental issue in New England. Responses to this problem are characterized by the geological, economic and emotional as well as environmental and technological concerns that challenge environmental managers.

New England's geologic deposits and topography were heavily influenced by the last continental glacier. Large meltwater lakes deposited fine silts and clays that formed extensive shallow aquitards. Extremely high yield aquifers in many areas were created by the abundant sand and gravel left behind by meltwater rivers. Glacial till comprises the majority of the deposits having substantially lower yield aquifers.

Ground water contamination is a significant and complex problem in New England since the region is peppered with small drainage areas and has generally heterogeneous soil types. This makes it difficult to determine ground water flow directions. In addition, fractured bedrock created by the glacier provides a network of cracks through which contaminants easily migrate from shallow surface aquifers into deep and broad regional aquifers.

New England's high precipitation rate enhances leachate generation from water infiltration and runoff through landfills and into ground water. Ground water contamination in New England is particularly significant since approximately 77% of the region's community water systems rely upon ground water. Moreover, all 38 New England National Priority List (NPL) sites have documented, or potential, ground water contamination problems.

The tremendous post-World War II growth in the generation of chemical waste as a by-product of industrial processes left a legacy of over 700 potentially hazardous waste dumps in New England. The region's strong high- and medium-technology, and support manufacturing industries, generate ever-increasing amounts of hazardous materials each year. Unlike other parts of the country, New England does not have a few large, centrally-located petrochemical plants that generate hazardous waste. Instead, the industrial landscape is characterized by many small facilities scattered throughout the region. New England's historically dispersed and small company manufacturing base complicates the detection of abandoned sites and the public management of operating treatment, storage and disposal (TSD) facilities.

The high cost of waste transportation and the long distances to disposal sites outside the region clearly increase facility operating costs, may inhibit continued manufacturing growth and increase the risk of transportation-related accidents. Yet, residents of New England towns remain adamantly opposed to siting TSD facilities in, or near, their communities.

Another economic concern is the states' ability to provide the financial match and operation and maintenance costs associated with the federal superfund program. When compared with other states on a per capita basis, New England states have roughly comparable levels of tax revenues, but they have higher levels of direct expenditures and substantially higher levels of long-term debt.

Hazardous waste is one of the leading public concerns in New England. Local and regional news services regularly carry site specific or related hazardous waste stories in almost every newspaper issue and television and radio news broadcasts. The Boston Globe, the region's leading newspaper, carried a seven page piece on regional and national hazardous waste problems, "The Poison Around Us", in its Tuesday April 12, 1983 issue.

Intense public concern is also illustrated by the citizens action groups organized at almost all of the 38 NPL sites in New England. These groups are emotionally concerned about the health related effects, i.e., cancer, resulting from contamination in their neighborhoods, and the public policy response.

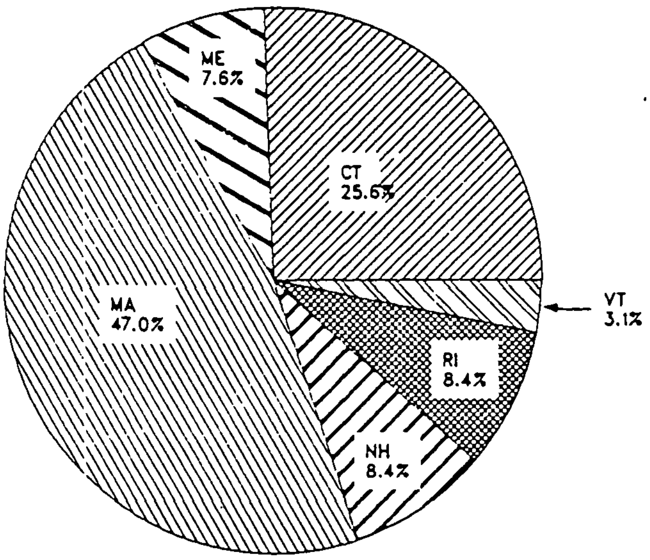
Technological advancements in contaminant identification and quantification have eclipsed the development of ground and surface water treatment technologies as well as our understanding of the health implications of exposure to hazardous materials. Although we are able to measure a myriad of chemicals at the parts per billion levels, and even parts per trillion, similar advancements in our ability to assess the impacts of these chemicals on public health has not kept pace.

RESOURCE, CONSERVATION AND RECOVERY ACT (RCRA)

There are approximately 5,200 hazardous waste handlers in Region I that comprise the regulated community subject to federal control under the Resource Conservation and Recovery Act (RCRA). A hazardous waste handler is anyone who generates, transports, or treats, stores, or disposes of hazardous wastes. The figure below shows the distribution of these sources among the Region I states.

FIGURE A
RCRA NOTIFIERS IN REGION I

SEPT. 30, 1982



All New England states have Phase I authorization from EPA to manage the RCRA program in lieu of the federal RCRA program. Phase I authorization enables each state to directly administer the manifest system, which provides "cradle to grave" tracking for hazardous wastes. Phase I authorization also gives states the lead in compliance activities.

In New England, 65% of the treatment, storage and disposal (TSD) facilities are required to have ground water monitoring. We believe that only 38% of these facilities are complying with this requirement. It is difficult to be precise about the compliance rate at this time because inspections have not been conducted at every facility in the region. However, facility inspection is the Region's highest priority RCRA activity for FY 83 and FY 84.

State Program Authorization

Each Region I state is now in the process of obtaining Phase II authorization which will give them the lead in facility permitting. The Phase II authorization process has been keyed to the promulgation of Phase II hazardous waste regulations that establish: 1) technical standards for permitting hazardous waste treatment, storage and disposal (TSD) facilities; and 2) general permitting procedures and requirements.

Technical standards for TSD facilities have been issued in stages corresponding to facility types: Component A includes the use and management of containers, storage and treatment in tanks, surface impoundments, and waste piles including location, closure and post-closure care, and financial responsibility; Component B covers incinerators; and Component C covers land disposal.

Phase II authorization is being carried out on a component by component basis, with some states applying for all three components; others for only one or two, at present. New Hampshire is the first Region I state to receive Phase II authorization. They were authorized for Components A & B on March 31, 1983.

Phase I and II authorization requires state programs to be "substantially equivalent" to the federal program. Draft final authorization guidance requires the state program to be "fully equivalent" to the federal program. It is still a matter of some uncertainty how this and other requirements for final authorization will be interpreted. Region I has identified some issues which may impede the final authorization process. Two of these concerns are outlined below:

- Draft final authorization guidance precludes the use of any variance and waiver provisions by the states which would render the state program less stringent than the federal program. At least three states in New England however, have variance authorities created by state statutes that may be problematic.
- Draft final authorization guidance indicates that state siting laws must be examined to establish their consistency with the federal program [40 CFR 123.32(b)]. The test of consistency as described in the guidance applies to "state provisions (e.g., state siting laws)" which prohibit storage, treatment, or disposal facilities for reasons which have no basis in human health and the environment. Some New England states have siting statutes which may allow for the prohibition of hazardous waste facilities for reasons other than health or the environment.

Another factor which may impede final authorization relates to resources. It has been proposed by EPA that as states receive final authorization they also accept full funding responsibilities for RCRA. Region I has received indications from all six of it's states that they would probably refuse final authorization if they were forced to bear the entire cost of implementing RCRA. In their view, RCRA is an EPA program for which the federal government should continue to provide a major share of funding.

Facility Permitting

Beginning in FY 82, Region I and the states, in a cooperative effort, formally initiated calling in hazardous waste facility Part "B" permit

TABLE 1
PART B APPLICATIONS CALLED AND RECEIVED

	Storage and Treatment	Incinerators	Land Disposal
Applications Called	58	8	13
Applications Received	35	1	2
Applications Withdrawn	30	1	0

applications. As the process began, EPA had the lead (i.e., federal permits were being processed). The states will be responsible for the permit decision process after Phase II authorization. EPA will continue to assist in and overview the permitting effort.

As the three components of the facility regulatons were promulgated, Part B permit applications of corresponding facility types were called: first, storage and treatment facilities, then incinerators, and finally, land disposal facilities. Due to resource constraints, only a portion of all facilities can be permitted in each year. Given current resource and work effort assumptions, it should take approximately 12 to 16 years to permit all eligible, currently existing, facilities.

The table above shows Region I's progress to date in calling and receiving Part B applications:

Compliance

During FY 82 Region I continued the Subtitle C compliance effort initiated in FY 81 for the remaining unauthorized states. The following enforcement statistics show EPA's efforts for both fiscal years:

	FY81	FY82
Inspections conducted	178	115
Letters of Deficiency issued	28	25
§3008 Complaints issued	11	50
§3008 Final Orders issued	3	26
§3008 Penalties assessed	157,350	155,675
§3008 Penalties collected	5,100	73,500

The level of state inspection and enforcement activity increased from FY 81 to FY 82, as a result of states assuming the lead after receiving Phase I authorization from EPA. The following state statistics, on a regionwide basis, bear this out:

	FY81	FY82
Inspections conducted	519	1,384
Enforcement actions initiated	182	428

It is more difficult to establish a compliance rate for RCRA than for air and water. In the latter two programs, there has been a long history of compliance and virtually all major facilities have been inspected by EPA or the states on numerous occasions. In contrast, RCRA facilities are now being inspected for the first time relative to their hazardous waste handling procedures. Many facilities have yet to be visited.

To establish an indicator of compliance with RCRA regulations, a compliance rate was determined based on the number of facilities inspected rather than the number subject to RCRA requirements. This analysis indicates that in FY 81, 77% of the facilities were in compliance, while FY 82 only 64% of the facilities had no violations.

The compliance rate presented includes as violators only those facilities violating the RCRA regulations governing material handling practices. This violation rate includes only the serious violations which carry with them the potential for environmental harm (Class I violations). The Class I violations compliance rate is indicative of the degree to which industry manages wastes properly and implements measures necessary to minimize the likelihood of harm to public health or the environment.

Although the compliance rate has declined from FY 81 to FY 82, this is due in large part, to the closure and groundwater monitoring regulations which became effective in late FY 81 and early FY 82, respectively. EPA inspectors have found that these regulations are among the ones most often violated. Non-Class I requirements which are violated frequently include the provisions for personnel training and for the development of contingency plans. EPA has found that the electroplating industry seems to have the most trouble complying with RCRA. This may be the result of this type of facility being both a hazardous waste generator and a TSD facility, subject to closure and ground water monitoring requirements.

Regulatory Concerns

The RCRA regulations (40 CFR 261) inadequately address certain situations that pose significant environmental threats. Below are Region I's concerns with these regulations:

- Location Standards — existing and new facilities may obtain a permit even though they are located above sole source aquifers or have bases below the water table;
- Underground tanks and UIC wells are not subject to ground water monitoring regulations even though they are likely sources of ground water contamination;
- Decisions to delist a waste, i.e., remove it from being subject to hazardous waste regulations, are based upon the presence and concentration of constituents listed in 40 CFR 261 Appendix VII and not the more complete list/in Appendix VIII. As a result, delisted wastes, which are subject to lesser environmental regulation, may cause significant ground water contamination by leaching Appendix VIII constituents;
- Small quantity generators of hazardous waste may conduct on-site disposal without a RCRA permit even though the total accumulated waste may become environmentally significant. In addition, ground water monitoring is not required at these facilities; and
- The present regulatory exemptions for recycling facilities allows characteristic hazardous wastes to be placed in surface impoundments without any ground water monitoring. In at least one instance in New England a lined surface impoundment failed and an environmental release occurred.

COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION AND LIABILITY ACT (CERCLA)

The passage of CERCLA in 1980 enabled the Agency to pursue the clean-up of hazardous wastes in the environment through a provision other than the enforcement of the imminent hazard provisions of RCRA, or the corresponding provisions of the Clean Air or Water Acts, or the Toxic Substances Control Act. CERCLA provides the necessary enforcement authority to induce private party action; provides an economic deterrent via treble damages should a source fail to comply with a CERCLA clean-up order; and allows the Agency to act in the event of a release or threat of release of a hazardous substance to the environment, thereby addressing the hazardous waste only limitation RCRA presented. Further, in terms of effecting a site remedy, the Agency can now rely on the powers given it by CERCLA, as well as requiring compliance with RCRA's interim status and/or permits process, in order to develop an integrated comprehensive clean-up strategy.

The task of identifying uncontrolled sites is complicated by the fact that many have been inactive for years, or are now paved over, built over, or simply forgotten. With the passage of CERCLA, a mechanism by which we and the states can locate areas of past disposal activity, and then begin to evaluate their impact on the environment, was made available. Section 103(c) of the Act required notification by any person knowledgeable about any area where historic disposal may have occurred. In Region I, 413 103 (c) notice calls have been received to date.

The states' role in the implementation of CERCLA is not limited, however, to one of assisting EPA in the identification of problem sites and initiating enforcement action to induce private party clean-up. The Act requires that a state provide a financial match for federal monies spent at a site (a 10% match at privately owned sites, and a 50% match at publically owned sites), and also that they assume the operation and maintenance costs for all sites addressed using Fund monies. Obviously, these costs can be tremendous.

When compared with other states on a per capita basis, New England states have somewhat larger direct state expenditures, roughly comparable levels of tax revenues, and substantially higher levels of long-term debt. Although some of the states, most recently Massachusetts, have enacted their own Superfund to provide the necessary matching monies, state assumption of the financial burden resulting from the matching share provisions of CERCLA remain a problem that must be addressed.

New England has the second highest concentration of National Priority List (NPL) hazardous waste sites in the nation. There is one site in every 1,753 square miles in New England. Only Region 2 with a density of one site in every 653 square miles has a higher concentration. Moreover, Rhode Island (1 site/202 square miles) and Massachusetts (1 site/589 square miles) have higher concentrations of hazardous waste sites than any other states except New Jersey (1 site/120 square miles) and Delaware (1 site/257 square miles). Every state in New England has a hazardous waste site on the NPL.

Region 1 has made progress in implementing the Superfund program in New England. Region 1 spent the second largest amount of CERCLA funds to remedy the regional hazardous waste problem. The distribution of sites and percent of the regional total of Fund monies spent is as follows:

TABLE 2 SUPERFUND EXPENDITURES IN NEW ENGLAND		
State	Number of Sites	Percent of Fund Monies Spent
Massachusetts	14	11.1
New Hampshire	7	42.9
Rhode Island	6	42.4
Connecticut	4	0.1
Maine	5	3.4
Vermont	2	0

There are currently 700 hazardous waste sites in the regional site inventory, including the 38 NPL sites. The environmental impact of these non-NPL sites must be assessed and the appropriate response action determined. To date, the Region has performed preliminary assessment of approximately 50% of the sites which comprise our inventory, and have conducted site inspections at approximately 20% of the sites assessed. The Region intends to vigorously continue this program of site identification and assessment, using either contractor resources or state agency resources under a one FY 83 grant from EPA. In any event, one of our goals for this fiscal year is to achieve a complete understanding of the scope of the hazardous waste problem in New England, not merely as it is limited to effecting remedies at our NPL sites.

As an indicator of the progress being made toward implementing the Superfund program in Region I, the following table presents our enforcement efforts at those sites on the National Priority List:

Sites on the List	38
Enforcement Potentials Assessed	23
Notice Letters Issued	165
Enforcement Actions Initiated	8
Enforcement Cases Settled	5
Private Party Clean-ups	5
Cost-recovery Actions Taken	1

For each of the sites where Fund financed cleanup is intended, the Agency prepares a document known as a Remedial Action Master Plan (RAMP). These are essentially planning documents which also serve as site management tools. The document describes the problem potentially posed by the site, suggests an approach to better define the problem and discusses alternative remedies which will address the problem and comply with the national contingency plan. Each RAMP costs an average of $25,000 and takes eight to twelve weeks to prepare. Of the 38 sites on the NPL, 19 have had RAMPs prepared and an additional 7 others are in process. The remaining 12 sites are either already undergoing cleanup or will have RAMPs prepared by responsible parties.

By way of summarizing the Region's progress in implementing the remedial portion of the Superfund program:

# of NPL Sites	Site Status
26	RAMP completed or in process
10	RAMP unnecessary or will be prepared by responsible party
8	Superfund monies obligated for either an RI/FS or remedial action
2	Part of the remedial clean-up completed—Nashua, New Hampshire and Coventry, Rhode Island, and such work is underway at a third location—Epping, New Hampshire.

In addition to those sites where long term remedial action may be undertaken, the Region receives citizen complaints and referrals, and responds to situations where emergency conditions may exist. From 1981 to 1983 calls such as these have grown from 570 to 700 per year, attributable, perhaps, to heightened public awareness and increased media focus on the hazardous waste disposal problem throughout New England. During this same time period, our program for on-scene monitoring of remedial actions has grown from 17 to 50 sites; for off-scene monitoring from 150 to 215 sites; and for immediate removal investigations from 4 to 9 sites.

Clearly, the task of implementing the Superfund program is a difficult one and the demands placed on the Region have and will continue to escalate. Nonetheless, progress is being made. Eight of the 38 listed sites have had funds expended on them and the remainder of sites are undergoing RAMP development, enforcement case development, or have feasibility studies underway. Regional resources are now being expended on non-listed as well as NPL sites to prepare the necessary documentation to submit these sites as candidates for the NPL or to refer them to other programs or the states for action.

In addition to the day-to-day site work for both listed and non-listed sites, the Region has attempted to initiate, with our states, a better exchange of information about the program and technical approaches at specific sites. A two-day conference was held in March, 1983, at which all six New England states participated and shared programmatic experiences. This type of exchange needs to happen on a regular basis so that current guidance can be discussed and program innovations passed along. The closing remarks at the conference by one of the State Program Directors (in paraphrase) was that New England needs CERCLA and the technical resources that EPA provides in order to clean up the most serious sites in the region. Moreover, the states need a state-level program to address those sites that will never be NPL candidates, but cannot be ignored, and should rightly be cleaned up with state resources.

RADIATION

There is a variety of source categories that generate low-level radioactive wastes, with industrial applications and nuclear power generation (exclusive of spent fuel) by far predominant. Types of industrial applications include radio-pharmaceutical production, production of radioactive gauging equipment, and contaminated hardware and materials. Nuclear wastes include anything associated with the power production process other than spent fuel, which is a high-level waste; a significant future disposal problem in this regard will develop as older nuclear reactors are decommissioned and decontaminated (it is estimated that decommissioning New England's oldest reactor, Yankee Rowe, will result in approximately 18,000m^3 of waste, greater than the total amount of waste currently disposed in New England annually).

Recent developments have heightened the public awareness to the emerging problem of low-level radioactive waste disposal. In the mid-1970s, migration of radioactive elements detected on-site at three of the six existing low-level waste sites; in late 1979, packaging and transportation incidents led to the temporary closing of two other locations. In December, 1980, Congress responded to these concerns through enactment of the Low-Level Radioactive Waste Policy Act, which established, among other things, that:

- low-level waste can be best managed on a regional basis — states may enter into contracts to carry out this policy; and
- such contracts may restrict the use of regional disposal facilities after January 1, 1986, by excluding wastes generated by states outside the region.

As required by law, New England will soon have to dispose of its radioactive wastes either at the state of origin or within the northeast region (which includes four additional northeastern states). This disposal problem is a serious concern for New England, since we currently generate approximately 13% of the national and annual total of low-level radioactive waste and dispose of it in its entirety outside the region. In 1982, a Massachusetts referendum voted favorably that public approval is a necessary part of the facility siting process. If this is any indication, public opposition to any proposed low-level radioactive waste disposal facility will, as is the case with new hazardous waste disposal facilities, be a consideration to which we must address ourselves.

Nuclear power provides approximately 29% of the region's electrical generation and supplies approximately 8% of New England's total energy need. There are seven operating nuclear power plants in New England and three under construction with a combined net electrical generation capacity of 6.5 Gw. Eighty percent of these plants are located in three states — Connecticut, Massachusetts and New Hampshire.

PESTICIDES

Proper application of pesticides may result in contamination of ground water. Aldicarb residues have been found in two-thirds of the wells sampled in eastern Maine over the past three years. Approximately 10 percent of the wells sampled contain residues of aldicarb that exceed the EPA Drinking Water guidelines of 10 ppb.

Other applications of EPA registered pesticides may appear as residues in some underground water supplies. The unique soil and climatic conditions in New England, especially those that combine porous alluvial-type soils with cold, wet soil temperature conditions, may retard anticipated chemical degradation and thus, aggravate local contamination problems. Greater EPA emphasis on pesticide residue monitoring to determine the existence of unique residue situations would help to avoid additional contamination. Monitoring of residue from pesticide use would also provide useful data for more definitive registration.

Other pesticides now have few remaining uses following orderly concilation. Some of the remaining chlorinated hydrocarbon pesticides are purposely added to soil to protect homes and other buildings from termite damage. While the potential to contaminate underground water supplies is very low from such use, these chemicals are not classified "restricted use", which would limit use to persons properly trained in pesticide application.

PROBLEM STATEMENT: The Siting of New Hazardous Waste Facilities

Inadequate hazardous waste management capacity in Region I may have both environmental and economic impacts. When the cost of shipping waste out of the region is high, some firms may be tempted to dispose of their wastes improperly to save money. Firms which behave responsibly may be hurt by high transportation costs, resulting in a competitive disadvantage. New England's many small generators are especially vulnerable to this threat. If the region is not served by an adequate network of hazardous waste facilities, firms making decisions on where to locate plants may not select New England.

What constitutes an adequate regional hazardous waste handling network? At present not enough data is available to get an accurate picture of current hazardous wastes handling needs in Region I. Predicting future needs presents an even greater problem.

RECOMMENDATIONS

Headquarters Actions

- Make data, analysis, and resources available to states and regions to help assess the need for facilities.
- Strengthen facility permitting regulations and compliance activities to engender greater public confidence in EPA's and the states' regulatory programs.

Regional Actions

- Assist states in analyzing hazardous waste facility needs by providing data or allowing a portion of the RCRA grant to be used for this purpose.
- Assist states in strengthening their permitting and compliance capabilities.

Other Actions

- States should, both individually and in cooperation with neighboring states, analyze their need for facilities in terms of number, type, and location.
- States should strengthen their permitting and compliance capabilities and continue to reaffirm their credibility with the public.
- States should develop siting procedures which provide the means for all interests to be fairly addressed.

DISCUSSION

Background

There is general agreement among federal and state officials, industry, and environmental groups that Region I needs additional capacity to store, treat, and dispose of hazardous wastes. What is less clear is what the social and political process should be to select, finance, and, most difficult of all, site or expand treatment, storage, and disposal (TSD) facilities. As more data are collected from hazardous waste handlers through the manifest system and the biennial reports a clearer understanding of the type, size, and general location of facilities which would best suit the needs of Region I will emerge.

Facilities sited and operated in accordance with RCRA will undoubtedly serve the interests of the region. Lack of adequate TSD capacity in the region can add to the cost of doing business in New England for many firms and may particularly hurt small ones due to high transport costs. The presence of sufficient legal TSD capacity may reduce the amount of illegal hazardous waste dumping to some extent. (Most illegal dumping, however, is expected to be prevented by implementation of the manifest system.) In general, these facilities can add to both the Region's environmental and economic health.

While these facilities clearly serve the general public, proposed new TSD facilities face stiff local opposition. Although almost everyone agrees that they are needed, virtually no one wants one next door.

Past Responses

A study completed by Booz-Allen Hamilton in December 1981, estimated the amount of waste generated in New England and the region's capacity to manage that waste. The study estimated hazardous waste generation on an industry basis using assumed rates of generation specific to each type of activity.

Booz-Allen Hamilton estimated that approximately 580,000 wet metric tons of hazardous waste would be disposed of at off-site facilities in Region I. Off-site waste management capacity in Region I for 1981 was characterized in this study as small (an estimated 218,000 wet metric tons) and limited to relatively few technologies. The shortfall of 362,000 wet metric tons, while large, is of uncertain significance. The impact of this capacity shortfall is mitigated by the presence of a variety of facilities in nearby Regions II and III.

The states in Region I are in the process of implementing a regional automated data processing system primarily to handle data generated daily by the manifest system. Combined with federally required biennial reports, and annual reports which the states require of generators and TSD facilities, the regional system will provide a more reliable picture of the amount of waste generated, transported, and managed in New England. These data should provide the means to define more accurately the extent and significance of regional TSD capacity shortfalls.

Barriers to Overcome

There is general agreement that additional TSD capacity is needed in Region I. However, there has been a great deal of local resistance wherever new facilities have been proposed. Even with new, and often quite sophisticated, state hazardous waste siting laws and strict federal and state environmental laws and regulations, developers in Region I have encountered fierce resistance to siting proposals by citizens and officials of the proposed host and abutting communities. In order to be successful in siting a facility, its public and private sector backers must address the many valid concerns of those who feel they are at risk.

The potential adverse effects associated with the hazardous waste facilities include:

Physical Impacts

- Traffic — Increased traffic from waste haulers and employees of the facility, increased possibility of traffic accidents and spills, increased wear on local roads.
- Noise — Increased noise levels created by facility construction and operation and by operating traffic.
- Air — Emissions from incinerators, fugitive dust from landfills.
- Odors — Emissions from the transport, processing and storage of wastes.

Economic Impacts

- Property values — Decreased property values in the immediate vicinity of a facility and along routes traveled by transport vehicles.
- Real estate development — Restricted or foregone real estate options resulting from actual or perceived physical impacts and risks associated with a facility.
- Public service — Increased expenditures for highway maintenance, for fire and emergency spill response, and for facility inspections and monitoring.
- Tax revenues — Lost revenues resulting from property value declines and foregone real estate development.

Social Impacts

- Community image — Identification of "dumping ground" for wastes, may have other effects as well, such as changes in the quality of life and the movement of population.
- Aesthetic — Conflicts in visual fit with setting, and changes in visual identity, particularly from incinerators.

Risks and Uncertainties

- Ground and surface water discharges — At and around the site during and after operation; and offsite from transport spills.
- Fire and explosions — Present risk at the site during and after operation and disposal, and offsite from transport spills.
- Public health — Present risk of long-term unknown adverse effects from accidents and long-term exposure.

In addition to the above factors, there may be other barriers to facility siting. They may include uncertainty concerning the amount of hazardous waste to be managed, the absence of geologically suitable sites for land disposal facilities in New England. Good land disposal sites should have a deep water table and clay-rich sediments which will promote attenuation of many hazardous constituents. New England has very few such sites. In addition, New England has a high level of precipitation which can promote leaching of hazardous constituents. There are also the potential difficulties (both technical and bureaucratic) in obtaining

TABLE 3
SITING INCENTIVES EXAMPLES

Impact Issues	Compensation Examples	Incentive Examples
Truck Traffic	Improve or partly maintain roads; provide traffic light(s)	Completely maintain roadways
Aesthetic Impact	Offer direct cash payments to affected individuals/groups	Build an aesthetically pleasing park
Ground-water Impact Risk	Provide liability insurance (provided for in RCRA)	Develop additional water supplies
Loss of Wildlife Area	Provide fund for endangered wildlife	Build additional recreation area
Property Value Decline	Provide land value guarantees and direct payment	Buy and provide additional property to affected residents
Uncertaintly About Potential Damages	Provide performance bond liability insurance (provided for in RCRA); emergency response fund; provide tipping fees to community	Purchase or provide guarantees or backing of municipal bonds Donate to local charitable organizations Provide free disposal service to local industry Clean up existing waste sites

the necessary local approvals and state or federal permits.

Most states in Region I have recently passed laws which are being used by developers to site hazardous waste TSD facilities. These laws often include provisions for negotiating compensation and incentives to the host or abutting community. (See Table 3 previous page)

PROBLEM STATEMENT: Small Quantity Generators of Hazardous Waste

When EPA promulgated its hazardous waste management regulations in May 1980, a decision was made to exempt generators who produced less than 1,000 kg/month from most of the regulations. For waste considered to be acutely hazardous the exclusion level is 1 kg/month. While the 1,000 kg/month exemption, may be appropriate for most hazardous waste generators, it may not be appropriate for small quantity generators, which are highly concentrated in some areas of New England.

RECOMMENDATIONS

Headquarters Actions

- Continue research and analysis to determine the most appropriate small generator exemption level(s).
- Consider the problems of states with large concentrations of small quantity generators as well as the potential competitive advantage of firms in states with higher exemption levels.

State Actions

- States with 1,000 kg exemption levels should reconsider the appropriateness of this level if they have high concentrations of small quantity generators.

DISCUSSION

Background

EPA originally set its RCRA exemption level at 1,000 kg/month for the following reasons:

- The overwhelming majority of hazardous waste was estimated to be generated by a relatively small number of large manufacturing operations such as chemical plants. EPA decided to focus its resources on the 9% of all generators (those who generate more than 1,000 kg per month) who produce about 99% of the total waste stream nationwide. A 1,000 kg/month exemption therefore reduces the administrative burden while capturing nearly all of the waste in the system.
- The exemption benefits small firms that usually do not have the in-house capability to properly interpret and comply with complex regulations.
- Exclusions based on degree of hazard were determined to be impractical given the current state of knowledge.
- Small generators are still required to send their wastes to state-approved facilities for handling municipal, industrial or hazardous wastes. EPA made the assumption that small amounts of hazardous wastes mixed with large quantities of non-hazardous waste would be sufficiently dilute to minimize environmental risks.

The 1,000 kg/month cutoff was assumed by EPA to be temporary. EPA is conducting a two-year study of the number and types of small generators, the types of waste produced, and how the wastes are handled. Under a proposed amendment to RCRA, EPA would promulgate rules for generators of between 100 and 1,000 kg/month and would distinguish between classes and categories of generators in this range.

State hazardous waste regulations can be more stringent than federal regulations. Four states in Region I have set their exclusion levels below the federal level:

Rhode Island	>	0 kg/month
Massachusetts	>	20 kg/month
New Hampshire	>	100 kg/month
Vermont	>	100 kg/month

In general, states subject their small quantity generators to less burdensome administrative requirements than those who generate greater than 1,000 kg/month. For instance, in Massachusetts a licensed transporter is allowed to prepare the manifest (describing and tracking wastes shipped off-site) for small quantity generators. Nevertheless, small quantity generators must adhere to the more environmentally significant requirements such as sending their wastes to state-approved treatment, storage or disposal facilities.

Barriers to Overcome

The variability of small generator exclusion levels from state to state could present a potential economic competition problem for firms selling products in the same geographical market. A firm which is below the exclusion level of one state could have a competitive advantage over a firm of similar size in a neighboring state with a higher exclusion level.

Small generator exclusions also present the potential for environmental damage. Wastes generated by firms below exclusion levels may end up in municipal landfills. If there is a large concentration of such firms in an area, the possibility of serious contamination is significant. Federal support is no longer provided to assist states and localities in managing solid waste. Therefore, federal regulations allow a portion of the hazardous waste stream to escape the federal system. While the amount of wastes involved nationally is believed to be minimal, concentrated local impacts may be great. Given the relatively large number of small generators in New England, the regional environment may be seriously impacted.

PROBLEM STATEMENT: Abandoned and Uncontrolled Hazardous Waste

New England's strong industrial base has generated millions of tons of hazardous waste since the turn of the century. In the past, disposal practices were haphazard and subject to little regulation. Only during the past several years have we come to realize that these disposal practices result in significant hazardous waste contamination problems that may affect human health and contaminate the environment.

RECOMMENDATIONS

Headquarters Actions

- Establish a policy of maximum de-centralization of CERCLA. Regional Administrators should have the authority to approve remedial actions. Establish specific dollar categories and activity types that require headquarters concurrence.
- Establish clear policy on emergency response actions. Delegate the maximum authority possible to the Regional Administrator to determine when an emergency exists.
- Establish clear enforcement policy on responsible partly notification, multiple generator searches, cost recovery, and active vs. inactive facilities.
- Provide clear guidance to regional site managers that: a) outlines their authority under co-operative agreements and contracts; and b) defines what constitutes allowable costs under CERCLA.
- Eliminate the need for cost sharing on remedial planning activities.
- Evaluate the expansion of the current REM/FIT contract which is presently in danger of exceeding its first year contract funds.
- Establish program policy on municipal landfills that incorporates the cost match criteria and addresses the continued use vs. closure issue in response to leachate problems. Perhaps, a portion of the Superfund can be specifically targeted for municipal landfills.
- Evaluate the need for trained state personnel to carry out CERCLA provisions and develop a funding mechanism that would enable states to hire critical staff, other than through Section 3012 of RCRA.
- Establish a comprehensive technology transfer program for Regions and states. Sharing hazardous waste site investigation and treatment technology, and experiences can reduce the number of mistakes made in the field.
- Develop specific criteria on the acceptable degree of final clean-up that can be used at a site before the feasibility study is conducted, i.e., respond to the "how clean is clean" issue. This could take the form of technical monographs similar to the interim effluent guidelines used originally in the NPDES Permit program.
- Conduct a comprehensive review of the National Lab Contract. The capacity of this contract and the analysis turn-around time are critical to the conduct of the remedial investigation feasibility studies.

Regional Actions

- Provide management of National Priority List (NPL) sites consistent with the National Contingency Plan (NCP) to assure that necessary remedial activities are taken in the shortest possible time.
- Work with state agencies to develop information and legislative packages to insure adequate state cost sharing.
- Assist states to develop management plans for implementing Superfund within existing resource constraints.
- Provide training and additional program support to the states.

DISCUSSION

Background

Region I has been actively building an inventory of possible hazardous waste disposal sites. From public information, state inventories and notifications received as required by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA or "Superfund"), the Region has identified approximately 700 potential sites where past disposal practices need to be assessed.

Recently, EPA published a proposed National Priority List (NPL) of sites needing investigation and clean-up. There are 38 sites in New England on this list. The remaining sites will undergo investigation during FY 83 and FY 84. The Region expects to assess the potential hazards at each site by the end of FY 84.

All 38 New England NPL sites have documented or potential ground water contamination hazards, and 18 have documented or potential surface water impacts. This is especially significant in New England since the regional geology is characterized by a high water table, highly porous soils and fractured bedrock, which combined to create a serious leachate problem. In addition, some wastes have characteristics that cause them to float along the water table while others sink and may travel for thousands of feet from the disposal site through the regional aquifer.

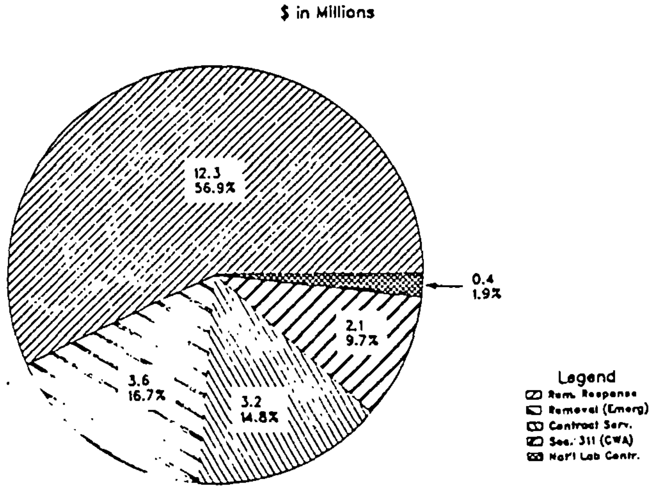
The 38 NPL sites have a number of contamination sources, including: lagoons, landfills, drums, piles, sludges, sediments, and leachfields. Contaminants include volatile solvents, pesticides, heavy metals, Polychlorinated Biphenyls (PCBs), oils and sludges, and other contaminants. (Chart A-A on pages 108 and 109 of the Appendix)

Region I has an active emergency hazardous waste response program. In FY 82, the Region received over 680 notifications of various hazardous waste spill types. Regional personnel monitored, on-site, over 40 clean-ups by private parties, initiated five federal emergency removal actions and conducted one longer term planned removal. In the second quarter of FY 83 the Region initiated five emergency removals, equal to total initiated last fiscal year.

Past Responses

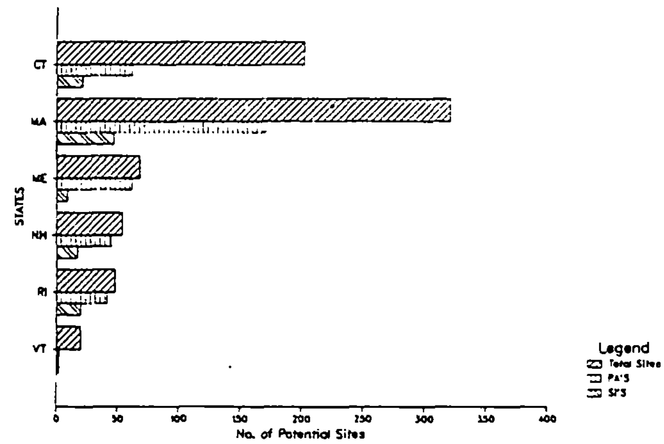
- Obligated over $21 million (includes $2 million of Clean Water Act Section 311 emergency funds) for the investigation and clean-up of Region I sites since 1980. (Figure B)

FIGURE B
UNCONTROLLED HAZARDOUS WASTE
SITE EXPENDITURES — REGION I



- Screened over 430 site notifications. (Figure C)
- Completed over 380 Preliminary Assessments of the 700 sites in the regional inventory.
- Applied the National Hazard Ranking Model to 67 sites resulting in 38 Region I sites on the first National Priority List.
- Entered into a consent decree with the W.R. Grace Company in Action, Massachusetts to clean-up their chemical lagoons and landfill and study clean-up of the aquifer which had supplied 40 percent of Acton's water. This was one of the first consent decrees under Section 7003 of RCRA.
- Issued one of the first Section 106 consent orders under CERCLA to Stauffer Chemical Company for remedial investigation and feasibility study of the Industriplex site in Woburn, Massachusetts. Phase I of the study has been completed at a cost of over one million dollars.

FIGURE C
SITE INVENTORY — EVENT STATUS



- Issued the first remedial action co-operative agreement for construction in the country for a slurry wall and cap at the 20 acre Sylvester site in Nashua, New Hampshire. Construction work and ground water treatment pilot studies are complete.
- Under co-operative agreement, the State of Rhode Island has completed removal and disposal of more than 10,000 buried drums at the Picillo site in Coventry. Region I's emergency response team successfully carried out an innovative on-site detonation of many shock sensitive laboratory materials which could not be transported.
- Completed a planned removal at the Keefe site in Epping, New Hampshire in which over 400 drums of highly dangerous packs and other chemicals were improperly disposed. The EPA mobile carbon absorption unit from Edison, New Jersey, has completed its fifth, and final, pump down of a million gallon chemical lagoon to prevent overflow at the site. The State of New Hampshire, under a co-operative agreement, has begun disposal of another 4000 drums, and studies on the lagoon disposal. Negotiations with over 130 identified waste generators are being conducted by the Region.
- Completed clean-up of the Motollo site in Raymond, New Hampshire with the excavation and disposal of over 1600 drums.
- Provided emergency water supplies to portions of Londonderry and Milford, New Hampshire.
- Removed over 200 drums during an emergency response at Derby, Connecticut that were exposed by river flooding.
- Performed an emergency response at the

Baird-McGuire chemical site in Holbrook, Massachusetts. This ongoing response included shoring up lagoons which threatened several water supplies, providing site security and conducting a groundwater study. A Remedial Action Master Plan (RAMP) is also underway.

- Required site owner to remove over 500,000 gallons of contaminated waste oils from the PSC Resources site in Palmer, Massachusetts.
- Received 19 draft and final Remedial Action Master Plans for the 38 priority sites. Eight additional RAMPS are underway.
- Completed an in-depth air study using the latest technology at the Silresim site in Lowell, Massachusetts in response to residents' complaints of adverse health effects. The study showed that potentially harmful levels of solvents were being emitted from nearby industries and not the site.

Barriers to Overcome

- Current technologies are insufficient to deal with the variety of problems that may be encountered at an uncontrolled site, including: techniques for cleaning aquifers, the stability of slurry walls in contact with a variety of wastes, and techniques for dredging and disposing of PCB contaminated sediments.
- Limited information on the health effects of many hazardous wastes, especially the cancer risk factor, and limited ability to translate worker exposure (8 hour) standards into a continuous contact neighborhood situation.
- Setting target levels for "acceptable" degree of clean-up is critical as we enter into more feasibility studies. Guidelines on risk, property values, and final disposition of "cleaned-up", sites are nearly always competing with the degree of clean-up.
- Innovations in analytical techniques enable investigation of a myriad of chemicals to the part per billion, and even part per trillion, level. However, because our ability to understand the precise health effects of these results is limited, it is difficult to use this information when making decisions on appropriate levels of clean-up.
- The public and EPA focus on "hot" pollutants, such as dioxin and, a related chemical, dibenzofuran. Decisions such as the "buy out" of Times Beach, Missouri influence public negotiations at other sites throughout the country. Citizens demand to know if these "hot" pollutants exist at the site near their homes, and if so when EPA plans to relocate them.
- Most municipal landfills in New England contain hazardous waste. The future tradeoffs between clean-up of these sites and the need for municipal refuse disposal is a critical emerging issue.
- Superfund does not provide program implementation funds to state environmental agencies. As a result, many state agencies borrow staff from other programs, such as RCRA, to manage their hazardous waste clean-up programs.
- Superfund requires significant cost sharing at clean-up sites, especially municipal landfills. It is believed that the 50 percent cost share requirement for municipal landfills may effectively preclude them from being cleaned because states have limited resources to devote to these expensive projects. In addition, as the Region's clean-ups move from the study phase to the remedial phase the cost sharing pressure on the states increases.
- The current policy of cost sharing on remedial planning activities has created extensive delays in many projects. While states struggle to enact funding for their cost share, provide staff, and enter into contracts or co-operative agreements to insure their 10 percent or 50 percent match, remedial planning is delayed several months. This is especially critical in Region I where the timing of projects must coincide with the weather conditions.
- CERCLA must be extended beyond its planned expiration date of 1985. If we are to complete remedial planning activities, the Act must be extended. In addition, the funds currently available are insufficient to clean up dump sites on the existing priority list.
- There is currently significant confusion on when to take an emergency action (immediate removal). The long turnaround time for funding approvals in quick response situations is impeding our ability to react and is jeopardizing our public credibility.
- The Superfund program is far too centralized. For example, every funding decision is made by the Assistant Administrator. To operate more efficiently, the agency should decentralize the decision making process.
- There is no clear policy on multiple generator negotiation and timely settlement with responsible parties. Delays caused by duplicative Headquarters' review of extensive regional negotiations damages the region's negotiating position and enforcement credibility.
- There is little guidance available for EPA site managers. Million dollar contract approval, voucher approval and co-operative agreement oversight decisions are made by site managers with little guidance on allowable costs, project manager authority, etc.
- It is Region I's experience that contamination at the uncontrolled and abandoned sites is generally more widespread and more extensive than originally estimated.

PROBLEM STATEMENT: Pesticide Residue in Water

Residues of pesticides have been found contaminating groundwater supplies even though they have been used properly. For example, aldicarb residues in the wells of Eastern Maine suggest that environmental and soil conditions existing in the area may favor residue accumulation. More monitoring may demonstrate that other pesticide uses are contributing to harmful residue accumulations.

RECOMMENDATIONS

Headquarters Actions

- Support residue monitoring of pesticides that are likely to migrate to groundwater supplies. Soil and climatic conditions favorable to pesticide residue and accumulation migration, especially for degradation resistant pesticides, should be considered in the development of a more comprehensive monitoring effort.
- Amend labels or cancel uses when monitoring data and/or experimentation indicate groundwater contamination.

Regional Actions

- Provide oversight of significant agricultural pesticide use and coordinate findings with other regional programs.
- Alert Headquarters to unusual pesticide use situations and conditions persisting in New England in which undesirable residue accumulations might be likely to occur.

Other Actions

- State agencies and Cooperative Extension Services should provide use information and information on encountered and/or anticipated problems to the EPA.

DISCUSSION

Background

Samples of water taken from wells in the potato growing area of eastern Maine have revealved the presence of Aldicarb, a systemic insecticide. Approximately 110 domestic wells were sampled over a three year period. Sixty-nine had measurable aldicarb levels (1ppb or more), and 12 exceeded the 10 ppb limits prescribed by EPA drinking water guidelines.

Since this discovery, the State of Maine, EPA and the pesticide producer have each taken steps to reduce further contamination of underground water supplies. The response includes changing label use directions, restricting use to certified applicators and requiring prior notification by the user of intended use. However, the states' ability to monitor pesticide use and determine the presence of unwanted residues is severely limited by available resources.

In addition, the accumulation of pesticides following application may be of greater significance in New England than in other areas of the country. Anticipated chemical degradation may be retarded by the cold, wet climate and porous alluvial-type soils that characterize the region, especially the three northern states.

Past Response

- A draft National Monitoring Plan (NMP), which would have measured the presence and persistence of active ingredients and harmful degradation products in the environment, prepared several years ago remains to be finalized.
- Specific and limited pesticide monitoring already conducted by Headquarters were designed to provide information otherwise unavailable but necessary for decision making.

Barriers to Overcome

- Finalization of a National Monitoring Plan would make the states a partner in measuring the movement and accumulation of pesticides in the environment.
- Utilization of existing pesticide enforcement support laboratories would significantly reduce the start up costs associated with a major monitoring effort.
- Recognition that pesticide monitoring should be assigned a much higher priority than in the past. The utilization of data generated by the monitoring effort should benefit both the registration and enforcement programs in their efforts to protect public health and the environment from unreasonable exposure risks.
- Resources needed to develop and implement an NMP, which would provide baseline data to assess environmental results, are unavailable. In addition, state funding needed to support the NMP state/federal partnership are also not available.

Expected Environmental Result

- The identification of pesticide residue problems unique to the region and the accumulation of data useful to registration process.
- Establishment of a pesticide residue data base that could be utilized to measure progress in protecting the environment and more quickly identify potentially harmful effects.

PROBLEM STATEMENT: Pesticide Classification

Some pesticide uses that were cancelled because of adverse environmental impacts are still available for use by the general public. Because these uses were not classified "restricted use", their widespread availability and possible misuse appears to be a source of increasing public concern and potential health risks.

RECOMMENDATIONS

Headquarters Actions

- Draft regulations to permit classification of preserved use as restricted use.
- Require, as a condition for negotiated settlement, the classification of non-cancelled uses as restricted use when cancellation action is based upon anticipated adverse effects and where changes in labeling require strict adherence during use.

Regional Actions

- Support Headquarters requirement for restricted use classification and provide documentation.

Other Actions

- State pesticide regulatory agencies should support restricted classifiction and deny state registration of pesticides with unclassified use.

DISCUSSION

Background

Under FIFRA, the EPA has the ability to cancel the use of a pesticide where there is evidence that it may adversely affect human health or the environment. However, some of these pesticides are still available for specific uses, even though most uses have been cancelled. Remaining uses may have no availability restrictions. Apparently, the public finds it difficult to understand how some uses can be cancelled while others remain available without further restriction, save label changes. Certified applicators who are trained to carefully apply restricted use pesticides appear to have similar objections.

This concern is demonstrated by an increase in the number of inquiries received relating to chlordane, and more recently aldrin, uses. These inquiries suggest possible past misuse and abuse by both the general public and professional applicators. Some inquiries raise serious allegations of injury to health that are believed to be attributable to a pesticide misuse.

Because EPA cannot provide the kind of regulatory relief the public expects, citizens are turning to the state and local officials for answers and protection. As a result, three New England states classified chlordane as restricted use, and considered an outright ban on some uses.

Past Responses

- Encouraged individuals using products containing a pesticide to strictly follow the use prohibitions and precautions directions on the label, regardless of its classifiction status.
- Responded generally to specific inquiries about use safety since EPA has not prepared any substantial answers.

Barriers to Overcome

- Lack of satisfactory response to inquiries concerning the continued use of exempted products leads the public to question the integrity of the registration process, especially when an active ingredient is shown to have harmful effects and yet remains available for general public use.
- We need to restore confidence in our ability to protect the public from perceived and real adverse effects. Failure to develop an information source that provides factual information about the safety and persistence of pesticides used in the home and workplace enhances public confusion and anxiety.

Expected Environmental Result

- Classification of remaining uses for cancelled pesticides as restricted use would limit application to trained and certified applicators. More restrictive use classification should reduce the prospect of abuse and misuse, and substantially reduce the likelihood of any unreasonable adverse effects to man or the environment.

PROBLEM STATEMENT: Low-Level Radioactive Wastes

Low-level radioactive wastes are generated as a byproduct of a variety of commercial processes. Both an increasing amount of waste generated and a shortage of disposal sites make this an important emerging problem in New England.

RECOMMENDATIONS

Headquarters Actions

- Issue final standards for low-level radioactive waste disposal sites on or ahead of the proposed March 1985 schedule. Promulgation of these regulations is important to the northeastern states, which must locate a low-level radioactive disposal facility in the area by January 1, 1986. To expedite review of these regulations, HQ should make the technical bases for the standards available to regions and states as they are developed.

DISCUSSION

Background

Low-level radioactive waste is generated as a byproduct of nuclear power generation, medical and industrial applications and weapons research and production. Four recent developments point to low-level waste disposal as a growing problem:

(1) In the mid-1970s technical problems caused three of the six existing commercial low-level

waste sites to close (West Valley, New York; Maxey Flats, Kentucky; and Sheffield, Illinois). A fourth site in Beatty, Nevada, closed recently in response to strong political pressure.

(2) In late 1979, packagaing and transportation incidents led to the temporary closing of the Hanford, Washington site.

(3) In December 1980, in response to these increasing concerns, Congress passed the Low-Level Radioactive Waste Policy Act (Public Law 96-573). This act established three basic federal policies:

- each state is responsible for ensuring that adequate disposal capacity is available for the low-level radioactive waste generated within its borders;
- since low-level waste can be most safely and efficiently managed on a regional basis, states may enter into regional compacts; and
- a compact may restrict the use of its regional disposal facilities after January 1, 1986, by excluding wastes generated in states outside the region.

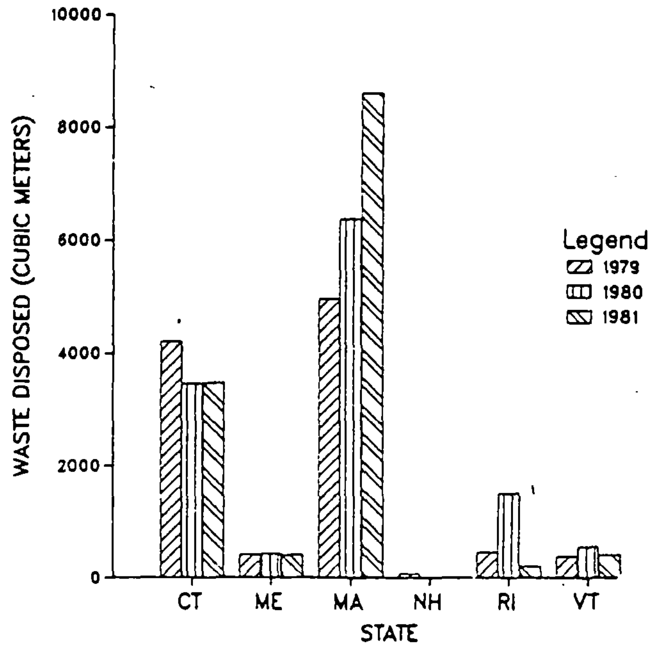
(4) There has been resistance in some New England states to siting the new low-level radioactive waste disposal sites that will be needed after 1986. In the 1982 Massachusetts elections, citizens voted in favor of a referendum that would require general public approval before any new disposal site is approved.

These institutional, political and technical problems are significant for New England since the region currently disposes of about 12,000 cubic meters of waste per year, approximately 13% of the national total. (Figure D) Moreover, all of this waste is currently transported out of the region.

New England's low-level radioactive waste is generated by a variety of sources. Industrial applications and nuclear power generation (other than high-level spent fuel) generate the greatest amounts in the region. Industrial source categories include radiopharmaceutical production, production of various types of radioactive gauging equipment, and contaminated hardware and materials. (Figure A-C on page 110 of the Appendix) Medical and academic activities contribute a significant, but smaller amount.

Nuclear wastes include anything other than spent fuel. A significant emerging nuclear waste disposal problem is decomissioned and decontaminated reactors. The oldest reactor in New England, Yankee Rowe, will be replacing reactor components in 1983 and is slated for decommissioning in the 1990s. Decommissioning will result in approximately 18,000 M^3 of waste, more than the entire amount currently disposed annually in New England. Other reactors will be decommissioned in 2010 and beyond.

FIGURE D
LOW LEVEL RADIOACTIVE WASTE DISPOSED BY STATE



In addition to volume, it is important to consider the radioactivity (measured in curies and half-lives) of the waste generated in Massachusetts, the largest generator of radioactive waste in the region. Table A-1 in the Appendix shows the type of radionuclides generated. Regional industry produces about 95% of the total curie content of the shipped waste, most of which is gaseous tritium used in radiopharmaceuticals.

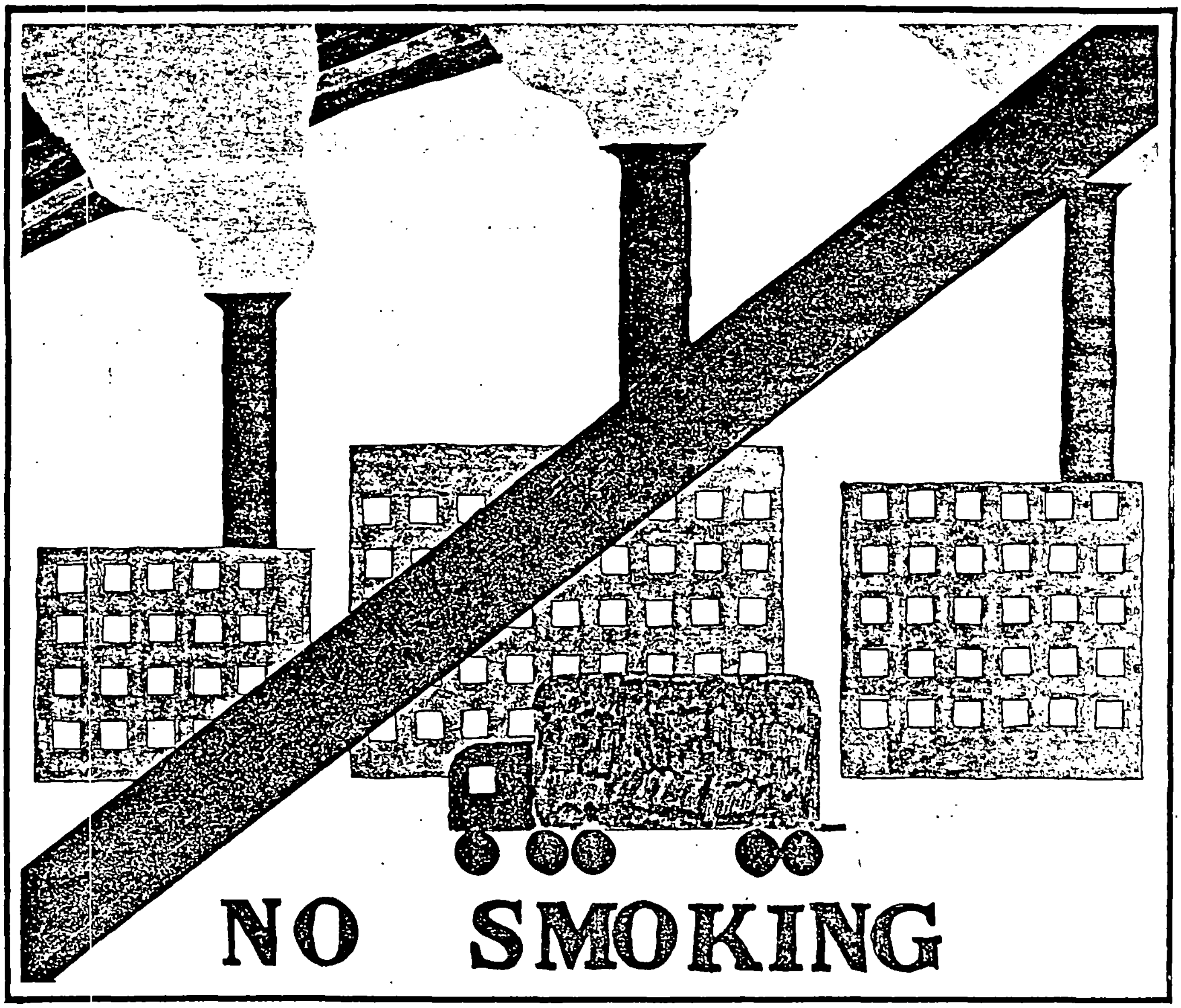
Past Responses

- EPA currently has a limited but important role in the siting process. It has the authority under the Atomic Energy Act to set emission standards that waste disposal sites must meet. Final standards for low-level disposal sites are expected in FY 85. The Nuclear Regulatory Commission must then promulgate specific performance and operating standards to meet those standards.

Barriers to Overcome

- As required by law, New England's radioactive waste will eventually have to be disposed of either within the state of origin or within the northeast region (which includes four other northeastern states). Although there are a number of waste treatment options available to reduce the volume of waste and render it more stable — including incineration, physical reduction, drying, absorption and solidification — waste disposal sites will still be required.
- Approving low-level radioactive waste disposal sites will be a difficult technical and political problem. A great deal of public resistance, e.g., 1982 Massachusetts referendum, should be expected.

AIR



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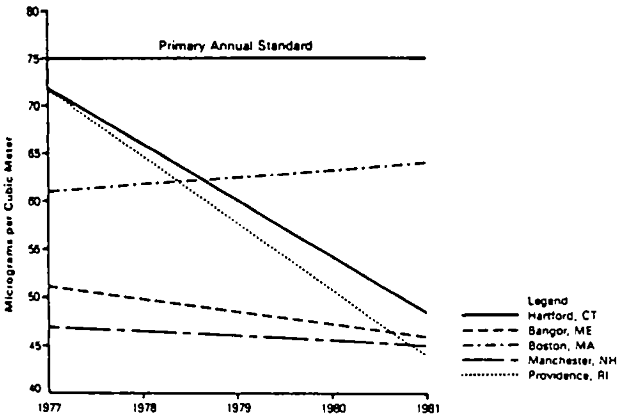
STATUS AND TRENDS

CRITERIA POLLUTANTS — AMBIENT LEVELS

For the past decade, the main objective of EPA and state air programs has been attainment and maintenance of the National Ambient Air Quality Standards (NAAQS). These seven standards are designed to protect both public health (primary standards) and welfare (secondary standards) and serve as mandatory goals in areas with violations of those standards (nonattainment areas). Each state must have a State Implementation Plan (SIP) which shows how the NAAQS will be achieved and maintained.

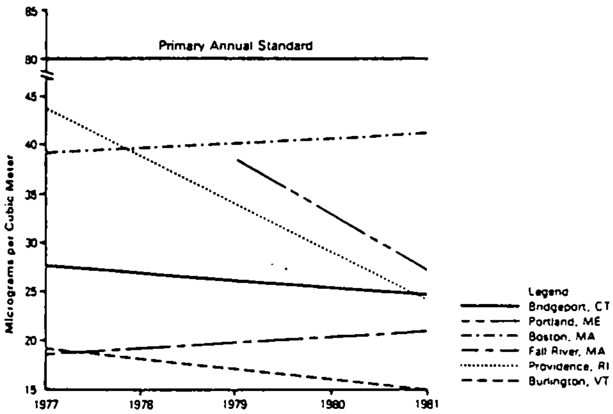
The following graphs, based on data from the SAROAD monitoring network, show five year trends for four of these pollutants in selected urban New England areas. These cities were chosen because they were representative of existing conditions and sufficient data were available. Seasonally adjusted trend lines are shown for TSP, SO_2, CO, and O_3. These trend lines are based on a statistical program that produces monthly means for each site, performs a linear regression and tests for significant trends. They provide an overview of major changes; more detailed data is published in the "1981 Annual Report on Air Quality in New England." Data on 1982 air quality will be available in the fall of 1983.

FIGURE A
FIVE YEAR TREND
TOTAL SUSPENDED PARTICULATES



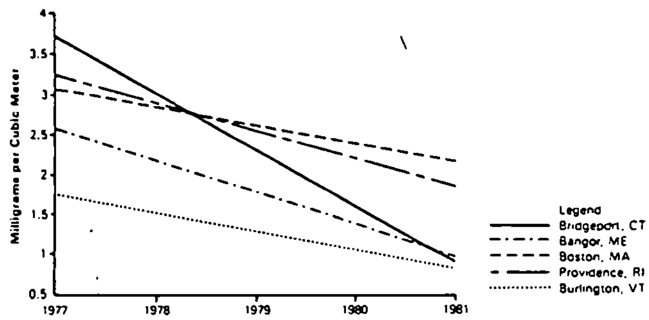
TSP levels have shown significant improvement in four of the five cities shown. The analysis of Boston's data shows no statistically significant trend for the past five years.

FIGURE B
FIVE YEAR TREND — SULFUR DIOXIDE



The data shows no general trend in SO_2 levels throughout New England. Three cities show decreases. Levels in Fall River, Mass., have been increasing. The analysis of Boston's data shows no statistically significant trend for the past five years.

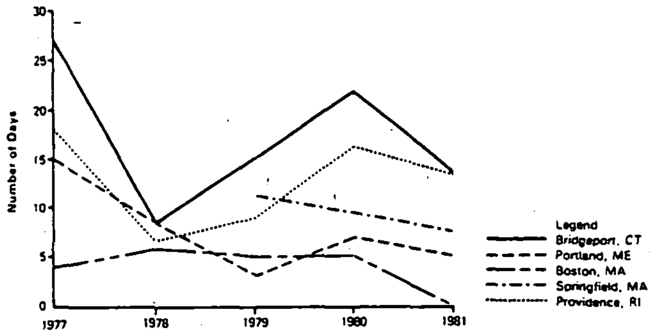
FIGURE C
FIVE YEAR TREND — CARBON MONOXIDE



All of the cities analyzed showed a significantly decreasing trend in CO levels. This has held true throughout the region. No site in New England showed increasing CO levels. Note that while this graph shows annual averages, the CO standards are set for 8 and 1 hour averaging times.

Because Ozone depends more on meteorology than any other pollutant, no clear trend is discernible in this graph of the number of days standards have been violated. For all cities, there were fewer days showing violations in 1981 than in 1977.

FIGURE D
FIVE YEAR TREND — OZONE

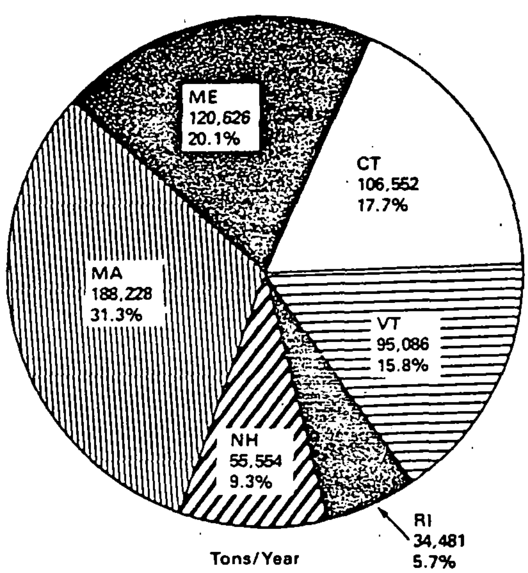


CRITERIA POLLUTANTS — EMISSIONS

Anthropogenic sources of these pollutants vary greatly from large point sources to small point sources to mobile sources. To estimate the amount of emissions each source contributes, states maintain emissions inventories for the National Emissions Data System (NEDS). NEDS contains emissions estimates for both point and area sources. Point sources are those large enough to require an individual permit. Area sources include both clusters of small emission points (such as a housing development) and mobile sources. For both types, NEDS contains emission estimates based on standard emission factors rather than actual emission tests.

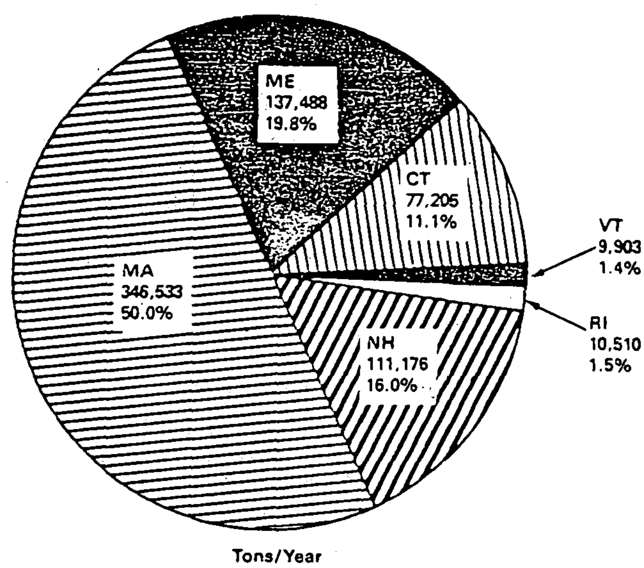
The following pie charts, based on the NEDS data base, show emissions estimates in 1980 for TSP, SO_2 and Volatile Organic Compounds (reactive Hydrocarbons that form Ozone).

FIGURE E
TOTAL SUSPENDED PARTICULATES



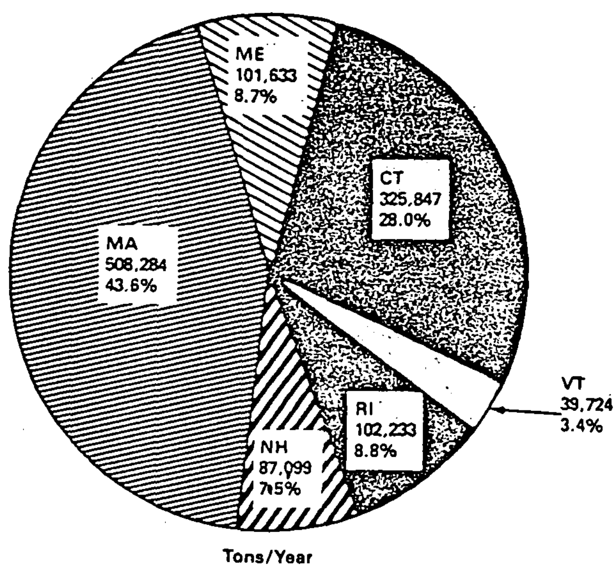
TSP emissions in New England totaled over 600,000 tons in 1980 according to the NEDS data base. By far the largest cause of these emissions were area sources such as construction sites and transportation. However, large point sources, such as powerplants, contribute a greater percentage in certain areas.

FIGURE F
SULFUR DIOXIDE



New England SO_2 emissions totaled over 690,000 tons in 1980. Unlike TSP, point sources emit the largest amount of SO_2, especially in industrialized states. Most of these emissions result from sulfur in fuel used for industrial heating or generating electricity. These emission estimates may understate SO_2 emissions because of the recent trend towards higher sulfur fuels.

FIGURE G
VOLATILE ORGANIC COMPOUNDS



For comparison, SO_2 emissions in Ohio (the largest source of SO_2) were estimated to be 2,781,032 tons.

While not a criteria pollutant, VOCs are regulated because they can form Ozone. Most VOCs originate from exhaust gases from mobile sources, but point sources can contribute significant amounts as well. Chemical manufacturers, degreasers, and dry cleaners are typical types of VOC sources. Based on NEDS, VOC sources in New England emit more than 1.1 million tons.

NON-CRITERIA POLLUTANTS

Recently, there has been a slowly growing concern over non-criteria pollutants. Problems such as indoor air pollution, hazardous air pollutants, and acid precipitation do not fit in the regulatory framework established by the Clean Air Act. Although these emerging problems are all very different, they do share some common characteristics.

• **Lack of Standards.** There are no ambient standards for most of these pollutants and only a limited number of emission or performance standards. This lack of regulatory control has made it difficult for EPA and states to establish programs to control these pollutants.

• **Lack of Information on Sources.** While there is a relatively good data base on ambient concentrations and emissions of criteria pollutants, there are large gaps in our information concerning sources of non-criteria pollutants. This hinders EPA and state ability to determine the scope of impacts or set priorities among source categories.

PROBLEM STATEMENT: Indoor Air Pollution

A number of studies have pointed to indoor residential air quality as a cause of adverse health effects. A variety of common sources may contribute to the problem, but there is insufficient information available to characterize the degree of risk to the general public and very little legislative authority to allow EPA or states to help solve the problem.

RECOMMENDATIONS

Headquarters Actions

- **More Research** — Fund more research through ORD to determine emission factors, indoor concentrations, control strategies, and health effects from indoor air pollution.
- **More Resources** — Consider indoor air pollution when developing workload models.
- **Develop Guidelines and Strategies** — Develop guidelines for acceptable levels of concentrations of indoor air pollutants. In conjunction with this, HQ should work with regions to develop strategies (such as increased public education) to reduce the problem.
- **Legislative Authority** — Seek legislative authority to deal with specific indoor air pollution problems.
- **Radon Detection** — Develop an accurate and inexpensive detection device for indoor radon levels which could be loaned to homeowners or renters for 1 to 2 weeks. A state agency could then provide analysis and dose interpretation. Since indoor radon levels are so highly dependent on a wide variety of factors, there is the need for a method to determine levels on a case by case basis.
- **Asbestos Research** — Examine asbestos levels in home air contributed by use of home vaporizers in areas having significant levels of asbestos in their water supply distribution system. Asbestos fibers could be dispensed into indoor air upon evaporation of atomized water containing asbestos. (A grant that was to have investigated this potential problem was cancelled.)

Regional Actions

- **Increased Public Information** — Increase capability to respond to public requests by providing more complete information on health effects and techniques to mitigate potential problems.
- **Support State Efforts** — Encourage state efforts to survey the extent of the problem and develop control strategies. This support could be in the form of specific SEA issues, grant outputs, workshops and coordination of technical information.

DISCUSSION

Background

Although almost all of EPA's air pollution control efforts thus far have been focused on ambient concentrations, concern has been growing in the research community and in the public over the total human exposure to air pollutants, including those found indoors. People spend most of their time indoors, and those segments of the population who are most susceptible to health risks (the old, the infirm, and the very young) spend essentially 100% of their time indoors. In spite of the limited information available, public concern over health effects from indoor air pollution is evidenced by the number of public inquiries reaching the regional office.

New England is particularly susceptible to this problem. The region is heavily dependent on high cost oil and has cold, severe winters (see energy section pp. 24). The average expenditure on energy per household is higher than any other part of the country (Table A-1, page 111, appendix). This combination of dependence on high cost oil plus the colder climate has given New Englanders a strong incentive to insulate their residences to limit indoor/outdoor air circulation and to avoid heat loss. A side effect of this can be increased concentrations of air pollutants. At the same time, there is also an incentive to switch to non-oil fuels. Some of these, such as wood, coal and kerosene, may contribute much more to indoor air pollution than oil or natural gas.

The kinds of pollutants under consideration are varied (see Table 1). They include pollutants found both indoors and outdoors and pollutants that are found mostly indoors. They range from pollutants that have been traditionally regulated under the air program, such as carbon monoxide, to a variety of organic compounds that have never been individually regulated and about which little is known. Also included are radon and asbestos.

Unlike outdoor concentrations which are generally stable over all but the shortest time periods, concentrations of indoor air pollutants can vary considerably depending on indoor activities (see Figures A-A and A-B on page 111, appendix).

Use of a wood stove, gas stove, oven cleaner, vacuum cleaner, or other commonplace device can significantly affect indoor concentrations. Smoking is another obvious source. It is also clear that correlations between indoor and outdoor concentrations are generally weak, and thus ambient air quality cannot be used as an indicator of indoor air quality. Table A-2 on page 112, appendix lists recent research studies done to monitor indoor concentrations.

The following describes a few specific sources of concern in more detail:

Radon — Recent studies show that a sizable fraction of public exposure to ionizing radiation is from inhalation of radon decay products in buildings. Radon is a radioactive gas that is formed by the decay of radium, a naturally occurring element found throughout the earth's crust. Radon itself decays into short-lived decay products which can attach themselves to respirable particles and be deposited in the lung.

Sources of radon in buildings include soil, construction materials, and tapwater when it is supplied from groundwater in radiumbearing aquifers. New England is particularly susceptible to radon exposure because of the prevalence of granite bedrock (see map on page 113). A recently completed survey shows Maine and Rhode Island ranking among the states with the highest radon readings in water from drilled wells.

TABLE 1
AIR POLLUTANTS BY SOURCE LOCATIONS.

Pollutants	Sources
Group I — Sources Predominantly Outdoor:	
Sulfur oxides (gases, particles)	Fuel combustion, nonferrous smelters
Ozone	Photochemical reactions
Pollens	Trees, grass, weeds, plants
Lead, manganese	Automobiles
Calcium, chlorine, silicon, cadmium	Suspension of soils or industrial emissions
Organic substances	Petrochemical solvents, natural sources, vaporization of unburned fuels
Group II — Sources Both Indoor & Outdoor:	
Nitric oxide, nitrogen dioxide	Fuel burning
Carbon monoxide	Fuel burning
Carbon dioxide	Metabolic activity, combustion
Particles	Resuspension, condensation of vapors and combustion products
Water vapor	Biologic activity, combustion, evaporation
Organic substances	Volatilization, combustion, paint, metabolic action, pesticides, insecticides, fungicides
Spores	Fungi, molds
Group III — Sources Predominantly Indoor:	
Radon	Building construction materials (concrete, stone), water, soil
Formaldehyde	Particleboard, insulation, furnishings, tobacco smoke, gas stoves
Asbestos, mineral and synthetic fibers	Fire-retardant, acoustic, thermal or electric insulation
Organic substances	Adhesives, solvents, cooking, cosmetics
Ammonia	Metabolic activity, cleaning products
Polycyclic hydrocarbons, arsenic, nicotine, acrolein, etc.	Tobacco smoke
Mercury	Fungicides in paints, spills, in dental care facilities or laboratories, thermometer breakage
Aerosols	Consumer products
Viable organisms	Infections
Allergens	House dust — animal dander

Although a statistically sound sampling program has not been conducted, available monitoring data suggest the problem is widespread and, in some cases, may be causing serious health risks. For example, one Maine residence has been shown to have radon exceeding 100 picocuries per liter, considerably above the level allowed in uranium mines. It is not unusual for Maine houses located in areas underlain by granite bedrock to have levels between 2 and 4 PCi/1.

Residential Wood/Coal Combustion — As discussed in the energy section (see page 24) New Englanders are rapidly switching to alternative fuels for residential heating. The most commonly used fuel is wood, but both anthracite and bituminous coal have made a resurgence as well. For example, in Massachusetts, homeowners used 16% more fuelwood in the winter of 1978-79 than they did the year before, and 33% more than they did the winter of 1976-77. The following table of Residential wood energy use in New England (excluding Rhode Island) highlights fuelwood use from 1976-80.

TABLE 2
RESIDENTIAL WOOD ENERGY USE
THOUSANDS OF CORDS
(New England exlcuding Rhode Island)

Heating Season 1976-77	2046
Heating Season 1977-78	2488
Heating Season 1978-79	2765
Heating Season 1979-80	3224

Wood and coal burning produces a variety of combustion byproducts including polycyclic aromatic hydrocarbons, NO_2, CO, SO_2 and others. Monitoring these pollutants, determining emission factors, and evaluating health effects is still in the research stages. Making definitive assessments of these factors is complicated by the wide range of variables that can affect combustion (stove type, fuel type, method of operation, etc.). Refer to the energy section for specific emission factors.

The small amount of work that has been done on indoor impacts does suggest potential adverse health effects. One two-week monitoring study in the Boston area indicated that indoor TSP concentrations during woodburning were three times that during nonwoodburning periods. Indoor Benzo-a-pyrene (a known carcinogen) concentrations averaged five times more than during nonwoodburning periods.

Kerosene — Kerosene space heaters are another alternative heating source widely used in New England. An estimated 2 million units were sold nationwide in 1982, and sales of 8 to 10 million are projected by 1985. Early kerosene heaters were both fire hazards and significant sources of carbon monoxide. Although these problems have been eliminated, kerosene heaters can still be important sources of NO_2 and, in some cases of SO_2. Estimated NO_2 and SO_2 concentrations are shown on page 113, appendix.

As with other indoor sources of pollutants, concentrations are exacerbated by "tightening" of residences for energy conservation.

Formaldehyde — Formaldehyde is an irritant to the eyes and upper respiratory system and has produced cancers in laboratory animals. Common sources of formaldehyde include urea formaldehyde foam insulation as well as carpets, drapes, furniture, plywood, panelling, wood smoke, tobacco smoke and gas stoves. The potential for high indoor concentrations has been documented by the small number of monitoring studies completed.

Past Responses

- **Asbestos** — The TSCA asbestos inspection program has been EPA's most significant response to an indoor air pollution problem (see page 80). All schools are required to be inspected for asbestos by June 1983. Information pertaining to asbestos processing is being obtained under Section 8 of TSCA, and a variety of asbestos source categories are regulated by NESHAPS standards.
- **Research** — Although there has been little direct regulation of indoor air pollution, EPA has conducted substantial research under TSCA, the Clean Air Act, and RCRA that would be useful in evaluating health impacts once additional monitoring is done.

Barriers to Overcome

- **Lack of Authority** — Except for a few specific cases (like asbestos), EPA and most states lack legislative authority to establish any kind of a regulatory program. Under the Clean Air Act, for example, EPA's authority is limited to "ambient air" which has been interpreted to include only outdoor air.
- **Lack of Information** — As noted above, there is only sketchy information available on emission factors for sources of indoor air pollution, on indoor concentrations, on control technologies or techniques, and on health effects. Lack of information precludes establishing standards, setting priorities, and implementing other aspects of a regulatory program.

- **Lack of Resources** — There are very few resources that can be directed toward the problem of indoor air pollution. None of the air media workload models, for example, includes indoor air pollution as a line item.
- **Institutional Barriers** — Indoor air pollution is difficult to deal with in part because the problem is so diffuse and involves so many individual homeowners. Furthermore, while ambient air can be considered a "public good", indoor air is a private resource, at least in non-public buildings. The diffuse and, to a great extent, private nature of the problem makes it difficult to devise regulatory strategies, and suggests that emphasis should be placed on public education.

Expected Environmental Results

- Reduced levels of a wide variety of indoor air pollutants and resulting health benefits.

PROBLEM STATEMENT: Nonattainment Areas

Region I has a number of areas that have been designated as primary or secondary nonattainment as a result of a violation of one or more National Ambient Air Quality Standard (NAAQS).

RECOMMENDATIONS

Headquarters Actions

- **NCRMP Modeling** — Complete the NCRMP modeling project to determine the effects of the NY/NJ/CT ozone plume on ozone levels in southern New England
- **CO Emissions** — Do not relax current automotive CO emissions standards.
- **New Nonattainment Areas** — Re-evaluate the current nonattainment areas sanction policy that requires imposition of sanctions immediately upon designation, and consider allowing states to develop a nonattainment plan before sanctions are imposed.
- **Secondary TSP** — Update the secondary nonattainment TSP policy and provide regions with more adequate guidance for developing secondary TSP attainment plans.
- **105 Grants** — Recommend increases in 105 grants.

Regional Actions

- **107 Designations** — Review the 107 designation policy to ensure expeditious action on ambient violations.
- **Secondary TSP** — Develop a policy that responds to state requests, the current Connecticut Fund for the Environment suit concerning secondary TSP designation, and the impending TSP standard revision.

DISCUSSION

Background

Region I nonattainment areas are shown on maps in the appendix (page 114). While all primary non-attainment areas require some investment of public and private resources to bring them into attainment, some require more resources than others. The clusters on page 84 show high, medium, and low priorities for assigning resources to Region I non-attainment areas.

The sources of these violations vary from pollutant to pollutant and from state to state. Air pollution sources are categorized in a number of ways to include mobile sources, stationary sources, and area sources; they are further broken down by the type of mobile source, type of industrial process, etc. In addition, interstate transport of pollutants can be a significant contributor to violations in some states. As required by the Clean Air Act, EPA developed a policy to impose sanctions on areas that were not in attainment by the end of 1982 or had not received extensions.

General causes of violations for each pollutant as well as proposed solutions and barriers to solutions are discussed below.

Ozone — Ozone forms as a result of a wide variety of photochemical reactions involving reactive hydrocarbon compounds that act as precursors to its production. These compounds, principally nitrous oxides and Volatile Organic Compounds (VOCs) are emitted by both mobile sources and a number of types of stationary source categories. Ozone nonattainment areas cover wide areas, which reflect both the dispersed nature of these sources and the impact of long distance transport.

In the industrialized areas of southern New England, Ozone is caused by both intrastate and interstate sources. Emission inventories for Massachusetts and Connecticut show that mobile sources generate about half of the VOCs that originate in those states with stationary sources making up the rest. Important stationary sources of VOCs include the surface coating, gasoline marketing, and chemical industries.

CO — In New England, CO violations are due almost entirely to motor vehicle emissions. These violations tend to be localized in areas of heavy traffic such as overcrowded intersections. Reducing these ambient concentrations involves both regional and national programs.

TSP (Primary and Secondary) — Unlike Ozone and CO, Region I's primary TSP violations can be attributed mainly to single sources. In Maine and New Hampshire, large paper companies are the main cause of violations. In Worcester, Massachusetts, the problem was a combination of area sources such as road

TABLE 3
NONATTAINMENT AREA PRIORITY CLUSTERS

CLUSTER 1: Good possibility that attainment will be achieved only by significant investment of public and private resources or won't be achieved by the required date.

State	Area	Pollutant	Date of Last Violation	% Over Standard
CT	Statewide	O_3	1975-1981	25%-68%
ME	Lincoln	TSP	1981	113%
MA	Statewide	O_3	1981	38%
NH	Nashua	CO	1981	88%
NH	Berlin	TSP	1981	55%
RI	Statewide	O_3	1981	25%

CLUSTER 2: High probability that attainment will be achieved by 1987, (or other required date) but to do so will still require public and private investments.

State	Area	Pollutant	Date of Last Violation	%Over Standard
CT	5 Countries	CO	1980-1981	19%-77%
ME	Southern ME	O_3	1978-1981	12.5%-37.5%
MA	5 Counties	CO	1977-1981	5%-22%
NH	Manchester	CO	1980	41%
NH	Southern NH	O_3	1981	12%

CLUSTER 3: Attainment will almost certainly be achieved by required dates. Little or no EPA involvement required.

State	Area	Pollutant	Date of Last Violation	% Over Standard
ME	Lewiston,	CO	1979	25%
	Bangor	"	1978	36%
	Millinocket	SO_2	1980	7.7%
MA	Worcester	TSP	1981	4%
NH	Berlin	SO_2	1980	85.7%
RI	Providence	CO	1981	11%

sanding and inefficient, older, point sources. Worcester is expected to be redesignated to attainment in 1983.

Southern New England also has a large number of secondary TSP nonattainment areas. These violations, many of which were monitored in the mid to late 70s, could be caused by a variety of types of stationary and area sources (such as road building or other construction). Lack of resources and lack of a clearly defined policy have prevented EPA or states from developing secondary TSP attainment plan. The region has recently been sued for the failure to develop such a plan.

SO_2 — Like primary TSP violations, Region I's small number of primary SO_2 violations are caused by local single source problems. In New Hampshire and Maine all the sources of concern are pulp and paper mills. Those areas currently in violation are expected to be redesignated to attainment because of the installation of new stacks and more efficient process technology. Lincoln, Maine may be redesignated to nonattainment for SO_2 because of recent violations caused by a pulp and paper mill.

Pb — The New England lead violations have been infrequent in the last five years. The success of the lead-in-fuel program, coupled with the closing of the few potential industrial sources of lead emissions has produced what may be region-wide attainment. In 1980, the three northern New England states submitted plans showing attainment and maintenance of the lead standard. A recent suit by NRDC is causing EPA to exert pressure on the southern states to make a suitable demonstration. Until these plans are submitted, reviewed and approved, however, EPA will not know for sure the extent of New England's ambient lead problem.

Past Responses

- VOC Controls — All states with Ozone non-attainment areas must implement controls on stationary VOC sources as part of the State Implementation Plan (SIP) by requiring them to use Reasonably Available Control Technology (RACT). Urbanized states (Connecticut and Massachusetts) must use Inspection and Maintenance of automobiles to reduce hydrocarbon (HC) emissions. These actions will not, of course, reduce Ozone caused by interstate transport from New York and New Jersey.
- CO Controls — States with CO problems have undertaken several analyses of specific problem intersections. Because there are more intersections than monitors to record violations, states undertook a CO 'hotspot analysis' to identify intersections that may violate standards in 1987. For those intersections that still showed modeled violations in 1987, states were required to develop attainment plans that would eliminate those violations. These plans consist of a variety of transportation control measures. Depending on the intersection, the plan might involve changing traffic signals to improve traffic flow, adding turning lanes, removing street parking, or channelizing traffic.
- TSP Controls — Controlling TSP violations involves installing appropriate TSP control technology. In Berlin, New Hampshire, the source installed new steam boilers, constructed new stacks, and paved roads, but violations have still been recorded. This problem may be addressed in negotiations with the company as part of enforcement of a consent decree. In Maine, the state is developing an attainment plan to control dust from sawdust piles, the key source of the violations.

Barriers to Overcome

- Stationary Source VOC Controls — Controlling stationary source VOC emissions is hampered by the lack of good emissions inventory information — there are a large number of small VOC sources and specific controls cannot be required until those sources are identified. For some sources, financial barriers may hinder compliance.
- Inspection/Maintenance — The Inspection and Maintenance programs in Connecticut and Massachusetts are designed to reduce both HC and CO emissions. Both states have experienced start-up problems. In Connecticut, a centralized contractor-based program began on January 1, 1983 and was met with opposition because of the required fees and inconvenience. In Massachusetts, a decentralized garage based program was delayed until April 1, 1983, and there were a variety of organization problems in getting it started.
- Long-Range CO Trends — While current CO controls should bring about attainment by 1987, the combination of a growth in automobile traffic and possible relaxed federal standards on new automobiles makes the CO situation in the 1990's uncertain. Currently, automobile traffic in Massachusetts, for example, is growing at a rate of 2.3% per year. If CO emissions are increased in newer cars, areas that show attainment in 1987 may not be able to maintain those levels in the 1990's.

Expected Environmental Results

- Attainment and maintenance of the NAAQS.

PROBLEM STATEMENT: Emissions from Significant Violators

Although the vast majority of major stationary sources of pollution are complying with air pollution control requirements, a small percentage remain delinquent. These violators constitute approximately 5% of the major source inventory at any given time. The most important of these sources are classified as 'significant violators' since they either are emitting greater than 100 tons per year of a criteria pollutant and are located in a non-attainment area or are violating a PSD, NSPS, or a NESHAPS standard. Their continued non-compliance creates a potentially serious public health problem as well as a major resource drain for the federal and state agencies (EPA, DOJ) involved in pursuing corrective action. Region I identified certain management and resource problems which affect our major source enforcement effort.

RECOMMENDATIONS

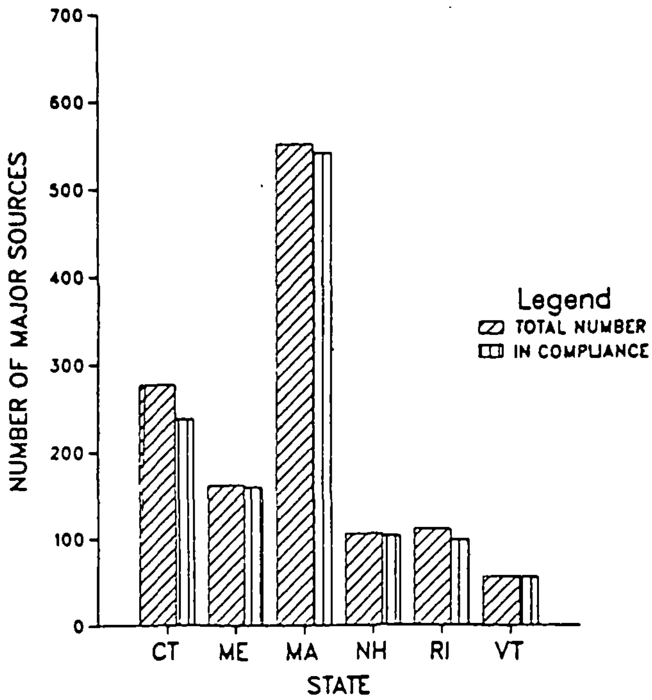
Headquarters Actions

- **105 Grants** — Consider increasing the amount of 105 grant money available for enforcement, especially inspections.
- **Accountability System Milestones** — Consolidate and reduce EPA guidance on defining and proceeding against significant violators. Consider establishing specific milestones for action against individual significant violators and tracking achievement of the milestones.

Regional Actions

- **CDS** — Continue to work with the states to improve the capture, input and reliability of data in the CDS system.
- **Legal Resources** — Review the adequacy of legal resources currently devoted to enforcement at EPA and in the states.
- **State Inspections** — Support state efforts to adequately train the state's regional inspectors. Some state inspection offices have not been provided with adequate technical or policy guidance.

FIGURE H
MAJOR SOURCES: TOTAL NUMBER AND NUMBER IN COMPLIANCE



DISCUSSION

Background

The Compliance Data System (CDS) lists nearly 1300 major stationary sources in New England. In addition, it appears that there are a substantial number of sources, 4-500, not listed that should be. Figure H above, shows the total number of major sources (based on CDS) and the total number in compliance. Only eleven of these major sources are currently classified as significant violators. Five sources each are violating VOC or TSP emission limits; the eleventh source is a chemical manufacturer in violation of a NESHAPS regulation. Many of these eleven have been 'problem' sources for a number of years. Seven are located in Connecticut (see page 114, appendix).

Inspection of these sources and enforcement against those in violation is both an EPA and state responsibility. In negotiating our 105 grants for FY83 and in reviewing output reports for progress to date, it is clear that our states cannot meet the target of inspecting all of their largest sources each year. In Maine, for example, the state committed to inspect only 75% and appears unlikely to be able to meet that target. They do not have enough staff to conduct additional inspections. We cannot increase their grant without decreasing another state's and we cannot perform the inspections ourselves.

Past Responses

- In 1982, EPA conducted 50 inspections, concentrating on major emission sources. These sources were generally identified using the CDS data base.
- Historically, CDS has been a problem for the regional office and the states. Our input is improving substantially but requires continuous emphasis. Currently we are getting contractual help to identify additional sources.

Barriers to Overcome

- We have had substantial difficulty this year, as have all regions and headquarters, with the new "significant violators" system. Final, consolidated and concise guidance would help.
- State reluctance to use CDS — according to the states, CDS provides no direct benefits.
- Substantial personnel resource problems and the difficulty of getting additional resources in times of fiscal austerity at EPA and the states.

PART III / APPENDIX

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SOURCES OF TOXIC SUBSTANCE CONTAMINATION IN NEW ENGLAND

SOLID AND HAZARDOUS WASTE SITES

Toxic substances handled at controlled and uncontrolled solid and hazardous wastes disposal facilities in New England may impact air, land and water. Initially, the environmental impact appears to be one of land use. However, an examination of the actual constituents in disposal sites and their potential transport routes, clearly indicates that the problems impact not only land but also surface water, ground water and air. (Table A-1)

TABLE A-1
INTER MEDIA — TOXIC SUBSTANCES

	Environmental Impact					
	Surface water		Ground water	Air	Land	Ocean
Sources	Recreation	DW*	Drinking			
Treatment Plants						
1) Industrial discharges	X	X			X	X
2) Municipal discharges	X	X			X	X
Herbicide & pesticide applications	X	X	X	X	X	
Hazardous waste sites and contamination problems	X	X	X	X	X	
Treatment measures for hazardous wastes						
1) aeration towers	X	X	X	X		
2) incinerators				X	X	
3) sludges (treatment by-product)				X	X	
4) carbon filters				X	X	
Underground containers						
1) fuel tanks			X		X	
2) septic tanks			X		X	
Car emissions	X	X		X	X	
Industrial plants	X	X	X	X	X	
Chemical plants	X	X	X	X	X	
Pharmaceutical plants	X	X	X	X	X	
Power plants	X	X		X	X	X
Spills	X	X	X	X	X	X

*DW--Drinking Water

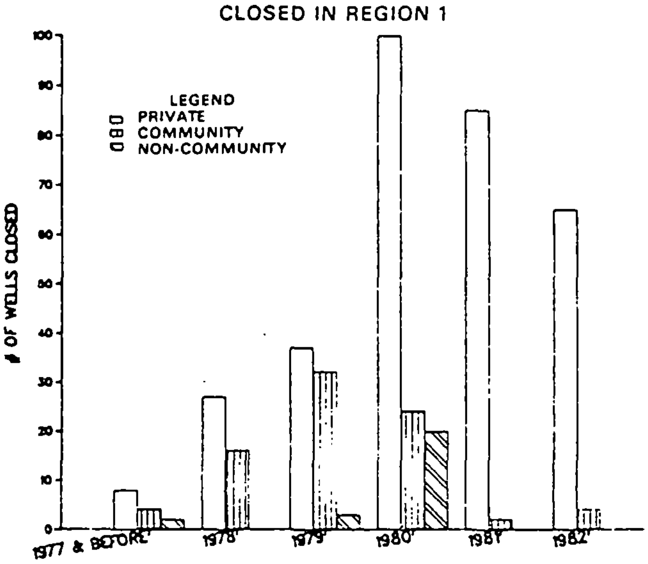
To date, there are approximately 1000 RCRA Solid Waste Land disposal facilities in New England. In addition, there are 700 uncontrolled hazardous waste sites, 38 of which are on the National Priority List. The obvious adverse environmental impact at some of these sites is evident in the stressed surrounding vegetation, which acts as a bell weather indicator of ecosystem strain. Instead of providing nutrients, the contaminated soil is a source of toxic pollutants for the plants. It is not uncommon to see brown vegetation around a disposal site, e.g., Tyngsboro, Massachusetts.

Run-off from a disposal site, or tributaries adjacent to a site, can carry toxic pollutants away from the site to rivers, lakes, reservoirs and ponds. While contaminated sediments may not always affect the actual water quality, they represent the second major water use impact. Sediments contaminated with toxic substances will not support the aquatic life at the bottom of the food chain and will impair the aesthetic and primary water contact uses. Due to the tremendous number of impoundments which trap sediments, the contaminated substrate problem is widespread and the cause of a significant impairment of water uses in New England. This is confirmed by fish studies conducted at the Housatonic and Sudbury Rivers and the Framingham Reservoirs. Analyses of the fish from the Housatonic River revealed elevated levels of PCB, while elevated levels of mercury were detected in fish sampled from the Sudbury River and Framingham Reservoirs.

The discharge of toxic chemicals can be determined through analysis of bottom sediments. Water samples provide an instantaneous "snap-shot" picture of conditions at the time of sampling. Sediment analysis, on the other hand, shows what has been discharged to the river or lake during the last week, last year, or even the last decade. One sediment sample analysis can therefore yield data for certain constituents that might take years of water column or effluent monitoring to detect.

Toxic pollutants can also be transported from a disposal site by means of leachate. Leachate contaminating the ground water is an existing and continuing threat to New England's water supplies. It is difficult to assess the severity of these contamination incidents because: a) states do not have consistent analytical capabilities; b) the constituents analyzed vary from state to state; c) disposal practices were never well documented; and d) investigations into the extent of contamination generally cease when the well is closed.

FIGURE A-A
TOTAL NUMBER OF DRINKING WATER WELLS CLOSED IN REGION 1



The first incident of organic chemical contamination of drinking water was reported in Region I in 1975. Since then, more than 105 cities/towns have reported similar contamination. (Figure A-A) A majority of these contaminated sites appeared to be located in less densley populated areas. Fifty-six percent of these sites were located in towns with a population density of less than 500 people per square mile, while only 26% were in towns with greater than 1000 per square mile. (Figure A-B and A-C) The four population density maps (pages 95 and 96) selected from a random sample of ten illustrate that most contamination from hazardous waste sites occurs in less densely populated areas of New England. The most common result of such contamination is the closure of the community and private drinking water wells.

Uncontrolled sites, i.e., disposal and illegal dumps, accounted for 12 percent, and landfills accounted for 13 percent, of the organic contamination of drinking water in the region. Figure A-D depicts the number of drinking water wells closures attributed to hazardous waste sites. One should note that the increased number of wells closed in 1980 was a direct result of state and regional investigatory programs.

FIGURE A-B
RELATIONSHIP OF CONTAMINATED DRINKING WATER SITES WITH POPULATION DENSITY IN REGION 1

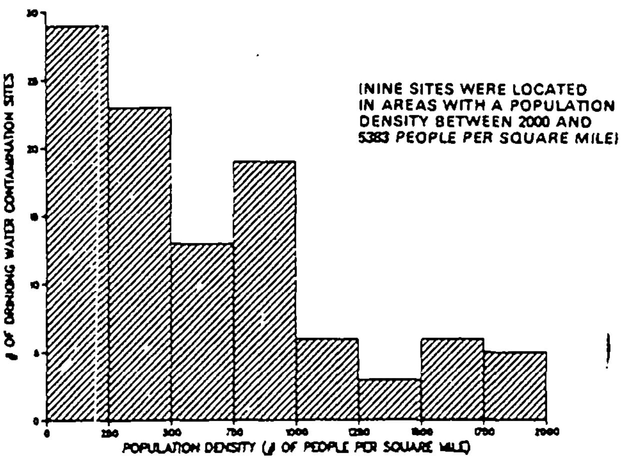


FIGURE A-C
NUMBER OF DRINKING WATER WELLS CLOSED IN REGION 1 ATTRIBUTED TO LANDFILLS AND DUMPS

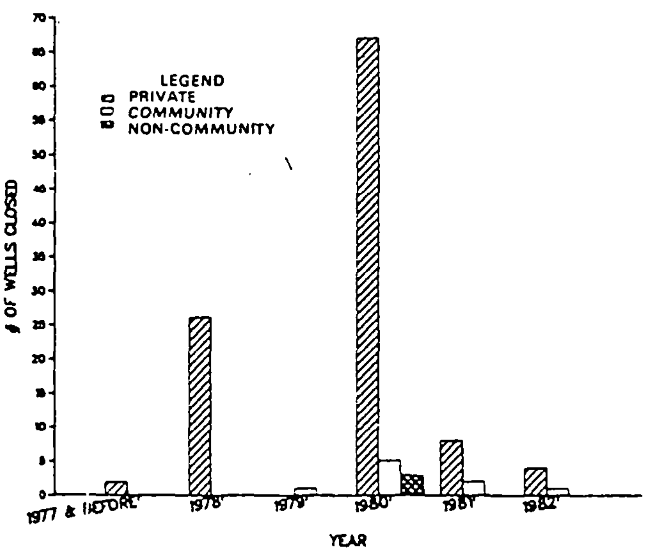
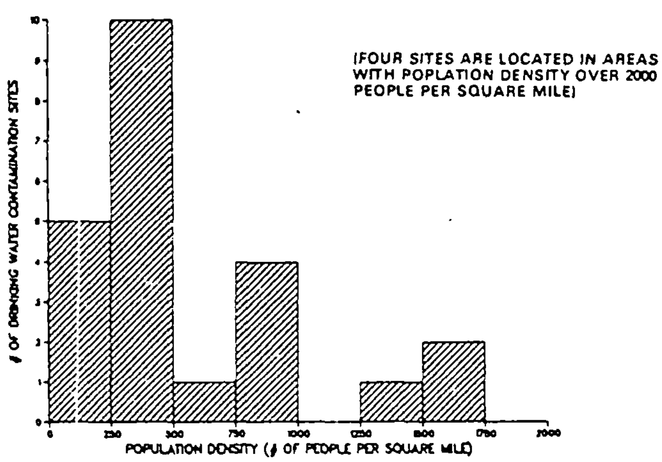


FIGURE A-D
RELATIONSHIP OF CONTAMINATED DRINKING WATER SITES ATTRIBUTED TO LANDFILLS AND DUMPS WITH POPULATION DENSITY IN REGION 1



Urbanization does not appear to be a major contributing factor to the organic contamination in drinking water in New England. The combination of disposal sites, illegal dumping, and landfills contribute almost equally to the drinking water contamination found in both rural and urban areas.

In addition, toxic substances emitted by solid and hazardous waste sites enter the atmosphere as particulates and gases, causing air problems. Ambient air quality monitoring at regional uncontrolled hazardous waste sites detected high levels of air-borne toxic substances.

The toxic substance contamination impact at the Nyanza Chemical Company and the Woburn uncontrolled waste sites are summarized below.

Nyanza Chemical Site (Massachusetts)

Two brooks flow through this site. The Trolley Brook discharges to the Sudbury River, which eventually flows into Framingham Reservoir No. 2. EPA investigations revealed high concentrations of mercury, lead and chromium in the sediment of Reservoir No. 2. High levels of mercury, well above Ambient Water Quality Criteria, have also been detected in the Sudbury River.

Investigation of soil conditions reveal elevated levels of heavy metals, i.e., concentrations above natural soil levels. The ground water reflected the same contamination. In addition to the heavy metals, a variety of organic chemicals were also present. Preliminary air monitoring detected high levels of mercury and organics in and around the site. Mercury samples taken directly above the sludge pits were 140-620% higher than the normal background air levels. Samples taken at breathing level both on and near the site indicated mercury levels to be within normal background levels.

Woburn Site (Massachusetts)

The Aberjona River has been sampled extensively since 1980 when it was suspected that toxic pollutants were washing downstream from the Woburn Superfund site. Sediment analyses detected the highest levels recorded for phenols at 0.3 ppm, lead at 180 ppm, arsenic at 42.8 ppm, and cyanide at 0.6 ppm.

Hydrogeological studies revealed concentrations of heavy metals in the ground water that exceed federal drinking water standards. Soil samples taken around and below disposal sites also showed heavy metal concentrations that were significantly above natural soil levels.

With the support of EPA, the state is currently investigating the air quality at this site. Monthly samples for one year are being taken to determine the total volatile organic chemicals present.

WASTE WATER TREATMENT PLANTS (W.W.T.P.)

Preliminary investigations indicate that for the most part, the presence of toxic substances in New England's surface water is due to industrial waste discharges with less important sources being contaminated ground water inflow and urban run-off. To a much lesser degree, municipal discharges contribute to the presence of pollutants in Region I's surface water. This is partially attributable to the fact that 10-15% of New England's municipalities receive industrial waste water.

Table A-2 is a list of "hot-spot" areas discovered over the last few years by the EPA surveys. The examples cited here note surface water impact. It should also be noted that aside from the obvious water bodies such as rivers and lakes, the ocean is impacted by industrial discharges. One example is the discharge problem of PCB into New Bedford Harbor. Although the PCB discharge problem in the Housatonic River is known, the consequence of this discharge on the river basin is unknown at the present time. Both these PCB problem areas are currently under further investigation.

To a much lesser degree, drinking water wells have been affected by industrial discharges. Industrial activities consisting of improper discharges, disposal, and handling/

TABLE A-2
NEW ENGLAND SURFACE WATER "HOT SPOTS"

Location	Year of Survey	Sources	Analytical Results from Sediment Samples	Comments
1. Quinnipaic River (Connecticut)	1980 and 1982	1. metal finishing companies 2. pharmaceutical companies 3. chemical companies 4. solvent recovery plants	-arsenic at 11.3 ppm -cyanide at 9.8 ppm -other heavy metals at 1,140 ppm -chlorobenzene at 1.9 ppm -3,3'-dichlorobenzine at 28 ppm	1. Concentrations were higher downstream than samples taken upstream. 2. Toxicity depends upon how the compound is bound to the sediments. 3. Environmental impacts are unknown. 4. There are man-made compounds.
2. Pawtuxet River (Rhode Island)	1978, 1979 and 1980	1. 3 major WWTP 2. chemical company	-Pesticide-class compounds -DDD at 160 ppb -PCB 1016 at 3.4 ppm	1. Pesticides are man-made 2. Environmental impacts at these concentrations are unknown. 3. Toxicity depends how the compound is bound in the sediment.
3. Connecticut River (Springfield, Massachusetts)	1980	1. industrial companies	-arsenic at 12 ppm -cyanide at 4 ppm -other heavy metals at 24 ppm -chloroform at 7.1 ppm	1. Concentrations are higher downstream than upstream. 2. Release of organics and inorganics depends upon how they are bound to sediments. 3. Chloroform may or may not be naturally occurring.
4. Merrimack River (from Nashua, NH to Lawrence, MA)	1981	1. industrial companies	-arsenic at 12 ppm -cyanide at 4 ppm -other heavy metals at 200 ppm -toluene at 160 ppb -anthracene at 36 ppb	1. This segment of the river is the source of drinking water for several communities. 2. Toxicity of constituents found depends upon how they are bound in sediments. 3. Environmental imacts are unknown.
5. Nashua River (New Hampshire)	1982	1. tannery	-heavy metals at 130 ppm -base-neutrals at 7 ppm -cyanide at 600 ppb -PCB at 5 ppb	1. Release of constituents from sediments depends uon how they are bound to sediments. 2. Organics pose more of a toxicity problem since the are man-made and are the predominant compounds. 3. Environmental impacts have not been investigated.
6. Suncook River (New Hampshire)	1980	1. tannery	-heavy metals at 200 ppm -phenols at .3 ppm -arsenic at 8 ppm -cyanide at .7 ppm -pyrene at 4.1 ppm -fluoranthene at 3.9 ppm -anthracene at 2.7ppm -PCB 1248 at 650 ppm	1. Concentrations are higher upstream than downstream. 2. Toxicity from these compounds will depend on whether they will leachat out of the sediments. 3. Organic compounds may pose more of a concern depending upon River pH. 4. Environmenal impacts are currently unknown.
7. Black River (Springfield, Vermont)	1979	1. industrial activities	-PCB 1248 at 3 ppm	1. Chemical is man-made. 2. Environmental impacts of concentrations found are unknown.
8. Passumpsic River (St. Johnsbury, Vermont)	1979	1. industrial activities	-PCB 1254 at 4.8 ppm -2-nitrophenol at 6 ppm	1. Chemical compounds are man-made. 2. Environmental impacts of concentrations found are unknown.
9. Androscoggin River (Maine)	1982	1. Lewiston - Auburn (WWTP)	-heavy metals at 27 ppm -phenols at 2 ppm -PCB 1248 at .24 ppm -toluene at 14 ppb -anthracene at 3.4ppm	1. Concentrations are higher downstream than upstream. 2. Organic chemicals are man-made and pose more of a toxic concern depending upon the amount leaching from sediments. 3. Environmentl impacts are currently unknown.

storage are responsible for an estimated 35 percent of the drinking water contamination incidents in New England. Approximately one-fifth of these contamination incidents are attributed to improper industrial discharges.

Even though the primary waste water treatment plant impact is surface water discharges, there is also potential for the release of harmful substances through air emissions. Industrial treatment plants that handle large amounts of solvents have volatilizing organic chemical problems as the waste water passes through the treatment process. Such volatization may also occur during the discharge stage. To date, volatile organic emissions from these treatment plants have not been a problem, however the potential exists.

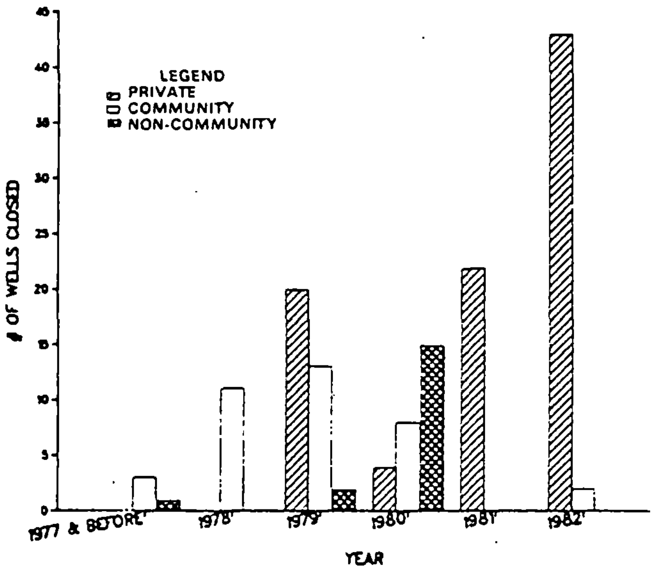
Several treatment plants in New England dispose of sewage sludge by incineration, which may result in localized toxic emission problems. Two examples of these problems are: 1) chromium emissions from a sewage sludge incinerator in South Essex, Massachusetts; and 2) possible hazardous emissions from an incinerator in New Bedford which incinerates PCB contaminated wastes. Municipal incinerators may also cause localized problems. Emissions of cadmium and lead are suspected to be from printing industry. wastes.

INDUSTRIAL AND COMMERCIAL FACILITIES

The obvious impacts of industrial activities in New England are in surface waters, both recreational and drinking water sources, and in air. The major transport routes for toxic substances in water are discharges, while point and fugitive emissions are the main air sources.

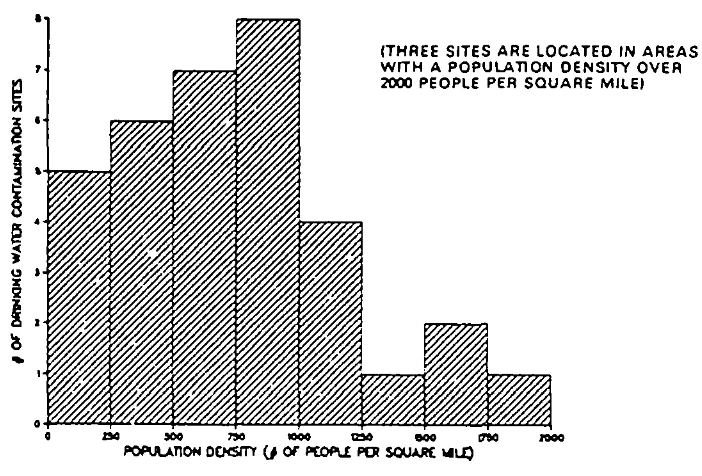
On-site activities such as disposal handling and chemical storage are also sources of contamination. In fact, industrial activities are the predominant sources of the contaminants in drinking water. Thirty-three percent of the contaminated drinking water sites in New England were polluted by improper industrial discharge, disposal, and handling/stoarge. (Figure A-E)

FIGURE A-E
NUMBER OF DRINKING WATER WELLS CLOSED IN REGION 1 ATTRIBUTED TO INDUSTRIAL ACTIVITIES



In New England, two-thirds of the drinking water contamination from industrial activities occurs in urban areas. Approximately 70% of the contaminated sites are located in areas with population densities of less than 1000 people per square mile. (Figure A-F)

FIGURE A-F
RELATIONSHIP OF CONTAMINATED DRINKING WATER SITES ATTRIBUTED TO INDUSTRIAL ACTIVITIES WITH POPULATION DENSITY IN REGION 1



The detection of trichloroethylene, 1,1,1-trichloroethane, and tetra-chloroethylene are closely related to industrial sources of contamination. Trichloroethylene is identified more than half the time as the primary or one of the primary contaminants at regional sites.

Industrial activities generate various air emissions that adversely impact ambient air quality. Following are brief discussions of three sources of concern in New England.

Pharmaceutical Plants

Two New England states received complaints of odors from residents living near pharmaceutical plants. Monitoring conducted in these areas indicated high levels of organic compounds were present. However, controlling air emissions from pharmaceutical companies is difficult because most emissions are fugitive, and the industrial processes often change daily.

Dry Cleaners

Not all the hazardous air pollutants concern is focused on large industries using large volumes of organic solvents. There are some concerns over dry cleaners that use perchloroethylene (PERC). PERC, a colorless liquid of moderate volatility, is widely used in dry cleaning of fabrics and in degreasing of fabricated metal parts. Some studies, including a National Cancer Institute bioassay, indicate PERC may be carcinogenic. PERC is currently under assessment in the NESHAPS program to determine if it should be listed as a hazardous air pollutant.

Miscellaneous

Various unregulated substances have caused considerable concern in New England, including chromium, benzene phenol, ethyl acrylate, chlorine gas and styrene. In response to public demands, ambient air and emissions studies have been conducted at Upjohn in Connecticut, Ciba-Geigy in Rhode Island and other locations in the region. Public interest groups more frequently demand air monitoring of toxic chemicals in hazardous waste dumps, especially at sites that require immediate clean-up. Large users of solvents, such as paper and fabric coaters, printers, manufacturers of synthetic organic chemicals (SOCMI sources) and perchloroethylene dry cleaners are of considerable concern in the region. We expect that the New England states will develop strategies to identify sources of toxic chemicals and control them. To accomplish these tasks, the states are requesting considerable assistance from Region I in the areas of health assessment, inventory, control techniques, ambient and source emissions monitoring, and quality assurance.

In March of 1983, Region I conducted on-site monitoring at the Silresim Chemical Corporation Superfund site in Lowell, Massachusetts to determine if chemical emissions were detectable in the neighborhoods surrounding the site. No significant emissions that could be traced to the disposal site were found. However, the monitors detected significant levels of toluene, dimethylformamide, xylene, dimethylamine, benzene, and other organic chemicals coming from two nearby industrial sources. As a result, the state has ordered the industrial sources to reduce their emissions. We believe that similar tests in other areas would produce similar results.

HERBICIDE AND PESTICIDE APPLICATIONS

Herbicide and pesticide use is usually considered a multimedia problem. Aerial and ground spray application techniques affect the air quality in the target area and may potentially affect areas downwind from the application site. Depending upon the specific application site, surface waters, both recreational and drinking water sources, may be affected. The chemical structure of the particular herbicides and pesticides determine the persistence, half-life, and biodegradability of the compounds. Consequently, certain herbicides and pesticides will persist in the environment and may migrate into the ground water.

Agricultural areas have non-point source contamination problems resulting from the use of pesticides and herbicides. As part of a September 1979 survey in Vermont, sediments from eleven sites throughout the state were analyzed for toxic contamination. Pesticides were found in Lake Champlain at Spar Mill Bay in greater concentrations than other locations around the State and DDD, DDE, and DDT were all present at 130 ppb. Although the potential for ground water impact also exists, it has not been investigated.

In 1982, the state of Massachusetts elected to use the pesticide Carbaryl as a means of controlling gypsy moths. The state considered the multiple environmental impacts (air, water, and land) as well as the significant economic and health effects impacts of the decision.

Twenty-six communities applied Carbaryl by aerial spray and 87 communities used ground spraying in conjunction with aerial spray as their application mode. There appears to be no adverse environmental and economic impacts, and no adverse health effects were reported. However, the project created considerable public apprehension and anxiety since citizens believed that they were exposed to uncertain health and safety risks.

TREATMENT MEASURES FOR HAZARDOUS WASTE AND CONTAMINATION PROBLEMS

Thirty-eight of the 700 uncontrolled sites in New England are on the National Priority List. Clean-up actions at these sites are currently being investigated and designed. A major concern in this region is water supplies that are contaminated by leachate from an uncontrolled site. Since this type of contamination is pervasive and frequently there are no feasible alternative drinking water resources the problem is especially significant.

Remedial actions designed to address and correct one dimension of the problem, e.g., contaminated water supply, may simply displace the hazard or toxic pollutants from one medium to another. Table A-3 depicts the sources of pollutants, the respective clean-up measure, and the by-products or "new toxic pollutants" which might be generated.

TABLE A-3
TREATMENT MEASURES FOR HAZARDOUS WASTE AND CONTAMINATION PROBLEMS

Sources of Toxic Pollutants	Remedial Measures	By-products Generated	Disposal Route	Environmental Impact
1. Contaminated groundwater	air-stripping and aeration towers	volatization of organic chemicals	1. air emissions 2. discharges from treatment	1. air 2. land 3. surface water
2. Contaminated water	granular activated carbon filters	spent carbon	1. open dump	1. land 2. surface water 3. ground water
3. Contaminated water	powder activated carbon filter	slurry	1. open dump	1. land 2. surface water 3. ground water
4. Hazardous waste lagoon	pumping liquid out	toxic liquids	1. drums 2. secure landfill	1. land 2. surface water 3. ground water
5. Solid and hazardous wastes	excavation of material	concentrate toxic materials and soil	1. secure landfill	1. land 2. surface water 3. ground water 4. air
6. Solid and hazardous wastes	capping landfill	toxic materials and soil unaltered	1. in-situ	1. air 2. land
7. Solid and hazardous waste	clay liner	toxic materials and Soil unaltered	1. in-situ	1. air 2. land
8. Solid and hazardous wastes	incinerator	fumes and sludge	1. air emissions 2. open dump	1. air 2. land

ASBESTOS

Asbestos is a potential health hazard for individuals exposed to asbestos fibers used in insulation and fireproofing in schools and office buildings as well as workers handling the material. The regional toxics office is focused on the joint EPA/state program to encourage schools to voluntarily inspect for and correct deteriorating asbestos insulation.

On May 27, 1982, EPA published a final rule which requires all schools to inspect for asbestos and post warnings if it is found. The 6,600 schools in New England must comply with this requirement by June 1983. Until information from this program becomes available, there is little definitive information on the extent of the problem.

Asbestos is also regulated under the NESHAPS program as a hazardous air pollutant, and a number of emission standards have been promulgated for a variety of asbestos source categories. An overlap between the air and toxics programs could occur if changes required by the school inspections result in an increase in asbestos renovation and demolition. Such activity, regulated under the NESHAPS program, could cause an increase in indoor and ambient asbestos concentrations as the material is torn out of buildings and disposed. Region I is consolidating its asbestos regulatory functions into one office to ensure consistency between the two programs.

POLYCHLORINATED BIPHENYLS (PCBs)

One hundred and seventy-five million pounds of Polychlorinated Biphenyls (PCBs), a stable and toxic chemical, are estimated to be in use nationally as an insulating fluid in electrical equipment, such as transformers and capacitors. PCB production is now banned, but continued use is permitted under controlled conditions specified by federal law. The amount of PCBs in New England is unknown, although the region does generate 3.3 percent of the nation's electricity — one indicator of the relative magnitude of the PCB problem.

Industries are required to maintain PCB containing equipment to prevent leaks or spills. This equipment must be properly labeled, and waste PCB must be disposed of through incineration or other approved methods. To augment EPA's inspection for these requirements, the agency initiated a pilot program granting states compliance monitoring authority. Connecticut is one of five states nationally selected for participation.

OTHERS

Though not well documented, there are other sources of toxic substances that impact multiple environmental media in New England.

a. Accidental and intended spills adversely impact nearly all of the environmental media. Accidental spills include over-turned cargo carriers of fuel. Intended spills are such things as truck washing and machine shops using solvents.

b. Underground containers, such as septic tanks and gasoline/fuel storage tanks, and their respective locations are land-use problems. Improperly installed, maintained or located underground containers pose soil and ground water contamination problems. New England has several community water supplies that were contaminated by underground gasoline storage tanks.

c. The degreasers or cleaning solvents used to maintain septic tanks account for 4 percent of the drinking water contamination problems in the region. As one would expect, septic tank degreaser problems are found only in rural areas since septic systems are more likely to exist in rural areas.

d. Leaks from gasoline and fuel storage tanks account for 13 percent of the region's drinking water contaminations. Approximately two-thirds of these sites are located in rural areas and in areas with population densities under 1000 people per square mile. (Figures A-G and A-H)

Since the effects of toxic substance contamination is not limited to one environmental medium, the control of toxic substances cannot be accomplished through one program or one set of regulations.

Toxic substances and their resulting contamination problems pose financial problems for both public and private sectors. The investigation of the potential contaminant sources, the clean-up of the contamination, the maintenance of a sophisticated laboratory, the treatment of the contaminated medium, and the search for alternative sources are all expensive parts of the solution.

In addition to monetary pressure, organics contamination may have adverse physiological and psychological

FIGURE A-G
NUMBER OF DRINKING WATER WELLS CLOSED IN REGION 1 ATTRIBUTED TO UNDERGROUND STORAGE TANK LEAKS

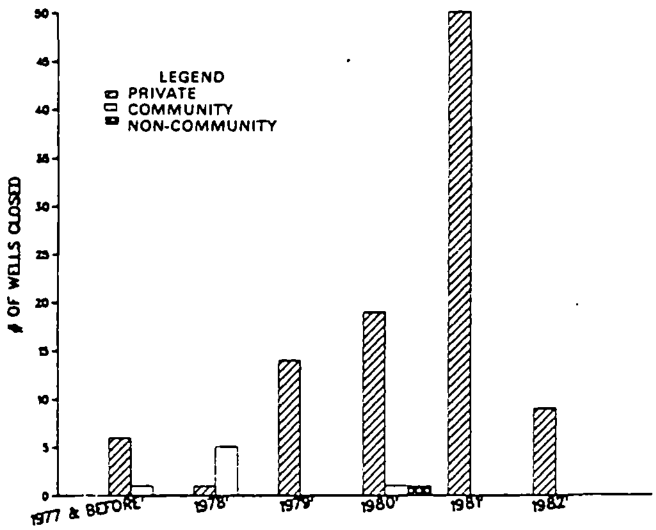
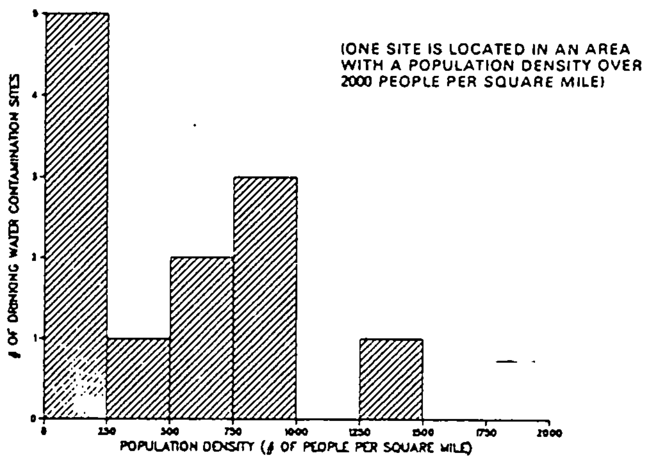


FIGURE A-H
RELATIONSHIP OF CONTAMINATED DRINKING WATER SITES ATTRIBUTED TO UNDERGROUND STORAGE TANK LEAKS WITH POPULATION DENSITY IN REGION 1



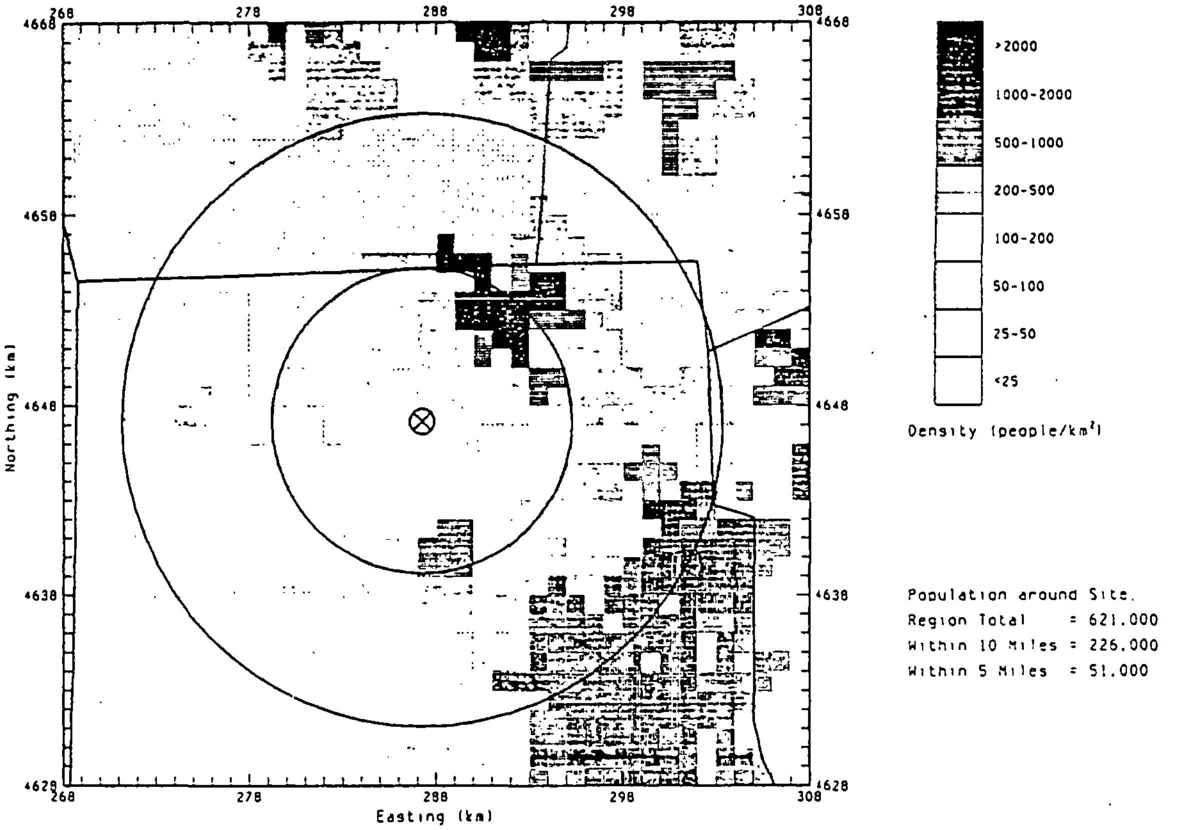
effects on the public. Public health implications from chronic exposure to organic chemicals in multiple media is difficult to assess. In fact, assessment of health effects from one environmental source contains many unknowns.

One of the more difficult situations to assess is the chronic exposure to low-level organic chemicals in drinking water. Organic contamination in drinking water rarely involves one single compound. The possibility of the synergistic effects from co-existing chemicals needs further investigation. Moreover, our knowledge of the health effects of many organics found in contaminated drinking water is limited.

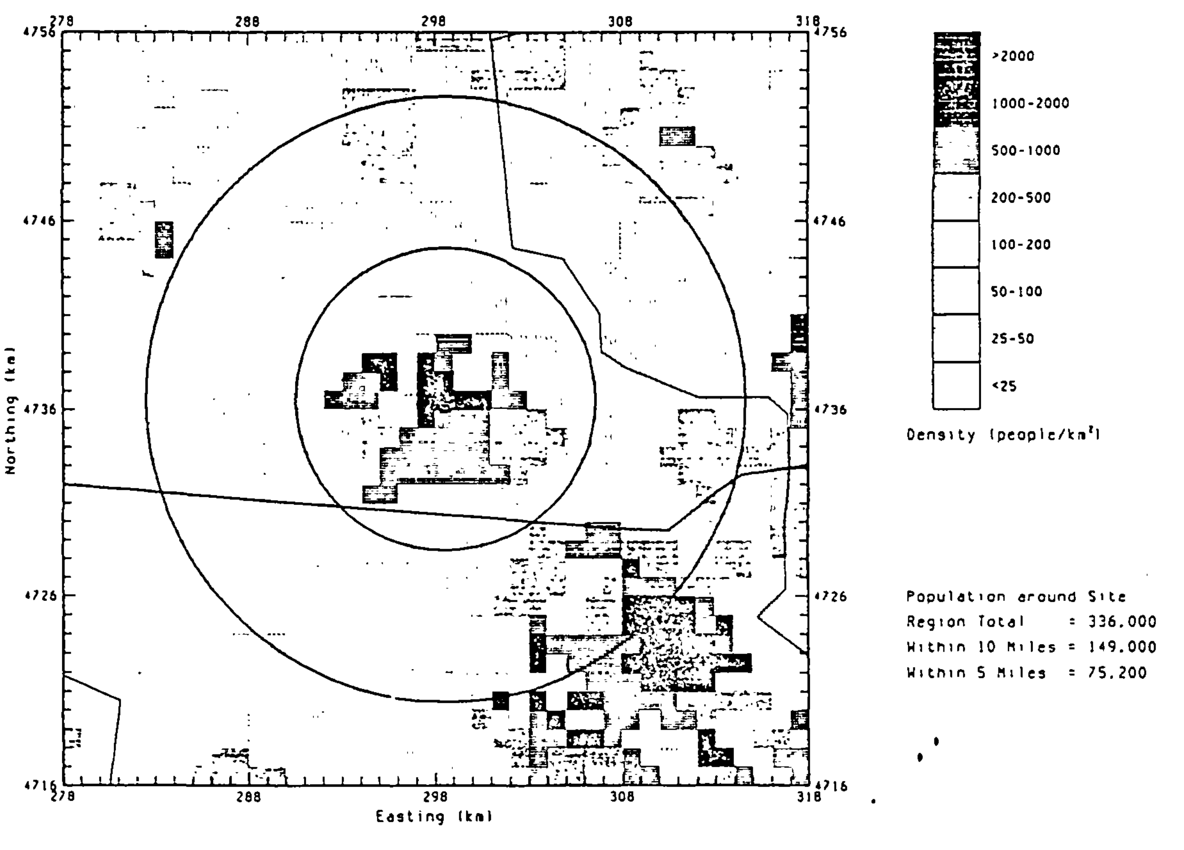
Water resources are not only used for drinking and cooking but also for recreational, bathing, and washing purposes. The health effects of using water contaminated by organics for these purposes needs to be addressed. Toxic substances accumulated in the sediments of our water resources affect the aquatic ecosystem and the subsequent food chain.

Outside air emissions, unlike occupational exposure, introduce a multitude of chemicals in an "open" environment. Public health and terrestrial implications are difficult to quantify and the cumulative effects are almost impossible to assess. Public awareness of and concern for toxic air contaminants is growing rapidly.

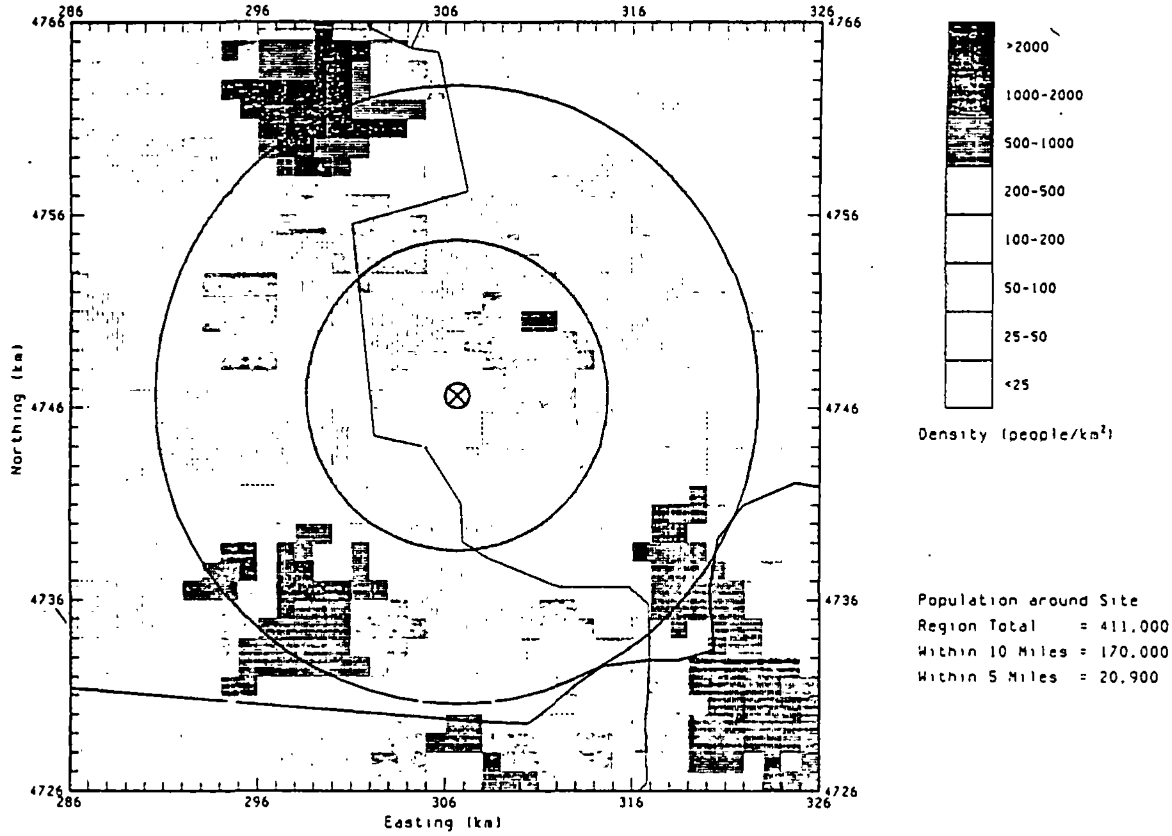
POPULATION DENSITY MAP
NORTH SMITHFIELD, RHODE ISLAND



POPULATION DENSITY MAP
NASHUA, NEW HAMPSHIRE



POPULATION DENSITY MAP
LONDONDERRY, NEW HAMPSHIRE



POPULATION DENSITY MAP
TYNGSBORO, MASSACHUSETTS

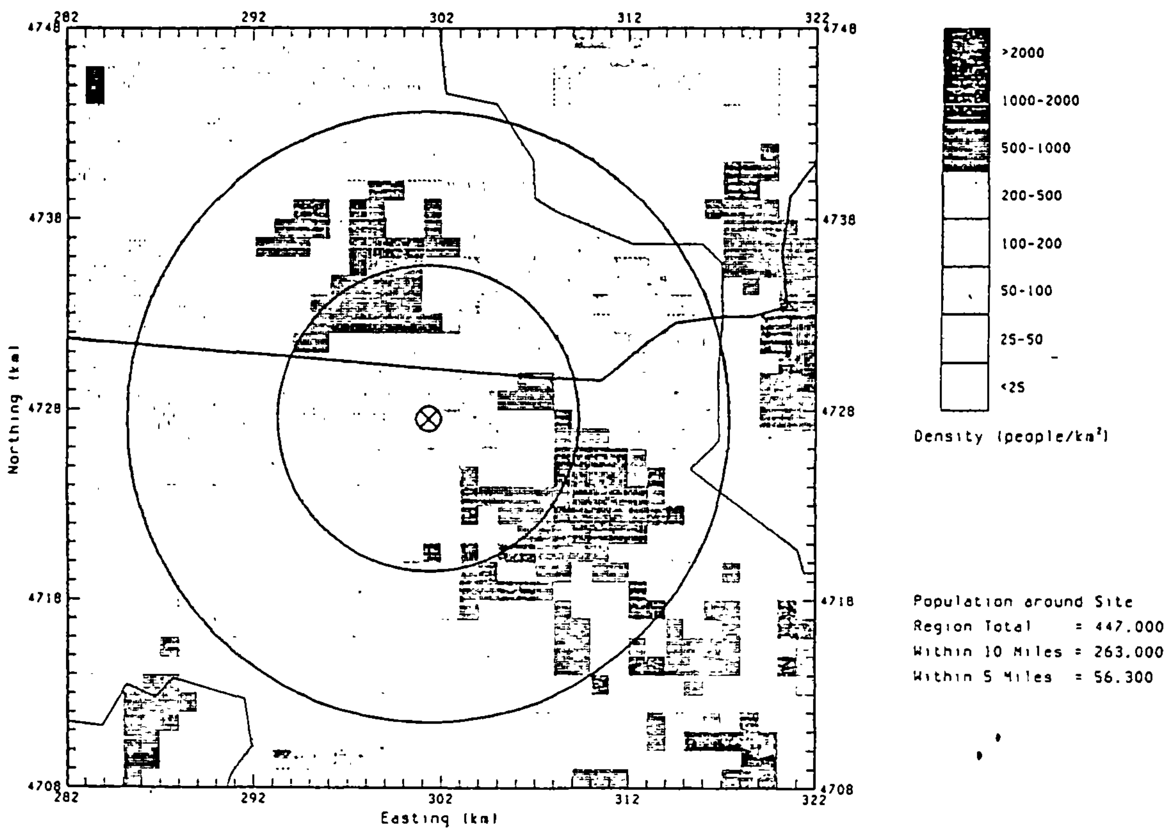


FIGURE A-I
HAND-DRAWN CONTOURS OF AVERAGE CONCENTRATIONS OF CRITICAL POLLUTANTS FROM THE SURE AND MAPS 3S NETWORKS; AUGUST 1978-JUNE 1979. AFTER PACK (1980).

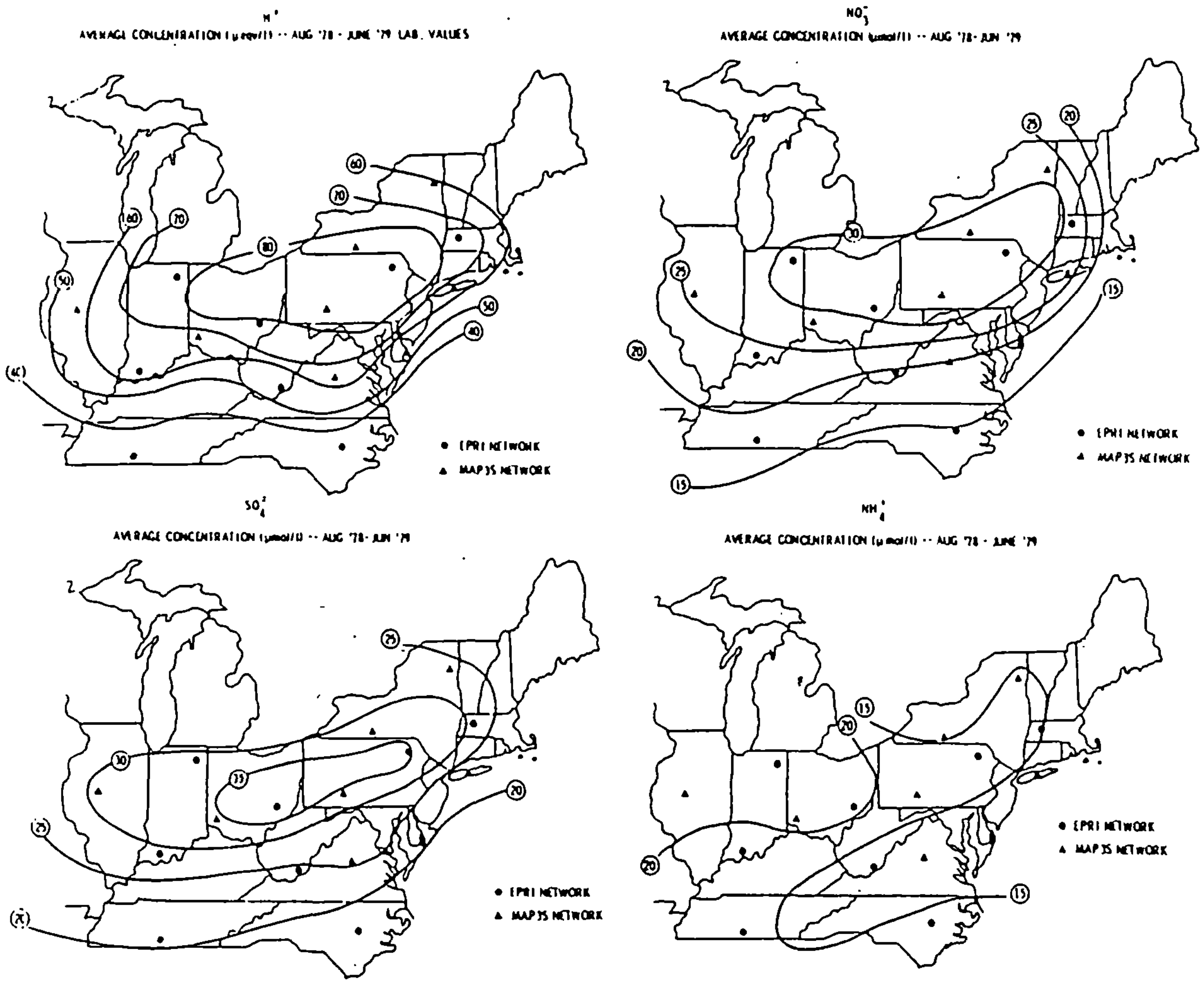


TABLE A-4
APPROXIMATE MEDIAN CONCENTRATIONS OF METALS IN THE ATMOSPHERE (NG M³)

Metal	Remote	Rural	Urban
Ag	0.01	0.3	1.1
As	0.2	6	25
Be	--	0.023	0.14
Cd	0.1	1.0	2.0
Co	0.05	0.1	10.0
Cr	0.3	5.0	40.0
Cu	0.2	6.0	100
Hg*	0.5	2.0	20
Mn	0.4	30.0	150
Mo	0.3	--	2
Ni	0.36	2	30
Pb	1.0	100	2000
Sb	0.2	3	30
Se	0.1	1.5	4.7
V	1.0	5	50
Zn	0.5	100	1000

*Total Hg in atmospheric measurement.

FIGURE A-J
ALKALINITY OF HEADWATER LAKES AND STREAMS IN NEW ENGLAND.

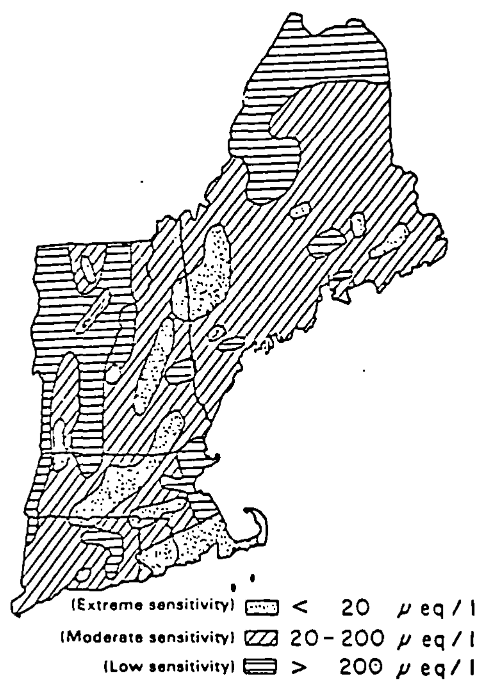
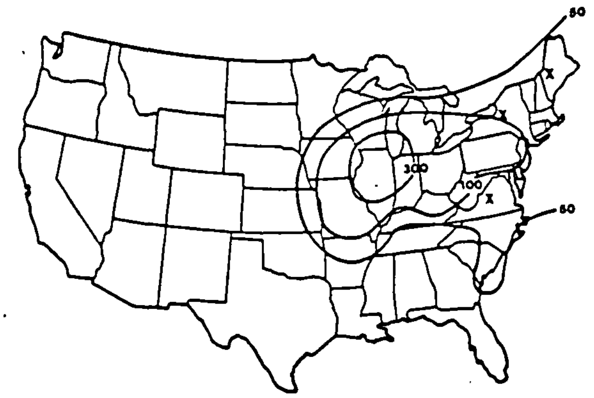
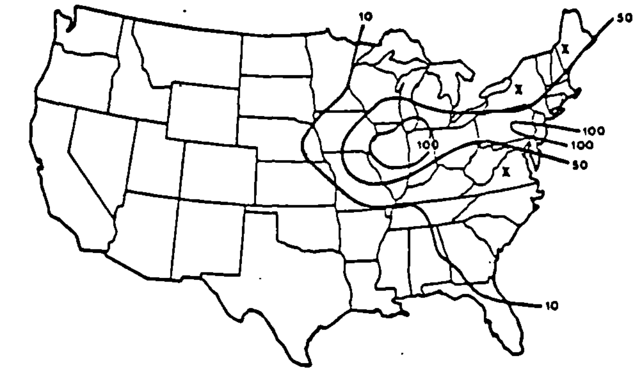


FIGURE A-K



Average deposition (g ha [1] mo [1]) of Zn by precipitation from September 1966 to March 1967 as determined by Lazrus et al. (1970).



Average deposition (g ha [1] mo [1]) of Pb by precipitation from September 1966 to March 1967 as determined by Lazrus et al. (1970).

Source: EPA 560/5-80-001 Jan 1981, The Potential Impact of Chemicals Released to the Environment, Ref 8.

FIGURE A-L
SOURCES OF PCBs IN THE NEW BEDFORD AREA

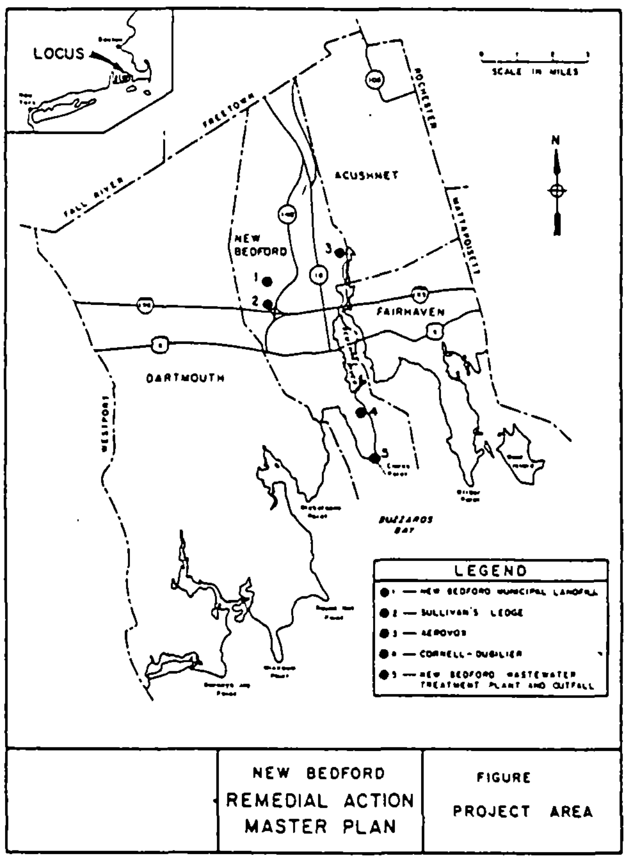


FIGURE A-M
PCBs LEVELS IN BOTTOM SEDIMENTS
(Upper Estuary)

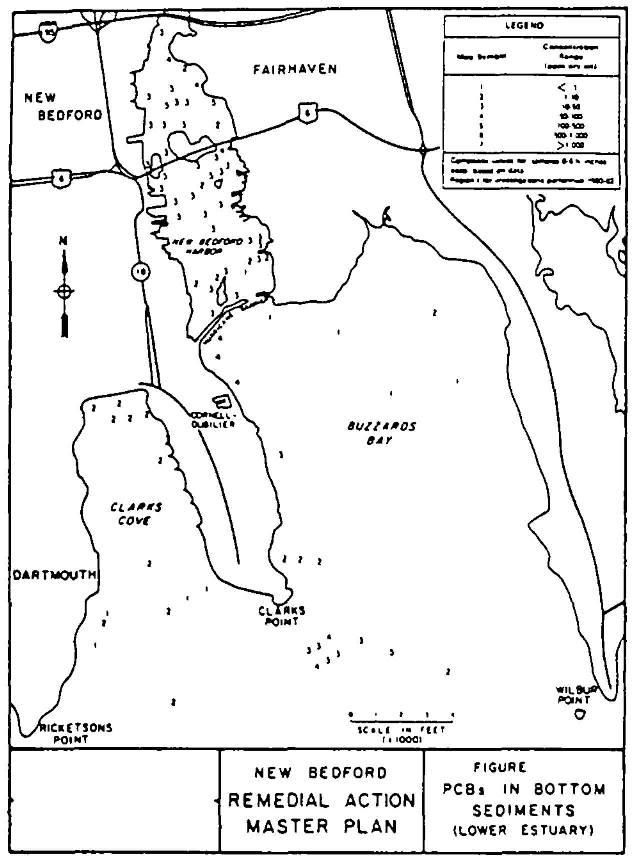


FIGURE A-N
PCBs LEVELS IN BOTTOM SEDIMENTS
(Lower Estuary)

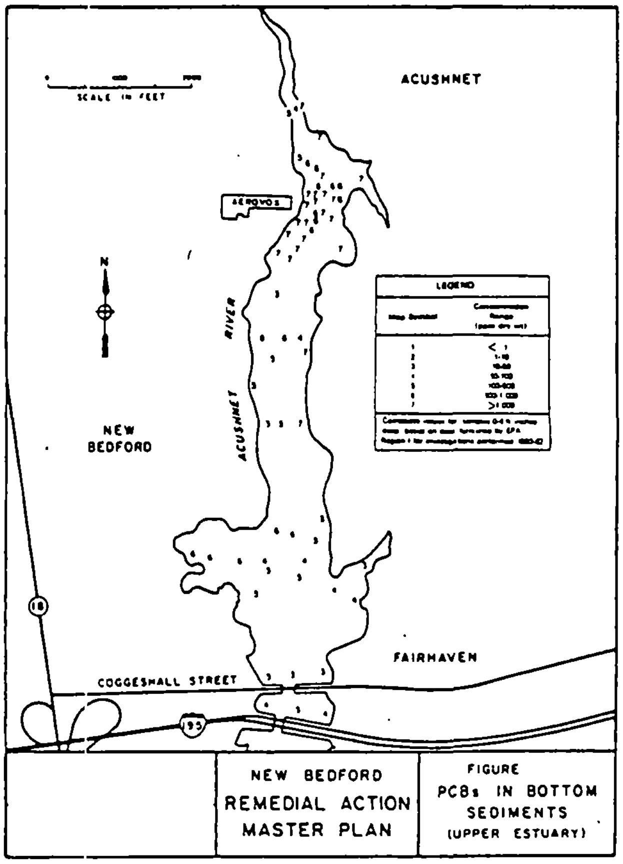


FIGURE A-O
KNOWN GROUND WATER CONTAMINATION
SITES IN MASSACHUSETTS

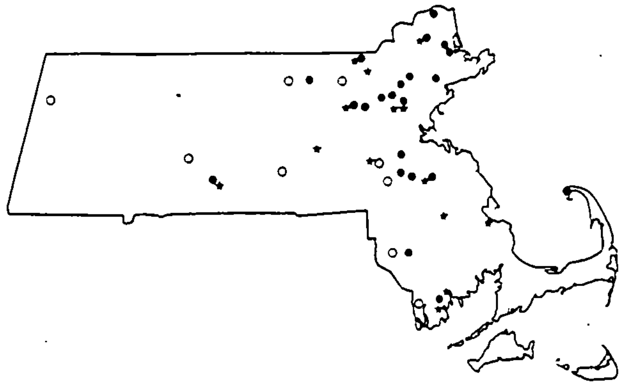


FIGURE A-O
POTENTIAL GROUND WATER CONTAMINATION
SITES IN MASSACHUSETTS

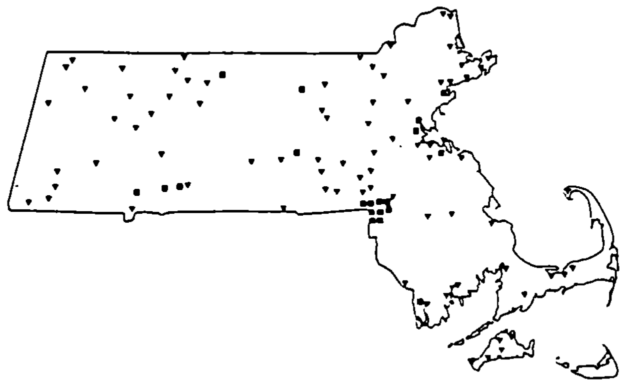


FIGURE A-P
KNOWN GROUND WATER CONTAMINATION
SITES IN RHODE ISLAND

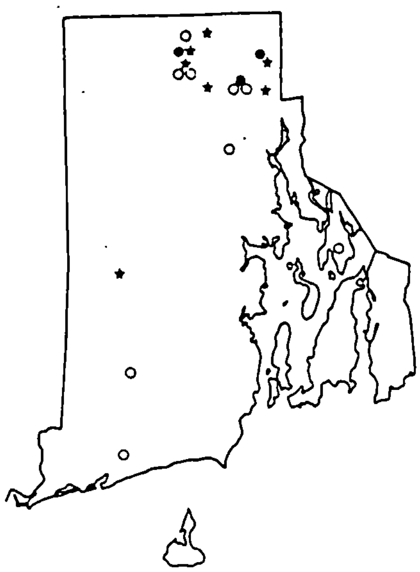


FIGURE A-P
POTENTIAL GROUND WATER CONTAMINATION
SITES IN RHODE ISLAND

★ Uncontrolled Hazardous Waste Sites

● Public Water Supply Sources Containing Organic Chemicals

○ Private Water Supply Sources Containing Organic Chemicals

■ Hazardous Waste Treatment, Storage and Disposal Facilities

▼ Open Dumps

FIGURE A-Q
KNOWN GROUND WATER
CONTAMINATION SITES
IN NEW HAMPSHIRE

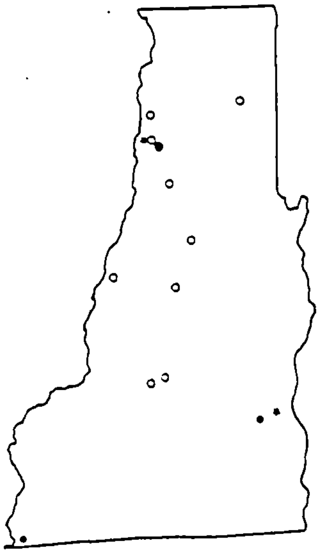


FIGURE A-Q
POTENTIAL GROUND WATER
CONTAMINATION SITES
IN NEW HAMPSHIRE

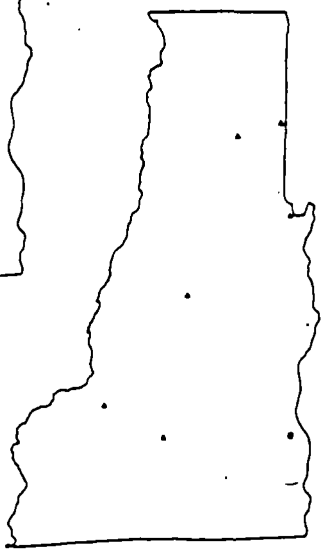


FIGURE A-R
KNOWN GROUND WATER
CONTAMINATION SITES
IN VERMONT

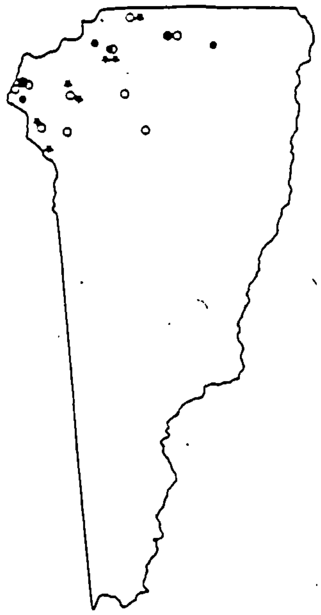
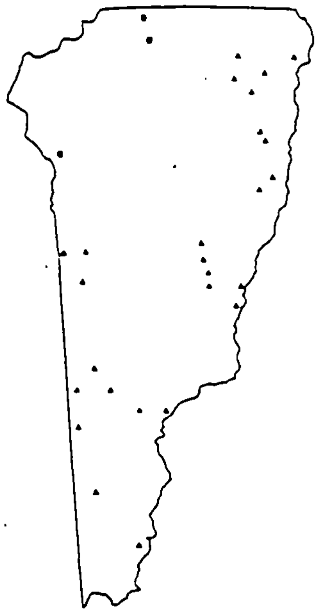


FIGURE A-R
POTENTIAL GROUND WATER
CONTAMINATION SITES
IN VERMONT



NOTE: Due to a printing error the maps in Figures A-Q and A-R were inverted and labeled incorrectly. Figure A-Q should be Vermont and Figure A-R should be New Hampshire.

FIGURE A-S
KNOWN GROUND WATER CONTAMINATION
SITES IN CONNECTICUT

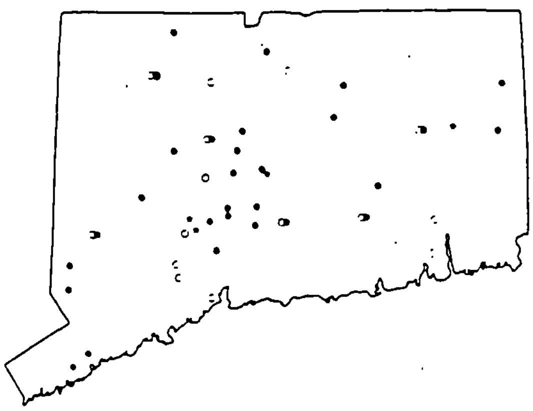
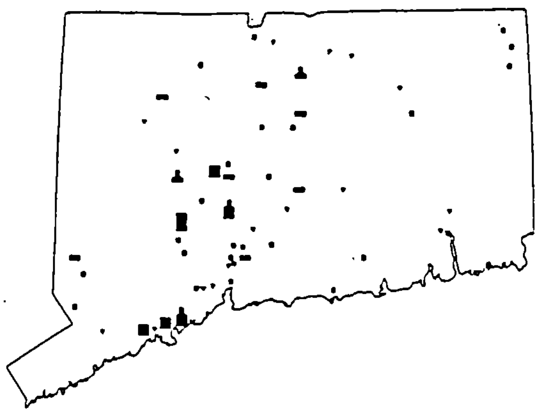


FIGURE A-S
POTENTIAL GROUND WATER CONTAMINATION
SITES IN CONNECTICUT



★ Uncontrolled Hazardous Waste Sites

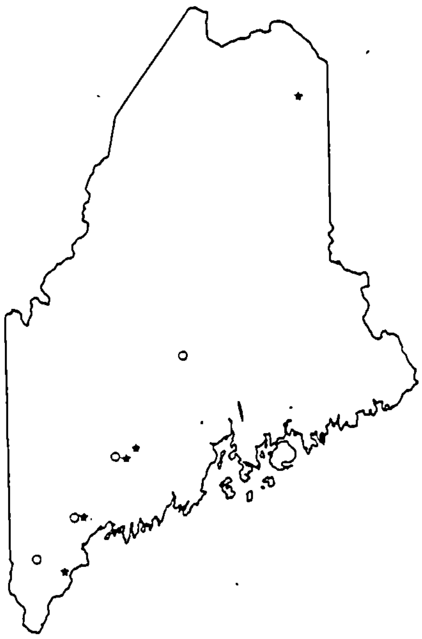
● Public Water Supply Sources Containing Organic Chemicals

•○ Private Water Supply Sources Containing Organic Chemicals

■ Hazardous Waste Treatment, Storage and Disposal Facilities

▼ Open Dumps

FIGURE A-T
KNOWN GROUND WATER CONTAMINATION
SITES IN MAINE

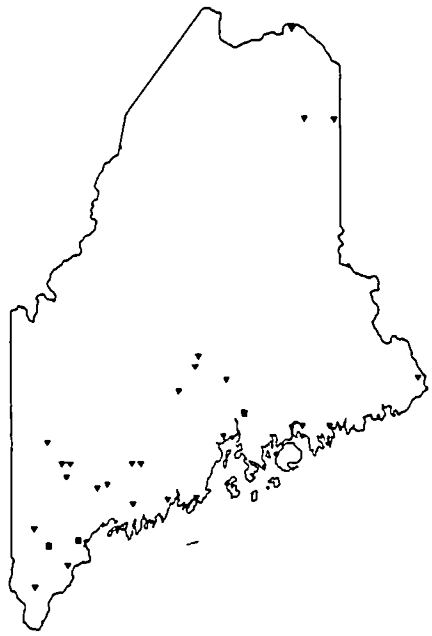


★ Uncontrolled Hazardous Waste Sites

● Public Water Supply Sources Containing Organic Chemicals

○ Private Water Supply Sources Containing Organic Chemicals

FIGURE A-T
POTENTIAL GROUND WATER CONTAMINATION
SITES IN MAINE



■ Hazardous Waste Treatment, Storage and Disposal Facilities

▼ Open Dumps

TABLE A-5
1982 SO_2 STATE IMPLEMENTATION PLAN REVISIONS

No.	State	Area/Facility	Size	SO2 Emission Limits Old Max	New Max	Actual Fuel	Status of Action	Comments	SO2 Change (tons/year) *Actual	*Paper
1	CT	Sikorsky Aircraft	192MM Btu/hr	0.5%	1.0%	NA	F-11/12/82	Boiler restrictions imposed	NA	+ 80
2	ME	Metro Portland AQCR	all sources	1.5%	2.5%	2.5%	F-1/8/82	Revision submitted in 1977	0	+ 10,000
3	MA	Holyoke Gas & Electric	229MM Btu/hr	1.0%	2.2%	residual oil	F-2/10/82	Capacity reduced from 765MM Btu/hr	+ 536	- 1,326
4	MA	ATF Davidson	100MM Btu/hr	0.55#	1.21#	NA	F-4/13/82	30-month variance	NA	+ 410
5	MA	Northeast Petroleum	45MM Btu/hr	0.5%	1.0%	0.5%	F-11/23/82	Over 50% reduction in oil use	0	0
6	MA	Polaroid	252MM Btu/hr	0.5%	2.2%	NA	F-12/1/82	Temporary variance	NA	+ 560
7	RI	Kenyon Piece Dye Works	104MM Btu/hr	1.0%	2.2%	NA	F-11/10/82 P-7/29/82	Temporary 1 yr. variance - boiler restrictions	NA	- 87
8	VT	Statewide	all sources	1.0%	2.0%	NA	F-1/8/82	Revision submitted in 1975 - never implemented by VT - increase based on 1980 fuel use	0	+ 1,700

*Actual SO2 Impact: Emission changes from the actual source emission levels
*Regulatory Change: Absolute emission differences between old and new limits
NA - Not available

TABLE A-6
EMISSIONS FROM RESIDENTIAL WOODBURNING STOVES

Wood burning device	Wood type	Wood burning rate,[a] kg/min	Average stack gas conditions: Temperature,[b] °C	Velocity,[b] m/min	Flow rate,[b] Nm^3/min	H_2O,[b] %	Co_2,[c] %	O_2,[c] %	CO,[c] %
Fireplace	Seasoned oak	0.18	152	308	6.5	3.8	0.5	21	0.07
Fireplace	Green oak	0.17	207	347	6.4	4.2	0.5	21	0.06
Fireplace	Seasoned pine	0.19	236	367	6.5	3.8	0.5	21	0.04
Fireplace	Green pine	0.16	207	332	6.5	0.5	0.5	21	0.04
Baffled stove	Seasoned oak	0.14	307	184	1.5	13	7.7	13	0.7
Baffled stove	Green oak	0.11	300	117	0.9	11	9.2	11	1.1
Baffled stove	Seasoned pine	0.12	378	146	1.0	15	14	4.4	2.8
Baffled stove	Green pine	0.10	247	213	2.0	11	9.4	11	0.9
Nonbaffled stove	Seasoned oak	0.13	384	128	0.9	11	14	5.5	2.8
Nonbaffled stove	Green oak	0.11	240	89	0.9	4	11	9.3	1.0
Nonbaffled stove	Seasoned pine	0.12	304	109	0.9	11	11	8.4	1.6
Nonbaffled stove	Green pine	0.13	305	111	0.8	15	9.9	10	1.5

a Average burning rate during EPA Method 5, POM, and SASS train operation.
b Determined for average EPA Method 5 data.
c Determined by Orsat and Drager tube.

Wood burning device	Wood type	Emissions, g/kg[a] (μg/j): Particulates	Condensable organics	Volatile hydrocarbon	NO_x	SO_x	CO	POM
Fireplace	Seasoned oak	2.3 (0.13)	6.3 (0.36)	19 (1.1)	2.4 (0.13)	b	30 (1.7)	0.025 (0.0014)
Fireplace	Green oak	2.5 (0.19)	5.4 (0.40)		1.9 (0.14)		22 (1.6)	
Fireplace	Seasoned pine	1.8 (0.10)	5.9 (0.32)		1.4 (0.08)		21 (1.2)	
Fireplace	Green pine	2.9 (0.21)	9.1 (0.67)		1.7 (0.13)		15 (1.1)	0.036 (0.0026)
Baffled stove	Seasoned oak	3.0 (0.17)	4.0 (0.22)		0.4 (0.02)		110 (6.2)	0.21 (0.012)
Baffled stove	Green oak	2.5 (0.19)	3.8 (0.28)		0.7 (0.05)		120 (9.0)	
Baffled stove	Seasoned pine	3.9 (0.21)	4.1 (0.23)	2.8 (0.15)	0.5 (0.03)		270 (15)	0.37 (0.020)
Baffled stove	Green pine	7.0 (0.51)	12 (0.88)		0.8 (0.06)		220 (16)	
Nonbaffled stove	Seasoned oak	2.5 (0.14)	6.0 (0.34)		0.4 (0.02)	0.16 (0.009)	370 (21)	0.19 (0.011)
Nonbaffled stove	Green oak	1.8 (0.13)	3.3 (0.25)	0.3 (0.02)	0.5 (0.04)		91 (6.8)	
Nonbaffled stove	Seasoned pine	2.0 (0.11)	5.6 (0.31)		0.2 (0.01)	0.24 (0.013)	150 (8.2)	
Nonbaffled stove	Green pine	6.3 (0.46)	10 (0.74)	3.0 (0.22)	0.4 (0.03)		97 (7.1)	0.32 (0.024

a Units in g/kg refer to grams of pollutant per kilogram of fuel burned, with no allowance for moisture content.
b Blanks indicate no data were obtained

SECONDARY SOLID WASTE IN REGION I FORECAST BY THE RESIDUAL ACCOUNTING MODEL

Introduction — The Residual Accounting Model

The Residual Accounting Model (RAM) was constructed to meet the Agency's need for an easily accessible computer model capable of predicting emissions of a variety of pollutants. The data here represents the latest revisions to the Model as programmed by the Mitre Corp for EPA and U.S. Department of Energy.

The Problem

The Residual Accounting Model shows that between base year 1975 and interim year 1985 annual secondary solid waste tonnage (ashes and sludges) will increase 3½ times in New England amounting to 4.6 million tons in 1985. By the year 2000, assuming compliance with air and water quality standards, implementation of the "associated primary pollutants" (a caveat basic to the output of RAM) will result in a six-fold increase in Region I's annual aggregated tonnage.

The Categories

Three categories of secondary solid wastes are:

1) **noncombustible solid waste,** (a) ash/dust particulates (fly ash) captured by control processes primarily in the wastestreams of coal combustion facilities and cement plants; and (b) bottom ash, another coal combustion residual,

2) **industrial sludge,** (a) sludges from various wastewater treatment processes of industry; and (b) sludges generated by the removal of sulfur oxides and particulates from combusion stack gases using wet scrubbers, and

3) **municipal sewage sludge,** sludge generated by the removal of organic matter and suspended solids by municipal wastewater treatment processes reported in dry short tons.

Discussion

RAM data shows that all types of secondary solid waste will be generated in New England at a faster pace than in the U.S. as a whole. The Model assumes that the conversion of all federally designated oil to coal power facilities will have been completed by 2000. It predicts that 4.3 million tons of fly ash (particulates) will have been captured annually by the end of the century. SO^2 sludges will amass at an even greater rate, growing from near zero levels in 1975 to over 2 million tons by the year 2000. Electric power generation in New England will account for 82 percent of the scrubber sludge, 75 percent of the bottom ash and roughly half the captured particulates by the year 2000. Together the tonnage amassed by the power industry for these secondary control wastes will amount to 3.9 million tons or approximately 52 percent of all secondary solid waste in Region I.

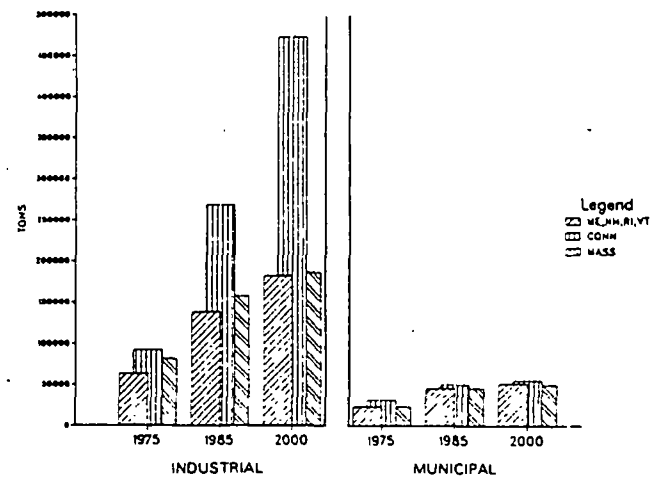
In addition to the electric power industry, other industries routinely contributing large amounts of such waste, will continue to be a major part of the solid waste problem. Producers of asphalt and tar mixtures used for paving roads, parking lots and other purposes and also manufacturers of roofing, siding and coatings from asphalt are major contributors. In base year 1975, firms accounted for 37 percent or 282,600 tons of the particulate dust/ash accumulations. During the period under review 1975 to 2000, the Model predicts that secondary solid waste annually generated by plants in these activities will rise 3¼ times to roughly 2 million tons.

Factories producing building materials, primarily cement gypsum and other stone and clay products, are the next largest industrial cause of secondary solid waste problems in the Region. In base year 1975, plants in this group amassed 170,000 tons of waste dust and sludge. These wastes are estimated to rise only 35 percent over the 25-year projection period.

The last industrial category identified as a large generator of secondary solid waste in the Region is the pulp and paper industry. New England paper manufacturers in 1975 generated 13 percent of the Region's total industrial sludge or 30,700 tons. The Model anticipates that technology will improve further its productive efficiencies through the year 2000, when New England's pulp and paper industry will generate 86,100 tons or only three percent of the Region's industrial sludge.

Wastewater treatment sludge accumulations are outlined in the Figure below. Although the chart shows marked increases in industrial wastewater treatment sludges, Model users are cautioned that this is the only residual waste under review lacking complete coverage. Nevertheless, portraying both municipal and industrial wastewater treatment sludges on the same Figure, using the same scale of measurement, reveals substantial accumulation of sludges by industry when compared with that produced by municipal wastewater treatment plants.

TRENDS IN SECONDARY SOLID WASTE WASTEWATER SLUDGE: INDUSTRIAL VS MUNICIPAL REGION 1, 1975, 1985, 2000



Although municipal wastewater sludges are accumulating at only one-fifth the rate of industrial sludges, the anticipated completion and efficient operation of new and existing wastewater treatment facilities in the Region will result in collecting as much sludge over the 25 year period according to RAM.

WATER

STATUS OF WATER QUALITY 1982 State of CONNECTICUT

Major Water Areas (Including Mainstem & Major Tributaries)	Total Miles Assessed	Miles Meeting Class B ("Fishable/ Swimmable" Standards) or Better	Miles Meeting State Water Quality Standards	Miles Not Meeting State Water Quality Standards	*Water Quality Problems	Source of Water Quality Problems M = Municipal I = Industrial CS = Combined Sewers NPS = Nonpoint Source
Connecticut River	158	88	88	70	2,6	M,I,CS,NPS
Park River	12	2	2	10	2,5,6	I,CS,NPS
Farmington River	71	68	68	3	2,5,6	M,I
Pequabuck River	15	3	3	12	2,5,6	M,I,NPS
Housatonic River	184	112	112	72	1,3,6	M,I,CS,NPS
Naugatuck River	50	22	22	28	1,2,5,6	M,I,CS,NPS
Thames River	107	84	84	23	2,5,6	M,I,CS,NPS
French River	6	0	0	6	2,5,6	M,I
Quinebaug River	42	26	26	16	2,5,6	M,I,NPS
Willimantic River	27	27	27	0	---	M,NPS
Shetucket River	18	15	15	3	2,5,6	M,CS,NPS
Central Connecticut Coastal	96	87	87	9	2,5,6	M,I,CS,NPS
Quinnipiac River	34	7	7	27	2,5,6	M,I,CS,NPS
Western Connecticut Coastal	98	89	89	7	2,5,6	M,CS,NPS
Eastern Connecticut Coastal	35	35	35	0	6	NPS
Pawcatuck River	10	10	0	0	---	---
	963	675	675	288		
% of Miles Assessed		70%	70%	30%		

*Water Quality Problems:
1. Toxic or hazardous substances
2. Suspended solids, temp., pH
3. Nutrient enrichment
4. Salinity, acidity, alkalinity
5. Oxygen depletion
6. Coliform bacteria

STATUS OF WATER QUALITY 1982 State of MAINE

Major Water Areas (Including Mainstem & Major Tributaries)	Total Miles Assessed	Miles Meeting Class B ("Fishable/ Swimmable" Standards) or Better	Miles Meeting State Water Quality Standards	Miles Not Meeting State Water Quality Standards	*Water Quality Problems	Source of Water Quality Problems M = Municipal I = Industrial CS = Combined Sewers NPS = Nonpoint Source
Androscoggin River	112	22	112	0	2,6	M,I,CS
Little Adroscoggin	48	22	42	6	1,2,5,6	M,I,CS
Nezinscot River	30	30	30	0	---	---
Coastal Basins						
Machias River	32	31	32	0	2,6	CS
Narraguagus River	48	48	48	0	---	---
St. Georges River	42	41	42	0	2,6	CS
Sheepscot River	55	55	55	0	---	---
Union River	39	37	39	0	2,6	CS
Kennebec River	200	115	200	0	2,6	M,I,CS,NPS
Carrabasset Stream	43	42	43	0	2,6	M,CS
Dead River	74	74	74	0	---	---
Moose River	65	59	65	0	2,6	CS
Sandy River	70	70	70	0	---	---
Sebasticook River	98	44	44	54	2,3,5	M,I,CS
Penobscot River (main stem)	99	0	99	0	2,6	M,I,CS
Bashahegan Stream	48	38	48	0	2,6	CS
Kenduskeag Stream	33	31	33	0	2,6	CS
Mattawamkeag Stream (main stem)	43	38	43	0	2,6	CS
Mattawamkeag (EB)	34	34	34	0	---	---
Mattawamkeag (WB)	40	34	40	0	2,6	CS
Medomak River	36	36	36	0	---	---
Molunkus Stream	39	39	39	0	---	---
Passadumkeag River	45	45	45	0	---	---
Penobscot (EB)	102	102	102	0	---	---
Penobscot (WB)	41	10	24	17	2,5	M,I
Piscataquis River	67	38	67	0	2,6	CS
Pleasant River	30	30	30	0	---	---
Presumpscot River	24	15	17	7	2,6	M,I,CS
Crooked River	42	42	42	0	---	---
St. Croix River	52	42	42	10	2,5,6	M,I,CS
St. John River	154	109	116	38	2,4	M,I,CS
Allagash River	69	69	69	0	---	---
Aroostock River	100	72	72	28	2,5,6	CS,NPS
Fish River	62	60	62	0	2,6	CS
Little Madawaska R.	41	41	41	0	---	---
Machias River	46	46	46	0	---	---
Meduxnekeag River	43	43	43	0	---	---
Presque Isle Stream	32	32	32	0	---	---
Southern Maine Basins						
Goosefare Brook	25	0	0	25	1,5,6	M,I
Mousam River	24	12	12	12	2,5,6	I,CS
Salmon Falls River	36	36	36	0	---	---
Saco River	81	79	79	2	2,6	CS
Total Miles	2444	1863	2245	199		
% Miles Assessed		76%	92%	8%		

STATUS OF WATER QUALITY 1982 State of MASSACHUSETTS

Major Water Areas (including mainstem & major tributaries)	Total Miles Assessed	Miles Meeting Class B ("Fishable/Swimmable" Standards) or Better	Miles Meeting State Water Quality Standards	Miles Not Meeting State Water Quality Standards	*Water Quality Problems	Source of Water Quality Problems M - Municipal I - Industrial CS - Combined Sewers NPS - Nonpoint Source
Blackstone River	85	36	36	49	1,2,3,5,6	M,I,CS,NPS
Boston Harbor Tributaries	81	11	11	70	2,3,5,6	M,I,CS,NPS
Buzzards Bay	77	69	69	8	1,3,5,6	M,I,CS,NPS
Cape Cod **	(58)	(35)	(35)	(23)	2,5,6	M,I,NPS
Charles River	78	62	62	16	3,4,5,6	M,I,CS,NPS
Chicopee River	124	87	87	37	1,2,3,5,6	M,I,CS,NPS
Connecticut River	80	61	61	19	1,2,3,6	M,I,CS
Deerfield River	79	67	67	12	1,2,6	M,I
Farmington River	25	25	25	0	---	---
French & Quinebaug River	70	25	25	45	1,2,3,5,6	M,I,NPS
Hoosic River	40	12	12	28	1,6	M,I,NPS
Housatonic River	84	22	22	62	1,3,5,6	M,I,NPS
Ipswich & Parker Rivers	63	54	54	9	5,6	NPS
The Islands **	(26)	(25)	(25)	(1)	2,6	M,I,NPS
Merrimack River	108	33	33	75	3,5,6	M,I,CS,NPS
Millers River	48	26	26	22	2,3,5,6	M,I,CS
Nashua River	106	8	8	98	3,5,6	M,I,CS,NPS
North Coastal **	29 (7)	5 (6)	5 (6)	24 (1)	5,6	M,I,NPS
North River	34	26	26	8	2,3,5,6	M,NPS
South Coastal **	7 (6)	0 (2)	0 (2)	7 (4)	2,3,5,6	M,I,CS,NPS
SuAsCo	89	26	26	63	3,5,6	M,CS,NPS
Taunton River	175	50	50	125	1,2,3,4,5,6	M,I,CS,NPS
Ten Mile River	23	4	4	19	2,3,5,6	M,CS,NPS
Westfield River	106	72	72	34	2,6	
Total Miles	1611	781	781	830		
% of Miles Assessed		48%	48%	52%		

**Numbers in parentheses represent segments, not stream miles, in these basins, due to their coastal location.

STATUS OF WATER QUALITY 1982 State of NEW HAMPSHIRE

Major Water Areas (Including Mainstem & Major Tributaries)	Total Miles Assessed	Miles Meeting Class B ("Fishable/Swimmable" Standards) or Better	Miles Meeting State Water Quality Standards	Miles Not Meeting State Water Quality Standards	*Water Quality Problems	Source of Water Quality Problems M - Municipal I - Industrial CS - Combined Sewers NPS - Nonpoint Source
Androscoggin River	78	59	59	19	2,6	M,I,CS,NPS
Connecticut River	339	130	132	207	2,5,6	M,I,CS,NPS
Ashuelot River	76	36	36	40	2,5,6	M,I,CS
Ammonoosuc River	62	36	36	26	6	M,CS
Merrimack River	235	120	123	112	2,5,6	M,I,CS,NPS
Pemigewasset River	124	124	124	0	---	---
Contoocook River	108	70	70	38	6	M
Nashua River	10	0	0	10	2,6	M,I,CS, from MA
Piscataqua River and Coastal Basins	183	122	122	61	2,5,6	M,I,CS,NPS
Saco River	94	94	94	0	6	M, I
Total Miles	1309	791	796	513		
% of Miles Assessed		60%	61%	39%		

STATUS OF WATER QUALITY 1982 State of RHODE ISLAND

Major Water Areas (Including Mainstem & Major Tributaries)	Total Miles Assessed	Miles Meeting Class B ("Fishable/Swimmable" Standards) or Better	Miles Meeting State Water Quality Standards	Miles Not Meeting State Water Quality Standards	*Water Quality Problems	Source of Water Quality Problems M - Municipal I - Industrial CS - Combined Sewers NPS - Nonpoint Source
Blackstone River	89	48	76	13	5,6	M,I,CS
Moosup River	25	25	25	0	---	---
Moshassuck River	17	8	15	2	5,6	M,CS,NPS
Pawcatuck River	115	93	93	22		M,I
Pawtuxet River	60	28	43	17	1,5,6	M,I
Woonasquatucket River	23	14	23	0	5,6	M,CS,NPS
Estuarine Areas & Salt Ponds (acres)	117,000 acres	106,000 acres	106,000 acres	11,000 acres	6	MS,I,NPS,CS
Total Miles	329	216	275	54		
% of Miles Assessed		66%	84%	16%		

*Water Quality Problems:
1. Toxic or hazardous substances
2. Suspended solids, temp., pH
3. Nutrient enrichment
4. Salinity, acidity, alkalinity
5. Oxygen depletion
6. Coliform bacteria

STATUS OF WATER QUALITY 1982 State of VERMONT

Major Water Areas (Including Mainstem & Major Tributaries)	Total Miles Assessed	Miles Meeting Class B ("Fishable/ Swimmable" Standards) or Better	Miles Meeting State Water Quality Standards	Miles Not Meeting State Water Quality Standards	*Water Quality Problems	Source of Water Quality Problems M = Municipal I = Industrial CS = Combined Sewers NPS = Nonpoint Source
Battenkill, Walloomsac, Hoosic Rivers	47	28	30	17	5,6	M,I,CS
Poultney, Mettawee Rivers	44	30	42	2	6	M,NPS
Otter Creek	85	64	79	6	5,6	M,CS,NPS
Lake Champlain Tributaries	23	6	13	10	2,3,5	M,I,CS,NPS
Missisquoi River	93	79	85	8	5,6	I,CS,NPS
Lamoille River	97	89	97	0	5,6	M,CS,NPS
Winooski River	116	65	99	17	2,3,5,6	M,I,CS,NPS
White River	69	58	63	6	6	M,CS
Ottauquechee, Black Rivers	63	40	50	13	1,6	M,I,CS
West, Williams Saxtons Rivers	86	78	82	4	6	M
Deerfield Rivers	34	30	32	2	6	M
Connecticut River*	---	---	---	---	2,5,6	M,I,CS,NPS
Stevens, Wells Waits, Ompompanoosuc Rivers	17	7	8	9	1,4,6	I,NPS
Passumpsic River	47	25	33	14	5,6	M,CS
Lake Memphremagog, Black, Barton and Clyde Rivers	67	56	63	4	2,3,6	M,CS,NPS
Total Miles	888	655	776	112		
% of Miles Assessed		74%	87%	13%		

*Connecticut River mileage tabulated in New Hampshire Section.

*Water Quality Problems:
1. Toxic or hazardous substances
2. Suspended solids, temp., etc.
3. Nutrient enrichment
4. Salinity, acidity, alkalinity
5. Oxygen depletion
6. Coliform bacteria

PRIORITY LAKE RESTORATION PROJECTS IN NEW ENGLAND
ESTIMATED COST OF CLEAN UP

Connecticut

West Hill Pond	$ 60,000
Middle and Lower Bolton Lakes	150,000
Silver Lake	3,500,000
Coventry Lake	60,000
Ball Pond	100,000
Highland Lake	125,000

Maine

Lovejoy Pond	$ 100,000
Webber Pond	400,000
Three Mile Pond	400,000
Tooth Acker Pond	75,000
Togus Pond	100,000
Cochnewagon Pond	200,000
Echo Lake	100,000

Massachusetts

Spy Pond	$ 720,000
Porter Lake	1,100,000
Pontoosuc Lake	336,000
Congamond Lake	100,000
Webster Lake	320,000

New Hampshire

Doors Pond	$ 125,000
Crystal Lake	60,000
Hot Hole Pond	55,000
Northwood Pond	45,000
Kezar Lake	60,000

Rhode Island

Gorton Pond	$1,000,000
Tiogue Lake	820,000
Olney Pond	215,000
Worden Pond	5,000,000
Wilson Reservoir	610,000
Slacks Reservoir	750,000

Vermont

Harvey's Lake	$ 200,000
Lake Morey	400,000
Lake Iroquois	250,000
Lake Champlain	1,000,000
Lake Memphremagog	250,000
Lake St. Catherine	250,000

GLOSSARY OF TERMS AND ACRONYMS

BAT	— Best Available Treatment
BMP	— Best Management Practice
BOD	— Biochemical Oxygen Demand
BPJ	— Best Professional Treatment
CT DEP	— Connecticut Department of Environmental Protection
CWA	— Clean Water Act
CSO	— Combined Sewer Overflows
DO	— Dissolved Oxygen
EMR	— Environmental Management Report
EPA	— US Environmental Protection Agency
FDA	— US Food and Drug Administration
HQ	— Headquarters
MADECE	— Massachusetts Department of Environmental Quality Engineering
MADWPC	— Massachusetts Division of Water Pollution Control (Division of MADEQE)
MCL	— Maximum Contaminant Level
mg/l	— Milligrams per liter
MDC	— Metropolitan District Commission (Boston, MA)
M/r	— Monitoring and Reporting
NIPDWR	— National Interim Primary Drinking Water Regulations
NPDES	— National Pollutant Discharge Elimination System Permit Program
OCS	— Outer Continental Shelf
OMB	— US Office of Management and Budget
PCB	— Polychlorinated Biphenyls
POTW	— Publicly Owned Treatment Works
PWS	— Public Water System
RCWP	— Rural Clean Water Program
SDWA	— Safe Drinking Water Act
SEA	— State/EPA Agreement
SCS	— Soil Conservation Service, US Department of Agriculture
WWTF	— Wastewater Treatment Facility

REFERENCED SECTIONS OF THE CLEAN WATER ACT (CWA)

106 Funding	— Grants for Pollution Control
201 Grants	— Funding for the Construction of municipal wastewater treatment plants
301(h) Waiver	— Waiver of Secondary Treatment for POTW
304(b) Report	— Water Quality Inventory Report mandated by Section Section 305(b) of CWA
314 Program	— Clean Lakes Program
402 Permits	— NPDES Permits
404 Permits	— Permits for Dredged and Fill Material

LAND

CHART A-A
NPL SITE MATRIX

SITE NAME LOCATION	SOURCE OF CONTAMINANTS: LAGOON	LANDFILL LAND DISPOSAL	DRUMS/TANKS	PILES	SLUDGES/ SEDIMENTS/SOILS	LEACHFIELD	TYPE OF CONTAMINANT: VOLATILES	PESTICIDES	HEAVY METALS	PCBs	OILS/SLUDGES	OTHER	ROUTES OF CONCERN: GROUND WATER	SURFACE WATER	AIR
Charles/George Tyngsborough		●	●				●		●				●	●	
Silresim Lowell			●				●	●	●	●	●		●		
PSC Resources Palmer	●		●			●	●	●	●	●	●	●	●	●	●
Resolve, Inc. Dartmouth	●				●		●		●	●	●		●	●	
Baird & McGuire Holbrook	●					●	●	●	●				●	●	
Wells G&H Woburn	●		●	●			●		●				●	●	
Nyanza Waste Dump Ashland	●	●			●		●		●		●		●	●	●
W.R. Grace Acton	●	●	●	●	●		●				●		●		●
Groveland G&H Groveland		●				●	●						●		
Industriplex-128 Woburn	●	●		●			●		●				●	●	●
New Bedford Harbor New Bedford		●			●				●	●			●	●	●
Hocomoco Pond, Westborough					●		●				●		●	●	
Cannon Engineering Plymouth			●				●				●		●	●	
Cannon Engineering Bridgewater			●				●						●	●	
Sylvester's Nashua			●			●	●		●				●	●	●
Keefe Env. Services Epping	●		●		●		●	●	●	●	●		●		●
Ottati & Goss Kingston	●		●	●			●			●	●		●	●	
Tinkham Garage Londonderry		●					●			●	●		●	●	
Auburn Rd. L.F. Londonderry		●	●		●		●						●	●	
Dover Mun. L.F. Dover		●			●		●		●				●	●	
Somersworth L.F. Somersworth		●					●						●	●	
Beacon Heights L.F. Beacon Falls		●					●						●	●	
Laurel Park Naugatuck		●					●		●				●	●	
Yaworski Waste Lagoon Canterbury	●		●				●						●	●	
SRS Southington		●					●		●				●	●	
Old Springfield L.F. Springfield		●					●		●				●	●	
Pine Street Canal Burlington		●			●		●		●	●			●	●	
Forestdale Forestdale		●	●				●						●		
Peterson-Puritan Lin. Cumberland		●				●	●						●		
LLRR N. Smithfield		●					●	●	●				●		
Picillo Farm Site Conventry		●	●	●			●	●	●	●			●	●	
Davis Liquid Smithfield		●	●				●		●		●		●	●	
Western Sand & Gravel Burriville	●				●		●		●	●	●		●	●	
Winthrop L.F. Winthrop		●					●	●	●			●	●	●	
Sacco Tanning Sacco	●								●			●	●	●	
Pinettes Salvage Washburn					●					●	●		●		
F. O'Connor Site Augusta	●	●	●						●	●	●		●		
McKinn Site Gray	●		●				●			●	●		●		

SITE NAME LOCATION	POPULATION USING GROUND WATER WITHIN 3 MILE RADIUS				CURRENT STATUS: REMEDIAL			CURRENT STATUS: ENFORCEMENT				
	< 1000	1000-3000	3000-10,000	> 10,000	RAMP	RI-FS	RD	RC	POTENTIAL ASSESSED	ENFORCEMENT INITIATED	CASE SETTLED	PRIVATE PARTY CLEANUP
Charles/George Tyngsborough		●			●				●			
Silresim Lowell			●		●							
PSC Resources Palmer			●		●							
Resolve, Inc. Dartmouth	●				●	●						
Baird & McGuire Holbrook			●		●							
Wells G&H Woburn			●		●				●			
Nyanza Waste Dump Ashland			●		●	●			●			
W.R. Grace Acton				●	●	●						●
Groveland G&H Groveland			●		●							
Industriplex-128 Woburn				●	●				●			
New Bedford Harbor New Bedford			●		●				●			
Hocomoco Pond Westborough				●	●							
Cannon Engineering Plymouth			●		●							
Cannon Engineering Bridgewater				●	●							
Sylvester's Nashua			●					●	●			
Keefe Env. Services Epping			●		●				●	●		
Ottati & Goss Kingston			●		●					●		
Tinkham Garage Londonderry			●		●							
Auburn Rd. L.F. Londonderry		●										
Dover Mun. L.F. Dover			●		●							
Somersworth L.F. Somersworth				●	●							
Beacon Heights L.F. Beacon Falls	●				●							
Laurel Park Naugatuck	●				●							
Yaworski Waste Lagoon Canterbury	●											
SRS Southington			●					●				●
Old Springfield L.F. Springfield	●				●				●			
Pine Street Canal Burlington				●	●	●			●			
Forestdale Forestdale		●							●			●
Peterson-Puritan Un. Cumberland				●					●	●		●
LLRR N. Smithfield			●		●							
Picillo Farm Site Conventry		●				●	●		●			
Davis Liquid Smithfield			●									
Western Sand & Gravel Burriville			●									
Winthrop L.F. Winthrop		●							●			
Sacco Tanning Sacco	●				●							
Pinettes Salvage Washburn		●			●				●			
F. O'Connor Site Augusta		●			●							
McKinn Site Gray			●		●							

FIGURE A-B

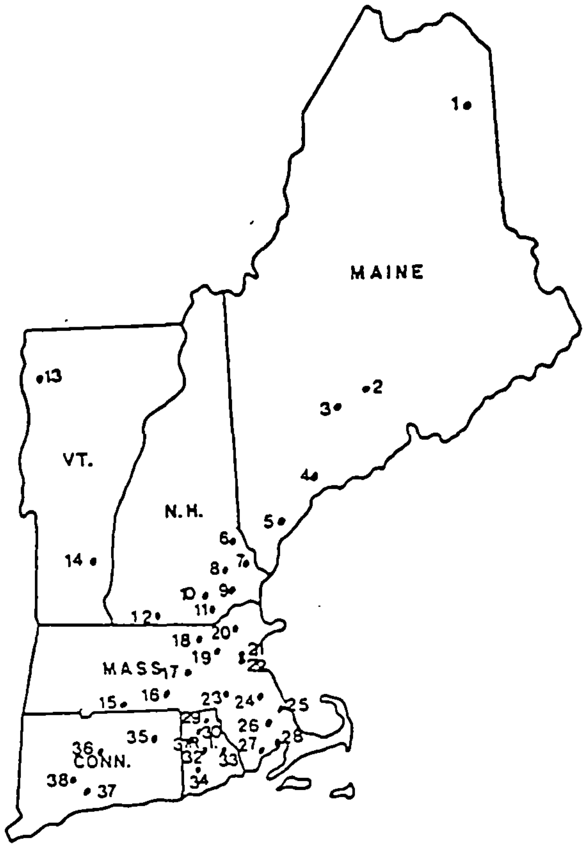


TABLE A-1
PRIMARY RADIONUCLIDES IN MASSACHUSETTS WASTE WASTE STREAM IN 1981:

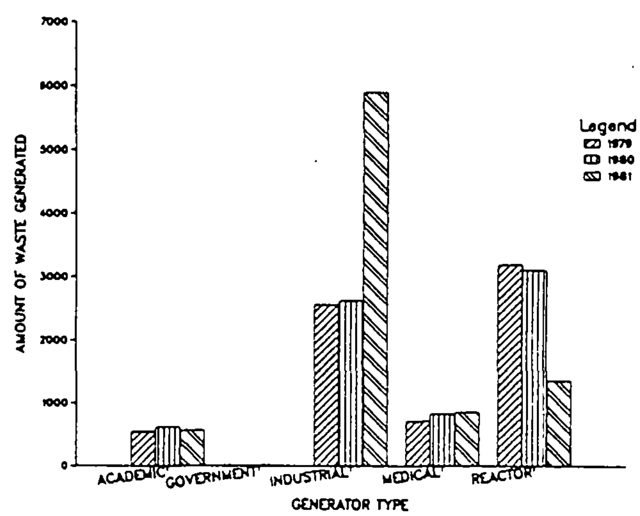
Radionuclides	Curies	Half-life	Radiation emitted
ACADEMIC			
Carbon-14	3.4	5730 years	beta
Hydrogen-3 (tritium)	73.0*	12.3 years	beta
Iodine-125	3.9	60.2 days	gamma
Phosphorus-32	2.3	14.3 days	beta negative
Rubidium	1	18.7 days	beta neg., gamma
INDUSTRIAL			
Carbon-14	490.3	5730 years	beta
Chromium-51	1	27.8 days	gamma
Cesium-137	234	30 years	alpha, gamma
Hydrogen-3	113,803*	12.3 years	beta
Iodine-125	112.4	60 days	gamma
Iridium-192	47	74 days	beta neg., gamma
Strontium-90	17	28.1 years	beta
Uranium-238	298*	4.51×10^9 years	alpha, gamma
Zinc-65	30	245 days	beta positive, gamma
MEDICAL			
Hydrogen-3	10.9	12.3 years	beta
Iodine-125	1.6	60 days	gamma
Iridium-192	11	74 days	beta neg., gamma
REACTOR			
Barium/La-140	15*	40.2 days	beta neg., gamma
Cobalt-58	220*	71.3 days	beta, gamma
Cobalt-60	2641*	5.2 years	beta, gamma
Chromium-51	35*	27.8 days	gamma
Cesium-134	163*	2.05 years	beta, gamma
Cesium-137	335*	30 years	alpha, gamma
Iron-55	4832*	2.6 years	gamma
Iron-59	4*	45.6 days	beta, gmma
Iodine-131	5*	8 days	beta neg., gamma
Manganese-54	183*	303 days	gamma
Strontium-89	40*	10 days	
Strontium-90	7*	28.1 years	beta
Zinc-65	7*	245 days	beta pos., gamma

* three-year averages

REGION I NATIONAL PRIORITY SITES — KEY

1. Pinette's Salvage Yard, Washburn, ME
2. F. O'Connor Site, Augusta, ME
3. Winthrop Landfill, Winthrop, ME
4. McKin Site, Gray, ME
5. Saco Tanning Waste Pits, Saco, ME
6. Somersworth Landfill, Somersworth, NH
7. Dover Municipal Landfill, Dover, NH
8. Keefe Environmental Services, Epping, NH
9. Ottati & Goss/Kingston Steel Drum, Kingston, NH
10. Auburn Road Landfill, Londonderry, NH
11. Tinkham Site, Londonderry, NH
12. Sylvester's Site, Nashua, NH
13. Pine Street Canal Site, Burlington, VT
14. Old Springfield Landfill, Springfield, VT
15. PSC Resources, Palmer, MA
16. Hocomoco Pond, Westboough, MA
17. W.R. Grace, Acton, MA
18. Charles George Land Reclamation Trust Landfill, Tyngsborough, MA
19. Silresim Chemical Corporation, Lowell, MA
20. Groveland Wells 1 & 2, Groveland, MA
21. Industri-plex 128, Woburn, MA
22. Wells G & H, Woburn, MA
23. Nyanza Chemical Waste Dump, Ashland, MA
24. Baird & McGuire, Inc., Holbrook, MA
25. Plymouth Harbor Cannon Engineering Corporation, Plymouth, MA
26. Cannon Engineering Corporation, Bridgewater, MA
27. ReSolve, Inc., Dartmouth, MA
28. New Bedford Sites, New Bedford, MA
29. Forestdale-Stamina Mills, Forestdale, RI
30. Landfill & Resource Recovery, North Smithfield, RI
31. Western Sand & Gravel Site, Burrillville, RI
32. Davis Liquid Waste Site, Smithfield, RI
33. Peterson-Puritan, Lincoln/Cumberland Wellfield, RI
34. Picillo Farm Site, Coventry, RI
35. Yaworski Waste Lagoon, Canterbury, CT
36. Solvents Recovery Services, Southington, CT
37. Beacon Heights Landfill, Beacon Falls, CT
38. Laurel Park, Inc., Naugatuck, CT

FIGURE A-C
LOW LEVEL WASTE GENERATED IN MASSACHUSETTS, BY TYPE OF GENERATOR



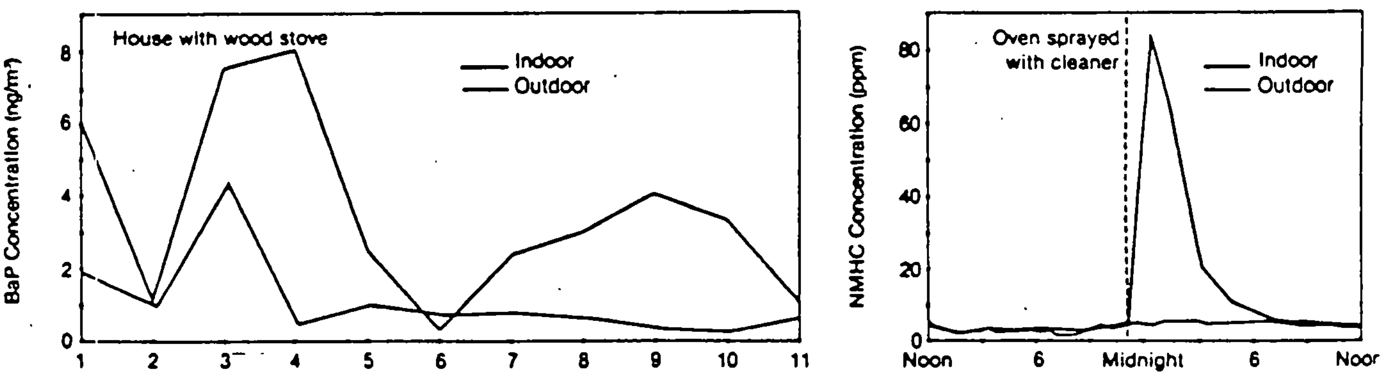
AIR

TABLE A-1

TOTAL RESIDENTIAL ENERGY CONSUMPTION AND EXPENDITURES APRIL 1979 THROUGH MARCH 1980

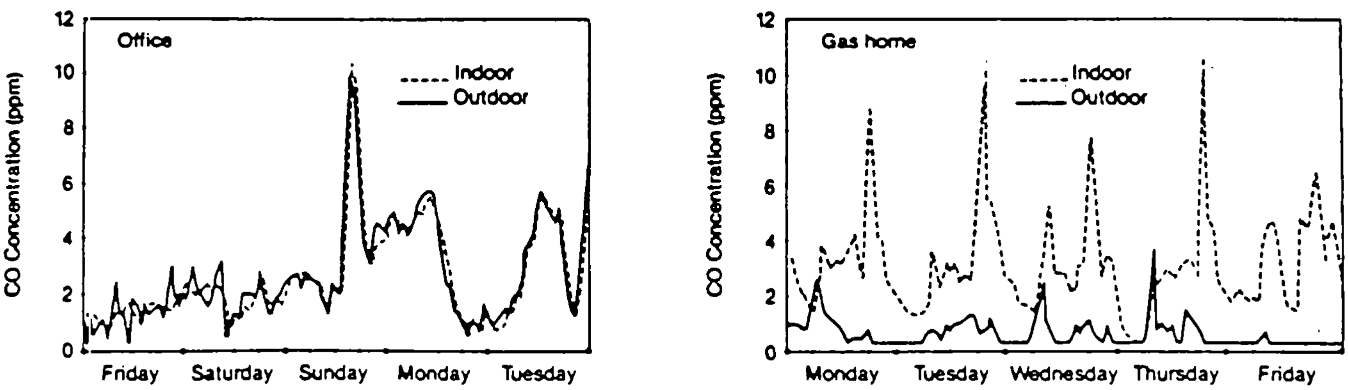
HOUSEHOLD CHARACTERISTICS	TOTAL HOUSEHOLD (MIL'N)	ALL FUELS: TOTAL AMOUNT CONSUMED (QUAD'N BTU)	ALL FUELS: AVG AMOUNT CONSUMED PER HOUSEHOLD (MIL'N BTU)	ALL FUELS: TOTAL EXPEND (BIL'N $)	ALL FUELS: AVG EXPEND PER HOUSEHOLD ($)	NATURAL GAS: TOTAL AMOUNT CONSUMED (QUAD'N BTU)	NATURAL GAS: TOTAL EXPEND (BIL'N $)	ELECTRICITY: TOTAL AMOUNT CONSUMED (QUAD'N BTU)	ELECTRICITY: TOTAL EXPEND (BIL'N $)	FUEL OIL AND KEROSENE: TOTAL AMOUNT CONSUMED (QUAD'N BTU)	FUEL OIL AND KEROSENE: TOTAL EXPEND (BIL'N $)	LIQUID PETROLEUM GAS: TOTAL AMOUNT CONSUMED (QUAD'N BTU	LIQUID PETROLEUM GAS: TOTAL EXPEND (BIL'N $)
TOTAL HOUSEHOLDS	77.5	9.74	126	63.2	815	5.31	17.8	2.42	32.6	1.71	10.7	0.307	2.06
CENSUS REGION													
NORTHEAST	17.2	2.90	146	17.8	1033	1.05	4.3	.39	6.8	1.00	6.5	029	35
NORTH CENTRAL	20.7	3.48	168	19.1	924	2.46	7.8	59	6.6	31	2.0	098	60
SOUTH	24.9	2.30	92	18.5	744	.91	3.1	.97	12.6	28	1.6	143	98
WEST	14.7	1.47	100	7.7	527	.88	2.6	.47	4.4	.09	6	037	22
URBAN/RURAL													
URBAN	58.8	7.41	130	45.3	797	4.66	15.7	1.52	21.8	1.17	7.4	061	45
RURAL	20.7	2.34	113	17.9	864	65	2.1	.90	10.8	54	3.3	246	1.61
SMSA/NON-SMSA													
SMSA	53.4	6.98	131	44.1	826	4.15	14.1	1.49	21.3	1.24	7.8	104	76
NON-SMSA	24.1	2.78	114	19.1	792	1.16	2.7	.90	11.2	46	2.9	203	1.31
AIA HEATING AND COOLING DEGREE DAY ZONES													
< 2000 CDD AND > 7000 HDD	6.7	94	141	5.6	841	52	1.7	21	2.6	19	1.2	032	20
< 2000 CDD AND 5500-7000 HDD	21.2	3.35	158	19.3	908	2.15	7.2	.59	8.3	55	3.4	063	37
< 2000 CDD AND 4000-5499 HDD	20.2	2.82	139	18.5	915	1.37	4.8	.60	8.3	.78	4.9	075	50
< 2000 CDD AND < 4000 HDD	17.5	1.62	92	11.4	649	81	2.6	.58	7.3	15	1.0	072	49
> 2000 CDD AND < 4000 HDD	11.9	1.02	86	8.4	709	46	1.5	44	6.1	05	3	075	50

FIGURE A-A



Patterns of household activity can have extreme effects on air quality in the home. In a residence with a wood stove (left), average levels of benzo-a-pyrene (BaP) were significantly higher than those outdoors except on days 2, 6, and 11, when the stove was not in use. In another case (right), a commercial oven cleaner caused levels of nonmethane hydrocarbons (NMHC) recorded in a kitchen to increase 16-fold in less than 90 minutes.

FIGURE A-B



The high air exchange rate in office environments where mechanical air-handling systems are used cuts indoor carbon monoxide (CO) concentrations to about the same levels recorded outdoors (left graph); indoor CO concentrations in all-electric residences are slightly higher, although they still track the outdoor changes very closely. In contrast, the significantly higher CO levels in a residence with gas facilities (right graph) do not closely follow changes in outdoor concentrations, being more dependent on indoor activities, such as cooking and heating. Note the regular occurrence of sharp peaks around the dinner hour.

Both From: "Air Quality in the Home", *EPRI Journal*, Mar. 1982, pp 7

TABLE A-2
CHRONOLOGICAL SUMMARY OF MAJOR U.S. INDOOR-OUTDOOR AIR QUALITY RESEARCH

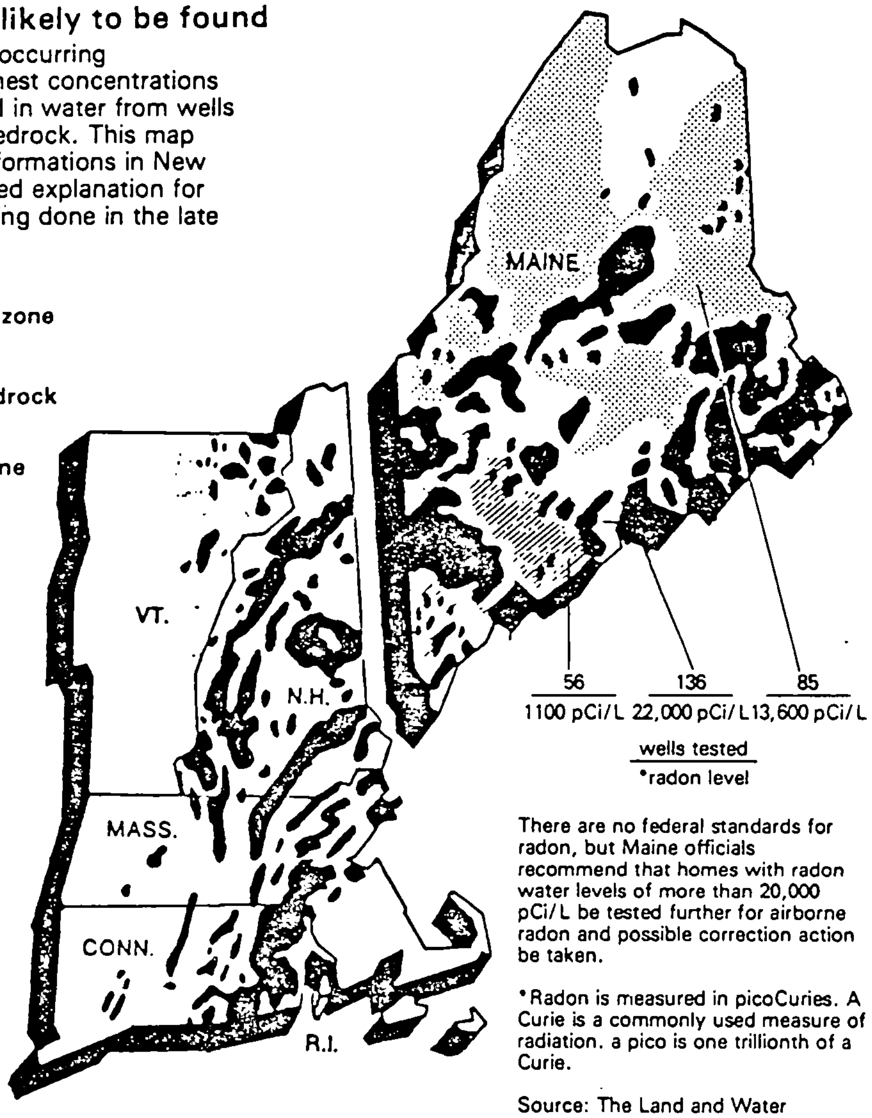
Research organization	Time period	Pollutants monitored	Locations of structures	Numbers and types of buildings monitored	Other features
TRC Environmental Consultants[1,2]	1969–70	CO, SO_2, total suspended and soiling particulate matter, particle sizing, benzene-soluble and lead content of particulate matter	Hartford, CT area	8 private homes with gas or electric stoves 2 non-air-conditioned public buildings (1 an air-rights structure) 2 air-conditioned office buildings	Data collected and analyzed on a 12-h day/night basis.
General Electric Co.[11]	1970–71	CO, hydrocarbons, total suspended particulate matter, Pb in particulate matter	New York, NY	2 high-rise apartment houses, an air-rights structure	Extensive meteorological and traffic survey data were collected.
University of California at Riverside[12]	1971	Total oxidant, peroxyacetyl nitrate, NO, NO_2, CO, and particulate matter	Southern California	4 hospitals 1 swimming pool 6 schools 1 department store 1 shopping mall 1 university building 2 private homes	Structures represented a range of ventilation and air-cleaning systems.
California Institute of Technology[13]	Early 1970s to present	Ozone, nitrogen oxides, CO, tracers	Southern California	Various types; mostly university buildings and houses	This is on-going work and consists of a variety of different research efforts and published papers.
TRC Environmental Consultants[14,15]	1973–74	CO, NO, NO_2	Hartford, CT area	4 homes with gas-fired stoves	Laboratory study to measure pollutant emissions from gas-fired stoves and heaters. Inventory of other indoor sources.
Harvard University Six Cities Study[16]	1975 to present	SO_2, NO_2, respirable particulate matter, sulfates, chemical analysis of particulate matter for metals	Portage, WI Kingston, TN Harriman, TN Watertown, MA St. Louis, MO Steubenville, OH	Approximately 10 homes in each city plus personal monitoring situations.	On-going program for development of indoor, outdoor and total exposure of pollutants in support of large epidemiological study. A large number of published articles and research reports have been generated.
GEOMET, Inc.[4,17]	1976–78	CO, SO_2, NO, NO_2, O_3, NMHC, total and respirable particulate matter, sulfates, nitrates, metals, aldehydes, ammonia, asbestos fibers	Washington, D.C. Denver, CO Chicago, IL Baltimore, MD Pittsburgh, PA	3 experimental dwellings 4 conventional dwellings 1 school 6 apartments (high- and low-rise) 2 mobile homes 1 hospital	Literature search. Development and validation of indoor air quality model. Evaluation of episodic releases of pollutants indoors.
Lawrence Berkeley Laboratory[18]	1977 to present	CO, CO_2, NO, NO_2, O_3 formaldehyde, adelhydes, radon, total and respirable particulate matter, elemental analysis of particulate matter	Various locations throughout the U.S.	Various types of buildings and houses, usually in relation to energy conservation measures	Extensive data collected on indoor air quality in relation to air exchange rates. Measurement of emissions from indoor sources. Significant efforts on measurement methods development.
TRC Environmental Consultants[7]	1977–79	CO, NO, NO_2, O_3 (under subcontract to Xonics, Inc.)	Garden Grove, CA West Los Angeles, CA Upland, CA	6 private homes with and without gas stoves, smoking and fireplaces	Part of a larger program to develop a model to characterize total human exposure to air pollutants. Study results showed variation in outdoor pollutant levels between central monitor and the homes being studied.
GEOMET, Inc.[4,19]	1978–79	CO, NO, NO_2, CO_2, O_3, SO_2, total and NMHC, total and respirable particulate matter, sulfates, nitrates and BaP	Boston, MA	10 residences with gas or electric stoves and with or without smoking occupants 2 office buildings	Personal monitoring at 3 residences. Validation of an indoor air quality model. Evaluation of interzonal indoor air quality. Development of mobility patterns and exposure estimates.

FIGURE A-8

Where radon is likely to be found

Radon is a naturally occurring radioactive gas. Highest concentrations are likely to be found in water from wells drilled into granite bedrock. This map shows such granite formations in New England and a detailed explanation for Maine based on testing done in the late 1970s.

- Sillimanite zone
- Granite bedrock
- Chlorite zone



There are no federal standards for radon, but Maine officials recommend that homes with radon water levels of more than 20,000 pCi/L be tested further for airborne radon and possible correction action be taken.

*Radon is measured in picoCuries. A Curie is a commonly used measure of radiation. a pico is one trillionth of a Curie.

Source: The Land and Water Resources Center, University of Maine at Orono, and the Division of Health and Engineering, Maine Department of Human Services.

Source: Dr. C. T. Hess, Department of Physics, University of Maine at Orono

GLOBE MAP BY DEB PERUGI

TABLE A-4
PREDICTED NO_2 FROM A KEROSENE HEATER
WITH R = 0.3, 1.0, AND 3.0 ACH

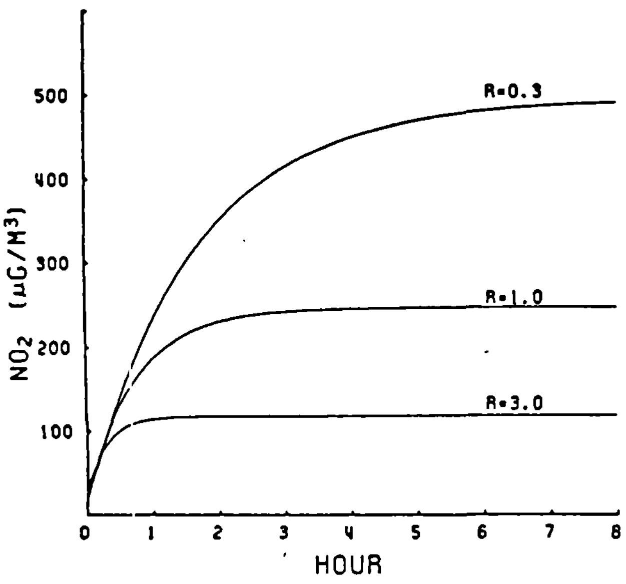


TABLE A-5
PREDICTED SO_2 FROM A KEROSENE HEATER
WITH R = 0.3, 1.0, AND 3.0 ACH

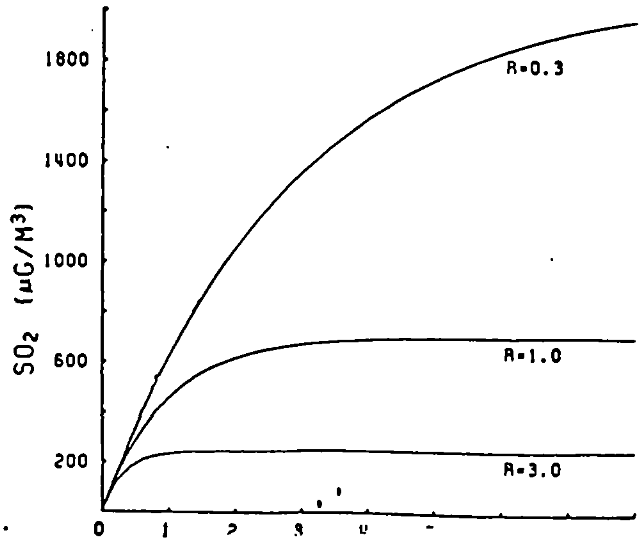


FIGURE A-C
OZONE AND CO NON-ATTAINMENT COUNTIES

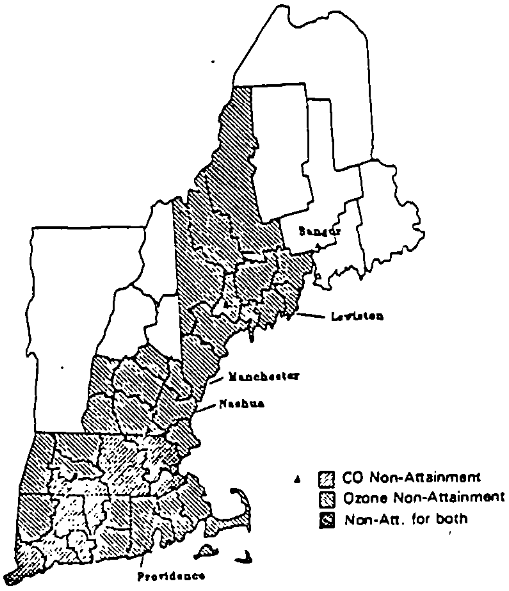


FIGURE A-D
TSP AND SULFUR DIOXIDE NON-ATTAINMENT COUNTIES

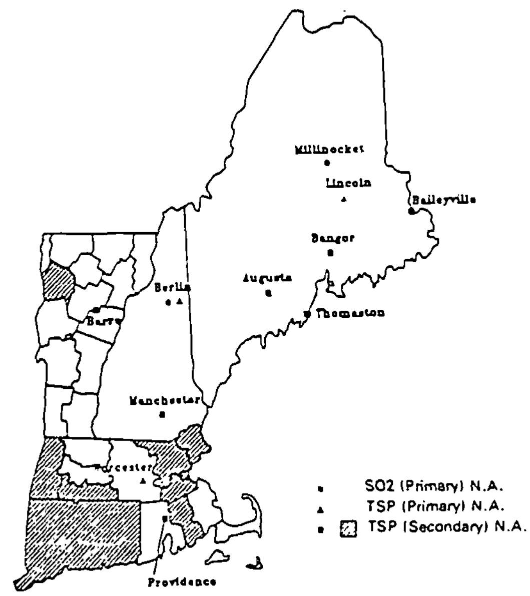


TABLE A-6
REGION I SIGNIFICANT VIOLATORS

STATE	CITY	SOURCE NAME/TYPE	POLLUTANT	ALLOWABLE EMISSIONS	ACTUAL EMISSIONS	COMMENTS
1. CT	Bridgeport	Bridgeport East Side Incinerator/Municipal Incinerator	TSP	.4 lbs/1000 lbs flue gas	1.3 lbs/1000 lbs flue gas	In violation of 1977 court decree to shut down. Further lit. in process.
2. CT	Waterbury	Century Brass Products Inc./Brass and Bronze Mill Products	Fugitive TSP	NA	NA	Referred to Justice on 8/7/80
3. CT	Union	Conn. Charcoal Co./ Industrial Charcoal Production	TSP	3.39 lbs/hr	91 lbs/hr	Case recently settled; compliance expected by 6/1/83
4. CT	West Haven	Deitsch Laminating/ Fabric Vinyl Coating	VOC	3.8 lb/gal of coating	5.82 lb/gal of coating	Referred to Justice on 7/1/82. Settlement under negotiation
5. CT	Plainfield	Pervel Industries, Inc./Urethane Fabric Coater	VOC	800 lbs/day	935 lbs/day	Awaiting enforcement action
6. CT	Groton	Electric Boat/Submarine construction and overhaul	VOC	3.5 lb/gal of coating	NA	State inspections determined noncompliance. EPA involvement pending
7. CT	New Haven	New Haven Terminal/ Gasoline and Chemical Storage and Loading	VOC	.67 lb/10_3 gal	1.45 lb/10_3 gal	Awaiting enforcement action
8. MA	Lawrence	Andrews Wilson Co./ Metal Furniture Coating	VOC	3.0 lb/gal coating	Line 1: 5.95 lb/gal Line 2: 4.6 lb/gal Line 3: X	State has enforcement lead
9. MA	Leominster	Borden Chemical/ PVC Chemical Production	Vinyl Chloride (NESHAPS)	0	10 tons (1982)	Administrative Order issued in 1979
10. RI	Providence	Narragansett Improvement/Asphalt Batching	TSP	10.7 tons/yr	26.7 tons/yr	Violating New Source Performance Standards/litigation ongoing
11. RI	Providence	Providence/Sewage Sludge Incinerator	TSP	23.9 tons/yr	31.3 tons/yr	EPA is negotiating an amended consent decree that requires additional O&M and incinerator upgrading