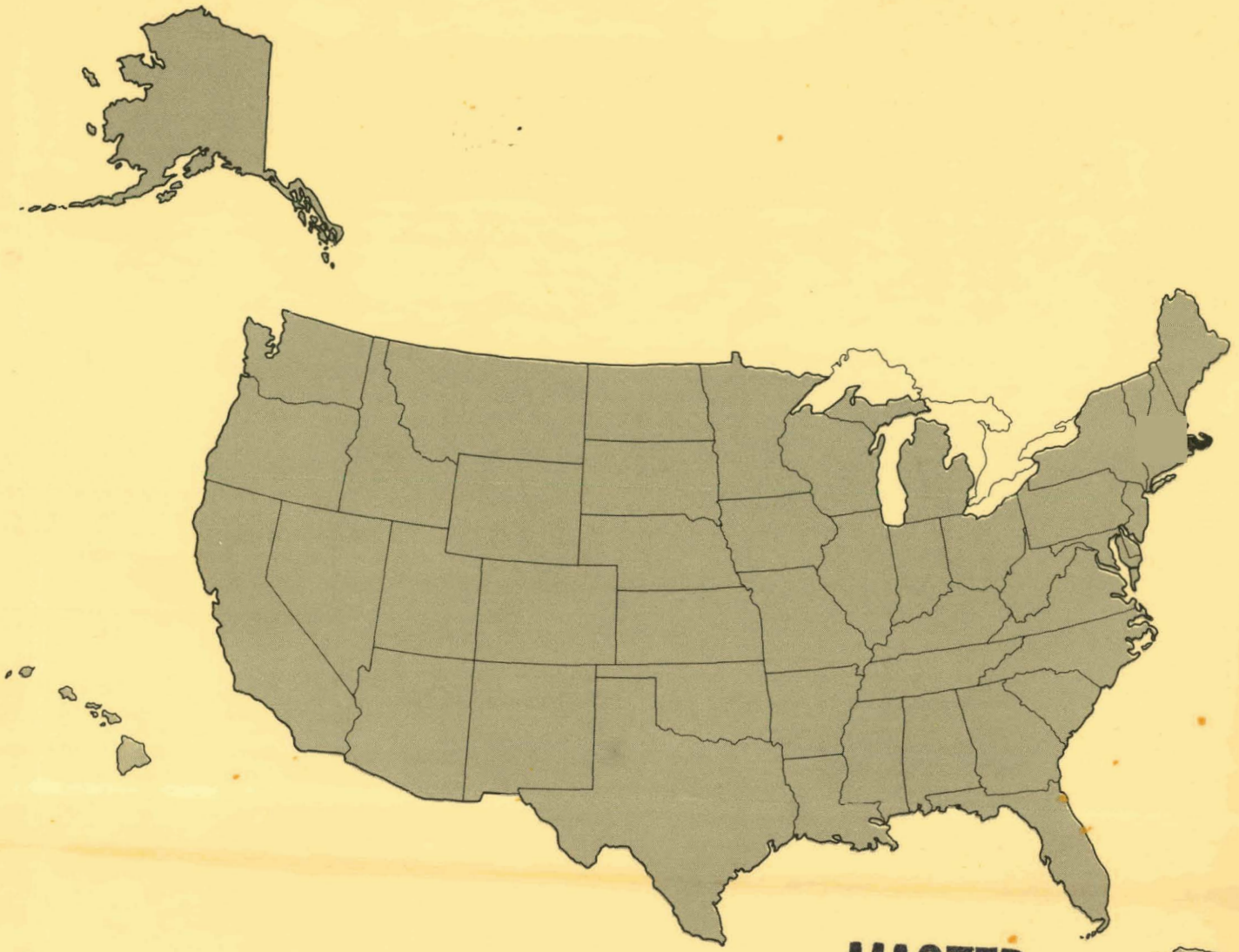

Massachusetts State Briefing Book for Low-Level Radioactive Waste Management

DISCLAIMER

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MASSACHUSETTS STATE BRIEFING BOOK FOR LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT

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Prepared for

EG&G Idaho, Inc.
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Subcontract No. K-1959

Prepared by

Politech Corporation
2220 Austin National Bank Tower 515 Congress Avenue
Austin, Texas 78701

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FOREWORD

The information contained in this state briefing book for low-level waste management was compiled from several sources. Information about the structure, organization, and jurisdiction of state and local governments; statutory and regulatory requirements; news media; and interested parties was obtained principally through on-site interviews with state officials and printed materials gathered during the state capitol visits.

In addition, other materials previously prepared for EG&G Idaho, Inc. in support of the National Low-Level Radioactive Waste Management Program have been incorporated into this volume. Specifically, the project conducted for EG&G is The 1979 State-by-State Assessment of Low-Level Radioactive Wastes Shipped to Commercial Burial Grounds, prepared by NUS Corporation in November, 1980. Some materials and tables contained in this state handbook have been excerpted verbatim from that project.

INTRODUCTION

The U.S. Department of Energy (DOE) is the lead federal agency in the area of commercial low-level radioactive waste management. The policy of state responsibility for commercial low-level waste disposal is not only DOE's policy, but is now formalized in federal law through the passage of the "Low-Level Radioactive Waste Policy Act," P.L. 96-573, in December, 1980. Several national groups and organizations, including the State Planning Council, the National Governors' Association, and the National Conference of State Legislatures, have endorsed this position on state responsibility as well as the concept that states be allowed to enter into regional compacts to meet their responsibilities for disposal of low-level wastes.

Radioactive wastes are produced whenever radioactive materials are processed or used. Few general statements can be made about the composition of these wastes since this depends on the source. A myriad of industrial, medical, and institutional activities generate low-level waste of various types. Wastes are characteristic of the process from which they originate and may occur in a gaseous, airborne particulate, liquid, or solid form.

Since low-level wastes contain less than 10 nanocuries per gram of transuranic (TRU) contaminants or may be totally free of the TRU contaminants, most require little or no shielding and have low, but potentially hazardous concentrations or quantities of radionuclides. The hazards posed by low-level wastes require that they be adequately isolated from direct routes of radiation exposure to humans (i.e., drinking water and air) as well as the indirect routes (i.e., plants and animals eaten). In the case of most low-level wastes, this can be accomplished by shallow land burial.

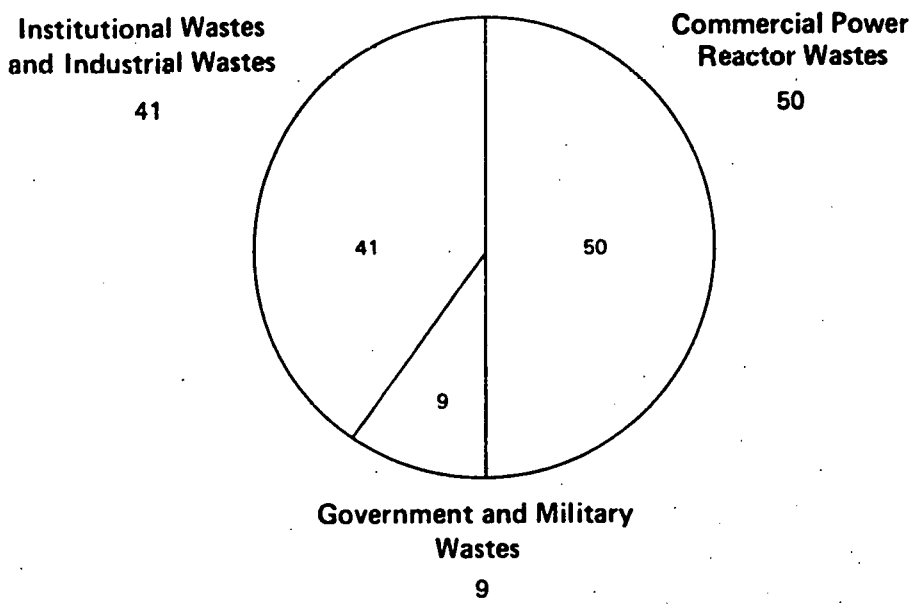
To date, approximately 2.5 million cubic meters of low-level wastes have been disposed in this country by shallow land burial. As Figure 1.1 shows, 50% of this was generated by commercial power reactors with the other 50% by industrial, institutional and government sources. Moreover, of all the states, Massachusetts ranked sixth in the amount of low-level waste generated in 1979 (See Table 1.1). Current estimates by the U.S. Nuclear Regulatory Commission predict that the existing capacity of the three operating commercial disposal facilities--Beatty, Nevada; Hanford, Washington; and Barnwell, South Carolina--will be exhausted between 1984 and 1989 (Figure 1.2). The governors of Nevada, Washington, and South Carolina have clearly stated their positions that their states should not be asked to continue to act as the sole repositories for the nation's low-level waste. Moreover, they have suggested that additional disposal capacity be created through the construction of regional facilities.

This state briefing book has been prepared to assist the Department of Energy in its efforts to help states institute a workable waste management system. It is one of a series produced under contract with the Department of Energy, Office of Nuclear Waste Management, Idaho Operations Office, through contract with EG&G Idaho, Inc., that will provide background information on waste management practices, state government structure and jurisdiction, relevant state statutes and regulatory programs, local government jurisdictions, nature and volume of low-level waste generation, interested groups and individuals, and state print and broadcast news media.

UNITED STATES

Total Low-Level Radioactive Waste Disposed of at Commercial Facilities 79,914 m^3

Percentages by Source



Commercial Power Reactor Wastes[a,b,c,d,e,f]
(Number of Installations 71)

Waste Form	Volume, Cubic Meters	Radioactivity, Curies	Typical Radionuclides
Spent resins, filter sludges, and evaporator bottoms	15,791	40,711	^{51}Cr, ^{54}Mn, ^{59}Fe, ^{58}Co, ^{60}Co, ^{65}Zn, ^{134}Cs, ^{136}Cs, ^{137}Cs, ^{140}Ba, ^{141}Ce
Dry compressible waste and contaminated equipment	21,345	6,992	
Irradiated components	2,622	45,702	
Total	39,768	93,405	

Figure 1.1

Waste Distribution by State, 1979

State	Volume, m^3	Radioactivity, curies
Alabama	3,672	9,543
Alaska	<1	<1
Arizona	54	61
Arkansas	265	180
California	4,342	83,281
Colorado	225	25
Connecticut	3,970	2,764
Delaware	120	<1
District of Columbia	33	333
Florida	2,592	88,345
Georgia	1,261	820
Hawaii	83	10
Idaho	7	8
Illinois	6,758	9,044
Indiana	27	1
Iowa	961	1,271
Kansas	10	3
Kentucky	194	37
Louisiana	19	1
Maine	416	555
Maryland	978	2,271
Massachusetts	4,860	138,146
Michigan	2,151	875
Minnesota	1,461	13,315
Mississippi	68	54
Missouri	329	304
Montana	3	32
Nebraska	801	140
Nevada	4	62
New Hampshire	77	3
New Jersey	3,008	7,450
New Mexico	80	1
New York	9,572	78,961
North Carolina	5,304	4,504
North Dakota	2	<1
Ohio	1,905	5,632
Oklahoma	21	266
Oregon	1,219	337
Pennsylvania	6,825	2,567
Rhode Island	463	1
South Carolina	8,089	2,784
South Dakota	<1	<1
Tennessee	1,131	56
Texas	543	410
Utah	106	9
Vermont	370	918
Virginia	4,230	9,314
Washington	779	278
West Virginia	40	41
Wisconsin	487	3,058
Wyoming	<1	<1
Total United States	79,914	477,440

Table 1.1

UNITED STATES

Institutional Wastes (Medical Facilities and Universities)[g]
(Number of Licensees 6,415)[a]

Industrial Wastes
(Number of Licensees 10,961)[a]

	Volume, Cubic Meters	Radioactivity, Curies
Estimated Total	32,835	329,466

Government and Military Wastes Disposed of at Commercial Sites[j]
(Number of Installations 21)

	Volume, Cubic Meters	Radioactivity, Curies
Total	7,311	54,566

COMMENTS: By the best approximation available at the time of this report, the volume that could be attributed to the industrial category is 17,881 cubic meters and the volume that could be attributed to the institutional category is 14,954 cubic meters. No curie breakdown is possible from available sources of information.

Total Volume and Radioactivity of Wastes Disposed of at Commercial Sites[h]

Volume, Cubic Meters 79,914 Radioactivity, Curies 477,437

Percentages by Disposal Site

Barnwell, 79; Richland, 13; Beatty, 8

Figure 1.2

2. OVERVIEW OF LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT IN MASSACHUSETTS

Nuclear Regulatory Commission Licensees

There are approximately 410 Nuclear Regulatory Commission (NRC) licensees in Massachusetts producing an estimated 4,815 cubic meters of low-level radioactive waste annually. Massachusetts, ranking eighth in the nation in the generation of low-level waste, produces almost 50% of all radioactive waste generated in New England. As of December 31, 1980, the NRC had issued nine reactor licenses to eight licensees; there are five nuclear powered electric generating facilities in Massachusetts. There are 38 Special Nuclear Materials license holders in Massachusetts, 12 Source Materials license holders, and 360 By-product Materials licensees.

Current Disposal Practices

Reports to the U.S. Regulatory Commission indicate approximately 50% of the low-level waste generators in Massachusetts do not ship radioactive wastes. These generators isolate and store their wastes until the radioactive decay process renders the wastes innocuous, at which point the wastes may be disposed of as ordinary refuse. All other low-level wastes are packaged in U.S. Department of Transportation (USDOT) approved containers, usually 55-gallon steel drums, and shipped to the commercial burial sites at either Hanford, Washington, or Barnwell, South Carolina. As of November, 1980, the unit cost of disposal for Massachusetts licensees ranged between $150 and $250 per 55-gallon drum. The distances separating Massachusetts and the disposal sites are great, approximately 3,000 miles and 1,000 miles respectively, and the increasing cost of motor fuel has increased the unit costs of disposal.

Most low-level waste generators in Massachusetts do not ship wastes directly to the burial sites. Since most low-level waste is shipped to the burial sites by "exclusive use" tractor trailers, generators typically contract with a carrier who collects wastes from a number of generators and stores the waste as necessary until a full trailer-load is collected.

Regulatory Enforcement

The U.S. Atomic Energy Commission (AEC) was the first agency to develop regulations for the control of low-level radioactive wastes. The U.S. Energy Research and Development Agency, the U.S. Department of Energy, the U.S. Nuclear Regulatory Commission, the U.S. Environmental Protection Agency, and the U.S. Department of Transportation have all promulgated regulations affecting radioactive waste management. Under 1959 amendments to the Atomic Energy Act of 1954, states were granted the right to enter individual agreements with the AEC to assume licensing and regulatory authority over low-level nuclear wastes generated within their boundaries. States that did not enter into the agreement yield this authority to the Nuclear Regulatory Commission. Although Massachusetts is not an "agreement" state, the Massachusetts Department of Public Health has promulgated regulations to control hazards associated with radioactive materials and machines that emit ionizing radiation. The Department of Public Health's responsibility extends primarily to the small-volume generators of low-level waste, as in the fields of medicine and research.

The states of Nevada, South Carolina, and Washington have regulations covering packaging and shipping regulations of low-level wastes. Shipments of low-level wastes that are improperly packaged or are in violation of NRC rules may be rejected at the disposal site.

The Massachusetts Advisory Council on Radiation Protection

The Massachusetts Advisory Council on Radiation Protection produced a report, Low-Level Radioactive Waste Management in Massachusetts, in November, 1980, at the request of Governor King (the full text of the report is Appendix A of this briefing book). The report concluded that Massachusetts cannot depend on Nevada, South Carolina, and Washington to accept Massachusetts' low-level wastes indefinitely. The report urged that Massachusetts initiate a low-level waste management program within the state. It suggested that it could be advantageous for Massachusetts to enter into a regional agreement with other states to share the "costs, facilities, and sites" associated with low-level radioactive waste management.

3. DEMOGRAPHY

Introduction

This demographic analysis for Massachusetts is designed to ascertain and analyze various demographic factors, data and trends that could be related to the quantity, nature, and potential management options of low-level radioactive wastes within the State and its subunits.

State Economic Areas. Before addressing each part of the demographic analysis, note that interpretation will be provided for the State of Massachusetts but also for its subunits, namely, its State Economic Areas. State Economic Areas are often used in demographic investigations of the subunits of states because most states are heterogeneous in terms of urban-rural distributions, climate, industry, topography, population size and growth, and economic activity, and it is not feasible to investigate these phenomena strictly at the state level. It is necessary to reduce the the state's geography into smaller units of analysis, but not so small that their number becomes too cumbersome for analysis; this might be the case were one to disaggregate the state into counties. The State Economic Area is an appropriate unit for the subject in this study and is midway in size between the state and the county. In the next paragraph we provide more information about this particular unit of analysis (See U.S. Bureau of the Census, 1972).

> State Economic Areas. Definition--State Economic Areas are relatively homogeneous subdivisions of a state, consisting of single counties or groups of counties which have similar economic and social characteristics. The boundaries of these areas have been drawn in such a way that each state is subdivided into relatively few parts, with each part having significant characteristics which distinguish it from adjoining areas.

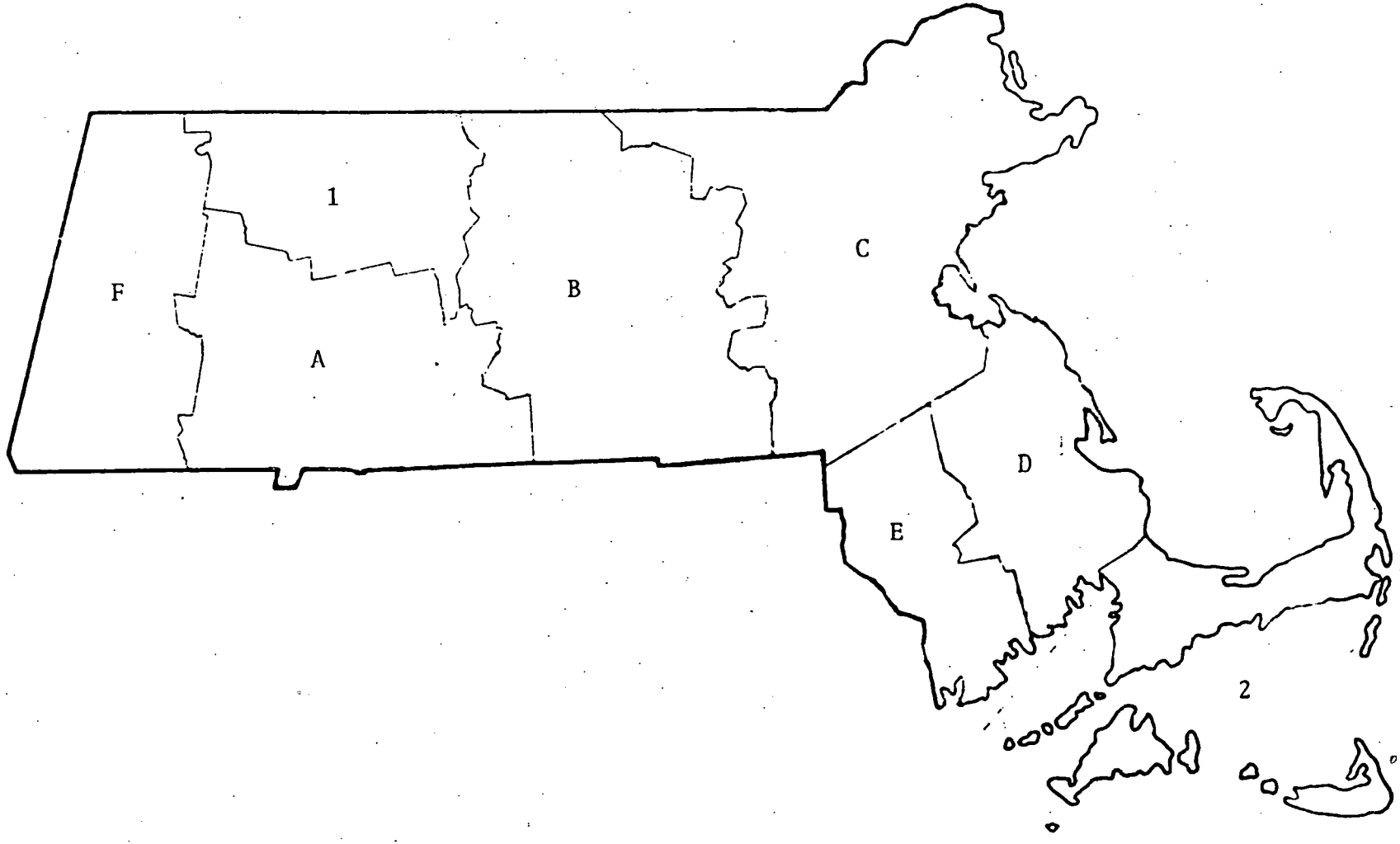
In the establishment of SEA's, factors in addition to industrial and commercial activities were taken into account. Demographic, climatic, physiographic, and cultural factors, as well as factors pertaining more directly to the production and exchange of agricultural and nonagricultural goods, were considered. The result is an intermediate area for study; smaller than a state, and larger than a county, with a homogeneous set of characteristics. Areas of this type are well adapted for use in a wide variety of studies in which state data are not sufficiently homogeneous or the quantity of county data presents real difficulty. Moreover, a standardized set of areas makes possible studies in widely different fields on a comparable area basis.

The State of Massachusetts is divided into eight State Economic Areas, two of which are nonmetropolitan: SEA 1: Berkshire-Monadnock; SEA 2: Cape Cod; the remaining six are metropolitan and are designated by letters instead of numbers; SEA A: Springfield-Chicopee-Holyoke Metropolitan Area; SEA B: Worcester Metro Area; SEA C: Boston-Lowell-Lawrence-Haverhill Metropolitan Area; SEA D: Brockton Metropolitan Area; SEA E: Fall River-New Bedford Metropolitan Area; SEA F: Pittsfield Metropolitan Area. These State Economic Areas are outlined and displayed on Map 3.1.

3.1 POPULATION AND LOCATION

According to the 1980 U.S. Census of Population, the State of Massachusetts contained a population on April 1, 1980, of 5,737,037. In this section, we first describe the population of the State and its SEA's in terms of their age compositon in 1978, 1980, and 1990. The data for 1980 and 1990 are based on population projections, and the data for 1978 on population estimates developed by the Bureau of the Census.

Looking first at the descriptions of age for 1978, we have developed population bar graphs for the State and each SEA which graph



Map 3.1: Massachusetts State Economic Areas

their age compositions. Figures 3.1.1 through 3.1.F are for the SEA's, and Figure 3.1.3 for the State as a whole.

These graphs suggest that the Cape Cod SEA (#2) (see Figure 3.1.2) contains fewer young persons in contrast to old persons, whereas the six graphs for the metropolitan SEAs (Figures 3.1.A through 3.1.F) show an opposite interpretation.

The population projection data is presented in Table 3.1 for the SEAs and the state in 1980 and 1990. These projections are based on assumptions generally governing demographic conditions of fertility, mortality, and migration as they existed in the last half of the 1960's and the early 1970's. In some ways they therefore do not reflect exactly the demographic conditions in the State of Massachusetts during the 1970's, especially with regard to migration. Since about the mid-1970's, many of the northeastern and north central states, including the State of Massachusetts, suffered population reductions due to net migration, and in some instances, have been losing more persons through net migration than they have gained.

At the time of this writing, the Bureau of the Census has only released the final 1980 population counts for states. Small area data, including those for counties which can then be aggregated into State Economic Areas, are not due for release until later, and the data will be total count data. We are able to compare the final 1980 count released for Massachusetts by the U.S. Bureau of the Census with that produced by our projection methodology for 1980 (see total number in Table 3.1). Clearly, our projected 1980 total for the State of Massachusetts of 6,585,566 greatly overpredicts the census final count for April 1, 1980, of 5,737,037. Our projections on this basis are rather liberal in their attempt to identify the levels of the population in 1980 and 1990, and they should be reviewed with this in mind.

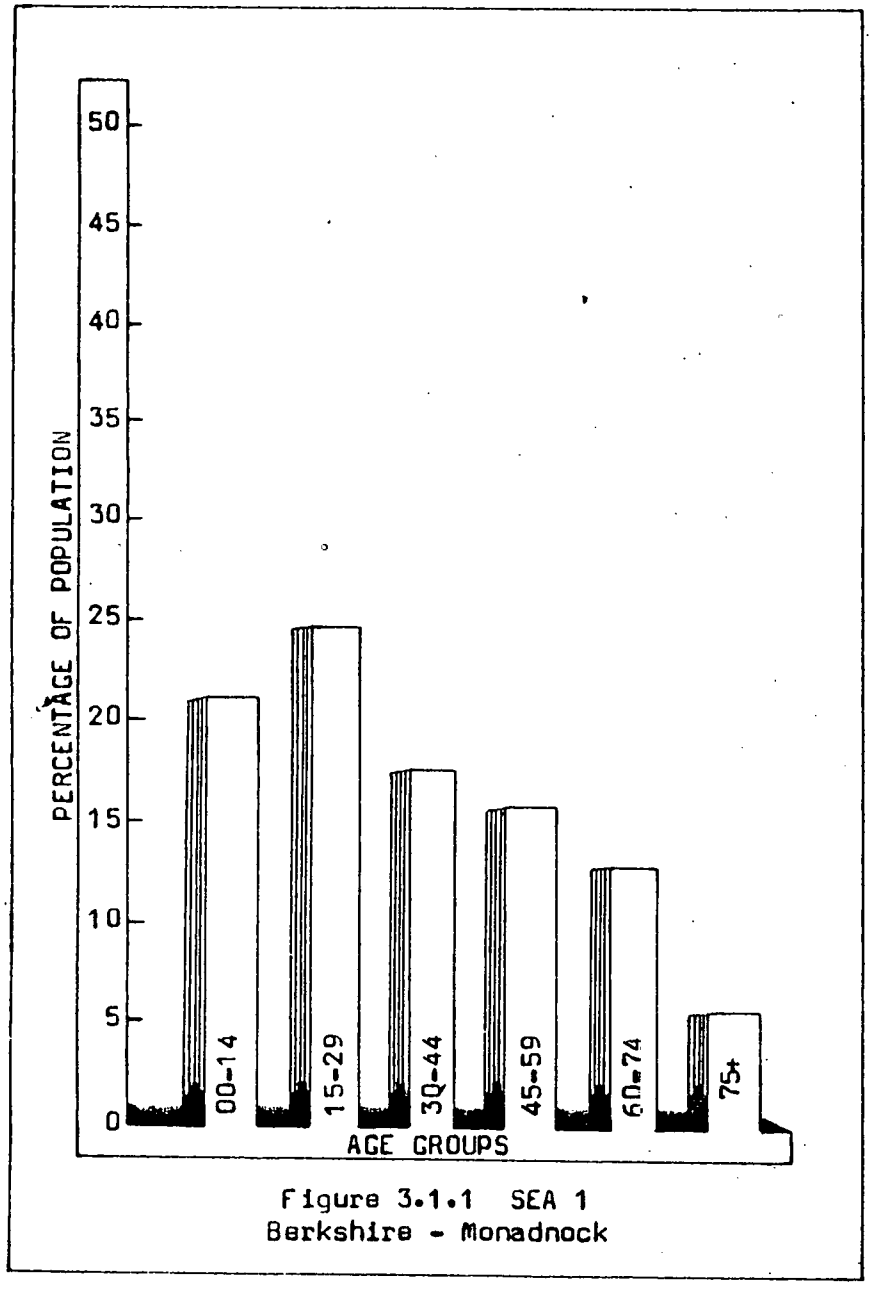


Figure 3.1.1 SEA 1
Berkshire - Monadnock

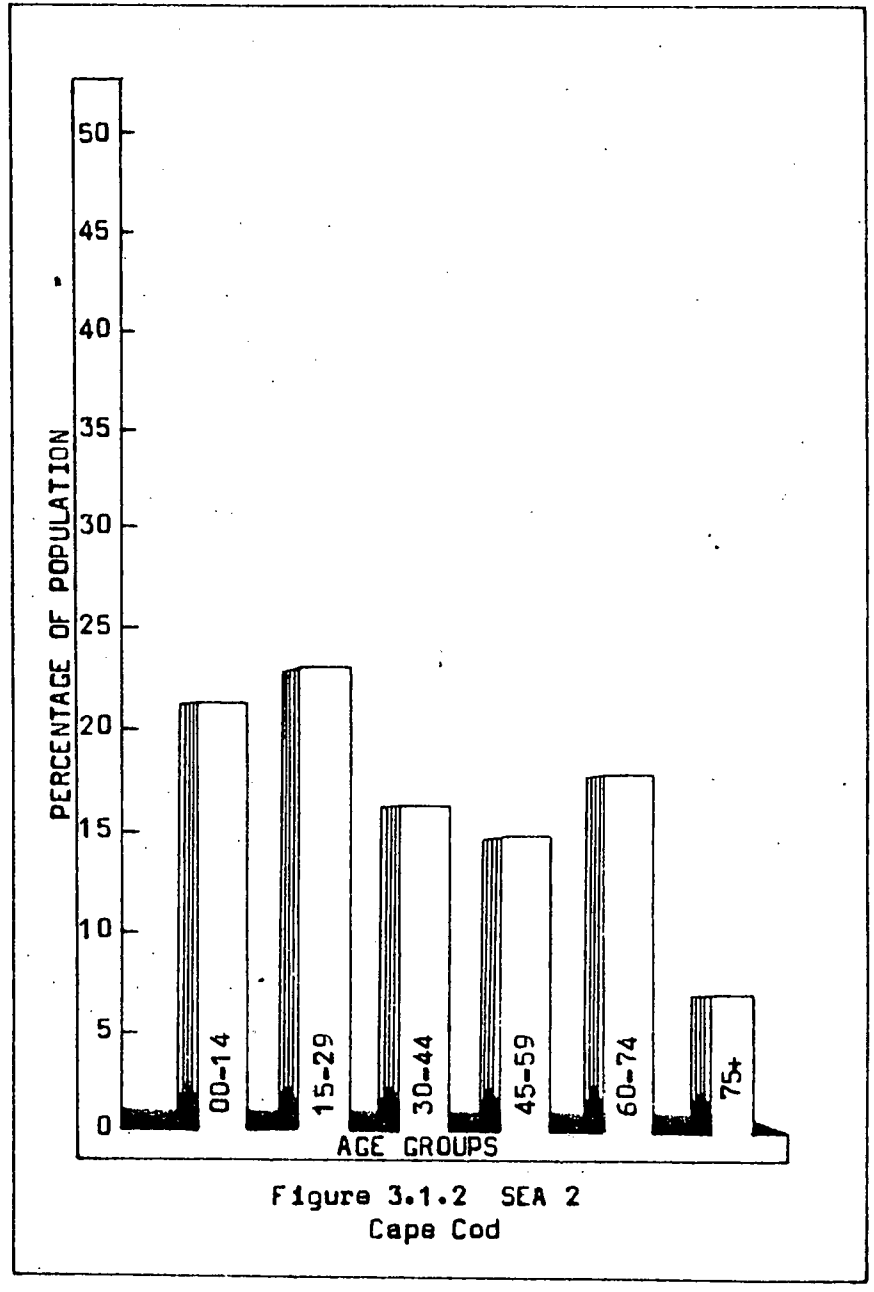


Figure 3.1.2 SEA 2
Cape Cod

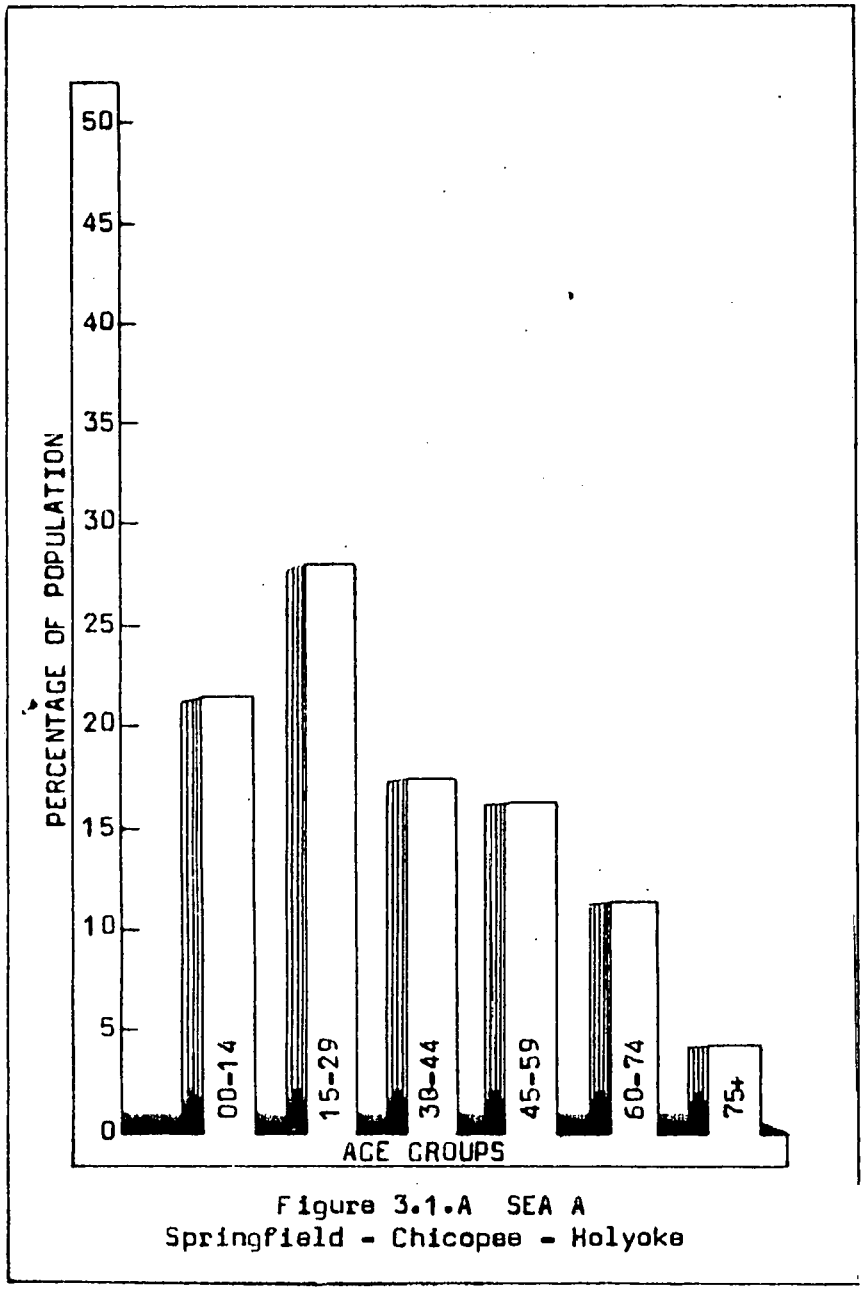


Figure 3.1.A SEA A
Springfield - Chicopee - Holyoke

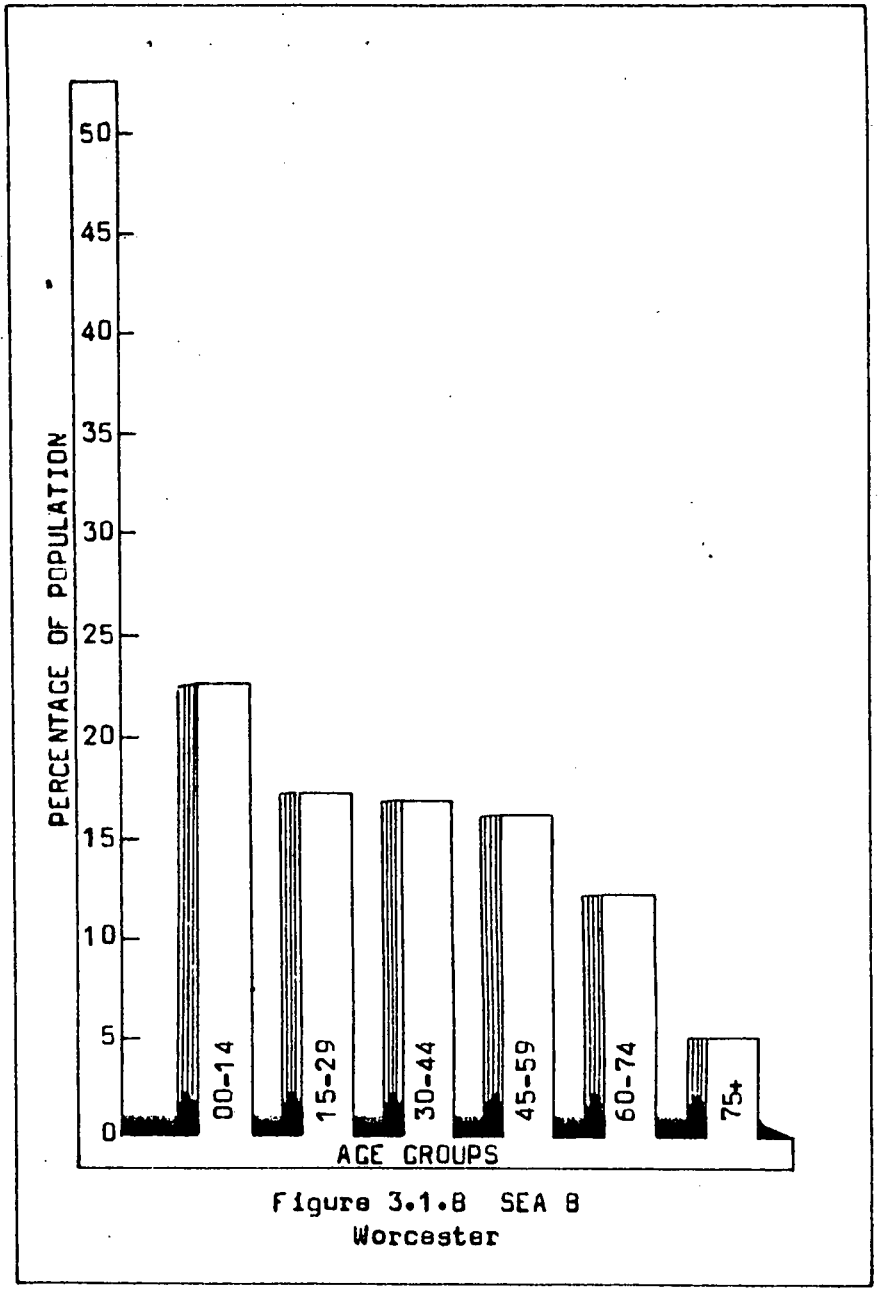


Figure 3.1.B SEA B
Worcester

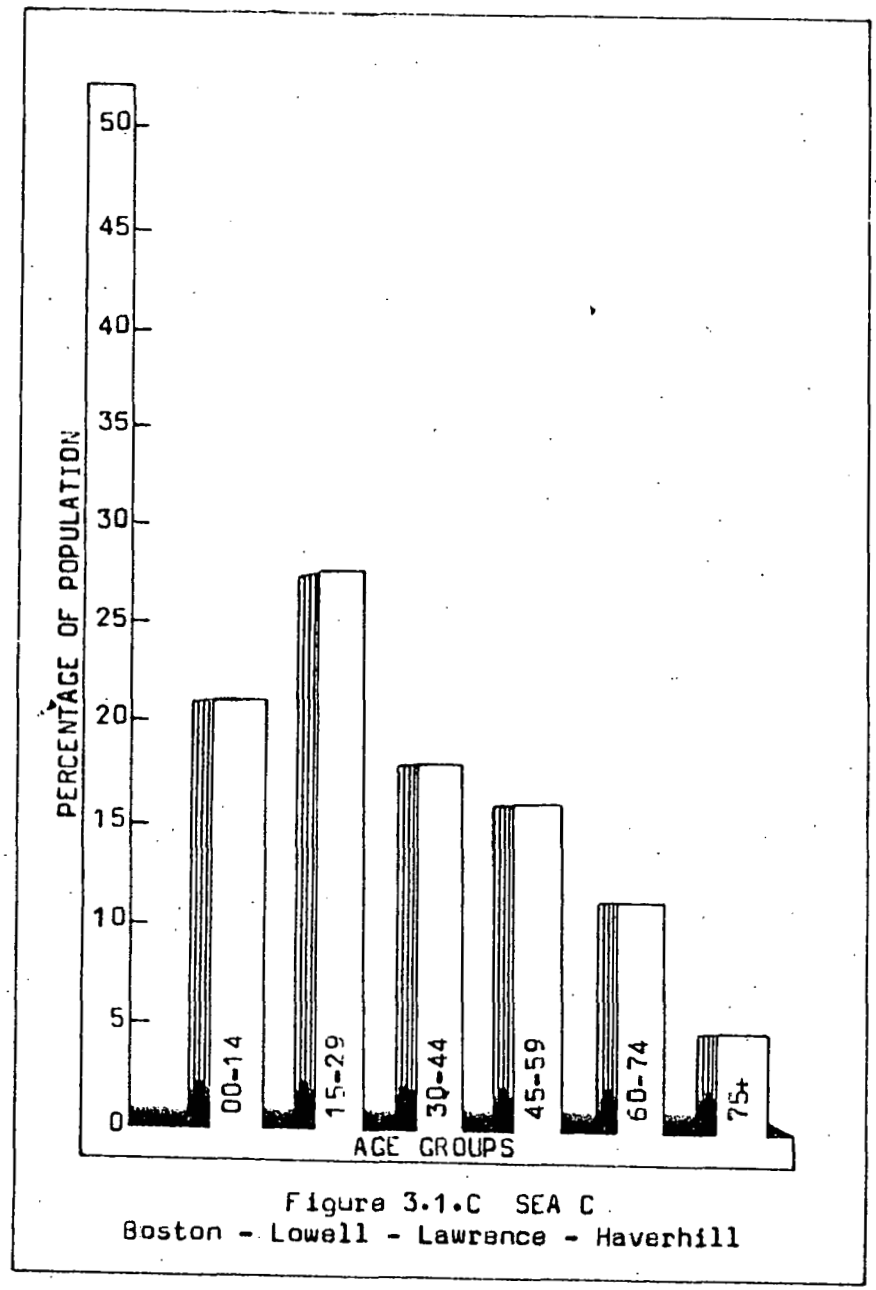


Figure 3.1.C SEA C
Boston - Lowell - Lawrance - Haverhill

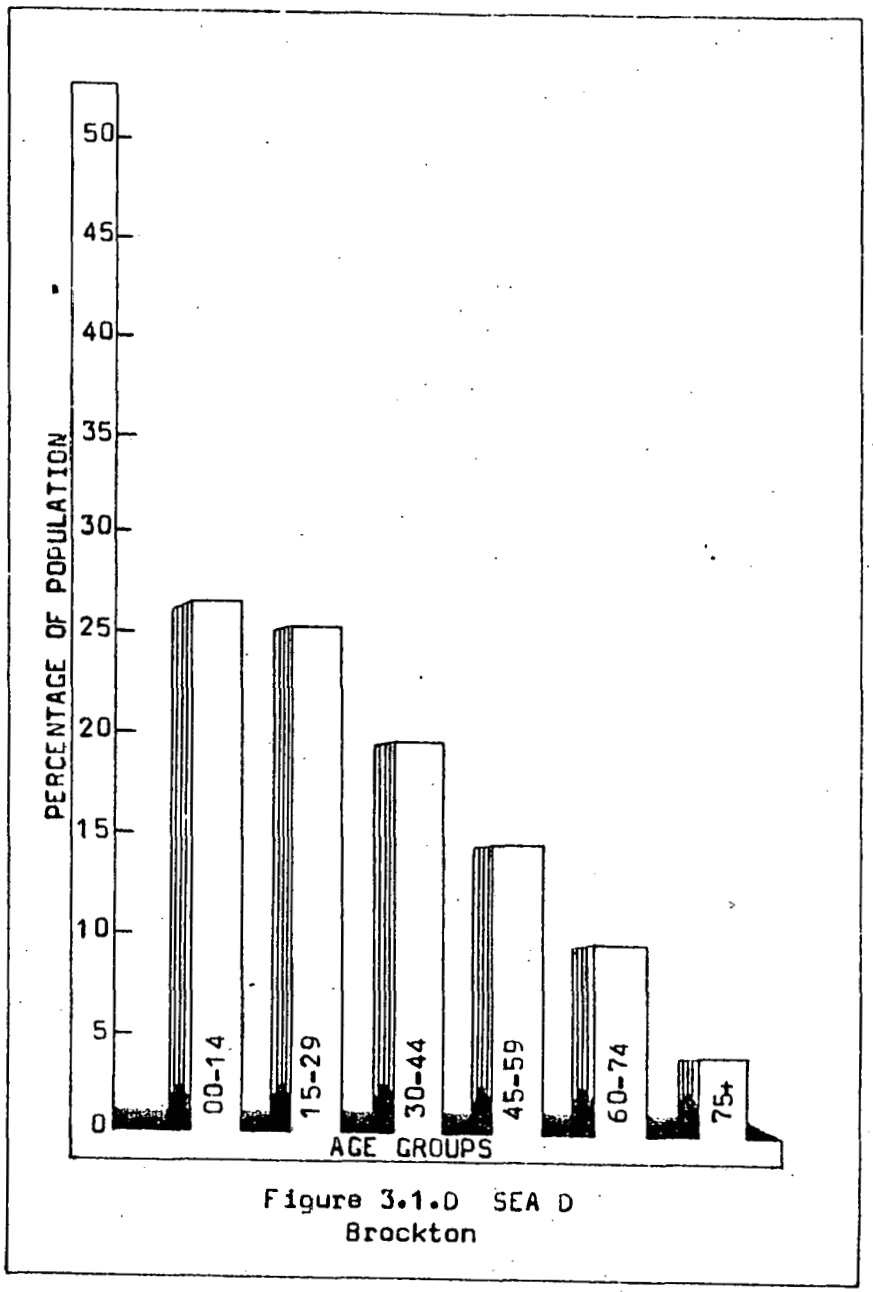


Figure 3.1.D SEA D
Brockton

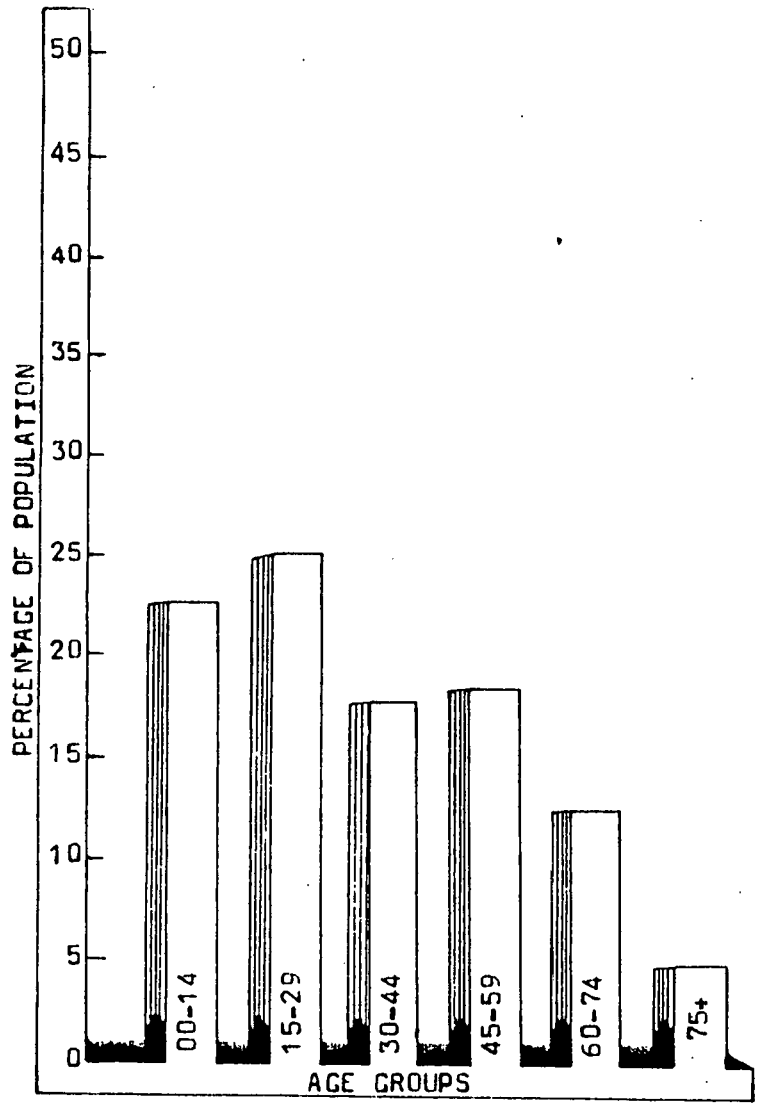


Figure 3.1.E SEA E
Fall River - New Bedford

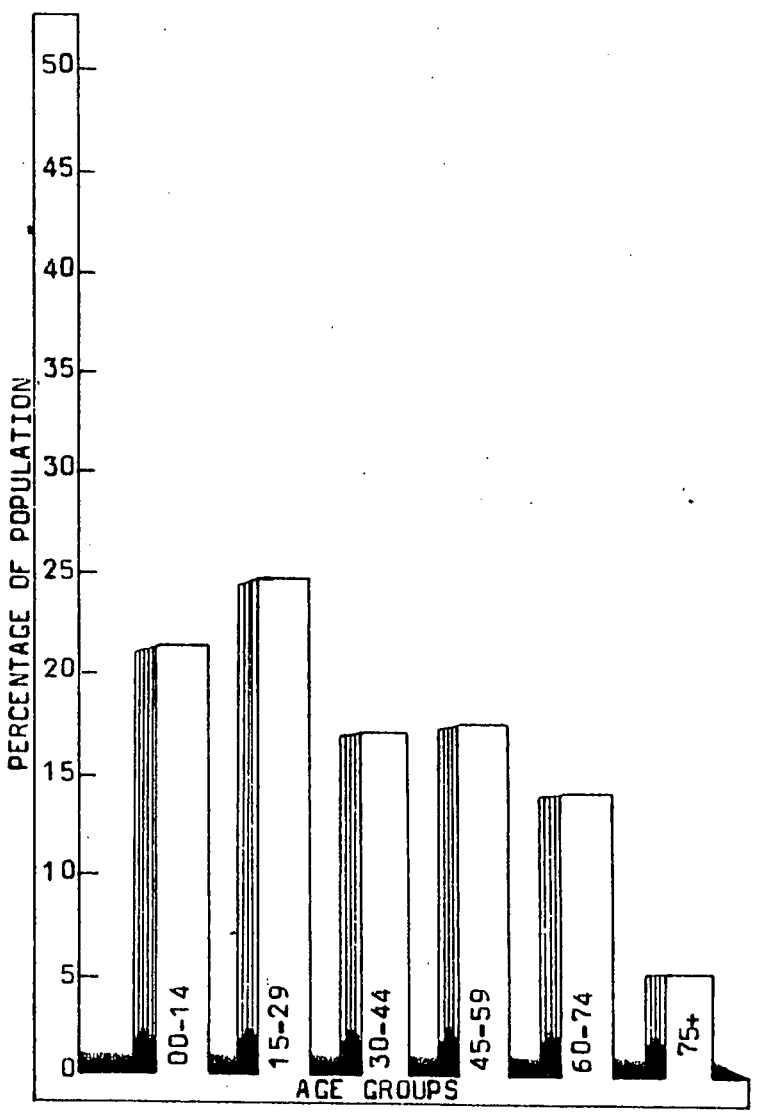


Figure 3.1.F SEA F
Pittsfield

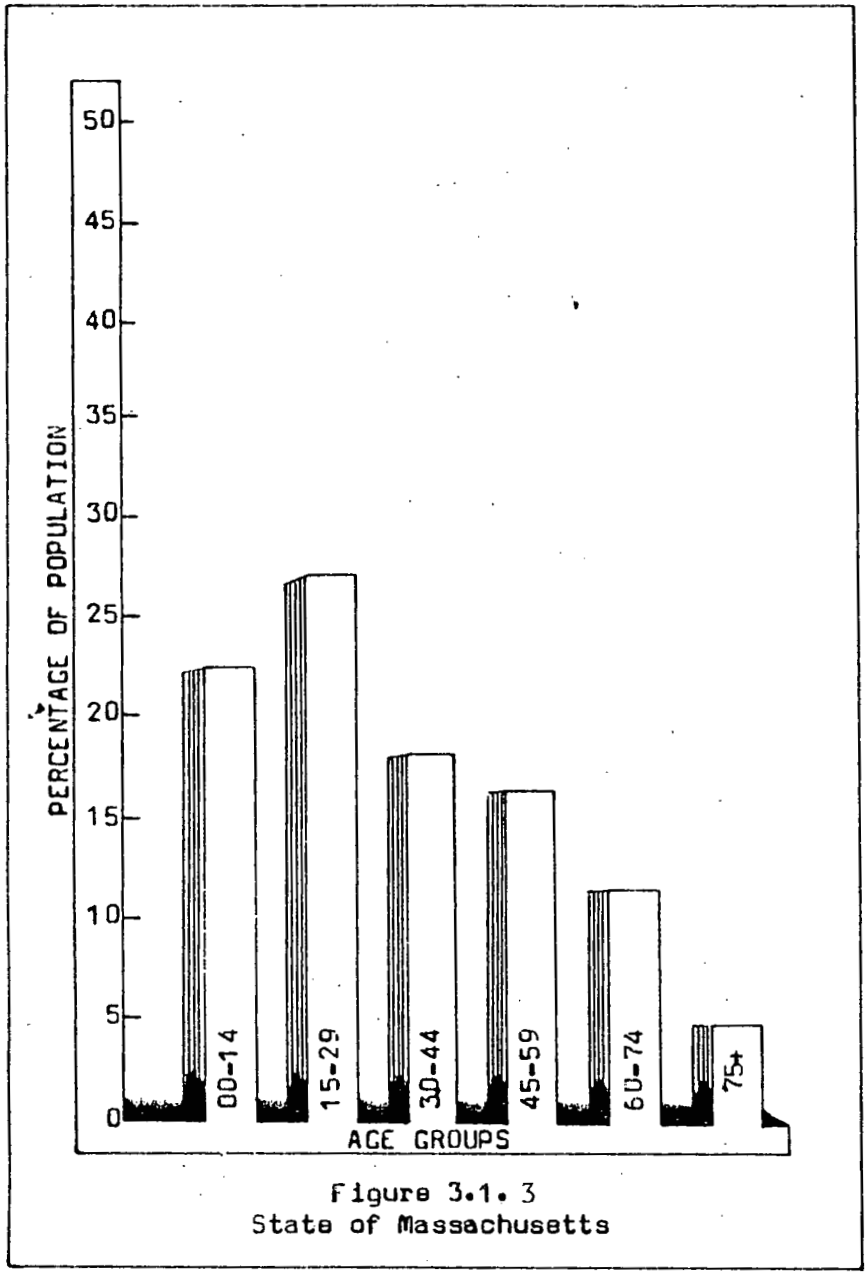


Figure 3.1. 3
State of Massachusetts

TABLE 3.1

DEMOGRAPHIC GROWTH AND DENSITY INFORMATION FOR
THE STATE OF MASSACHUSETTS AND ITS STATE ECONOMIC AREAS,
July 1, 1970 - July 1, 1978
AND POPULATION PROJECTIONS FOR 1980 AND 1990

State Economic Area	Population Growth Rate 1970-78 (%)	Growth Rate Due to Net Migration 1970-78 (%)	Population Density per Square Mile 1978	Population Projection 1980	Population Projection 1990
SEA 1: Berkshire-Monadnock	4.5	2.7	88	70,167	85,453
SEA 2: Cape Cod	43.7	45.2	287	176,361	284,793
SEA A: Springfield-Chicopee-Holyoke Metro Area	0.5	-2.3	512	622,342	790,625
SEA B: Worcester Metro Area	1.1	-1.7	427	666,554	817,941
SEA C: Boston-Lowell-Lawrence-Haverhill Metro Area	-1.9	-4.3	1872	3,617,785	3,955,835
SEA D: Brockton Metro Area	17.8	12.4	605	539,883	978,773
SEA E: Fall River-New Bedford Metro Area	6.0	2.9	852	659,776	1,103,704
SEA F: Pittsfield Metro Area	-3.8	-5.4	153	192,698	330,621
STATE OF MASSACHUSETTS	1.3	-1.3	738	6,585,566	8,077,745

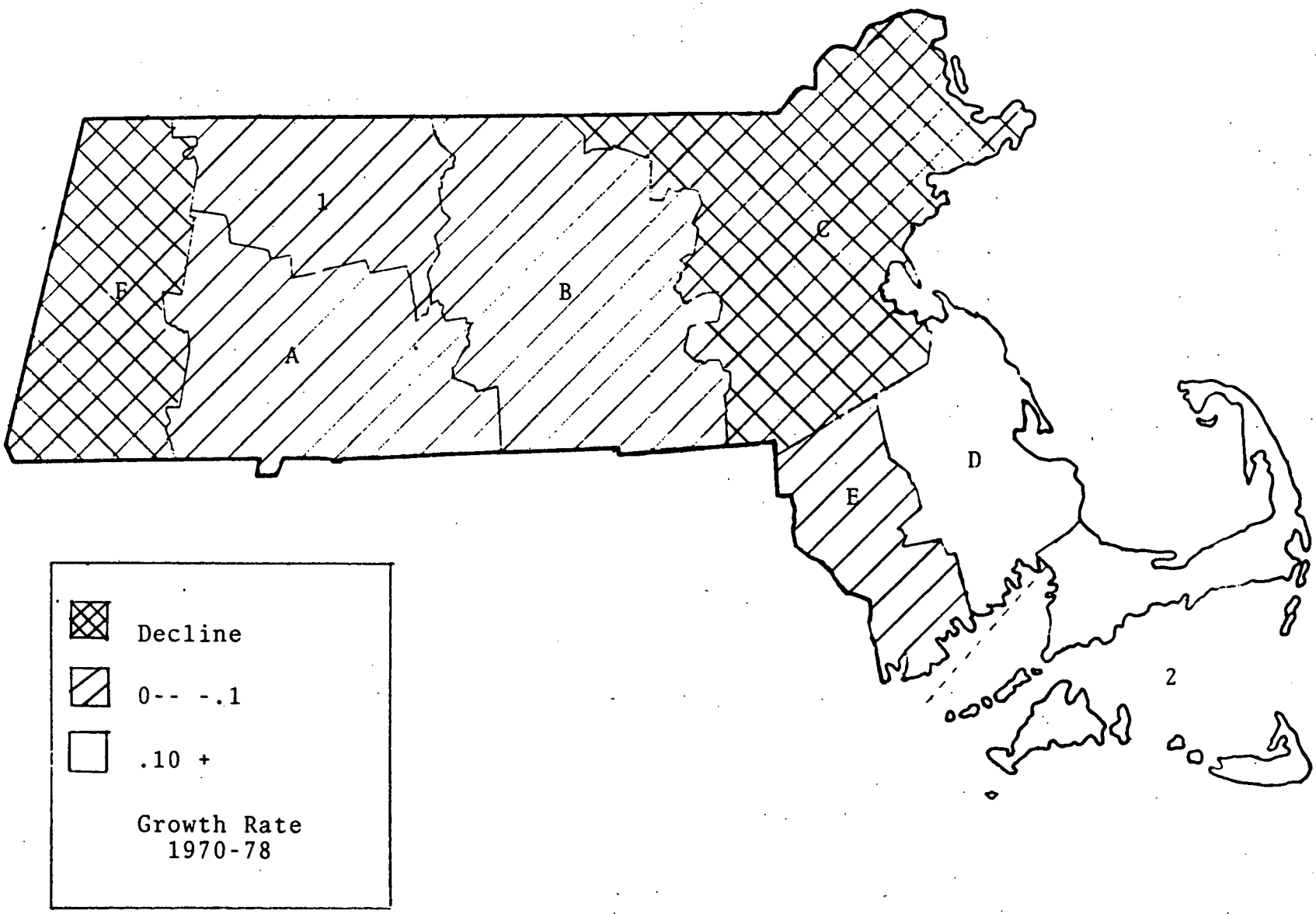
SOURCE OF DATA: Data obtained for the counties of the state from U.S. Bureau of the Census, County and City Data Book, 1977, Washington, D.C. (magnetic tape version); and U.S. Bureau of the Census, "NCI County Population Estimates, 1970-78" (magnetic tape version).

The SEA projections for 1980 and 1990 do suggest, however, that the main core of population in the State of Massachusetts will continue to be contained within SEA C: The Boston-Lowell-Lawrence-Haverhill State Economic Area. Despite the fact that the projected amounts are likely higher in 1980 than they are in reality, and higher for 1990 than they will be, they do indicate a continued presence of SEA C as the major population focal point in the State.

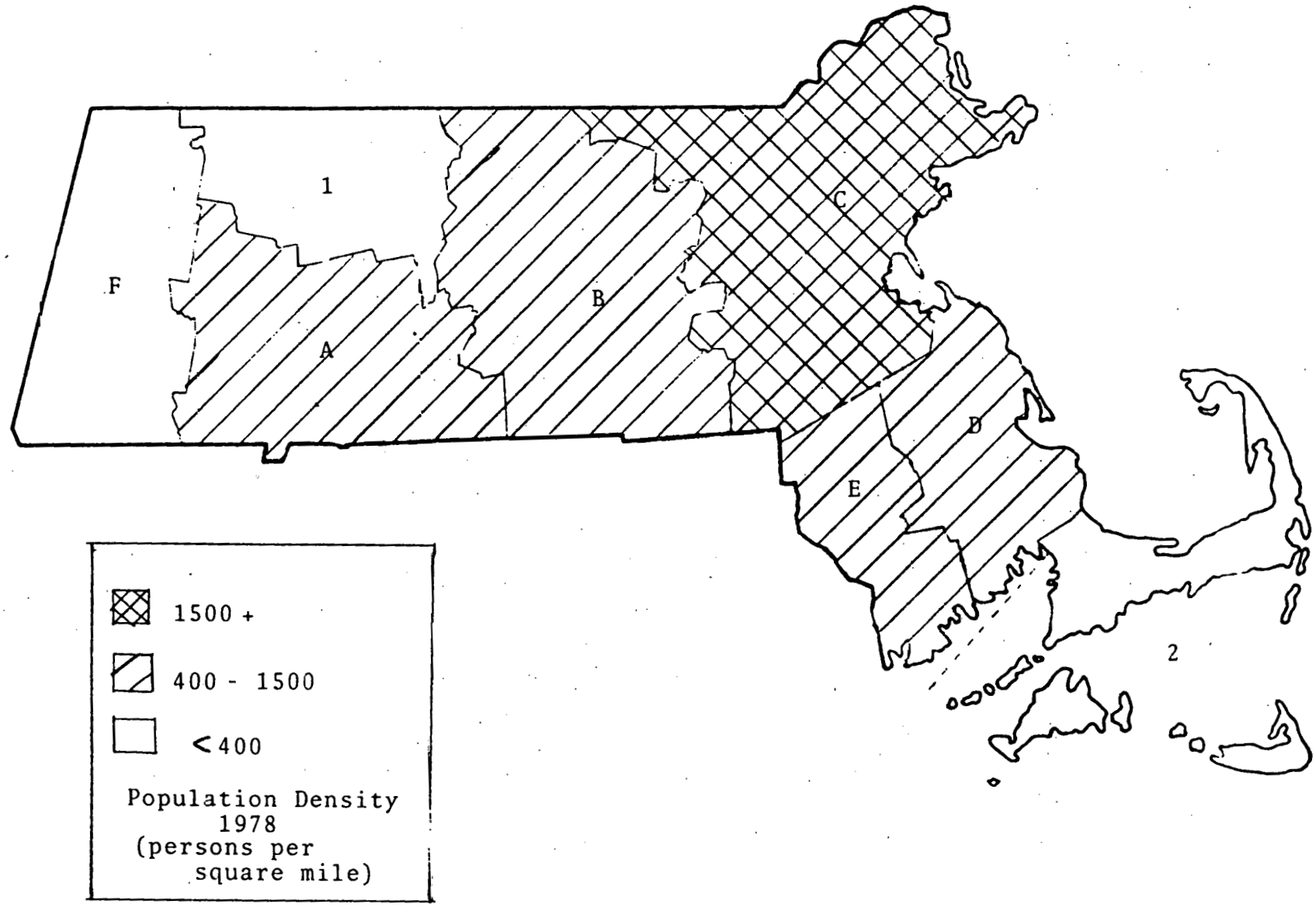
To this point we have restricted the demographic analysis of the population of the State of Massachusetts to matters largely involving total population size and age composition. We move now beyond these concerns to an examination of demographic growth and density for Massachusetts and its State Economic Areas. In Table 3.1, rates of population growth between 1970-78 are provided for the State and its State Economic Areas, along with growth rates due to net migration. Also presented in the table are data on population density (persons per square mile) and population projections for 1980 and 1990. A population with a positive rate of growth over an eight-year period, particularly one with a positive rate due to net migration, would imply increasing isotope use and therefore waste generation.

Of all the SEAs in the State, Boston is the most densely populated. Despite its negative rate of growth (both overall growth and growth due to net migration), this SEA remains as the major site of population concentration in the State of Masssachusetts.

Another way of viewing the demographic patterns and changes in Massachusetts and its State Economic Areas is through a series of maps. Two maps reflecting rates of overall population growth for the SEAs (Map 3.2), and patterns of population density for the State's SEAs (Map 3.3) according to three categories of density are presented also.



Map 3.2 Growth Rate 1970-78



Map 3.3 Population Density, 1978

3.2 GOVERNMENT

Demographic data on government employment and revenues in the State of Massachusetts and its State Economic Areas provide information on the scope of local, state, and federal government activity, and the extent to which they have changed in recent years.

Tables 3.2 and 3.3 present demographic data on government employment and revenues for Massachusetts and its State Economic Areas for 1972 and 1977. Data on government employment and payrolls are provided in Table 3.2. As expected, the SEA with the most government employees is SEA C: BostonLowell-Lawrence-Haverhill. The State of Massachusetts as a whole has the equivalent of 213,401 full-time employees in government, an increase of 13.2% over 1972 levels. Nearly 60% of the government employees in the State are located in Boston. The Boston SEA also has the most extensive government payroll in the State. And in terms of 1972 dollars, government payrolls in Boston increased by 22% between 1972 and 1977.

Table 3.3 presents general revenue data, total intergovernmental revenue data, and the amount of intergovernmental revenue from the federal government. These data are presented for both 1972 and 1977, and they indicate that the Boston SEA has the greatest amount of general revenue in 1977 in the State: over 2.2 billion dollars. However, this amount constitutes a loss of 11.5 in terms of adjusted 1977 dollars. The State of Massachusetts had total revenue of over 4 billion dollars in 1977, an adjusted increase of 2% over 1972 revenues.

With respect to total intergovernmental revenue in 1977, Boston again is the most prominent State Economic Area in Massachusetts. The State as a whole has nearly 1.8 billion dollars in intergovernmental revenue in 1977. Finally, in 1977, both the SEA of Boston-Lowell-Lawrence-Haverhill and the State of Massachusetts received more than 32% of their intergovernmental revenue from the federal government.

The government data provided in Tables 3.2 and 3.3 point again to the prominence of the Boston State Economic Area. The other SEAs in the State have relatively small shares of the government enterprise as measured by employment or revenue. Analyses of isotope utilization and waste generation must, by necessity, take this primary governmental influence into account.

3.3 AGRICULTURE

Demographic data on agriculture for the State of Massachusetts and its State Economic Areas indicate those areas within the State heavily engaged in agricultural activity. Data of this type could be influential in determining which areas within the State could be candidates for disposal sites for low-level radioactive waste products, and which areas should not.

Table 3.4 presents information for the State and its SEAs on the total amount of land in farms (expressed in thousands of acres) in 1974 and in 1978, and the percentage change between 1974 and 1978; the percent of all land devoted to farming in 1974 and 1978; and the simple difference between 1974 and 1978 percentages; and the average value of land and buildings per farm (in thousands of dollars) in 1974 and 1978, and the change between 1974 and 1978.

Acreage designated as "land in farms" consists primarily of agriculture land used for crops, pasture or grazing. It also includes weedland and wasteland not actually under cultivation nor used for pasture or grazing, provided it was part of the farm operator's total operation. Large acreages of woodland or wasteland held for non-agricultural purposes were deleted from individual reports during the census processing operations. Except for open range and grazing land used under government permits, all grazing land was included as "land in farms" provided the place was part of a farm or ranch.

TABLE 3.2

GOVERNMENT EMPLOYMENT AND PAYROLL DATA FOR THE STATE OF MASSACHUSETTS AND ITS STATE ECONOMIC AREAS
1972, 1977 and CHANGE BETWEEN 1972-77

STATE ECONOMIC AREA	GOVERNMENT EMPLOYMENT* 1972	1977	Change 72-77 (%)	LOCAL GOVERNMENT PAYROLL (millions)** Oct. 1972	Oct. 1977	Change 72-77 (%)***
SEA 1: Berkshire-Monadnock	1705	2070	21.4	1.3	1.9	0
SEA 2: Cape Cod	4527	6071	34.1	3.3	6.2	33.0
SEA A: Springfield-Chicopee-Holyoke Metro Area	17481	20016	14.5	13.6	20.1	5.0
SEA B: Worcester Metro Area	18867	22890	21.3	14.5	23.6	15.0
SEA C: Boston-Lowell-Lawrence-Haverhill Metro Area	116871	127463	9.1	102.1	153.2	6.0
SEA D: Brockton Metro Area	11402	14465	26.9	8.9	15.4	22.0
SEA E: Fall River-New Bedford Metro Area	12992	15850	22.0	9.9	16.1	15.0
SEA F: Pittsfield Metro Area	4705	4376	-7.0	3.7	4.7	-10.8
STATE OF MASSACHUSETTS	188550	213401	13.2	157.4	241.1	9.0

*Government employment is expressed in terms of full-time equivalents.

**Local government payrolls are for the month of October of the particular year and are expressed in millions of dollars.

***The percent change in government payroll between 1972-77 was computed after converting the 1977 payroll dollars into their equivalent on the basis of 1972 dollars, hence introducing a control for inflation.

SOURCE OF DATA: Data for 1972 taken from U.S. Bureau of the Census, County and City Data Book, 1977, Washington D.C. (magnetic tape version); 1977 data taken from U.S. Bureau of the Census, Census of Governments, 1977 (machine readable data files). County data were aggregated into respective State Economic Areas.

TABLE 3.3

GOVERNMENT FINANCE DATA FOR THE STATE OF MASSACHUSETTS AND ITS STATE ECONOMIC AREAS, 1972, 1977, and CHANGE BETWEEN 1972-77

STATE ECONOMIC AREA	GENERAL REVENUE (millions)* 1972	1977	Change 72-77 (%)**	TOTAL INTERGOVERNMENTAL REVENUE (millions)*** 1972	1977	Change 72-77 (%)**	INTERGOVERNMENTAL REVENUE FROM FED. GOVERNMENT (%) 1972	1977
SEA 1: Berkshire-Monadnock	26.2	43.6	18.0	8.1	16.3	90.0	8.3	29.5
SEA 2: Cape Cod	62.4	131.8	50.0	9.7	32.1	135.1	22.4	23.8
SEA A: Springfield-Chicopee-Holyoke Metro Arrea	225.1	408.9	29.0	55.6	150.1	92.0	19.6	35.0
SEA B: Worcester Metro Area	286.1	454.1	13.0	72.1	159.4	57.0	22.2	23.0
SEA C: Boston-Lowell-Lawrence-Haverhill Metro Area	1814.6	2264.2	-11.5	387.6	1124.2	106.0	27.3	32.4
SEA D: Brockton Metro Area	170.2	317.5	32.0	37.3	107.7	104.8	7.6	31.9
SEA E: Fall River-New Bedford Metro Area	177.3	342.1	37.0	50.9	143.6	100.0	18.2	42.7
SEA F: Pittsfield Metro Area	71.1	104.7	4.0	17.5	35.7	45.0	10.2	18.8
STATE OF MASSACHUSETTS	2832.9	4066.9	2.0	636.8	1769.1	97.0	23.4	32.1

*General revenue data are exclusive of interlocal revenue and are for the fiscal year which closed at various dates for each government during the 12 months ending June 30 of the particular year.

**The percent change in revenue between 1972-77 was computed after converting the 1977 dollars into their equivalent on the basis of 1972 dollars, hence introducing a control for inflation.

***Intergovernmental revenue data are exclusive of interlocal revenue.

SOURCE OF DATA: Data for 1972 taken from U.S. Bureau of the Census, County and City Data Book, 1977, Washington, D.C. (magnetic tape version); 1977 data taken from U.S. Bureau of the Census, Census of Governments, 1977 (machine readable data files). County data were aggregated into respective State Economic Areas.

The State Economic Area in the State with the greatest number of acres devoted to farming in 1978 was Worcester with 130,000 acres, a reduction of 1,000 acres (or 0.8%) from its 1974 level. The Cape Cod SEA had the fewest acres devoted to farming in 1978. Finally, regarding the total amount of land in the area devoted to farming, Brockton SEA had the highest percentage in 1978 with 2% of its land devoted to agriculture. As expected, of all the SEAs in the State, Cape Cod had the smallest portion of its land devoted to this pursuit.

Of the various State Economic Areas in the State of Massachusetts, the SEA of Boston had the highest average value of land and building per farm in 1978; after adjusting for inflation, this 1978 value represents an increase of more than 5% over the average value in 1974. The Pittsfield SEA was second. The Pittsfield figure for 1978 amounts to a 13.6% reduction compared to its 1974 value. The average value of land and buildings per farm in the State of Massachusetts in 1978 was $170,000, an adjusted decrease of 7.8% compared to its 1974 value.

3.4 THE ECONOMY

This section provides a description of the economy and distribution of activities in Massachusetts and in its State Economic Areas in 1974 and in 1978. To accomplish this goal we take each State Economic Area for each of two time periods (1974 and 1978) and present detailed economic information on employment and annual payrolls for each of nine industrial categories. Specifically, we provide the following information for each SEA (and then for the State as a whole) in 1974 and in 1978, by each of the nine industry categories: the number of employees for the week including March 12; and the annual payroll for the year (expressed in $1,000s).

The above data are taken from statistics provided in the County Business Patterns, a data source developed and published through the

TABLE 3.4

DATA ON FARM POPULATION FOR THE STATE OF MASSACHUSETTS AND ITS STATE ECONOMIC AREAS, 1974, 1978 & CHANGE 1974-78

STATE ECONOMIC AREA	Land in Farms Total Acrg. (1,000) 1974	1978	Percent Change 74-78	Percent of SEA Land devoted to farming 1974	1978	Diff. 74-78	Average value of land and buildings per farm ($1,000s) 1974	1978	Adjusted percent chg 74-78
SEA 1: Berkshire-Monadnock	73	80	9.6	16.1	17.6	1.5	119	153	-10.1
SEA 2: Cape Cod	13	16	23.1	4.8	6.2	1.4	162	165	-28.4
SEA A: Springfield-Chicopee-Holyoke Metro Area	107	105	-1.9	14.6	15.6	1.0	104	147	-1.0
SEA B: Worcester Metro Area	131	130	-0.8	13.5	13.4	-0.1	123	180	2.4
SEA C: Boston-Lowell-Lawrence-Haverhill Metro Area	84	86	2.4	7.6	7.8	0.2	154	232	5.2
SEA D: Brockton Metro Area	77	83	7.8	18.5	20.0	1.5	122	160	-8.2
SEA E: Fall River-New Bedford Metro Area	42	45	7.1	11.9	12.7	0.8	105	172	14.3
SEA F: Pittsfield Metro Area	73	73	0	12.1	12.1	0	169	208	-13.6
STATE OF MASSACHUSETTS	602	681	13.1	12.0	13.6	1.6	129	170	-7.8

SOURCE OF DATA: Data for 1974 taken from U.S. Bureau of the Census, County and City Data Book, 1977, Washington, D.C. (magnetic tape version); 1978 data taken from U.S. Bureau of the Census, Census of Agriculture, 1978 (machine readable data files). County data were aggregated into respective State Economic Areas.

U.S. Bureau of the Census which provides characteristics annually on the economic activity of all counties in the United States. The data reported represent general employment covered by the Federal Insurance Contributions Act.

Tables 3.5.1 through 3.5.F present the above economic data for each of the State Economic Areas for 1974 and 1978, with Table 3.5.3 providing the same information for the State of Massachusetts. Finally, Table 3.6 provides summary change data between 1974-78 for the economic payrolls of each SEA and the state in each of the nine industry categories, after adjusting for inflation.

The State of Massachusetts as a whole may be characterized mainly by manufacturing with services being of secondary importance. In 1978 manufacturing payrolls in the State amounted to over 9 billion dollars, with services totaling over 5.3 billion. The differential between the two industries with regard to the number of employees, however, is not as striking: there are nearly 651,000 manufacturing employees and almost 568,000 services employees (see Table 3.5.3). In Massachusetts, manufacturing payrolls increased by 2% and the services payrolls by 16% between 1974-78 (Table 3.6).

Looking next at Table 3.5.1 for SEA 1 (Berkshire-Monadnock), in 1974, the manufacturing industry provides the major economic base for the SEA. There were over 6,000 manufacturing employees with an annual payroll of over 60 million dollars. In 1978, the data show the same type of industrial concentration and distributions. Finally, Table 3.6 shows that SEA 1 actually experienced a slight reduction in its manufacturing payrolls between 1974-78; after adjusting for inflation its 1978 payrolls were only 96% of its 1974 payrolls. There were increases, however, in some of the other industrial activities in this SEA. For example, the 1978 payroll in finance, insurance and real estate reflected a 52% increase in 1974 payrolls. An inspection of the ratios in Table 3.6 provides an informative summary of the economic conditions between 1974-78 in all SEAs and in the State.

TABLE 3.5.1

ECONOMIC DATA*FOR STATE ECONOMIC AREA 1: Berkshire-Monadnock, Massachusetts, 1974 and 1978

Industry Group	1974 Number of employees for week including March 12	1974 Annual Payroll (1,000s)	1978 Number of employees for week including March 12	1978 Annual Payroll (1,000s)
Agricultural services, forestry, fisheries	**		63	830
Mining	**		**	
Contract construction	626	7,590	482	7,616
Manufacturing	6,148	60,468	6,116	75,744
Transportation and other public utilities	788	9,319	794	10,920
Wholesale trade	531	5,397	591	7,872
Retail trade	3,398	18,368	3,604	22,913
Finance, insurance and real estate	531	3,927	820	7,820
Services	3,675	21,549	4,126	31,742

*Excludes government employees, railroad employees, self-employed persons.

**Data suppressed to preserve confidentiality.

SOURCE OF DATA: U.S. Bureau of the Census, County Business Patterns, 1974 and 1978 (machine readable data files). County data were aggregated into State Economic Area data.

TABLE 3.5.2

ECONOMIC DATA*FOR STATE ECONOMIC AREA 2: Cape Cod, Massachusetts, 1974 and 1978

Industry Group	1974 Number of employees for week including March 12	1974 Annual Payroll (1,000s)	1978 Number of employees for week including March 12	1978 Annual Payroll (1,000s)
Agricultural services, forestry, fisheries	277	3,002	266	3,829
Mining	25	377	**	
Contract Construction	3,382	30,176	2,914	33,677
Manufacturing	3,050	21,910	2,657	31,114
Transportation and other public utilities	2,384	26,725	2,732	41,784
Wholesale trade	3,230	8,459	964	11,289
Retail trade	10,815	79,057	13,679	117,171
Finance, insurance and real estate	1,992	17,882	2,760	31,015
Services	7,876	63,291	10,314	100,152

*Excludes government employees, railroad employees, self-employed persons.

SOURCE OF DATA: U.S. Bureau of the Census, County Business Patterns, 1974 and 1978 (machine readable data files). County data were aggregated into State Economic Area data.

TABLE 3.5.A

ECONOMIC DATA* FOR STATE ECONOMIC AREA A: Springfield-Chicopee-Holyoke, Massachusetts, 1974 and 1978

Industry Group	1974 Number of employees for week including March 12	1974 Annual Payroll (1,000s)	1978 Number of Employees for week including March 12	1978 Annual Payroll (1,000s)
Agricultural services, forestry, fisheries	189	1,531	404	3,782
Mining	**		124	2,056
Contract construction	6,588	85,554	5,036	80,321
Manufacturing	66,465	652,742	66,794	869,054
Transportation and other public utilities	8,528	91,211	8,695	122,983
Wholesale trade	9,915	101,713	9,919	134,408
Retail trade	45,070	211,871	39,879	259,914
Finance, insurance and real estate	12,811	104,741	16,408	246,636
Services	39,690	255,211	47,457	367,617

*Excludes government employees, railroad employees, self-employed persons.

**Data suppressed to preserve confidentiality.

SOURCE OF DATA: U.S. Bureau of the Census, County Business Patterns, 1974 and 1978 (machine readable data files). County data were aggregated into State Economic Area data.

TABLE 3.5.B

ECONOMIC DATA*FOR STATE ECONOMIC AREA B: Worcester, Massachusetts, 1974 and 1978

Industry Group	1974 Number of employees for week including March 12	1974 Annual Payroll (1,000s)	1978 Number of employees for week including March 12	1978 Annual Payroll 1,000s)
Agricultural services, forestry, fisheries	**		351	4,141
Mining	**		44	761
Contract construction	10,705	143,643	8,340	140,830
Manufacturing	99,295	968,299	93,034	1,239,604
Transportation and other public utilities	8,056	85,930	8,559	118,647
Wholesale trade	10,462	118,565	11,870	156,954
Retail trade	38,756	205,037	41,588	267,300
Finance, insurance and real estate	8,992	79,901	9,761	107,309
Services	37,137	236,815	48,788	362,207

*Excludes government employees, railroad employees, self-employed persons.

**Data suppressed to preserve confidentiality.

SOURCE OF DATA: U.S. Bureau of the Census, County Eusiness Patterns, 1974 and 1978 (machine readable data files). County data were aggregated into State Economic Area data.

TABLE 3.5.C

ECONOMIC DATA*FOR STATE ECONOMIC AREA C: Boston-Lowell-Lawrence-Haverhill, Massachusetts, 1974 and 1978

Industry Group	1974		1978	
	Number of employees for week including March 12	Annual Payroll (1,000s)	Number of employees for week including March 12	Annual Payroll (1,000s)
Agricultural services, forestry, fisheries	3,029	28,708	694	45,635
Mining	868	13,325	820	17,756
Contract construction	67,046	863,298	53,853	913,062
Manufacturing	367,171	4,003,041	365,577	5,467,689
Transportation and other public utilities	80,298	925,280	76,497	1,214,713
Wholesale trade	168,509	1,069,618	88,760	1,375,731
Retail trade	233,817	1,339,804	249,424	1,758,121
Finance, insurance and real estate	114,735	1,112,971	103,436	1,366,717
Services	328,913	2,687,919	402,203	4,095,556

*Excludes government employees, railroad employees, self-employed persons.

SOURCE OF DATA: U.S. Bureau of the Census, County Business Patterns, 1974 and 1978 (machine readable data files). County data were aggregated into State Economic Area data.

TABLE 3.5.D

ECONOMIC DATA*FOR STATE ECONOMIC AREA D: Brockton, Massachusetts, 1974 and 1978

Industry Group	1974 Number of employees for week including March 12	1974 Annual Payroll (1,000s)	1978 Number of employees for week including March 12	1978 Annual Payroll (1,000s)
Agricultural services, forestry, fisheries	288	2,609	331	3,900
Mining	34	489	77	240
Contract construction	3,305	34,760	2,822	42,527
Manufacturing	20,959	185,745	20,166	232,920
Transportation and other public utilities	5,533	57,126	5,475	79,016
Wholesale trade	3,326	37,459	4,287	58,756
Retail trade	24,096	130,156	25,961	177,889
Finance, insurance and real estate	3,162	25,704	3,774	40,357
Services	13,092	87,048	16,647	140,541

*Excludes government employees, railroad employees, self-employed persons.

SOURCE OF DATA: U.S. Bureau of the Census, County Business Patterns, 1974 and 1978 (machine readable data files). County data were aggregated into State Economic Area data.

TABLE 3.5.E

ECONOMIC DATA*FOR STATE ECONOMIC AREA E: Fall River-New Bedford, Massachusetts, 1974 and 1978

Industry Group	1974 Number of employees for week including March 12	1974 Annual Payroll (1,000s)	1978 Number of employees for week including March 12	1978 Annual Payroll (1,000s)
Agricultural services, forestry, fisheries	1,672	16,203	2,003	34,762
Mining	58	672	61	908
Contract construction	4,247	49,141	3,728	52,445
Manufacturing	79,451	601,246	76,936	815,099
Transportation and other public utilities	8,231	92,194	7,179	103,758
Wholesale trade	6,328	58,032	7,209	88,312
Retail trade	27,208	137,297	28,011	180,010
Finance, insurance and real estate	4,799	37,171	6,126	56,407
Services	20,484	128,840	25,177	195,279

*Excludes government employees, railroad employees, self-employed persons.

SOURCE OF DATA: U.S. Bureau of the Census, County Business Patterns, 1974 and 1978 (machine readable data files). County data were aggregated into State Economic Area data.

TABLE 3.5.F

ECONOMIC DATA*FOR STATE ECONOMIC AREA F: Pittsfield, Massachusetts, 1974 and 1978

Industry Group	1974 Number of employees for week including March 12	1974 Annual Payroll (1,000s)	1978 Number of employees for week including March 12	1978 Annual Payroll (1,000s
Agricultural services, forestry, fisheries	115	1,177	88	797
Mining	94	1,303	26	557
Contract construction	1,658	20,628	1,320	20,691
Manufacturing	21,575	255,430	19,561	301,112
Transportation and other public utilities	1,640	14,980	1,560	18,255
Wholesale trade	1,500	14,201	1,580	17,150
Retail trade	9,411	50,356	9,485	66,296
Finance, insurance and real estate	2,152	18,630	2,320	26,523
Services	10,803	68,021	12,960	96,640

*Excludes government employees, railroad employees, self-employed persons.

SOURCE OF DATA: U.S. Bureau of the Census, County Business Patterns, 1974 and 1978 (machine readable data files). County data were aggregated into State Economic Area data.

TABLE 3.5.3

ECONOMIC DATA*FOR STATE OF MASSACHUSETTS, 1974 and 1978

Industry Group	1974 Number of employees for week including March 12	1974 Annual Payroll (1,000s)	1978 Number of employees for week including March 12	1978 Annual Payroll (1,000s)
Agricultural services, forestry, fisheries	6,088	57,402	7,231	98,154
Mining	**	-	1,183	23,907
Contract construction	97,557	1,234,791	78,539	1,291,910
Manufacturing	664,848	6,757,311	650,841	9,032,336
Transportation and other public utilities	115,804	1,306,893	111,491	1,710,076
Wholesale trade	121,119	1,413,449	125,180	1,850,620
Retail trade	392,590	2,171,991	411,631	2,850,042
Finance, insurance and real estate	149,237	1,401,380	145,405	1,833,779
Services	461,687	3,548,822	567,672	5,389,888

*Excludes government employees, railroad employees, self-employed persons.

**Data not given for State because of suppression for confidentiality in some State Economic Areas.

SOURCE OF DATA: U.S. Bureau of the Census, County Business Patterns, 1974 and 1978 (machine readable data files). County data were aggregated into State Economic Area data.

TABLE 3.6

CHANGE IN ECONOMIC PAYROLLS*BETWEEN 1974 AND 1978 (IN CONSTANT DOLLARS) FOR THE STATE OF MASSACHUSETTS AND ITS STATE ECONOMIC AREAS, BY EACH OF NINE INDUSTRIAL CATEGORIES

		STATE ECONOMIC AREAS							
INDUSTRY	STATE	SEA 1	SEA 2	SEA A	SEA B	SEA C	SEA D	SEA E	SEA F
Agricultural services, forestry, fisheries	1.31	**	.97	1.88	**	1.21	1.14	1.64	.52
Mining	**	**	**	**	**	1.02	.37	1.03	.33
Contract construction	.80	.77	.85	.72	.75	.81	.93	.81	.77
Manufacturing	1.02	.96	1.08	1.02	.98	1.04	.96	1.03	.90
Transportation and other public utilities	1.00	.89	1.19	1.03	1.05	1.00	1.06	.86	.93
Wholesale trade	1.00	1.11	1.02	1.01	1.01	.98	1.20	1.16	.92
Retail trade	1.00	.95	1.13	.94	1.00	1.00	1.04	1.00	1.00
Finance, insurance and real estate	1.03	1.52	1.32	1.80	1.03	.94	1.20	1.16	1.09
Services	1.16	1.12	1.21	1.10	1.17	1.16	1.23	1.16	1.08

*Excludes government employees, railroad employees, self-employed persons. Size class 1-4 includes establishments having payroll but no employees during mid-March pay period.

SOURCE OF DATA: U.S. Bureau of the Census, County Business Patterns, 1978, (machine readable data files). County data were aggregated into State Economic Area data.

Summarizing the other SEAs, we observe that the major economic activity in SEA 2 (Cape Cod) is retail trade, although services is a close second (see Table 3.6.2); both economic activities experienced an increase in payrolls between 1974-78 (Table 3.6). SEA A (Springfield) is mainly characterized by manufacturing (Table 3.5.A) and the payroll situation in the SEA increased by only 2% between 1974-78 (Table 3.6). State Economic Area B (Worcester) is also characterized by a heavy manufacturing base (Table 3.5.B), with a slight reduction in manufacturing payroll between 1974-78 (Table 3.6). The Boston State Economic Area (SEA C) is mainly manufacturing and services (Table 3.5.C); its 1978 payroll in manufacturing amounted to almost 5.5 billion dollars, whereas its services payroll in the same year was just under 4.1 billion dollars. The Boston manufacturing payroll constituted over 60% of the manufacturing payroll in the State as a whole, whereas the Boston services payroll was almost 76% of that of the State. There was a slight gain in manufacturing payrolls in Boston between 1974-78, and a marked gain (16%) in services during the same interval (Table 3.6). As expected, Boston remains the focal point of the economic structure in Massachusetts.

The Brockton State Economic Area (SEA D) is mainly a manufacturing center, with retail trade activities following closely (Table 3.5.D); its payrolls in these two industries declined slightly in manufacturing and increased slightly in retail between 1974-78 (Table 3.6). State Economic Area E (Fall River) is mainly manufacturing (Table 3.5.E), with a modest gain in manufacturing payroll (about 3%) between 1974-78 (Table 3.6). Finally, the Pittsfield SEA (SEA F) is like most of the other SEAs of the State; it emphasizes manufacturing (Tables 3.5.F); its manufacturing payrolls, however, declined by about 10% between 1974-78 (Table 3.6).

3.5 HEALTH

This section presents and analyzes selected health information for the State of Massachusetts and its State Economic Areas. Table 3.7 provides the following 1975 data: number of hospitals, number of hospital beds; hospital beds per 10,000 population; and physicians per 100,000 population. The data on hospitals and beds have been collected by the American Hospital Association for all hospitals accepted for registration by the Association. The data on physicians are collected by the American Medical Association and refer to professionally active non-Federal physicians. The data presented in this section suggest that in terms of absolute numbers of hospitals and hospital beds, the Boston SEA is at the front. The distributions of hospital beds and physicians calculated on a per population basis, however, are even more than the absolute counts. The Boston SEA is the major site for radionuclide use in a hospital/medical context.

3.6 HIGHER EDUCATION

Colleges and universities are major users of radionuclides. Table 3.8 provides baseline information on higher education in the State of Massachusetts and its State Economic Areas for the academic years 1974-75 and 1978-79. In the year ending in 1975, there were 122 colleges and universities in the State of Massachusetts with a student enrollment over 377,000. Four years later, the number of institutions had declined to 119, but the student enrollment increased to slightly more than 378,000.

The geographical distribution of institutions of higher education and their respective enrollments in the State are uneven, with more than 60% of the institutions in 1979 located in the Boston-Lowell-Lawrence-Haverhill State Economic Area (SEA C). Some of the major

TABLE 3.7

HEALTH INFORMATION FOR THE STATE OF MASSACHUSETTS
AND ITS STATE ECONOMIC AREAS, 1975

State Economic Area	No. of hospitals	No. of hospital beds	Hospital beds per 100,000 population	Physicians per 100,000 population
SEA 1: Berkshire-Monadnock	2	294	462.8	125.9
SEA 2: Cape Cod	5	517	365.0	212.5
SEA A: Springfield-Chicopee-Holyoke Metro Area	19	5,154	862.7	148.7
SEA B: Worcester Metro Area	25	5,242	808.8	162.3
SEA C: Boston-Lowell-Lawrence-Haverhill Metro Area	125	28,464	843.9	303.0
SEA D: Brockton Metro Area	9	2,619	689.6	98.7
SEA E: Fall River-New Bedford Metro Area	10	2,588	558.0	97.9
SEA F: Pittsfield Metro Area	6	887	595.4	185.9
STATE OF MASSACHUSETTS	201	45,765	787.4	234.8

SOURCE OF DATA: Data obtained for the counties of the state from U.S. Bureau of the Census, County and City Data Book, 1977, Washington, D.C. (magnetic tape version). County data were aggregated into the respective State Economic Areas.

universities located in this SEA are Harvard, Boston College, Boston University, and MIT. This SEA also contained more than 65% of the higher education enrollment of the State in 1979. The only other two SEAs in the State with comparable institutional or enrollment densities in 1979 are the Worcester State Economic Area (SEA B) with over 14% of the institutions of higher education, and the Springfield-Chicopee-Holyoke State Economic Area (SEA A) with over 15% of the student enrollments. Consideration of isotope utilization and disposal, however, should focus primarily on the Boston SEA, and secondarily on the Springfield and Worcester SEAs. Clearly the Boston SEA contains the bulk of the institutions and student enrollment in the state of Massachusetts.

4. GOVERNMENTAL AND PUBLIC ASPECTS

This section describes the structure and jurisdiction of the Massachusetts state government. Key state government officials, the Massachusetts' delegation to Congress, and state statutes and regulations relevant to radioactive waste management are identified and briefly summarized. A discussion of print media and public action organizations is also included.

4.1 MAJOR POLITICAL PARTIES

The majority party in Massachusetts politics is the Democratic party. Both U.S. Senators from Massachusetts are Democrats, and of the 12 Massachusetts Congressional Representatives, ten are Democrats. The membership of the Massachusetts General Court (the state legislature) is also predominantly Democratic.

4.2 THE MASSACHUSETTS DELEGATION

The Massachusetts U.S. Senators and Representatives are:

Senators:

Edward M. Kennedy (D) 2241 Dirksen Senate Office Building Washington, D.C. 20510 202-224-4543	Mr. Kennedy began service in 1962; he is a member of the Joint Economic, the Judiciary, and the Labor and Human Resources Committees.
Paul E. Tsongas (D) 342 Russell Senate Office Building Washington, D.C. 20510 202-224-2742	Mr. Tsongas began service in 1979; he is a member of the Energy and Natural Resources and the Foreign Relations Committees.

Representatives:

Thomas P. O'Neill, Jr.
2231 Rayburn House Office Building
Washington, D.C. 20515
202-225-5111
(D, 8th District)

Mr. O'Neill began service in 1953 and was elected as the Speaker of the House in 1977. The Speaker of the House does not serve on any legislative committees.

Edward P. Boland
2426 Rayburn House Office Building
Washington, D.C. 20515
202-225-5601
(D, 2nd District)

Mr. Boland began service in 1953; he is Chairman of the Select Committee on Intelligence and Chairman of the HUD-Independent Agencies Subcommittee under the Appropriations Committee.

Silvio O. Conte
2300 Rayburn House Office Building
Washington, D.C. 20515
202-225-5335
(R, 1st District)

Mr. Conte began service in 1959; he is the Ranking Minority Member of the Appropriations Committee and a member of the Small Business Committee.

Brian Donnelly
1021 Longworth House Office Building
Washington, D.C. 20515
202-225-3215
(D, 11th District)

Mr. Donnelly began service in 1979; he is a member of the Merchant Marine and Fisheries, and the Public Works and Transportation Committees.

Joseph D. Early
1032 Longworth House Office Building
Washington, D.C. 20515
202-225-6101
(D, 3rd District)

Mr. Early began service in 1975; he is a member of the Appropriations Committee.

Barney Frank
2452 Rayburn House Office Building
Washington, D.C. 20515
202-225-5931
(D, 4th District)

Mr. Frank was elected on November 4, 1980; he is a member of the Judiciary, and the Banking, Finance and Urban Affairs Committees. Mr. Frank is also on the Select Committee on Aging.

Margaret Heckler
2312 Rayburn House Office Building
Washington, D.C. 20515
202-225-4335
(R, 10th District)

Ms. Heckler began service in 1967; she is a member of the Agriculture, the Joint Economic, and the Veteran's Affairs Committees.

Edward J. Markey
213 Cannon House Office Building
Washington, D.C. 20515
202-225-2836
(D, 7th District)

Mr. Markey began service in 1976; he is a member of the Interior and Insular Affairs, and the Interstate and Foreign Commerce Committees.

Nicholas Mavroules
1204 Longworth House Office Building
Washington, D.C. 20515
202-225-8020
(D, 6th District)

Mr. Mavroules began service in 1979; he is a member of the Armed Services, and the Science and Technology Committee.

Joe Moakley
221 Cannon House Office Building
Washington, D.C. 20515
202-225-8273
(D, 9th District)

Mr. Moakley began service in 1973; he is a member of the Rules Committee.

James M. Shannon
226 Cannon House Office Building
Washington, D.C. 20515
202-225-3411
(D, 5th District)

Mr. Shannon began service in 1979; he is a member of the Ways and Means Committee.

Gerry E. Studds
1501 Longworth House Office Building
Washington, D.C. 20515
202-225-3111
(D, 12th District)

Mr. Studds began service in 1973; he is a member of the Foreign Affairs, and the Merchant Marine and Fisheries Committee. Mr. Studds is Chairman of the Coast Guard and Navigation Subcommittee.

4.3 STATE GOVERNMENT

The Massachusetts state government is comprised of Executive and Legislative branches and the Judiciary. This section describes the structure and jurisdiction of the Massachusetts state government and identifies major state officials.

4.3a. EXECUTIVE BRANCH

The executive branch of the State of Massachusetts consists of 14 constitutional officers and over 500 departments, boards, and commissions. The Constitutional Officers are the Governor, Lieutenant Governor, Attorney General, Treasurer and Receiver-General, Auditor of the Commonwealth, Secretary of the Commonwealth, and the eight members of the Governor's Council.

Massachusetts is not an NRC agreement state. Most state authority governing the installation, usage, handling, transportation and storage of sources of radiation has been concentrated within the Radiation Control Section of the Department of Public Health.

Office of the Governor

The Governor is the "supreme executive magistrate" of the Commonwealth of Massachusetts. He is elected to a four-year term. Presently, the Governor of Massachusetts is Edward J. King, a Democrat from Winthrop. Governor King was elected to office in November, 1978. Before becoming Governor, he served as President of the New England Council and as Comptroller, Secretary-Treasurer, and Executive Director of the Massachusetts Port Authority. The Governor appoints the heads of various departments and members of boards and commissions, prepares and submits the state budget to the General Court, vetoes bills, and initiates legislation. The Governor is Commander-in-Chief of the Massachusetts National Guard and President of the Governor's Executive Council. He is also empowered to submit executive branch reorganization plans to the General Court. If the reorganization plan is not disapproved by the General Court within sixty days after its submission, it has the force of law.

The Governor's address and his principal staff members are:

Governor Edward J. King
State House, Room 360
Boston, Massachusetts 02133
617-727-3600

Chief Secretary:	Paul Buzzi
Legislative Aide:	Jack McAlynn
Legal Aide:	Neil Lynch
Communications and Press:	Ron Brinn
Scheduling:	Patricia Connelly
Appointments:	Jeanne Marie Boylan
Special Advisor:	Eric Jostrum
Correspondence:	Mary Ellen Fitzpatrick

Governor's Cabinet. The Governor's Cabinet was created by the General Court in 1971. The Secretaries are appointed by and directly accountable to the Governor for the administration of the departments and agencies under their jurisdictions. Each Secretary has the authority to review and act on financial and budgetary matters concerning the programs that they administer. Pertinent Cabinet Secretaries are:

John A. Bewick
Secretary of Environmental Affairs
100 Cambridge Street, 20th Floor
Boston, MA 02202
617-727-9800

Charles Mahoney
Secretary of Human Services
State House, Room 109
Boston, MA 02133
617-727-8065

Joseph Fitzpatrick
Secretary of Energy Resources
73 Tremont Street, Room 700
Boston, MA 02108
617-727-4732

George A. Luciano
Secretary of Public Safety
1010 Commonwealth Avenue
Boston, MA 02215
617-566-4500

Barry Locke
Secretary of Transportation and Construction
One Ashburton Place, 16th Floor
Boston, MA 02108

Governor's Executive Council. The Governor's Executive Council is comprised of eight elected members, the Lieutenant Governor, and the Governor. The Governor, who is the presiding officer, has no vote.

The Council may be contacted at:

State House, Room 184
Boston, MA 02133
617-727-2795.

The members of the Governor's Executive Council are:

Governor	Edward J. King
Lieutenant Governor	Thomas P. O'Neill, III

Executive Council Members:

Honorable John Britland
Honorable George F. Cronin, Jr.
Honorable Herbert L. Connelly
Honorable Peter L. Eleey
Honorable John F. Markey
Honorable Joseph A. Longone
Honorable Leo J. Turo
Honorable Edward M. O'Brien

Office of Federal-State Relations. This office monitors actions of the federal government that may directly affect Massachusetts. The Office of Federal-State Relations provides a mechanism to promote the interests of the Commonwealth by influencing the direction of proposed federal legislation, policy, and agency regulations. It seeks to obtain federal funds and works directly with state agencies to assist them in their relationships with the federal government. This is in the Office of the Governor.

Office of Federal-State Relations
State House, Room 259
Boston, MA 02133
617-727-7289

Executive Agencies

Executive Office of Environmental Affairs

> The Executive Office of Environmental Affairs was established to "serve as the principal agency...for the protection and improvement of the quality of the environment of the Commonwealth and the resources which together constitute it, and the improvement of the public's opportunity to enjoy and exist healthily in that environment, by controlling the manmade despoilation of such resources and directing growth and development along planned lines which preserve for all time an ecologically sound and aesthetically pleasing balance of naturally-occurring resources."

The Office administers coastal zone management conservation services, environmental impact review, and law enforcement. The Office has five departments: Department of Environmental Quality Engineering; Department of Environmental Management; Department of Food and Agriculture; Department of Fisheries, Wildlife, and Recreation Vehicles; and Department of Metropolitan District Commission. The Secretary of the Office of Environmental Affairs is:

John A. Bewick
100 Cambridge Street
Boston, Massachusetts 02202
617-727-9800

Department of Environmental Quality Engineering. The Department of Environmental Quality Engineering administers those regulatory programs for air, water, solid waste, and land use controls. The Department also performs regulatory functions designed to protect public health

and provides technical advice to local communities and agencies. The Commissioner is:

Dr. Anthony Cortese
100 Cambridge Street, 20th Floor
Boston, MA 02202
617-727-2690

Division of Water Pollution Control. Contained within the Department of Environmental Quality Engineering is the Division of Water Pollution Control. The division establishes programs for the prevention, control, and abatement of water pollution. It is responsible for approving plans for the construction of waste disposal facilities and for inspecting existing facilities. The Director is:

Thomas McMahon
110 Tremont Street, 3rd Floor
Boston, MA 02108
617-727-3855

Division of Hazardous Waste. Also contained within the Department of Environmental Quality Engineering is the Division of Hazardous Waste. This division has the responsibility for developing criteria, standards, and requirements for handling hazardous wastes. The Division's authority encompasses the identification, treatment, storage, transportation, use and disposal of hazardous wastes. It monitors the impact of such materials and licenses collectors, haulers, and disposers of hazardous wastes. The Director is:

William Cass
600 Washington Street
Boston, MA 02111
617-727-0776

Department of Public Health. The Department of Public Health is responsible for providing direct health services, maintaining surveillance over the health of the citizens of Massachusetts, and regulating health care facilities, consumer products, and food and drug processing. The Commissioner of the Department of Public Health is:

Alfred Frechette
600 Washington Street
Boston, MA 02111
617-727-2700

Environmental Health Division. Contained within the Department of Public Health is the Environmental Health Division. The Division contains six sections: Lead Poisoning, Radiation, Food and Drug, Sanitary Code, Fluoridation, Safe Drinking Water, and Hazardous Waste Control. The Director is:

Gerald S. Parker
600 Washington Street, Room 770
Boston, MA 02111
617-727-2660

Radiation Control Section--Contained within the Environmental Health Division is the Radiation Control Section. Most authority within the executive branch governing the installation, usage, handling, transportation, and storage of sources of radiation is in the Radiation Control Section. All X-ray units in Massachusetts must be inspected by and registered with this office. The Director is:

Robert M. Hallisey
600 Washington Street, Room 770
Boston, MA 02111
617-727-6214

Advisory Council on Radiation Protection. The Advisory Council on Radiation Protection consists of the Commissioner of Public Health, Commissioner of Labor and Industries, Commissioner of Public Safety, Commissioner of Administration, Personnel Administrator, Director of Civil Defense, and six persons appointed by the Governor. The Council meets at least twice yearly. It makes recommendations to the Governor, General Court, and various departments concerning ionizing radiation. The Council submitted to Governor King a report entitled: Low-Level Radioactive Waste Management in Massachusetts in November, 1980. A copy of the report is contained in Appendix A of this handbook. The Advisory Council on Radiation Protection may be contacted through Mr. Robert Hallisey of the Radiation Control Section. The members of the Council are:

Constantine J. Maletskos, Chairman
Colburn Street
Gloucester, MA 01930
617-283-2339

Frank Archibald
Department of Labor
and Industries

Manson Benedict
Massachusetts Institute
of Technology

Gerald S. Parker
Department of Public Health

Paul Cahill
Civil Defense Agency

Patrick Scavotto
West Roxbury, MA

Edward Hanley
Executive Office of
Administration and Finance

Carlisle Smith
Department of Public Safety

James R. Nichols
Nichols and Pratt

John Marchant
Division of Personnel
Administration

State Geologist. The State Geologist is responsible for providing state agencies with information and advice on matters relating to groundwater, exploration of coal resources and offshore oil, soil formation, and mineral resources. The State Geologist is:

Joseph A. Sinnoter
1-11 Winter Street
Boston, MA
617-727-4796

4.3b. LEGISLATIVE BRANCH

The official name of the Massachusetts Legislature is the General Court. The General Court consists of a Senate, which has 50 members, and a House of Representatives, which has 160 members. All legislators are elected to two-year terms. The General Court convenes annually on the first Wednesday in January and adjourns when both houses agree and request the Governor and the Governor's Council to adjourn the session. The General Court is empowered to enact laws, administer oaths of office, levy an income tax, charter cities, and authorize the state to obtain land.

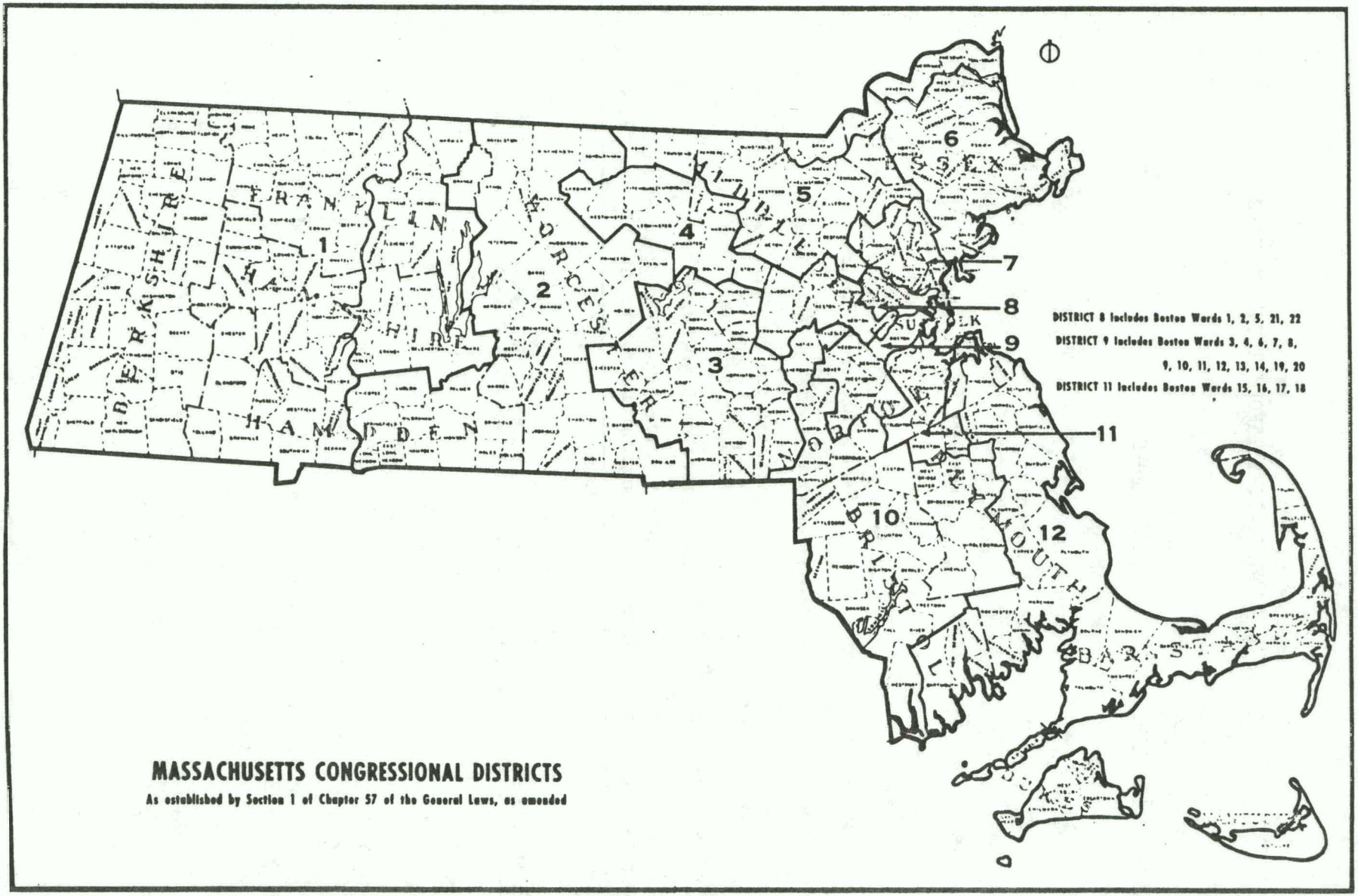
Table 4.1 provides a list of legislative information sources, and Map 4.1 illustrates the Massachusetts Congressional Districts .

Senate

The membership of the Massachusetts Senate consists of 31 Democrats, 7 Republicans, 1 Independent and 1 vacancy. A roster of Senate members, including their political affiliations, hometowns, and State House phone numbers, is on pages 4-23 and 4-24.

TABLE 1. LEGISLATIVE INFORMATION SERVICES

Type of Information	Source	Phone Number
General information	Central Exchange	(617) 727-2121
Information pertaining to the previous years' legislative activity and laws	State House News Service	727-2416
Information on pending legislation	Senate Clerk's Office House Clerk's Office	727-2476 727-2356
Information on bills pending before the Governor	Governor's Office	727-3600
To obtain copies of bills	Legislative Document Room	727-2349
To obtain copies of laws	State House Bookstore	727-2834



Map 4.1 Massachusetts Congressional Districts

Senate Leadership. The presiding officer of the Senate is the President, who is elected by the members of the Senate. The President appoints the Majority and Assistant Majority Leaders, decides on all questions of order, appoints the members and chairmen of the Senate Standing Committees, and serves as the chairman of the Senate Rules Committee.

The officers of the Senate are:

President:	William M. Bulger (D, Boston)
Majority Leader:	Daniel J. Foley (D, Worcester)
Assistant Majority Leader:	Mary L. Fonseca (D, Fall River)
Minority Leader:	John F. Parker (R, Taunton)
Assistant Minority Leader:	David H. Locke (R, Wellesley)
Assistant Minority Leader:	John F. Aylmen (R, Barnstable)
Assistant Minority Leader:	Robert A. Hall (R, Fitchburg)

Committee Structure. Joint Standing Committees bear the major burden of conducting hearings and recommending action on legislative proposals. Joint Standing Committees are composed of 6 Senators and 11 Representatives. The President appoints the Senate members of the Joint Standing Committees and a Senate Chairman for each committee. Joint Standing Committees must issue their final reports not later than the fourth Wednesday in April on all matters referred to them on or after that date. All meetings are open to the public unless voted otherwise by a majority of the committee members. Those Joint Standing Committees that may be relevant to radioactive waste management or radiation control are given on pages 4-17 through 4-22.

House of Representatives

The membership of the Massachusetts House of Representatives comprises 128 Democrats, 31 Republicans, and 1 Independent. A roster of House members, including their political affiliations, hometowns, and State House phone numbers, is given on pages 4-25 through 4-30.

House of Representatives Leadership. The presiding officer of the House is the Speaker, who is elected by the members of the House. The officers of the House of Representatives are:

Speaker:	Thomas W. McGee (D, Lynn)
Majority Leader:	George Keverian (D, Everett)
Majority Whip:	John E. Murphy, Jr. (D, Peabody)
Asst. Majority Whip:	Vincent J. Piro (D, Somerville)
Minority Leader:	William G. Robinson (R, Melrose)
Asst. Minority Leader:	Edward W. Connelly (R, Agawam)
Asst. Minority Leader:	Iris K. Holland (R, Longmeadow)
Asst. Minority Leader:	Andrew H. Card, Jr. (R, Holbrook)

Committee Structure. Joint Standing Committees bear the major burden of conducting hearings and recommending action on legislative proposals. Joint Standing Committees are composed of 6 Senators and 11 Representatives. Those Joint Standing Committees that may be relevant to radioactive waste management or radiation control are given on pages 4-17 through 4-22.

RELEVANT JOINT COMMITTEES

Energy. The Energy Committee considers all matters concerning the exploration, exploitation, and development of energy sources. This includes the siting of energy facilities and other related matters that may be referred to the Committee.

Chairmen:

Sen. Michael LoPresti, Jr.	(D, Boston)
Rep. Thomas C. Norton	(D, Fall River)

Senators--

John W. Olver	(D, Amherst)
Sharon M. Pollard	(D, Methuen)
John P. Burke	(D, Holyoke)
Louis P. Bertonazzi	(D, Milford)
Paul D. Harold	(D, Quincy)

Representatives--

Angelo R. Cataldo	(D, Revere)
James G. Collins	(D, Amherst)
Charles F. McNally	(D, Franklin)
Timothy M. Rourke	(D, Lowell)
John H. Flood	(D, Canton)
Steven Angelo	(D, Saugus)
Allan R. Chiocca	(D, Bridgewater)
Susan D. Schor	(D, Newton)
Bruce N. Freeman	(R, Chelmsford)
Walter A. DeFilippi	(R, West Springfield)

Federal Financial Assistance. This Committee considers all matters regarding the receipt of federal aid, joint resolutions memorializing the United States Congress or other federal agencies or officials, and other pertinent matters.

Chairmen:

Francis D. Doris	(D, Revere)
Doris Bunte	(D, Boston)

Senators--

Bill Owens	(D, Boston)
Gerald D'Amico	(D, Worcester)
John G. King	(D, Danvers)
Louis P. Bertonazzi	(D, Milford)
Peter C. Webber	(R, Great Barrington)

Representatives--

Thomas M. Finneran	(D, Boston)
William R. Keating	(D, Sharon)
Walter E. Bickford	(D, Berlin)
James R. Miceli	(D, Wilmington)
Kenneth M. Lemanski	(D, Chicopee)
Peter G. Trombly	(D, Waltham)
Susan D. Schur	(D, Newton)
Howard C. Cahoon	(R, Chatham)
Steven D. Pierce	(R, Westfield)
Peter Forman	(R, Plymouth)

Health Care. The Health Care Committee considers all matters concerning health care programs and regulation of the health care system including rate setting, licensing of health facilities and personnel, and other related matters.

Chairmen:

Sen. Edward L. Burke	(D, Framingham)
Rep. Theodore J. Aleixo, Jr.	(D, Taunton)

Senators:

Louis P. Bertonazzi	(D, Milford)
Samuel Rocondi	(D, Winchester)
John G. King	(D, Danvers)
Philip L. Shea	(D, Lowell)
Peter C. Webber	(R, Great Barrington)

Representatives--

Andrew J. Rogers, Jr.	(D, Framingham)
Elizabeth N. Metayer	(D, Braintree)
James A. Whitney	(D, Dudley)
Thomas K. Lynch	(D, Barnstable)
Stephen J. Karol	(D, Attleboro)
John M. Menard	(D, Somerset)
Walter D. Silveira	(D, Fairhaven)
Thomas J. Vallely	(D, Boston)
Argeo P. Cellucci	(R, Hudson)
James T. Harrington	(R, Holden)

Natural Resources and Agriculture. This Committee considers all matters pertaining to natural resources and the environment; air, water and noise pollution; solid waste disposal; sewerage; agriculture; and other related matters.

Chairmen:

Sen. Carol C. Amick	(D, Bedford)
Rep. William P. Nagle, Jr.	(D, Northampton)

Senators--

Edward L Burke	(D, Framingham)
Robert D. Wetmore	(D, Barre)
Philip L. Shea	(D, Lowell)
Francis D. Doris	(D, Revere)
Peter C. Webber	(R, Great Barrington)

Representatives--

Joseph S. Scelsi	(D, Pittsfield)
Nickolas Lambros	(D, Dracut)
Henry R. Grenier	(D, Spencer)
Melvin H. King	(D, Boston)
Roger R. Goyette	(D, New Bedford)
Walter E. Bickford	(D, Berlin)
Nicholas J. Costello	(D, Amesbury)
Thomas K. Lynch	(D, Barnstable)
Richard R. Silva	(R, Gloucester)
Lucile P. Hicks	(R, Wayland)

Public Safety. This Committee considers all matters relevant to public safety, including civil defense, motor vehicle laws, and other related matters.

Chairmen:

Sen. John P. Burke	(D, Holyoke)
Rep. Thomas P. White	(D, Worcester)

Senators--

John A. Brennan, Jr.	(D, Malden)
William Q. MacLean, Jr.	(D, Fairhaven)
Martin T. Reilly	(D, Springfield)
Edward P. Kirby	(R, Whitman)
George Bachrach	(I, Watertown)

Representatives--

George J. Bourque	(D, Fitchburg)
Angelo Picucci	(D, Leominster)
Nickolas Lambros	(D, Dracut)
William A. Carey	(D, Easthampton)
Roger R. Goyette	(D, New Bedford)
Roger L. Tougas	(D, Dartmouth)
William E. Moriarty	(D, Ware)
Stephen W. Doran	(D, Lexington)
Kevin Poirier	(R, North Attleborough)
Robert L. Howarth	(R, Springfield)

Transportation. This Committee considers all matters concerning the development, operation, regulation, and control of all modes of transportation. Also within the Transportation Committee's purview is the setting of tollrates for tunnels and bridges.

Chairmen:

Sen. John B. Walsh	(D, Boston)
Rep. Louis R. Nickinello	(D, Natick)

Senators--

John W. Olver	(D, Amherst)
Samuel Rotondi	(D, Winchester)
Carol C. Amick	(D, Bedford)
Robert C. Buell	(R, Bosford)
Paul D. Harold	(D, Quincy)

Representatives--

Jeremiah F. Cahir	(D, Bourne)
Paul W. White	(D, Boston)
Elizabeth N. Metayer	(D, Braintree)
Mary Jane Gibson	(D, Belmont)
George J. Bourque	(D, Fitchburg)
Alfred A. Minahan, Jr.	(D, Wakefield)
David B. Cohen	(D, Newton)
Sherman W. Saltmarsh, Jr.	(R, Winchester)
John Gray	(R, Groveland)

ROSTER OF SENATORS

1981-82 SESSION

This roster provides each Senator's name, political affiliation and hometown.

Name	Political Affiliation and Hometown
Amick, Carol C.	D, Bedford
Atkins, Chester G.	D, Concord
Aylmer, John F.	R, Barnstable
Bachrach, George	I, Watertown
Backman, Jack H.	D, Brookline
Bertonazzi, Louis P.	D, Milford
Boverini, Walter J.	D, Lynn
Brennan, John A.	D, Malden
Buckley, Anna P.	D, Brockton
Buell, Robert C.	R, Boxford
Bulger, William M.	D, Boston
Burke, Edward L.	D, Framingham
Burke, John P.	D, Holyoke
D'Amico, Gerard	D, Worcester
Doris, Francis D.	D, Revere
Foley, Daniel J.	D, Worcester
Fonseca, Mary L.	D, Fall River
Hall, Robert A.	R, Fitchburg
Harold, Paul D.	D, Quincy
King, John G.	D, Danvers
Kirby, Edward P.	R, Whitman
Lewis, Arthur Joseph, Jr.	D, Boston

Locke, David H.	R, Wellesley
LoPresti, Michael, Jr.	D, Boston
MacLean, William Q., Jr.	D, Fairhaven
McGovern, Patricia	D, Lawrence
McKenna, Denis L.	D, Somerville
McKinnon, Allan R.	D, Weymouth
Olver, John W.	D, Amherst
Owens, Bill	D, Boston
Parker, John F.	R, Taunton
Pollard, Sharon M.	D, Methuen
Reilly, Martin T.	D, Springfield
Rotondi, Samuel	D, Winchester
Shea, Philip L.	D, Lowell
Sisitsky, Alan D.	D, Springfield
Timilty, Joseph F.	D, Boston
Walsh, Joseph B.	D, Boston
Webber, Peter C.	R, Great Barrington
Wetmore, Robert D.	D, Barre

ROSTER OF REPRESENTATIVES

1981-82 SESSION

This roster provides each Representative's name, political affiliation and hometown.

Name	Political Affiliation and Hometown
Aguiar, Antone S., Jr.	D, Swansea
Aleixo, Theodore J., Jr.	D, Taunton
Alexander, Lawrence R.	D, Marblehead
Ambler, Robert B.	D, Weymouth
Angelo, Stephen	D, Saugus
Asiaf, Peter George	D, Brockton
Barrett, Michael J.	D, Reading
Bassett, Timothy A.	D, Lynn
Benson, William D.	D, Greenfield
Bickford, Walter E.	D, Berlin
Blanchette, Kevin P.	D, Lawrence
Bohigian, Robert J.	D, Worcester
Bolling, Royal L., Jr.	D, Boston
Bourque, George J.	D, Fitchburg
Brownell, Thomas F.	D, Quincy
Buglione, Nicholas J.	D, Methuen
Bunte, Doris	D, Boston
Businger, John A.	D, Brookline
Cahir, Jeremiah F.	D, Bourne
Cahoon, Howard C., Jr.	R, Chatham
Canavan, Ellen M.	R, Needham
Card, Andrew H., Jr.	R, Holbrook
Carey, William A.	D, Easthampton
Cataldo, Angelo R.	D, Revere

Cellucci, Argeo P.	R, Hudson
Cerasoli, Robert A.	D, Quincy
Chiocca, Allan R.	D, Bridgewater
Chmura, Rudy	D, Springfield
Ciccarelli, Salvatore	D, Watertown
Clark, Forrester A., Jr.	R, Hamilton
Cochran, Deborah R.	R, Dedham
Cohen, David B.	D, Newton
Cohen, Gerald M.	D, Andover
Collaro, Andrew	D, Worcester
Collins, James G.	D, Amherst
Connelly, Edward W.	R, Agawan
Corazzini, Leo R.	D, Shrewsbury
Correia, Robert	D, Fall River
Costello, Nicholas J.	D, Amesbury
Craven, James J., Jr.	D, Boston
Creedon, Michael C.	D, Brockton
Cusack, John F.	D, Arlington
Decas, Charles N.	R, Wareham
DeFilippi, Walter A.	R, West Springfield
DeNucci, A. Joseph	D, Newton
DiMasi, Salvatore F.	D, Boston
Doran, Stephen W.	D, Lexington
Doyle, Charles Robert	D, Boston
Driscoll, John R.	R, Northbridge
Duffin, Dennis J.	D, Lenox
Emilio, Frank A.	D, Haverhill
Fallon, Thomas F.	D, Clinton
Finnegan, John J.	D, Boston
Finneran, Thomas M.	D, Boston
Fitzgerald, Kevin W.	D, Boston
Flaherty, Charles F., Jr.	D, Cambridge
Flaherty, Michael F.	D, Boston

Flood, John H.	D, Canton
Flynn, William J., Jr.	D, Hanover
Forman, Peter	R, Plymouth
Freeman, Bruce N.	R, Chelmsford
Gallagher, Thomas M.	D, Boston
Galvin, William F.	D, Boston
Gibson, Mary Jane	D, Belmont
Glodis, William J., Jr.	D, Worcester
Goyette, Roger R.	D, New Bedford
Graham, Saundra	D, Cambridge
Gray, Barbara E.	R, Framingham
Gray, John	R, Groveland
Greenhalgh, Haden G.	R, Harwich
Grenier, Henry R.	D, Spencer
Harrington, James T.	R, Holden
Healy, Jonathan L.	R, Charlemont
Hermann, Joseph N.	D, North Andover
Hicks, Lucile P.	R, Wayland
Holland, Iris K.	R, Longmeadow
Howarth, Robert L.	R, Springfield
Howe, Marie E.	D, Somerville
Johnston, Philip W.	D, Marshfield
Jordan, Raymond A., Jr.	D, Springfield
Karol, Stephen J.	D, Attleboro
Keating, William R.	D, Sharon
Keverian, George	D, Everett
King, Melvin H.	D, Boston
Kollios, Paul	D, Millbury
LaFontaine, Raymond M.	D, Gardner
Lambros, Nickolas	D, Dracut
Lawrence, Denis	D, New Bedford
Lawton, Mark E.	D, Brockton
LeLacheur, Edward A.	D, Lowell

Lemanski, Kenneth M.	D, Chicopee
Lombardi, Leon J.	R, Easton
Lombardi, Michael J.	D, Cambridge
Loring, John H.	R, Acton
Lussier, Thomas R.	D, Pittsfield
Lynch, Thomas K.	D, Barnstable
Mann, Charles W.	R, Hanson
Manning, M. Joseph	D, Milton
Marotta, Angelo	D, Medford
Matrango, Frank J.	D, North Adams
McGee, Thomas W.	D, Lynn
McGlynn, Michael J.	D, Medford
McKenna, Arthur J.	D, Springfield
McNally, Charles F.	D, Franklin
McNeil, John C.	D, Malden
McNeil, Robert D.	D, Leicester
Menard, Joan M.	D, Somerset
Metayer, Elizabeth N.	D, Braintree
Miceli, James R.	D, Wilmington
Minahan, Alfred A., Jr.	D, Wakefield
Monahan, F. John	D, Beverly
Moore, Richard T.	D, Uxbridge
Moriarty, William E.	D, Ware
Morrissey, Michael W.	D, Quincy
Mullins, William D.	D, Ludlow
Murphy, John E., Jr.	D, Peabody
Murray, Mary Jeanette	R, Cohasset
Nagle, William P., Jr.	D, Northampton
Natsios, Andrew S.	R, Holliston
Navin, Joseph M.	D, Marlborough
Nelson, David R.	D, New Bedford
Nickinello, Louis R.	D, Natick
Norton, Thomas C.	D, Fall River

Paleologos, Nicholas A.	D, Woburn
Parente, Marie J.	I, Milford
Picucci, Angelo	D, Leominster
Pierce, Steven D.	R, Westfield
Piro, Vincent J.	D, Somerville
Poirier, Kevin	R, North Attleborough
Pokaski, Daniel F.	D, Boston
Rea, Michael J., Jr.	D, Billerica
Robinson, William G.	R, Melrose
Rogers, Andrew J., Jr.	D, Framingham
Rohan, Robert J.	D, Holyoke
Rourke, Timothy M.	D, Lowell
Ruane, J. Michael	D, Salem
Saggese, Alfred E., Jr.	D, Winthrop
Saltmarsh, Sherman W., Jr.	R, Winchester
Scaccia, Angelo M.	D, Boston
Scelsi, Joseph S.	D, Pittsfield
Schur, Susan D.	D, Newton
Scibelli, Anthony M.	D, Springfield
Serra, Emanuel G.	D, Boston
Silva, Richard R.	R, Gloucester
Silveira, Walter, Jr.	D, Fairhaven
Silvia, Charles E.	D, Fall River
Speliotis, Theodore C.	D, Danvers
Sullivan, Gregory William	D, Norwood
Switzer, Royall H.	R, Wellesley
Tougas, Roger L.	D, Dartmouth
Trombley, Peter G.	D, Waltham
Vallely, Thomas J.	D, Boston
Vigneau, Robert A.	D, Burlington
Voke, Richard A.	D, Chelsea
Walsh, Richard L.	D, Boston
Wetherbee, Bruce E.	D, Pepperell

White, Thomas B.	D, Worcester
White, W. Paul	D, Boston
Whitney, A. James	D, Dudley
Woodward, Francis H.	D, Walpole

4.3c. JUDICIAL BRANCH

The Massachusetts courts comprise seven Departments that are supervised by the State Trial Court. The Justices of the seven departments select one of their members for a seven-year term as Chief Administrative Justice. The Chief Administrative Justice, with the approval of the State Supreme Judicial Court, appoints an Administrator of Courts for the Trial Courts to assist in the management of the court system.

The Supreme Judicial Court designates one Justice from each of the seven departments as the Administrative Justice for their respective departments. Although the term of the Administrative Justices is five years, initial appointees have life tenure as Administrative Justices.

The Supreme Judicial Court

A Chief Justice and six Associate Justices sit on the bench of the Supreme Judicial Court, which is located in Boston. The Supreme Judicial Court is the final authority on the interpretation of the Constitution of Massachusetts and the laws enacted by the General Court (Legislature). The Supreme Court is authorized by the Consitution to render advisory opinions on important questions of law when requested by the Governor, the General Court, or the Executive Council.

The Appeals Court

The Appeals Court, consisting of a Chief Justice and five Associate Justices, has the same jurisdiction as the Supreme Judicial Court. Although the Appeals Court is a court of final resort, the Appeals Court may refer cases that raise significant legal issues or substantial constitutional questions, directly to the Supreme Judicial Court.

District Courts

The District Courts, referred to as the "People's Courts," are courts of general jurisdiction. The District Courts are the courts of origin for most cases concerned with civil, criminal and small claims matters.

The Superior Court

The Superior Court is a a circuit court which hears cases in 21 locations throughout the State. The Superior Court may preside over criminal cases, civil cases, or cases in equity. A citizen may petition the Superior Court to order a state or local government official to allow that citizen access to public records. A citizen who suspects that a local government official is about to spend money illegally may present the Superior Court with a petition signed by 10 taxpayers requesting a restraining order on that official. If the official involved is a state official, 24 signatures are required.

The Land Court

The Land Court has specialized jurisdiction in the registration of real estate titles and other matters relating to the ownership or use of real estate. In each Massachusetts county, there is a separate section in the office of the Registry of Deeds for records of the Land Court. All ownership and boundary disputes are adjudicated in this court.

4.3d. RELEVANT STATUTES AND REGULATIONS

In this section the legislation relevant to low-level radioactive waste management or radiation control is summarized, followed by a summary of implementing regulations. The full text of all Massachusetts statutes and regulations cited in this section is included in Appendix B.

Chapter 474, Section 5B, of the General Laws of Massachusetts. This Section authorizes the Department of Health to require registration of sources of ionizing and nonionizing radiation. It also empowers the Department to promulgate rules and regulations for the control of radiation hazards associated with the use, transportation, storage, packaging, sale, distribution, production, and disposal of radioactive materials.

Department of Public Health Regulations. The Massachusetts Department of Public Health has promulgated "Rules and Regulations to Control the Radiation Hazards of Radioactive Materials and of Machines Which Emit Ionizing Radiation." The purpose of these rules is to protect the Massachusetts citizenry from hazards associated with the use, transportation, storage, packaging, sale, distribution, production, and disposal of radioactive materials (Section A.1).

Radioactive materials that do not exceed the quantities set forth in Table 1 of Section D.1 and which do not result in exposure levels exceeding 5 million per year are exempt from these regulations. Also exempt are radioactive materials that are transported intrastate in conformance with the regulations of any agency which maintains jurisdiction over interstate transportation, providing that such regulations meet the ionizing radiation protection requirements of the Department of Health (Section D).

All radioactive material must be kept or stored in a manner that provides reasonable assurance that no individual will receive an absorbed dose in excess of the Radiation Protection Guides outlined in Table 2 of the regulations. All radioactive material must be stored in a manner that will prevent unauthorized removal from the place of storage (Section J).

All work performed with radioactive material must be conducted in a manner which minimizes the possibility of contamination that would result in an individual receiving an absorbed dose of radiation in excess of the Radiation Protection Guides. All persons who work with radioactive material not contained in a sealed source must have immediate access to instruments suitable for determining and measuring contamination levels (Section K).

The presence of ionizing radiation in an area must be indicated by conspicuous signs that bear the radiation caution symbol and the appropriate wording specified in Table 4 of the regulations. All containers used for the transfer or storage of radioactive material must indicate the kind and quality of material and the name of the person responsible for that material (Section L).

No radioactive material may be released into the air or water or buried in a manner which would result in individual exposure levels in excess of the Radiation Protection Guides. No radioactive material which occurs in a quantity greater than that stated in Table 1 of the regulations may be disposed of by burial or stored in or on unenclosed ground without first obtaining the approval of the Department of Health (Section M).

Hazardous Waste Regulations. The Massachusetts Hazardous Waste Board has promulgated regulations that specify the manner in which hazardous substances may be handled and disposed of.

Handling of Hazardous Wastes--No person may dispose of a classified hazardous waste at a site within Massachusetts unless the Division of Water Pollution Control has approved of the disposal. No person may dispose of hazardous waste at an off-shore disposal site unless that site has been approved by the Division of Water Pollution Control. In no instance may radioactive material be dumped in the

waters of the Commonwealth of Massachusetts (315 Code of Massachusetts Regulations, Section 2.03).

Disposal Methods and Locations--Disposal of radioactive material may be permitted at an offshore site if that site has been designated by the Division of Water Pollution Control. Disposal may also be permitted at those land-sites licensed by the Division (315 CMR 2.05).

Licensing--Any person who wishes to handle or dispose of hazardous waste must submit an application for a license to the Division of Water Pollution Control (315 CMR 2.06).

Chapter 6, Section 91, of the General Laws of Massachusetts. This section directs various state agencies to continuously monitor laws and regulations administered by them which are relevant to radioactive material. When appropriate, the agencies are further directed to recommend new laws or regulations or changes in the current laws and regulations. Seven agencies are assigned specific areas of responsibility:

- Department of Public Health - hazards to public health and safety
- Department of Labor and Industries - hazardous working conditions
- Department of Industrial Accidents - claims for injuries arising from accidents
- Department of Public Works - transportation of radioactive material
- Department of Public Utilities - transportation of radioactive materials by intrastate common carriers and in the development of industrial or commercial uses of radioactive material

- Division of Insurance - insurance of persons and property from hazards associated with atomic development

- Department of Environmental Affairs - hazards of natural resources

Transportation Regulations. These regulations, governing the transportation of hazardous materials in commerce on state highways, were promulgated by the Department of Public Works. The regulations are applicable to all common, contract, and private carriers of hazardous materials on state highways of Massachusetts. These regulations establish comprehensive regulation of shipping, packing, marking, labeling, placarding, handling, and transportation of hazardous materials in commerce (Title 720, Code of Massachusetts Regulations Sections 8.01 and 8.02).

The regulations promulgated by the United States Department of Transportation regarding the transportation of hazardous materials that are adopted by Massachusetts are:

> Title 49, Chapter 1 of the Code of Federal Regulations, Parts 171, 172, 173, 177, 178, and 179 (720 CMR 8.03).

Massachusetts specifically excludes portions of the adopted federal regulations governing transportation of hazardous materials by air, water, rail, or pipeline. Also excluded are reporting requirements of 49 CFR 171.15 and 49 CFR 171.16 (720 CMR 8.05).

The Department of Public Works accepts any exception granted by the U.S. Department of Transportation under Title 49 of the Code of Federal Regulations, Section 107, Subpart B. Subpart B prescribes the procedures by which persons who are subject to the requirements of Subchapter C of Title 49, and 46 CFR Parts 64 and 146 may obtain administrative relief from the requirements of those regulations (720 CMR 8.06).

Massachusetts Turnpike Authority. The Massachusetts Turnpike Authority allows radioactive shipments on the turnpike provided a permit is obtained from the Authority prior to the movement. Radioactive materials are prohibited from the Callahan and Sumner Tunnels in the Boston area.

4.4 FEDERAL ACTIVITIES IN THE STATE OF MASSACHUSETTS

The federal government does not operate any major nuclear facility in Massachusetts. Three sites in Massachusetts that may require action under the Formerly Utilized Sites Remedial Action Program are: the Watertown Arsenal site (approximately five miles west of Boston); the Ventron Corporation site in Beverly (approximately 15 miles northeast of Boston); and the Shpack Landfill site in Norton (approximately 15 miles northeast of Providence, Rhode Island).

4.5 LOCAL GOVERNMENT AUTHORITY

Cities and Towns

Cities and towns are the primary units of local government in Massachusetts; every square foot of the state lies within a city or town. These are the only units of government having legal power under the state constitution. The primary difference between a town and a city is that in the former, all of the inhabitants meet, deliberate, act and vote on the major issues; whereas under a city government, all this is done by representatives. Cities are governed by a variety of charters.

Other Local Government Authorities

There also exist a number of secondary agencies in the state with local government authority. These agencies vary in the degree of authority held as well as characteristics of authority and size. Among

these are: Counties, Regional Districts, Home Rule and Housing Authorities. Counties have no power to legislate or levy taxes under Massachusetts law, and are therefore relatively weak.

Home Rule. In 1966, the Home Rule Amendment was adopted to "reaffirm the customary and traditional liberties of the people with respect to the conduct of their local government..." This amendment precludes the Legislature from interfering in local matters within certain limits and except in defined circumstances. No provision of any city or town charter may be inconsistent with any provision of the Constitution or a law enacted by the General Court in accordance with the provisions in the Home Rule Amendment.

Zoning. A municipality or town is empowered to adopt zoning ordinances or bylaws for the purpose of promoting the health, safety, convenience, morals, or welfare of its inhabitants. Cities have the power to "prohibit noxious trades within the municipality or any specified part thereof."

Public Health. The City Council or Town Representatives have the power to form a Board of Health. They can sit on the board themselves or can appoint members. The Board of Health has broad plenary powers to regulate and prohibit health hazards. The Board has the power to adopt or amend existing regulations to prevent pollution or contamination of the atmosphere, however, it must first hold a public hearing, and secondly, receive the approval of the governor and city council. In addition, some cities have Air Pollution Districts which have the power to enforce rules and regulations adopted by the state. Cities must receive permission from the state to form Air Pollution Districts.

4.6 CITIZEN ACTION

The Constitution of Massachusetts provides two mechanisms for legislative action by citizens. Through popular initiative, a group

of citizens may propose a bill for the General Court's consideration. If the General Court does not pass the bill, but the requisite number of voters sign a petition in favor of the bill, it must be put on the ballot at the next biennial election. A popular referendum is a procedure by which citizens may require a law to be placed on the biennial election ballot for voters' approval.

Public Interest Groups

The following list provides the names of some of the public interest organizations operating in Massachusetts. Addresses, telephone numbers, and individuals to contact are provided where available.

The League of Women Voters of Massachusetts. The Massachusetts League is a non-partisan organization of 10,000 members with chapters in 190 cities and towns. The League seeks to provide information to its members and the general public on a variety of issues, and supports issues that it has studied and found to be in the public interest. The address of the League is:

Barbra Fegan, President
Dana Duxbury, Natural Resources Coordinator
120 Boylston Street
Boston, MA 02116
617-357-8380

The Union of Concerned Scientists. This organization studies the impact of advanced technology on society and disseminates its findings through quarterly newsletters, newspaper and magazine articles, media appearances, and public speaking engagements. The Union is headquartered in Cambridge and has a branch office in Washington, D.C. The chairman of the Board of Directors of the Union of Concerned Scientists is Dr. Henry W. Kendall, a nuclear physicist at the Massachusetts Institute of Technology.

Union of Concerned Scientists, Inc.
1384 Massachusetts Avenue
Cambridge, MA 02238
617-547-5552

Massachusetts Public Interest Research Group, Inc. The Massachusetts Public Interest Research Group (MASSPIRG) is an organization headquartered in Boston with 12 affiliated chapters throughout the state. MASSPIRG maintains a professional staff to coordinate citizen action, publishes MASSCITIZEN, a quarterly newsletter, and THE MASSPIRG REPORT, a semi-annual newsletter. This organization also maintains research and information files for use by its members.

Douglas Phelps, Executive Director
120 Boylston Street, Room 323
Boston, MA 02116
617-423-1796

Massachusetts Voice of Energy. The Massachusetts Voice of Energy (MVOE) acts as a clearinghouse for information concerning the benefits of nuclear energy. MVOE also maintains a roster of speakers for public engagements and testifying at public hearings. The MVOE is headquartered in Boston and has three student chapters across the state.

Murray Campbell, President
Massachusetts Voice of Energy
100 Statler Office Building
Boston, MA 02116
617-482-3513

Energy Policy Information Center. The Energy Policy Information Center (EPIC) acts as a clearinghouse for information on nuclear energy. EPIC also maintains a network of people interested in the nuclear waste issue called "Waste Watch." This organization is lobbying state governments to enact laws limiting the siting of nuclear waste disposal facilities.

Energy Policy Information Center
3 Joy Street
Boston, MA 02114
617-523-0376

The No Nuclear News Collective. This is an independent collective providing a monthly cooperative clipping service. The NO NUCLEAR NEWS is a monthly publication presenting newspaper clippings and graphics relevant to nuclear energy. The publication also provides a "score-board" that reports nuclear accidents or incidents occurring in the preceding month.

No Nuclear News
C/O The Boston Clamshell Coalition
595 Massachusetts Avenue
Cambridge, MA 02139

The New England Coalition on Nuclear Pollution Inc. The Coalition maintains a "mobile energy van" which provides presentations and literature on nuclear energy, models and displays of alternate energy sources, and other materials to illustrate alternative technologies. The Coalition maintains a roster of "Science Advisors" to speak on nuclear power issues. The Coalition maintains a resource center that provides books, documents, and other research material, and operates a film rental library containing films such as "Danger Radioactive Waste," an NBC documentary highlighting military and civilian radioactive waste problems.

Headquarters:
New England Coalition on Nuclear Pollution, Inc.
Box 637
Brattleboro, VT 05301
802-257-0336

Massachusetts office:
New England Coalition on Nuclear Pollution, Inc.
C/O Elizabeth Gage
5 Moody Street
Northfield, MA 01360

Boston Clamshell Coalition. This organization disseminates information on nuclear energy issues. The Coalition also organizes activities such as a planned "confrontational teach-in" at one of Boston Edison's downtown building lobbies.

Boston Clamshell Alliance
595 Massachusetts Avenue
Cambridge, MA 02139
617-661-6204

Coalition for Direct Action at Seabrook. The Coalition for Direct Action at Seabrook (CDAS) originated as a task force formed within the Clamshell Alliance. The CDAS grew into a national coalition. Through "collective nonviolent direct action", the CDAS is committed to halting "nuclear proliferation" and the construction of nuclear energy facilities.

Coalition for Direct Action at Seabrook
C/O Boston Clamshell Coalition
595 Massachusetts Avenue
Cambridge, MA 02139

There are a number of regional "Contract Groups" that maintain liaison with the CDAS; the Massachusetts organizations are:

Greater Newburyport Clamshell
C/O Box 1515
Seabrook, NH 03874
603-474-2455

Boston Clamshell Coalition
595 Massachusetts Avenue
Cambridge, MA 02139
617-661-6204

Lesbians United in Non-Nuclear Action
C/O The Cambridge Woman's Center
46 Pleasant Street
Cambridge, MA 02139
617-354-8807

May 24 Organizing Committee
Garret Schenck, Eric Finke
C/O Hampshire County AEC
85 Main Street
Amherst, MA 01002
413-584-4483 / 584-8147

Student Coalition Against Nukes
C/O University of Massachusetts AEC
R.S.O. 498, U. MAss.
Amherst, MA 01002

Cape and Islands
236 Popponssett Road
Cotuit, MA 02636
617-428-5338

Brian Stewart, WECAN
Box 386, Chandler Village
Worcester State College
Worcester, MA 01602
617-752-1478

Greenpeace of New England. This group is affiliated with the national Greenpeace Foundation. Greenpeace seeks to preserve and protect the environment.

Greenpeace New England
286 Congress Street
Boston, MA
617/542-7052

The New England Chapter of the Sierra Club. The Sierra Club maintains a legal defense fund and has sued various federal agencies, such as the Department of Interior, in order to prevent actions that the Sierra Club believes are not in the best interests of the environment.

New England Chapter
3 Joy Street
Boston, MA 02108
617-227-5339

Washington Legislative Office
330 Pennsylvania Avenue, S.E.
Washington, D.C. 20003
202-547-1141

Mobilization for Survival. The Mobilization for Survival (MFS) is a national coalition of organizations which seek to channel public

awareness into public action. The MFS is committed to obtaining a complete moratorium on all facets of nuclear power and weapons.

Mobilization for Survival
13 Sellars Street
Cambridge, MA
617-354-0008

National Headquarters:
3601 Locust Walk
Philadelphia, PA 19104
215-386-4875

The Women's International League for Peace Freedom. The United States Section of the League advocates an immediate halt to nuclear projects and stringent control of radioactive waste disposal.

Women's International League for Peace and Freedom
15 Sellars Street
Cambridge, MA
617-734-4216

4.7 PRINTED MEDIA

Appendix C contains newspaper articles published over a two-week period in either the "Boston Globe" or the "Boston Herald". These recent articles are supplemented by a larger number of newspaper clippings that were provided by Mr. Robert M. Hallisey, the Director of the Massachusetts Department of Public Health's Radiation Control Section. The clippings presented are all relevant to the broad area of nuclear energy.

Appendix D is a list of newspapers published or circulated in Massachusetts. The list provides the name of the paper, address and telephone number, area and size of circulation, and the press release deadline.

5. SURVEY METHODOLOGY

A brief questionnaire was developed to solicit basic information necessary to generally characterize the low-level radioactive waste management practices in the State of Massachusetts. The survey form is presented in Exhibit I. The form is divided into five parts dealing with areas of:

I. Type of Facility
II. Disposal Method
III. Sources of Radioactive Waste
IV. Physical Form of Shipped Waste
V. Waste Quantity

The form was designed to provide information in a structured format (i.e., check off of predefined possible answers) wherever possible. In addition, the questions asked were limited to those which have a direct bearing on the overall characterization of practices within the State, rather than on the detailed characterization of each facility.

The name and address of each radioactivity licensee within the state were obtained from the Nuclear Regulatory Commission. A questionnaire package was mailed to each licensee and consisted of a cover letter from the Massachusetts Radiation Control Office, a transmittal letter (including brief instructions), a blank survey form, and a return envelope. The cover letter and transmittal letter are presented in Exhibits II and III, respectively.

As each response was received from the licensees, the information presented in Appendix A, List of Radioactive Material Licensees, was determined. A five-week response period was allowed, at which point all licensees not responding were classified as such and their "type

of facility" classification determined from the licensee name, if possible. If not possible, they were classified as "unknown." The information provided by the licensee was then tabulated in the formats presented in Tables 1 through 11 of this Briefing Book.

Overview

A total of 365 radioactive material licenses are in effect in Massachusetts. Information on disposal practices was solicited from each license holder by a written questionnaire (see section below). Appendix A presents the name and address of each license holder; whether the licensee responded, indicated by "Y" for yes and "N" for no; the type of facility; and whether they ship waste to a commercial disposal site.

The type of facility was classified as either Medical, Educational, Industrial, Power Reactor, or Governmental according to Part 1 of the survey form shown in Exhibit I. It should be noted that the Medical classification includes both medical education facilities and governmental medical facilities, that the Educational classification excludes medical education facilities, and that the Governmental classification excludes both medical and educational facilities. A service unit, such as a laboratory, was classified according to the type of facility to which it provides the service.

Of the 365 radioactive material users, contact was made with 164, of which 77 indicated they ship waste to commercial disposal facilities. Table 1 presents a breakdown of license holders by type of facility, response to questionnaire, and number of shippers. The "percent of responses" was calculated as the number of respondents divided by the total number of licenses times 100. The "percent of shippers responding"

was calculated as the number of respondents shipping waste divided by the total number of respondents in a facility classification times 100.

Table 8 presents the on-site waste disposal practices employed, including disposal method other than shipment to commercial disposal facilities. In this table, the total of "number using" exceeds the total number of respondents due to use of several disposal practices by some facilities. It is believed that many facilities reported only the major disposal method used rather than all methods used and the data should be viewed with this qualification in mind. The "percent of total respondents" value was calculated as the number of respondents in a "type of facility" classification reporting use of a method divided by the total number of respondents times 100. In addition, Table 3 presents the source of the radioactivity which eventually requires use of some disposal method.

Exhibit I

RADIOACTIVE WASTE SURVEY

LICENSEE NAME _____

NAME OF FACILITY _____

STREET ADDRESS _____

CITY/STATE/ZIP _____

TELEPHONE NO. _____

PERSON SUPPLYING INFORMATION _____

TITLE _____

PART I - TYPE OF FACILITY

(CHECK THE ONE CATEGORY WHICH IS MOST APPLICABLE)

MEDICAL

( ) HOSPITAL
( ) PHARMACEUTICAL MANUFACTURER
( ) MEDICAL RESEARCH/EDUCATION
( ) OTHER (SPECIFY) _____

INDUSTRIAL

( ) INCORPORATES RADIOACTIVITY INTO PRODUCTS
( ) USES RADIOACTIVITY IN PROCESS CONTROL
( ) COMMERCIAL POWER REACTOR
( ) OTHER (SPECIFY) _____

EDUCATIONAL

( ) UNIVERSITY
( ) HIGH SCHOOL
( ) OTHER (SPECIFY) _____

GOVERNMENTAL (NON-MEDICAL OR EDUCATIONAL)

( ) FEDERAL
( ) MILITARY
( ) STATE
( ) LOCAL

PART II - DISPOSAL METHOD

CHECK EACH DISPOSAL METHOD WHICH YOU DO EMPLOY

( ) SHIP TO COMMERICAL REPOSITORY
( ) RELEASE TO SEWER
( ) COMBINE WITH COMMON REFUSE
( ) VENT TO ATMOSPHERE
( ) BURY ON-SITE
( ) RETURN TO VENDOR
( ) DISTRIBUTE IN PRODUCT FORM
( ) NO WASTE GENERATED
( ) OTHER (SPECIFY) _____

WHAT ON-SITE PROCESSING OF WASTE DO YOU EMPLOY?

( ) NONE

( ) MECHANICAL COMPACTION

( ) INCINERATION

( ) SOLIDIFICATION OR EVAPORATION OF LIQUIDS

( ) ABSORPTION OF LIQUIDS

( ) OTHER (SPECIFY)_____

PART V - WASTE QUANTITY

INDICATE TOTAL YEARLY VOLUME (IN CUBIC FEET) OF WASTE SHIPPED TO A COMMERCIAL DISPOSAL FACILITY

	CUBIC FEET SHIPPED
ACTUAL SHIPPED IN 1978	
ACTUAL SHIPPED IN 1979	
ACTUAL SHIPPED IN 1980	

INDICATE TOTAL YEARLY VOLUME (IN CUBIC FEET) OF WASTE PROJECTED TO BE GENERATED WHICH WILL BE SHIPPED.

	CUBIC FEET ESTIMATED
ESTIMATED GENERATION IN 1981	
ESTIMATED GENERATION IN 1985	
ESTIMATED GENERATION IN 1990	

INDICATE THE QUANTITY OF RADIOACTIVITY (IN CURIES) SHIPPED TO A COMMERCIAL FACILITY IN THE YEARS 1978, 1979 AND 1980.

ISOTOPE	QUANTITIES SHIPPED (CURIES): 1978	1979	1980

PART III - SOURCE OF RADIOACTIVE WASTE

(CHECK EACH SOURCE OF YOUR POTENTIAL RADIOACTIVE WASTE AND, IF YOU SHIP, INDICATE THE PERCENTAGE OF YOUR TOTAL SHIPPED WASTE VOLUME ORIGINATING FROM EACH SOURCE CATEGORY)

SOURCE OF RADIOACTIVITY	PERCENT OF WASTE VOLUME SHIPPED
( ) NUCLEAR REACTOR	
( ) NEUTRON GENERATOR	
( ) CYCLOTRON OR SYNCHROTRON	
( ) SEALED SOURCE	
( ) UNSEALED RADIOACTIVE MATERIAL	
( ) NATURAL ORES OR MILL TAILINGS	
( ) OTHER(SPECIFY)_____	
	100 %

IF YOU DO NOT SHIP RADIOACTIVE WASTES, YOU HAVE COMPLETED THE QUESTIONNAIRE. THANK YOU. IF YOU DO SHIP, PLEASE CONTINUE WITH THE FOLLOWING QUESTIONS.

PART IV - PHYSICAL FORM OF SHIPPED WASTES

(CHECK EACH FORM OF WASTE WHICH YOU SHIP AND INDICATE THE PERCENTAGE OF YOUR TOTAL SHIPPED WASTE VOLUME REPRESENTING EACH FORM)

	PERCENT OF WASTE VOLUME SHIPPED
( ) DRY SOLIDS, TRASH, IRRADIATED COMPONENTS	
( ) SOLIDIFIED OR ABSORBED LIQUIDS, SOLID SLUDGES, SPENT RESINS, FILTER SLUDGES OR EVAPORATOR BOTTOMS	
( ) ANIMAL CARCASSES OR OTHER BIOLOGICAL WASTE	
( ) SEALED SOURCES	
( ) OTHER (SPECIFY)_____	
	100%

DOES WASTE CONTAIN ANY MATERIAL WHICH IS POTENTIALLY:

YES	NO	
( )	( )	COMBUSTIBLE
( )	( )	EXPLOSIVE
( )	( )	CHEMICALLY TOXIC

WHAT SHIPPING CONTAINERS DO YOU USE?

( ) 55 GALLON STEEL DRUMS

( ) 30 GALLON STEEL DRUMS

( ) OTHER (SPECIFY)_____

WHAT ON-SITE PROCESSING OF WASTE DO YOU EMPLOY?

( ) NONE

( ) MECHANICAL COMPACTION

( ) INCINERATION

( ) SOLIDIFICATION OR EVAPORATION OF LIQUIDS

( ) ABSORPTION OF LIQUIDS

( ) OTHER (SPECIFY)_____

PART V - WASTE QUANTITY

INDICATE TOTAL YEARLY VOLUME (IN CUBIC FEET) OF WASTE SHIPPED TO A COMMERCIAL DISPOSAL FACILITY

	CUBIC FEET SHIPPED
ACTUAL SHIPPED IN 1978	
ACTUAL SHIPPED IN 1979	
ACTUAL SHIPPED IN 1980	

INDICATE TOTAL YEARLY VOLUME (IN CUBIC FEET) OF WASTE PROJECTED TO BE GENERATED WHICH WILL BE SHIPPED.

	CUBIC FEET ESTIMATED
ESTIMATED GENERATION IN 1981	
ESTIMATED GENERATION IN 1985	
ESTIMATED GENERATION IN 1990	

INDICATE THE QUANTITY OF RADIOACTIVITY (IN CURIES) SHIPPED TO A COMMERCIAL FACILITY IN THE YEARS 1978, 1979 AND 1980.

ISOTOPE	QUANTITIES SHIPPED (CURIES): 1978	1979	1980

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Exhibit II

The Commonwealth of Massachusetts
Department of Public Health
600 Washington Street
Room 770 Boston 02111 Tel. (617) 727-6214

Alfred L. Frechette, M.D.
Commissioner

January 30, 1981

TO: All Radioactive Material License Holders in Massachusetts

SUBJECT: Survey of Low-Level Radioactive Waste Disposal Practices

Dear Sir:

Continued free access to proper low-level radioactive waste disposal sites is an important priority for users of radioactive material within Massachusetts. The Politech Corporation is conducting a survey of nuclear material licensees for the U. S. Department of Energy to ascertain the volume and nature of waste generated in Massachusetts. The results of this survey will form an important part of the planning and future decisions regarding waste disposal site access.

This office encourages you to respond in timely fashion to the questionnaire contained in the accompanying materials. The quality of planning for radioactive waste disposal is dependent upon accurate data on the current waste situation.

Sincerely,

ROBERT M. HALLISEY, Director
Radiation Control Program

RMH:ll

Exhibit III

POLITECH CORPORATION

AUSTIN NATIONAL BANK TOWER
SUITE 2220
SIXTH AND CONGRESS
AUSTIN, TEXAS 78701

TELEPHONE: (512) 478-2126
TELEX: 767127
ANSWER BACK: SUNDANCE

January 28, 1981

Dear Sirs:

The enclosed Radioactive Waste Survey is one part of a project by POLITECH to assist the U.S. Department of Energy in the Development of a National Low-Level Waste Management Program. Compilation of accurate and current information about low-level waste generation, treatment, storage, shipments, and disposal is essential to implement this program. It is towards this end that POLITECH seeks your cooperation in completing this survey form. The enclosed Radioactive Waste Survey is largely self-explanatory, and the following instructions provide general guidelines. If you have any specific questions or concerns, please call either Chris Eakle at (512) 478-2126 or Kevin Dinan at (202) 659-0106.

GENERAL INSTRUCTIONS

1. If possible, all quantitative data should be taken directly from shipment records. If this is not possible, please estimate answers as accurately as possible.

2. Please explain or specify answers (where requested) as completely as possible. If additional space is needed, please use the space on the last page of this questionnaire.

3. When you have completed this questionnaire, please return it in the enclosed stamped, self-addressed envelope.

4. For any radioactive wastes not shipped to a licensed storage or disposal facility (e.g., wastes contaminated with isotopes which decay to background levels, or wastes disposed in trash), please fill out the survey form with the amount of material received each year and where those radioactive materials were disposed.

Thank you very much for your cooperation.

Sincerely,

Alvin C. Askew
President

6. MASSACHUSETTS RADIOACTIVE WASTE SURVEY

Use of Commercial Low-Level Waste Disposal Facilities

In the State of Massachusetts, a total of 365 potential shippers of low-level radioactive waste were identified. These potential shippers were sent, by direct mail, questionnaires concerning their waste management practices. The respondent was identified as either a medical, educational, industrial, power reactor, or governmental type facility. The tables below present the number of respondents using various disposal methods and the source of radioactivity used at facilities. Table 1 indicates that 47% (77 facilities) of the respondents use commercial low-level waste facilities. The following subsections present a summary of the characteristics and quantity of wastes disposed of by these 77 facilities.

Response to Survey

Table 1 presents, by facility type, the number of potential shippers surveyed, and the total number and percentage of responses obtained. If a facility provided at least the facility type and method of disposal, the answers were considered a response. If no information was obtained, the type of facility was determined by the facility name.

Forty-five % of all potential shippers identified provided some degree of response. Their response varied between type of facility, with the range being 25.0% for educational facilities and power reactors to 62.5% for government facilities.

It should be noted that of the 201 potential shippers (out of 365) which did not provide any information, many may in fact be shippers. It was assumed they in fact do ship wastes, since the only response

and effort required, if they do not ship wastes, was to return the form. Thus, there is a high probability that the percent response to the survey from shippers may be closer to 27.7% (77 shipper respondents out of a total of 278 shippers or non-respondents) rather than the 45% response from all potential shippers.

Origin and Distribution of Shipped Waste

Table 2 presents the distribution of numbers of facilities shipping wastes by major type of facility and by subgroup within each major type. The origin of radioactivity resulting in shipped waste was grouped into four categories: nuclear reactor operation, purchased as sealed sources, purchased as unsealed radioactivity, and produced in a cyclotron. Table 3 presents the distribution of number of facilities shipping wastes according to type of facility and origin of radioactivity. It should be noted that more than one origin may be appropriate for a given facility. Approximately 57% of the facilities shipping wastes obtain the radioactivity as unsealed radioactive material.

Volume of Shipped Waste

Volumes of low-level wastes shipped to commercial disposal facilities were provided by the 77 respondents that indicated they shipped wastes. Table 4 presents volumes of shipped wastes for the years 1978, 1979, and 1980 for each type of facility and for subgroups of each facility type.

Table 5 shows the volumes of wastes projected by the respondents to be shipped in the years 1981, 1985, and 1990. If a respondent only provided a projection for 1981 (or 1981 and 1985), the furthest projection in time given was assumed to apply for all subsequent time periods. The data shows an increase in total waste to be shipped of approximately 17% over the 10-year period of 1981 to 1990.

Activity of Shipped Waste

Table 6 presents quantity of activity in the waste shipped for the years 1978, 1979, and 1980 for each type of facility. Table 7 presents the distribution of activity by shipped radionuclide (by type of facility).

Physical Characteristics of Shipped Waste

On-site processing of low-level waste may be performed to either reduce the volume of the waste (compaction, incineration) or to remove free liquid (solidification, evaporation, absorption). Table 8 shows the number of facilities using these methods. Thirty of the 77 respondents indicated they did not engage in on-site processing of shipped waste. Table 9 presents the type of shipping container used on-site to package waste for transport to disposal facilities. Twenty-two % of the facilities (shown under "other" column) use cardboard boxes for small volumes of waste which are packaged in drums by the transporter. Shipped waste was categorized as either dry, moist, biological, sealed, or other. Table 10 presents the number of facilities shipping waste in any of these categories. Table 11 indicates the number of facilities shipping wastes with potential nonradiological hazardous characteristics classified as combustible, explosive and/or toxic.

MASSACHUSETTS RADIOACTIVE WASTE SURVEY

SUMMARY TABLES

TABLE 1

RESPONSE TO DIRECT MAIL SURVEY

Type of Facility	Number of Licensees	Number of Responses	%	Number of Shippers Responding	%
Medical					
o Hospital		46		11	23.9
o Pharmaceutical manufacturer		2		2	100.0
o Medical Research of Education		5		6	100.0
o Other		9		5	55.5
Total	123	63	51.2	24	38.1
Educational					
o University		9		7	77.8
o High School		1		0	0.0
o Other		5		4	80.0
Total	60	15	25.0	11	73.3
Industrial					
o Incorporate Radioactivity into Products		22		16	72.7
o Uses Radio-activity in Process Control		20		7	35.0
o Other		33		14	42.4
Total	162	75	46.3	37	49.3
Power Reactor	4	1	25.0	1	100.0
Governmental					
o Federal		5		2	40.0
o Military		0		0	0.0
o State		3		2	66.7
o Local				0	0.0
Total	16	10		4	40.0
Totals	365	164	44.9	77	46.9

TABLE 2

TYPE OF FACILITIES SHIPPING LOW-LEVEL WASTE

Type of Facility		Number of facilities shipping	Percent of all shippers	Percent of all respondents
Facility	Subgroup			
Medical	Hospital	11	14.3	6.7
	Pharmaceutical	2	2.6	1.2
	Research/Education	6	7.8	3.7
	Other	5	6.5	3.0
	Total	24	31.2	14.6
Education	University	7	9.1	4.3
	High School	0	0	0
	Other	4	5.2	2.4
	Total	11	14.3	6.7
Industrial	Product Use	16	20.8	9.8
	Process Control	7	9.1	4.3
	Other	14	18.2	8.5
	Total	37	48.1	22.6
Power Reactor	Total	1	1.3	0.6
Governmental	Federal	2	2.6	1.2
	Military	0	0	0
	State	2	2.6	1.2
	Local	0	0	0
	Total	4	5.2	2.4
TOTAL		77	100.00	46.9

TABLE 3

ORIGIN OF RADIOACTIVITY RESULTING IN SHIPPED WASTES

Type of facility	Number of respondents	Nuclear reactor		Cyclotron		Sealed Sources		Unsealed radioactive material	
		Number of Sources	Percent of all shippers	Number of sources*	Percent of all shippers	Number of sources*	Percent of all shippers	Number of sources*	Percent of all shippers
Medical	24	7	9.1	7	9.1	8	10.4	13	16.9
Educational	11	1	1.3	0	0.0	1	1.3	5	6.5
Industrial	37	4	5.2	1	1.3	12	15.6	23	29.9
Power Reactor	1	0	0	0	0.0	0	0	0	0
Governmental	4	0	0	0	0.0	1	1.3	3	3.9
TOTAL	77	12	15.6	8	10.4	22	28.6	44	57.1

*The total of "number of sources" exceeds the total number of respondents due to facilities generating waste from several sources.

FIGURE 4

VOLUME OF SHIPPED WASTE

Type of Facility		Number of Respondents	Volume Shipped					
			1978		1979		1980	
Facility	Subgroup		Cubic Meters	Percent of Total	Cubic Meters	Percent of Total	Cubic Meters	Percent of Total
Medical	Hospital	11	75.15	5.5	76.68	3.2	104.46	4.1
	Pharmaceutical	2	6.85	0.5	4.59	0.2	4.93	0.2
	Research/Education	6	26.43	1.9	27.04	1.1	49.49	1.9
	Other	5	499.55	3.6	60.11	2.5	77.27	2.9
	Total	24	608.98	11.5	168.42	6.9	240.14	9.0
Educational	University	7	104.65	7.6	114.73	4.7	119.74	4.5
	High School	0	0.00	0.0	0.00	0.0	0.00	0.0
	Other	4	3.78	0.3	15.37	0.6	17.43	0.7
	Total	11	108.43	7.9	130.10	5.4	137.17	5.1
Industrial	Product use	16	298.02	21.7	342.72	14.2	283.95	10.6
	Process control	7	.11	0.0	.22	0.0	.33	0.0
	Other	14	547.43	39.9	1538.44	63.5	1831.64	68.6
	Total	37	845.56	61.6	1881.38	77.7	2115.92	79.2
Power Reactor	Total	1	247.35	18.0	231.97	9.6	167.13	6.3
Governmental	Federal	2	13.00	0.9	9.61	0.4	11.53	0.4
	Military	0	0.00	0.0	0.00	0.0	0.00	0.0
	State	2	0.00	0.0	0.00	0.0	0.00	0.0
	Local	0	0.00	0.0	0.00	0.0	0.00	0.0
	Total	4	13.00	0.9	9.61	0.4	11.53	0.4
TOTAL		77	1822.34	100.0	2421.48	100.0	2671.90	100.0

TABLE 5

PROJECTED VOLUMES OF SHIPPED WASTES

Type of Facility		Number of Respondents	Projected Volume (cubic meters)		
Facility	Subgroup		1981	1985	1990
Medical	Hospital	11	72.29	18.10	18.10
	Pharmaceutical	2	6.01	6.01	3.17
	Research/Education	6	64.08	79.52	85.44
	Other	5	89.60	105.18	183.80
	Total	24	231.98	208.81	290.42
Educational	University	7	115.69	124.84	144.67
	High School	0	0.00	0.00	0.00
	Other	4	.99	54	.54
	Total	11	116.69	125.38	145.21
Industrial	Product use	16	318.53	345.41	402.38
	Process control	7	.11	.23	.23
	Other	14	4263.54	5681.67	7100.79
	Total	37	4582.18	6027.31	7503.40
Power Reactor	Total	1	212.46	198.30	141.64
Governmental	Federal	2	12.61	15.58	17.56
	Military	0	0.00	0.00	0.00
	State	2	.03	.03	.03
	Local	0	0.00	0.00	0.00
	Total	4	12.63	15.61	17.59
TOTAL		77	596.29	639.21	700.31

TABLE 6

ACTIVITY OF SHIPPED WASTE

Type of Facility		Number of respondents	Activity Shipped					
			1979		1979		1980	
Facility	Subgroup		Curies	Percent of total	Curies	Percent of total	Curies	Percent of total
Medical	Hospital	11	168.95	47.2	163.96	35.1	158.99	15.4
	Pharmaceutical	2	2.90	0.8	1.50	0.3	.50	0.0
	Research/Education	6	4.22	1.2	9.91	2.1	14.52	1.4
	Other	5	.02	0.0	.63	0.1	1.29	0.1
	Total	24	176.09	49.2	176.00	37.7	175.30	16.9
Educational	University	7	11.0	3.1	5.02	1.1	40.14	3.9
	High School	0	0.0	0.0	0.0	0.0	0.0	0.0
	Other	4	.18	0.0	.25	0.0	.32	0.0
	Total	11	11.18	3.1	5.27	1.1	40.46	3.9
Industrial	Product Use	16	45.14	12.6	70.90	15.2	44.36	4.3
	Process Control	7	25.0	7.0	164.60	35.2	114.20	11.0
	Other	14	96.98	27.1	46.91	10.0	656.16	63.4
	Total	37	167.12	46.7	282.41	60.5	814.72	78.7
Power Reactor	Total	1	0.0	0.0	0.0	0.0	0.0	0.0
Governmental	Federal	2	3.71	1.0	3.3	0.7	4.21	0.4
	Military	0	0.0	0.0	0.0	0.0	0.0	0.0
	State	2	0.0	0.0	0.0	0.0	0.0	0.0
	Local	0	0.0	0.0	0.0	0.0	0.0	0.0
	Total	4	3.71	1.0	3.3	0.7	4.21	0.4
TOTAL		77	358.10	100.0	466.98	100.0	1034.69	100.0

Massachusetts

TABLE 7

RADIONUCLIDES IN SHIPPED WASTES

Isotope	ACTIVITY (CURIES)																	
	Total			Medical			Educational			Industrial			Power Reactors			Governmental		
	1978	1979	1980	1978	1979	1980	1978	1979	1980	1978	1979	1980	1978	1979	1980	1978	1979	1980
H - 3	48.238	50.636	40.388	12.035	10.021	7.1283	.000001	.00915	.04635	33.704	39.106	32.314		0		2.5	1.5	.90
C - 14	3.20411	5.7234	6.38853	1.0001	3.0020	4.0015	.05001	.231405	.33103	2.212	2.480	2.056		0		0	0	0
P - 32	.4	.4336	.4821	0	0	0	0	.0336	.0821	.4	.4	.4		0		0	0	0
P - 33	0	0	0	0	0	0	0	0	0	0	0	0		0		0	0	0
S - 35	.505	.6625	.7083	0	0	0	0	.0272	.0698	.505	.6353	.6385		0		0	0	0
Cl - 36	.025	.00112	.00109	0	0	0	.025	.00112	.00109	0	0	0		0		0	0	0
Cl - 38	0	.0001	0	0	0	0	0	.00001	0	0	0	0		0		0	0	0
Ca - 45	0	.005804	.009425	0	0	0	0	.041404	.009455	0	0	0		0		0	0	0
Cr - 51	.585	.77525	.8691	.4500	.6500	.7500	.025	.01025	.0043	.1	.1	.09		0		.010	.015	.025
Co - 57	.03062	.03851	.07340	.0101	.0134	.0384	0	.000006	0	.01052	.01014	.01003		0		.010	.015	.025
Fe - 59	.010	.0155	.0264	0	.0005	.0014	0	0	0	0	0	0		0		.010	.015	.025
Co - 60	.72543	.01809	8.026	0	0	0	0	0	0	.71543	.00309	8.0010		0		.010	.015	.025
Ni - 63	.061836	.078514	1.1515	0	0	0	0	0	0	.001836	.003514	1.0015		0		.06	.075	.150
Zn - 65	0	.00045	0	0	.0002	0	0	.00025	0	0	0	0		0		0	0	0
Ga - 67	10.00	10.0002	10.00	10.00	10.00	10.00	0	.0002	0	0	0	0		0		0	0	0
Se - 75	1.020	.0159	.025	0	0	0	0	0	0	1.01	.0009	0		0		.010	.015	.025
Kr - 85	3.0002	.00037	.000185	0	0	0	0	0	0	28.0002	192.3	114.2		0		0	0	0
Sr - 90	.010	.015001	.025	0	0	0	0	.000001	0	0	0	0		0		.010	.015	.025
Mo - 99	2.001	2.001	2.001	2.001	2.001	2.001	0	0	0	0	0	0		0		0	0	0
Tc - 99m	100.0	100.0	100.0	100.0	100.0	100.0	0	0	0	0	0	0		0		0	0	0
TOTAL	See Page Two																	

TABLE 7 (continued)

RADIONUCLIDES IN SHIPPED WASTES

ACTIVITY (CURIES)

Isotope	Total			Medical			Educational			Industrial			Power Reactors			Governmental		
	1978	1979	1980	1978	1979	1980	1978	1979	1980	1978	1979	1980	1978	1979	1980	1978	1979	1980
Ru - 103	0	.002605	.0008	0	0	0	0	.002605	.0008	0	0	0		0		0	0	0
In - 111	10.00	10.00	10.00	10.00	10.00	10.00	0	0	0	0	0	0		0		0	0	0
I - 125	32,4885	32.1069	34.4022	28.631	28.094	28.479	.025	024965	098245	3.8325	3.973	5.800		0		.010	.015	.025
I - 129	.002	.00501	.005	.002	.005	.005	0	0	0	0	.00001	0		0		0	0	0
I - 131	10.25125	10.500	10.750	10.251	10.500	10.750	0	.00025	0	0	0	0		0		0	0	0
Ba - 133	.0252	.00025	000001	0	0	0	.025	.00005	0	.0002	.0002	.000001		0		0	0	0
Cs - 134	.5	.5	.3	.5	.5	.3	0	0	0	0	0	0		0		0	0	0
Cs - 137	.010295	.615270	191025	0	0	0	0	0000001	0	.000295	.60027	191.0		0		.010	.015	.025
Iv - 192	94.38	22.25	399.15	.25	.25	.25	0	0	0	94.13	22.00	398.9		0		0	0	0
Tl - 201	0	.0001	0	0	0	0	0	.0001	0	0	0	0		0		0	0	0
Po - 210	.00001	.00001	000005	0	0	0	0	0	0	.00001	.00001	000005		0		0	0	0
Ra - 226	0	0000001	06005	0	0	0	0	0000001	0	0	0	.00605		0		0	0	0
Mixtures	10.853	164.95	62.1	1.0	1.0	1.0	0	0	0	.1	.1	.1	9.753	163.85	61.0	0	0	0
U(depleted)	3.172	24.7737	60.0							2.1	23.7017	57.0				1.072	1.65	3.0
U 238	.046	.021	.019	.003						.043	.021	.019						
PM 147	.00005	.0251	00005							.00005	.0251	.00005						
Am - 241		.0005									.0005							
Fe- 55		.2									.2							
Cd - 109		.006									.006							
Zi - 83	11.0	5.0	40.0				11.0	5.0	40.0									
TOTAL	367.34	834.30	892.17	176.13	176.04	174.78	11.18	5.399	40.654	165.84	485.67	811.49	9.753	163.85	61.0	4.432	3.345	4.25

Massachusetts

TABLE 8
ONSITE PROCESSING OF SHIPPED WASTE

Type of facility	Number of respondents	None		Mechanical Compaction		Incineration		Solidification/ Evaporation		Absorption		Other	
		Number* using	Percent of total respondents	Number* using	Percent of total respondents	Number* using	Percent of total respondents	Number* using	Percent of total respondents	Number* using	Percent of total respondents	Number* using	Percent of total respondents
Medical	24	10	13.0	2	2.6	4	5.2	1	1.3	8	10.4	2	2.6
Educational	11	5	6.5	2	2.6	1	1.3	1	1.3	6	7.8	1	1.3
Industrial	37	14	18.2	6	7.8	2	2.6	10	13.0	10	13.0	5	6.5
Power Reactor	1	0	0.0	1	1.3	0	0.0	1	1.3	0	0.0	0	0.0
Governmental	4	1	1.3	1	1.3	1	1.3	0	0.0	1	1.3	0	0.0
TOTAL	77	30	39.0	12	11.8	8	10.4	13	16.9	25	32.5	8	10.4

*The total of "number using" exceeds the total number of respondents due to the use of several practices at each facility.

TABLE 9

SHIPPING CONTAINER USED

Type of facility	Number of respon-dents	55-gal. drums		30-gal.drums		Others	
		Number* using	Percent of total respon-dents	Number* using	Percent of total respon-dents	Number* using	Percent of total respon-dents
Medical	24	13	16.9	12	15.6	3	3.9
Educational	11	9	11.7	7	9.1	0	0.0
Industrial	37	15	19.5	18	23.4	13	16.9
Power Reactor	1	1	1.3	0	0.0	1	1.3
Governmental	4	2	2.6	2	2.6	1	1.3
TOTAL	77	40	51.9	39	50.6	17	22.1

*The total of "number using" exceeds the total number of respondents due to several types of containers being used at some facilities.

TABLE 10

PHYSICAL FORM OF SHIPPED WASTE

Type of facility	Number of respon-dents	Dry		Moist/potential free liquid		Biological Waste		Sealed Sources		Other	
		Number of facili-ties	Percent of total respon-dents	Number of facili-ties	Percent of total respon-dents	Number of facili-ties	Percent of total respon-dents	Number of facili-ties	Percent of total respon-dents	Number of facili-ties	Percent of total respon-dents
Medical	24	17	22.1	11	14.3	2	2.6	2	2.6	9	11.7
Educational	11	10	13.0	8	10.4	6	7.8	1	1.3	3	3.9
Industrial	37	24	31.2	11	14.3	1	1.3	11	14.3	8	10.4
Power Reactor	1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Governmental	4	2	2.6	2	2.6	0	0.0	1	1.3	0	0.0
TOTAL	77	53	68.8	32	41.6	9	11.7	15	19.5	20	26.0

*The total of "number of facilities" exceeds the total number of respondents due to waste being in several forms at some facilities.

TABLE 11

ORIGIN OF RADIOACTIVITY RESULTING IN SHIPPED WASTES

Type of facility	Number of respon-dents	Type of Potential Hazard					
		Combustible		Explosive		Toxic	
		Number of sources*	Percent of all shippers	Number of sources*	Percent of all shippers	Number of sources*	Percent of all shippers
Medical	24	10	13.0	5	6.5	9	11.7
Educational	11	5	6.5	1	1.3	6	7.8
Industrial	37	17	22.1	1	1.3	12	15.6
Power Reactor	1	1	1.3	0	0.0	0	0.0
Governmental	4	2	2.6	1	1.3	2	2.6
TOTAL	77	35	45.5	8	10.4	29	37.7

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE DELIVERED	QUESTIONNAIRE RESPONSE	TYPE OF FACILITY	SHIPS WASTE	COMMENTS
Simplex Time Recorder Co. 26 South Lincoln Street Gardner, Mass. 01440	Y	Y	I	N	
J. G. Sylvester Assoc. Inc. 900 Hingham Street Rockland, Mass. 02370	Y	N	I		
Holden District Hospital Boyden Road Holden, Mass. 01520	Y	N	M		
Armstron Cork Co. 10 Plain Street South Braintree, Mass. 02184	Y	Y	I	N	
Doble Engineering Co. 85 Walnut Street Watertown, Mass. 02172	Y	Y	I	Y	
Poly-Drug, Inc. Toxiciology Dept. 665 Beacon Street Boston, Mass. 02215	Y	N	I		
Commonwealth of Mass. Lab. of Occupational Hygiene 39 Boylston Street Boston, Mass. 02116	Y	N	I		
Johnson and Johnson Electronic Development Lab. 26 Rockway Avenue Weymouth, Mass. 02188	Y	N	I		
Jasins & Sayles Associates, Inc. 15 Mercer Road Natick, Mass. 01760	Y	N	I		

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE DELIVERED	QUESTIONNAIRE RESPONSE	TYPE OF FACILITY	SHIPS WASTE	COMMENTS
New England Biolabs 283 Cabot Street Beverly, Mass. 01915	Y	N	M		
Hale Hospital 40 Buttonwood Ave. Haverhill, Mass. 01830	Y	N	M		
Emmanuel College Physics Research Div. 400 the Renway Boston, Mass. 02115	Y	Y	E	N	
Harrington Memorial Hospital 100 South Street Southbridge, Mass. 01550	Y	Y	M	N	
Bóoks School North Andover, Mass. 01845	Y	Y	E	N	
ECO - Control 56 Rogers Street Cambridge, Mass. 02142	Y	N	I		
Commonwealth of Mass. Dept. of Natural Resources Cat Cove Marine Lab. 92 Fort Ave. Salem, Mass. 01970	Y	Y	G	N	
EG&G Bionomics, Inc. Main Street Wareham, Mass. 02571	Y	Y	I	Y	
Haller Testing Lab. of Mass. Inc 11A Walkup Drive Westborough, Mass. 01581	Y	N	I		

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE DELIVERED	QUESTIONNAIRE RESPONSE	TYPE OF FACILITY	SHIPS WASTE	COMMENTS
Yankee Atomic Electric Co. 20 Turnpike Road Westboro, Mass. 01581	Y	Y	I	Y	
New England Power Co. 20 Turnpike Road Westboro, Mass. 01581	Y	Y	I	N	
Boston Edison Co. 800 Boylston Street Boston, Mass. 02199	N	N	I		
Boston Edison Co. RFD #1, Rocky Hill Road Plymouth, Mass. 02360	Y	N	I		
Malden Hospital Malden, Mass. 02148	Y	Y	M	N	
Goddard Memorial Hospital 909 Summer Street Stoughton, Mass. 02072	Y	N	M		
Nuclear Metals, Inc. West Concord, Mass. 01781	Y	Y	I	Y	
Berkshire Medical Center 725 North Street Pittsfield, Mass. 01201	Y	N	M		

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE DELIVERED	QUESTIONNAIRE RESPONSE	TYPE OF FACILITY	SHIPS WASTE	COMMENTS
Department of the Army US Army Materials & Mech. Research Agency Watertown Arsenal Watertown, Mass. 02172	Y	N	G		
Arnold Greene Testing Labs.Inc. 6 Huron Drive East Natick Ind Natick, Mass. 01760	Y	N	I		
Dennison Manufacturing Co. 300 Howard Street Framingham, Mass. 01701	Y	N	I		
Raytheon Company Equipment Division 528 Boston Post Road Sudbury, Mass. 01776	Y	Y	I	Y	
Mass. Eye & Ear Infirmary Howe Lab. of Ophthalmology 243 Charles Street Boston, Mass. 02114	Y	N	M		
Worcester Fdn. for Experimental Biol. Inc. 222 Maple Avenue Shrewsbury, Mass. 01545	Y	N	I		
Mass. Civil Defense Agency 400 Worcester Road Framington, Mass. 01701	Y	N	G		
St. Elizabeth's Hospital 736 Cambridge Street Brighton, Mass. 02135	Y	N	M		
Boston College Chestnut Hill Massachusetts 02167	Y	N	E		

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	DELIVERED	RESPONSE			
Tufts Univ. Sch. of Medicine Physiology Department 136 Harrison Avenue Boston, Mass. 02111	Y	N	M		
Woods Hole Oceanographic Inst. Water Street Woods Hole, Mass. 02543	Y	Y	E	Y	
Salem Hospital Department of Nuclear Med. 81 Highland venue Salem, Mass. 91970	Y	N	M		
Mercy Hospital Department of Radiology 233 Carew Street Springfield, Mass. 01104	Y	Y	M		
Boston City Hospital Dept. of Rad.& Radia. Physics 818 Harrison Avenue Boston, Mass. 02118	Y	Y	M	Y	
Technical Operations, Inc. 40 North Avenue Burlington, Mass. 01803	Y	Y	I	Y	
New England Deaconess Hosp. Dept. of Radiation Therapy 185 Pilgrim Road Boston, Mass. 02215	Y	N	M		
Harvard College, President & Fellows of Dep.Env.He.& Saf. 75 Mt. Auburn Street Cambridge, Mass. 02138	Y	Y	E	Y	
Liberty Mutual Ins. Co. Health Physics Un.Loss Prev. Dept. Hopkinton, Mass. 01748	Y	N	I		

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	DELIVERED	RESPONSE			
Myerson Tooth Corporation 66-90 Hamilton Street Cambridge, Mass. 02139	Y	Y	I	Y	
Hardric Laboratories, Inc. 1490 Main Street Waltham, Mass. 02154	Y	N	I		
Wire & Metal Separation Systems, Inc. 542 Southbridge Street Worcester, Mass. 01610	Y	N	I		
Worc. Dept. of Public Health 419 Belmont Street Worcester, Mass. 01604	Y	Y	G	N	
Mass. Dept. of Public Works Research & Materials Division 99 Worcester Street Wellesley Hills, Mass. 02181	Y	Y	G	N	
Technical Operations, Inc. Radiation Products Div. Northwest Industrial Park Burlington, Mass. 01803	Y	N	I		
Sprague Electric Co. 87 Marshall Street North Adams, Mass. 01247	Y	Y	I	Y	
Dept. of the Army U.S. Army Material & Mechanics Res. Ctr. Watertown, Mass. 02172	Y	N	G		
Cooley Dickinson Hospital Dept. of Radiation Therapy 30 Locust Street Northampton, Mass. 01060	Y	N	M		

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE DELIVERED	QUESTIONNAIRE RESPONSE	TYPE OF FACILITY	SHIPS WASTE	COMMENTS
Joslin Diabetes Foundation, Inc. 170 Pilgrim Road Boston, Mass. 02215	Y	N	M		
Wing Memorial Hospital Dept. of Radiology Wright Street Palmer, Mass. 01069	Y	Y	M	Y	
Baird-Atomic Inc. 125 Middlesex Turnpike Bedford, Mass. 01730	Y	Y	I	Y	
J. B. Thomas Hospital 15 King Street Peabody, Mass. 01960	Y	Y	M	N	
Damon Damon Diagnostics 115 Fourth Ave. Neddham Heights, Mass. 02194	Y	N	M		
TGM Detectors, Inc. 166 Bear Hill Road Waltham, Mass. 02154	Y	N	I		
INTEREX Corporation 3 Strathmore Road Natick, Mass. 02154	Y	N	I		
tohler Isotope Chem. 49 Jones Road Waltham, Mass. 02154	Y	Y	I	N	
Universal Metal Corp. P.O. Box 652 Worcester, Mass. 98679	Y	Y	I	N	

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	DELIVERED	RESPONSE			
Milford-Whitinsville Regional Hospital Milford, Mass. 01757	Y	Y	M	N	
Milton Hospital 92 Highland Street Milton, Mass. 02186	Y	Y	M	N	
ABCOR Incorporated 850 South Main Street Wilmington, Mass. 01887	Y	N	I		
Charles Stark Draper Lab., Inc. 555 Technology Square Cambridge, Mass. 02139	Y	Y	I	Y	
SIAS Medical Research Lab. Brooks Hospital Div. of Lahey Clinic 605 Commonwealth Ave. Boston, Mass. 02115	Y	Y	M	N	
Gas Rentals Inc./Lowell Gas Willie & Dutton Streets Lowell, Mass. 01853	Y	Y	I	Y	
Lawrence Memorial Hospital of Medford 170 Governors Avenue Medford, Mass. 02155	Y	N	M		
Eastern Associated Coal Corp. Research Center 138 Robin Street Everett, Mass. 02149	N	N	I		
Honeywell, Inc. 2 Forbes Road Lexington, Mass. 02173	Y	Y	I	N	

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE DELIVERED	QUESTIONNAIRE RESPONSE	TYPE OF FACILITY	SHIPS WASTE	COMMENTS
JBF Scientific Corporation 2 Jewel Drive Wilmington, Mass. 01887	Y	Y	I	N	
Baker Testing Services, Inc. 21 Fottler Road Hingham, Mass. 02043	Y	Y	I	N	
Cambridge Analytical Assoc. Inc. 222 Arsenal Street Watertown, Mass. 02172	Y	Y	I	N	
Harvco Alloys, Inc. 386 Watertown Street Newton, Mass. 02158	Y	Y	I	N	
Findley Research, Inc. P.O. Box 375 Assonet, Mass. 02702	Y	N	I		
Mass. Materials Research, Inc. 241 W. Boylston Street W. Boylston 01583	Y	Y	I	N	
Foster-Miller Associates, Inc. 350 Second Avenue Waltham, Mass. 02154	Y	N	I		
Stat Toxicology Service of Boston, Inc. 1105 Commonweath Ave. Boston, Mass. 02215	Y	N	I		

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE DELIVERED	QUESTIONNAIRE RESPONSE	TYPE OF FACILITY	SHIPS WASTE	COMMENTS
Digital Equipment Co. Central Incoming Test (LSI) 180 Milk Street Westboro, Mass. 01581	Y	N	I		
Ludlow Hospital 14 Chestnut Place Ludlow, Mass. 01056	Y	N	M		
Woburn Senior High School Science Dept. 88 Montvale Ave. Woburn, Mass. 01801	Y	N	E		
Penicillin Assays, Inc. 33 Harrison Ave. Boston, Mass. 02111	Y	Y	I	N	
HCHP Central Lab. Chemistry - Central Lab. 63 Rogers Street Cambridge, Mass. 02142	Y	Y	M	N	
Lycott Environmental Research Co. 600 Charlton Street Southbridge, Mass. 01550	Y	Y	I	N	
Interior, Department of the U.S. Geological Survey, Office of Marin E. Geology Building B - Quissett Campus Woods Hole, Mass. 02543	Y	N	G		
Union Carbide Imaging Systems, Inc. 333 Providence HIghway Norwood, Mass. 02062	Y	N	I		
Ocean Spray Cranberries, Inc. Main Street Hanson, Mass. 02341	N	N	I		

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE DELIVERED	QUESTIONNAIRE RESPONSE	TYPE OF FACILITY	SHIPS WASTE	COMMENTS
Beloit Corporation Jones Division, Research Center 1311 E. Street Pittsfield, Mass. 01201	Y	N	I		
Falmouth Hospital Ter Heun Drive Falmouth, Mass. 02540	Y	Y	M	N	
Tobey Hospital 43 High Street Wareham, Mass. 02571	Y	N	M		
Briggs Engineering & Testing Co. 164 Washington Street Norwell, Mass. 02061	Y	N	I		
Energy Resources Co., Inc. 185 Alewife Brook Parkway Cambridge, Mass. 02138	Y	Y	I	Y	
Stocker & Yale, Inc. Route 128 & Brimbal Ave. Beverly, Mass. 01915	Y	Y	I	Y	
Fairlawn Hospital 189 May Street Worcester, Mass. 01602	Y	Y	M	N	
Springfield Regional Red Cross Blood SubCenter 63 Springfield Street Springfield, Mass. 01109	Y	Y	M	N	
Henry Heywood Memorial Hospital Dept. of Radiology 242 Green Street Gardner, Mass. 01440	Y	Y	M	Y	

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE DELIVERED	QUESTIONNAIRE RESPONSE	TYPE OF FACILITY	SHIPS WASTE	COMMENTS
Aerodyne Research, Inc. Crosby Drive Bedford, Mass. 01730	Y	N	I		
F. X. Masse Associates, Inc. P.O. Box 95, Maple Street Middleton, Mass. 01949	Y	N	I		
Clinical Science Lab. Inc. 21 South Main Street Sharon, Mass. 02067	Y	Y	M	Y	
Erm Electronics, Inc. 203 Middlesex Turnpike Burlington, Mass. 01803	N	N	I		
Bunker Hill Comm. College Charlestown, Mass. 02129	Y	N	E		
Stanley Home Products, Inc. 116 Pleasant Street Easthampton, Mass. 01027	Y	N	I		
Mount Pleasant Hospital 60 Granite Street Lynn, Mass. 01904	Y	Y	M	N	
Raytheon Company 350 Lowell Street West Andover, Mass. 01810	Y	N	I		
Radiation Monitoring Devices, Inc. 44 Hunt Street Watertown, Mass. 02172	Y	N	I		

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	DELIVERED	RESPONSE			
Mt. Auburn Hospital 330 Mt. Auburn Street Cambridge, Mass. 02138	Y	Y	M	N	
St. John's Hospital 14 Bartlette Street Lowell, Mass. 01852	Y	N	M		
Cardinal Cushing General Hospital 235 Pearl Street Brockton, Mass. 02401	Y	Y	N	N	
St. Vincent Hospital 25 Winthrop Street Worcester, Mass. 01604	Y	N	M		
Jordan Hospital Sandwich Street Plymouth, Mass. 02360	Y	N	M		
Univ. of Mass. Medical Center 55 Lake Avenue North Worchester, Mass. 01605	Y	N	M		
Optovac, Inc. North Brookfield, Mass. 01535	Y	Y	I	N	
Eastern Nazarene College 23 East Elm Avenue Quincy, Mass. 02170	Y	N	E		
Mass. College of Pharmacy 179 Longwood Avenue Boston, Mass. 02115	Y	Y	E	Y	

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE DELIVERED	QUESTIONNAIRE RESPONSE	TYPE OF FACILITY	SHIPS WASTE	COMMENTS
Am. Red Cross N.E. Regional Red Cross Blood Program 419 Belmont Street Worchester, Mass. 01644	Y	Y	M	N	
Instrumentation Lab. Inc. 113 Hartwell Avenue Lexington, Mass. 02173	Y	Y	M	Y	
Marthas Vineyard Hospital Oak Bluffs, Mass. 02557	Y	N	M		
Camp Dresser & McKee Inc. One Center Plaza Boston, Mass. 02108	Y	N	I		
Organic Lab. Corporation 3 Maple Street Belchertown, Mass. 01007	Y	N	I		
Wyman-Gordon Co. Worcester Street North Grafton, Mass. 01536	Y	N	I		
Gillette Advanced Technology Lab. 252 Third Street Cambridge, Mass. 02142	Y	N	I		
Butler-Newton Incorporated 389 University Ave. Westwood, Mass. 02090	Y	N	I		
Affiliated Hospitals Center, Inc. Peter Bent Brigham Hospital Div. 721 Huntington Ave. Boston, Mass. 02115	Y	N	M		

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	DELIVERED	RESPONSE			
Mercy Hospital Carew Street Springfield, Mass. 01104	Y	N	M		
Boston City Hospital 818 Harrison Avenue Boston, Mass. 02118	Y	N	M		
Harvard University 75 Mt. Auburn Street Cambridge, Mass. 02138	Y	N	E		
Boston University 111 Cummington Street Boston, Mass. 02215	Y	N	E		
University of Mass. Harbour Campus Dorchester, Mass. 02125	Y	Y	E	N	
Department of the Army U.S. Army Materials & Mechanics Research Center Watertown, Mass. 02172	Y	Y	G	Y	
Baystate Medical Center 759 Chestnut Street Springfield, Mass. 01107	Y	N	M		
St. Vincent Hospital 25 Winthrop Street Worcester, Mass. 01610	Y	Y	M	Y	
J. R. M. Bege Co.(The) 4 Court St. Place Arlington, Mass. 02174	Y	N	I		

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	DELIVERED	RESPONSE			
Veterans Admin. Hospital Radioisotope Laboratory 150 E. Huntington Avenue Boston, Mass. 02130	Y	N	M		
St. Luke's Hospital Dept. of Nuclear Medicine 101 Page Street New Bedford, Mass. 02740	Y	N	M		
Beth Israel Hospital 330 Brookline Avenue Boston, Mass. 02215	Y	N	M		
Boston University Chemistry Department 725 Commonwealth Avenue Boston, Mass. 02215	Y	N	E		
General Electric Company Lynn Relations Operation 1100 Western Avenue Lynn, Mass. 01910	Y	Y	I	N	
University of Massachusetts Univ. Health Services Amherst, Mass. 01003	Y	Y	E	Y	

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	DELIVERED	RESPONSE			
Burbank Hospital Nickols Road Fitchburg, Mass. 01420	Y	Y	M	Y	
Mass. Institute of Technology Cambridge, Mass. 02139	Y	N	E		
Clark University Worcester, Mass. 01610	Y	N	E		
Brockton Hospital 680 Centre Street Brockton, Mass. 02402	Y	N	M		
Lynn Hospital 212 Boston Street Lynn, Mass. 01904	Y	N	M		
Mass. General Hospital 14 Fruit Street Boston, Mass. 02114	Y	Y	M	Y	
New England Medical Center Hospital 171 Harrison Avenue Boston, Mass. 02111	Y	Y	M	Y	
Williams College Thompson Physical Lab. Williamstown, Mass. 01267	Y	N	E		
AVCO Everett Research Lab. Incorporated 2385 Revere Beach Parkway Everett, Mass. 02149	Y	Y	I	Y	

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE DELIVERED	QUESTIONNAIRE RESPONSE	TYPE OF FACILITY	SHIPS WASTE	COMMENTS
Holyoke Hospital 575 Beech Street Holyoke, Mass. 01040	Y	N	M		
Lawrence General Hospital 1 General Street Lawrence, Mass. 01842	Y	Y	M	N	
Texas Instruments, Inc. Metallurgical Materials Div. 34 Forest Street Attleboro, Mass. 02703	Y	Y	I	Y	
Northeastern University 360 Huntington Avenue Boston, Mass. 02715	Y	Y	E	Y	
Wellesley College Dept. of Physics Wellesley, Mass. 02181	Y	N	E		
Mass. Commonwealth of (The) Lowell Technological Inst. Lowell, Mass. 01854	Y	N	E		
Holy Cross, College of the Worcester, Mass. 01601	Y	N	E		
Merrimack College North Andover, Mass. 01845	Y	Y	E	Y	
Woods Hole Oceanographic Inst. Woods Hole, Mass. 02543	Y	Y	E	Y	

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	DELIVERED	RESPONSE			
Eunice Kennedy Shriver Center 200 Trapelo Road Waltham, Mass. 02154	Y	N	E		
Medical Imaging Corporation 781 River Street Haverhill, Mass. 01830	Y	N	I		
Ionics, Inc. 65 Grove Street Watertown, Mass. 02172	Y	Y	I	Y	
Draper Brothers Co., Inc. Felt Service Dept. 28 Draper Lane Canton, Mass. 02021	Y	Y	I	N	
Monsanto Co. 190 Grochmal Avenue Indian Orchard, Mass. 01151	Y	Y	I	N	
Advanced Mechnical Technology Inc. Engineering Dept. 141 California Street Newton, Mass. 02158	Y	Y	I	N	
St. Luke's Hosptial of Middleborough 52 Oak Street Middleboro, Mass. 02346	Y	N	M		
Boston State Hospital Dept. of Mental Health Boston, Mass. 02124	Y	N	M		
Skinner & Sherman, Inc. 300 Second Avenue Waltham, Mass. 02154	Y	Y	I	N	

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE DELIVERED	QUESTIONNAIRE RESPONSE	TYPE OF FACILITY	SHIPS WASTE	COMMENTS
Penicillin Assays, Inc. 33 Harrison Avenue Boston, Mass. 02111	Y	Y	I	N	
Salem & Beverly Water Supply Board Filtration Plant Laboratory Beverly, Mass. 01915	Y	Y	M	N	
Haverhill Paperboard Corp. South Kimball Street Haverhill, Mass. 01830	Y	N	I		
Mass. Bay Transportation Authority Const. Dir. (Mat. Test. Lab.) 50 High Street ~~Boston, Mass. 02110~~	Y	Y	I	N	
Waters Associates, Inc. Analytical Servces Div. R&D Dept. 34 Maple Street Milford, Mass. 01757	Y	Y	I	N	
Chloride Pyrotector, Inc. 333 Lincoln Street Hingham, Mass. 02043	Y	Y	I	Y	
Solid State Testing Inc. Environmental Testing Dept. 56 Middlesex Trunpike Burlington, Mass. 0803	Y	N	I		
Winthrop Community Hospital 40 Lincoln Street Winthrop, Mass. 02152	Y	Y	M	N	
Gamewell Corporation (The) 7 Industrial Park Road Medway, Mass. 02053	Y	N	I		

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	DELIVERED	RESPONSE			
UNITRODE Corporation Solid State Products Co. Div. 609 Main Street Waltham, Mass. 02154	Y	Y	I	Y	
Corning Glass Works Biological Products Group Medfield, Mass. 02052	Y	N	I		
W. R. Grace & Co. Polyfibron Division Harmony Street Adams, Mass. 01220	Y	Y	I	Y	
Carroll Engineers 200 Andover Street Ballardvale, Mass. 01810	Y	N	I		
Boston Museum of Fine Arts 465 Huntington Avenue Boston, Mass. 02115	Y	Y	E	N	
Thermo Electron Corp. Cancer Research Division 45 First Avenue Waltham, Mass. 02154	Y	N	I		
Cambridge Hospital (The) Nuclear Medicine Lab. Radiology Department 1493 Cambridge Street Cambridge, Mass. 02139	Y	N	M		
Charles Choate Memorial Hospital 21 Warren Avenue Woburn, Mass. 01801	Y	Y	M	N	
Bridgewater State College Biology, Chemistry and Physics Departments Bridgewater, Mass. 02324	Y	N	E		

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	DELIVERED	RESPONSE			
Leominster Hospital Hospital Road Leominster, Mass. 01453	Y	N	M		
Leonard Morse Hospital 67 Union Street Natick, Mass. 01760	Y	Y	M	N	
Melrose-Wakefield Hospital 585 Lebanon Street Melrose, Mass. 02176	Y	N	M		
Waltham Hospital (The) Hope Avenue Watham, Mass. 02154	Y	Y	M	N	
Morton Hospital Dept. of Radiology 88 Washington Street Taunton, Mass. 02780	Y	N	M		
Symmes Hospital Arlington, Mass. 02174	Y	N	M		
CIS Radiopharmaceuticals, Inc. 5 De Angelo Drive Bedford, Mass. 01730	Y	N	I		
Wheaton College E. Main Street Norton, Mass. 02766	Y	N	E		
St. Vincent Hospital Chemistry Dept. Worcester, Mass. 01604	Y	N	M		

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	DELIVERED	RESPONSE			
Photometrics, Inc. 442 Marrett Road Lexington, Mass. 02173	Y	Y	I	N	
P. X. Engineering Co., Inc. 225 Merrimac Street Woburn, Mass. 01801	Y	N	I		
Ealing Corporation (The Warehouse Dept. 2225 Mass. Ave. Cambridge, Mass. 02140	Y	N	I		
Dynatech F/D Co. Chemical Engineering Dept. 99 Erie Street Cambridge, Mass. 02175	Y	N	I		
Mobil TYCO Solar Energy Corp. 16 Hickory Drive Waltham, Mass. 02154	Y	N	I		
Gamma Diagnostic Lab. Manufacturing, Quality Control, Research and Develop. P.O. Box 1349 Attleboro Falls, Mass. 02763	Y	Y	M	Y	
SISA Incorporated Dept. of Pharmacology 763D Concord Ave. Cambridge, Mass. 02138	Y	N	I		
Thyroid Diagnostics, Inc. 74 Loomis Street Bedford, Mass. 01730	Y	Y	I	N	
Hillcrest Hospital Dept. of Radiology 165 TOR Court Pittsfield, Mass. 01201	Y	N	M		

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE DELIVERED	QUESTIONNAIRE RESPONSE	TYPE OF FACILITY	SHIPS WASTE	COMMENTS
Boston Biomedical Research Inst. 20 Staniford Street Boston, Mass. 02114	Y	N	M		
Mass. Univ. of Medical Center 55 Lake Ave., North Worcester, Mass. 01605	Y	N	M		
Southeastern Mass. University Old Westport Road N. Dartmouth, Mass. 02747	Y	Y	E	Y	
AMICON Corp. 25 Hartwell Avenue Lexington, Mass. 02173	Y	Y	I	Y	
Emerson Hospital Old Road at Nine Acre Corner Concord, Mass. 07142	Y	N	M	Y	
Travenol Lab., Inc. Clinical Assays Div. 620 Memorial Drive Cambridge, Mass. 02130	Y	Y	I	Y	
Bon Secours Hospital 70 East Street Methuen, Mass. 01844	Y	Y	M	N	
Our Lady of the Elms, College of 291 Springfield Street Chicopee, Mass. 01013	Y	Y	E	Y	
Sancta Maria Hospital 799 Concord Avenue Cambridge, Mass. 02138	Y	N	M		

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	DELIVERED	RESPONSE			
Somerville Hospital Dept. of Radiology 230 Highland Avenue Somerville, Mass. 02143	Y	N	M		
Dept. of Transportation Transportation Systems Center Kendall Square Cambridge, Mass. 02142	Y	Y	G	N	
New England Analytical & Testing Lab. 2 Shady Oak Lane Natick, Mass. 01760	Y	N	M		
Environmental Protection Agency New England Regional Lab. 240 Highland Avenue Needham Heights, Mass. 02194	N	N	I		
Micro-Dynamics, Inc. 10 Sonar Drive Woburn, Mass. 01801	Y	Y	I	Y	
Clin-Chem. Lab. Inc. 1106 Commonwealth Avenue Boston, Mass. 02215	Y	N	M		
Anna Jaques Hospital Pathology Laboratory Newburyport, Mass. 01950	Y	Y	M	N	
Hunt Memorial Hospital Lindall Street Danvers, Mass. 01923	Y	N	M		
Herbert V. Shuster, Inc. Quincy Research Park 14 Hayward Street Quincy, Mass. 02171	Y	N	I		

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE DELIVERED	QUESTIONNAIRE RESPONSE	TYPE OF FACILITY	SHIPS WASTE	COMMENTS
Baystate Medical Center Wesson Memorial Unit 140 High Street Springfield, Mass. 01105	Y	N	M		
J. G. Sylvester Assoc., Inc. 900 Hingham Street Rockland, Mass. 02370	Y	N	I		
Department of the Army USA Natick Laboratories Natick, Mass. 01760	Y	N	G		
Department of the Army 575 Albany Street Boston, Mass. 02118	Y	N	G		
Sprague Electric Company Marshall Street North Adams, Mass. 01248	Y	Y	I	Y	
Lowell General Hospital X-Ray Department 295 Varnum Avenue Lowell, Mass. 01854	Y	N	M		
Monsanto Company Springfield Plant 730 Worcester Street Indian Orchard, Mass. 01051	Y	N	I		
Crane Company - Indian Orchard Plant Radiographic Laboratory 203 Hampshire Street Indian Orchard, Mass. 01151	Y	N	I		
Marine Biological Laboratory Department of Radiology M. B. L. Street Woods Hole, Mass. 02543	Y	N	I		

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	DELIVERED	RESPONSE			
Beverly Hospital Department of Radiology Herrick Street Beverly, Mass. 01915	Y	Y	M	N	
Microwave Associates, Inc. South Avenue Burlington, Mass. 01803	Y	Y	I	Y	
LFE Corporation Process Control Division 1601 Trapelo Road Waltham, Mass. 02154	Y	Y	I	Y	
Baystate Medical Center Springfield & Wesson Women's Units 759 Chestnut Street Springfield, Mass. 01107	Y	N	M		
American Sandpaper Company Production Department Rockland, Mass. 02370	Y	N	I		
Smith College Clark Science Center Northhampton, Mass. 01060	Y	Y	E	Y	
Gillette Company Gillette Park Boston, Mass. 02106	Y	Y	I		
Baird-Atomic, Inc. 125 Middlesex Turnpike Bedford, Mass. 01730	Y	N	I		
Arthur D. Little, Inc. Life Sciences Division 35 Acorn Park Cambridge, Mass. 02140	Y	N	I		

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE DELIVERED	QUESTIONNAIRE RESPONSE	TYPE OF FACILITY	SHIPS WASTE	COMMENTS
Tufts University Medford, Mass. 02155	Y	N	E		
Franklin County Public Hospital Department of Radiology 175 High Street Greenfield, Mass. 01301	Y	N	M		
The Memorial Hospital Radiation Therapy Department 119 Belmont Street Worcester, Mass. 01605	Y	Y	M	N	
Massachusetts Institute of Technology Cambridge, Mass. 02139	Y	Y	E	Y	
Mount Holyoke College South Hadley, Mass. 01075	Y	N	E		
High Voltage Engineering Corp S. Bedford Street Burlington, Mass. 01803	Y	N	I		
Microwave & Pwr.Tube Div.,I.C Raytheon Company 465 Centre Street P. O. Box 5300 Quincy, Mass. 02169	Y	N	I		
Crane and Company, Inc. Production Department South Street Dalton, Mass. 01226	Y	N	I		
Brandeis University 415 South Street Waltham, Mass. 02154	Y	N	G		

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	DELIVERED	RESPONSE			
Polaroid Corporation 730 Main Street Cambridge, Mass. 02139	Y	N	I		
P. R. Mallory & Co., Inc. Lab. for Physical Science Third Avenue Burlington, Mass. 01803	Y	N	I		
Dept. of the Air Force AF Cambridge Res. Laboratory Laurence G. Hanscom Field Bedford, Mass. 01731	Y	N	G		
Uniroyal, Inc. United States Rubber Co. 154 Grove Street Chicopee Falls, Mass. 01021	Y	N	I		
Retina Foundation 20 Staniford Street Boston, Mass. 02114	Y	N	I		
Weymouth Art Leather Co.,Inc. 180 Pearl Street South Braintree, Mass. 02185	Y	N	I		
Boston University Med.Center Medical Center University Hospital 750 Harrison Avenue Boston, Mass. 02118	Y	Y	M	Y	
Varian Associates 8 Salem Road Beverly, Mass. 01915	Y	Y	I	Y	
Clark University Department of Physica 950 Main Street Worcester, Mass. 01610	Y	N	G		

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE DELIVERED	QUESTIONNAIRE RESPONSE	TYPE OF FACILITY	SHIPS WASTE	COMMENTS
Lahey Clinic Foundation Dept. of Diagnostic Radiology 605 Commonwealth Avenue Boston, Mass. 02215	Y	Y	M	Y	
General Electric Co. One Plastics Avenue Pittsfield, Mass. 01201	Y	N	I		
Western Electric Co. 1600 Osgood Street North Andover, Mass. 01845	Y	N	I		
Interstate Uniform Services Corp. 295 Parker Street Indian Orchard, Mass. 01151	Y	N	I		
Foxboro Company (The) Neponset Avenue Foxboro, Mass. 02035	Y	N	I		
Mass. General Hospital Physics Research Lab. Fruit Street Boston, Mass. 02114	Y	N	M		
Factory Mutual Research Corp. 1151 Boston-Providence Turnpike Norwood, Mass. 02062	Y	N	I		
Pondville Hospital Nuclear Medicine Walpole, Mass. 02081	Y	Y	M	N	
Carney Hospital (The) Radioisotope Lab. 2100 Dorchester Avenue Boston, Mass. 02124	Y	Y	M	Y	

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE DELIVERED	QUESTIONNAIRE RESPONSE	TYPE OF FACILITY	SHIPS WASTE	COMMENTS
RCA Corporation Burlington, Mass. 01801	Y	Y	I	N	
Mass. College of Pharmacy 179 Longwood Avenue Boston, Mass. 02115	Y	N	M		
Holyoke Hospital Radiology & Pathology Depts. 575 Beech Street Holyoke, Mass. 01040	Y	N	M		
OMNI-Wave Electronics Corp. Blackburn Industrial PK., P.O. Gloucester, Mass. 01930	Y	N	I		
Stone & Webster Engineering Corp. 225 Franklin Street Boston, Mass. 02107	Y	Y	I	N	
Attleboro Fire Dept. 100 Union Street Attleboro, Mass. 02703	Y	N	I		
Anna Maria College Biology and Chemistry Depts. Paxton, Mass. 01612	Y	N	G		
Charlton Memorial Hospital, Inc. Dept. of Radiology & Nuclear Med Highland Ave., at New Boston Fall River, Mass. 02720	Y	N	M		
St. Anne's Hospital Dept. of Nuclear Medicine 795 Middle Street Fall River, Mass. 02722	Y	N	M		

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE DELIVERED	QUESTIONNAIRE RESPONSE	TYPE OF FACILITY	SHIPS WASTE	COMMENTS
Millipore Corporation Ashby Road Bedford, Mass. 01730	Y	Y	I	Y	
Goddard Memorial Hospital Dept. of Medicine and Radiology 909 Sumner Street Stoughton, Mass. 02072	Y	N	M		
Children's Hospital Medical Center Chairman, Radiation Safety Com. 300 Longwood Avenue Boston, Mass. 02115	Y	N	M		
Mass. State Dept. of Health C/O Univ. of Mass. Amherst, Mass. 01022	Y	N	G		
AMSTAR Corporation 425 Medford Street Boston, Mass. 02129	Y	Y	I	N	
Pittsfield, City of Dept. of Public Works 66 Allen Street Pittsfield, Mass. 01201	Y	Y	I	N	
Panametrics, Inc. 221 Crescent Street Waltham, Mass. 02154	Y	Y	I	Y	
American Science & Engineering Inc. 955 Mass. Avenue Cambridge, Mass. 02139	Y	N	I		
Faulkner Hospital Radiology & Pathology Depts. 1153 Centre Street Boston, Mass. 02130	Y	Y	M	Y	

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	DELIVERED	RESPONSE			
Brockton Veterans Administration 940 Belmont Street Brockton, Mass. 02401	Y	N	G		
Winchester Hospital 41 Highlands Avenue Winchester, Mass. 01890	Y	Y	M	N	
St. Margaret's Hospital Depts. of Pathology and Medical Research 90 Cushing Avenue Boston, Mass. 02125	Y	N	M		
Moleculon Research Corporation 139 Main Street Cambridge, Mass. 02142	Y	Y	I	N	
State Mutual Life Insurance Co. of America 440 Lincoln Street Worcester, Mass. 01605	Y	N	I		
Forsyth Dental Center 140 The Fenway Boston, Mass. 02115	Y	N	M		
Health, Education and Welfare Dept. of Food and Drug Adm, Winchester Engineering & Analytical Ctr 109 Holton Street Wincgester, Mass. 02115	Y	Y	G	Y	
Merrimack College Dept. of Biology North Andover, Mass. 01845	Y	N	G		
Sturdy Memorial Hospital Radioisotope Service 211 Park Street Attleboro, Mass. 02703	Y	N	M		

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE DELIVERED	QUESTIONNAIRE RESPONSE	TYPE OF FACILITY	SHIPS WASTE	COMMENTS
Ludlow Papers & Packaging Cummings Street Ware, Mass. 01082	Y	Y	I	N	
Framingham Union Hospital 25 Evergreen Street Framingham, Mass. 01701	Y	N	M		
Union Hospital Dept. of Pathology 500 Lynnfield Street Lynn, Mass. 01904	Y	Y	M	N	
Whidden Memorial Hospital 103 Garland Street Everett, Mass. 02149	Y	Y	M	N	
Borden Chemical Co. (The) 1 Clark Street North Andover, Mass. 01845	Y	Y	M	N	
Mason Research Institute 57 Union Street Worcester, Mass. 01608	Y	Y	M	Y	
Collaborative Research, Inc. 1365 Main Street Waltham, Mass. 02154	Y	N	I		
Plymouth Rubber Co. 104 Revere Street Canton, Mass. 02021	Y	Y	I	N	
Gordon College and Divinity School 255 Grapevine Road Wenham, Mass. 01984	Y	Y	E	Y	

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE DELIVERED	QUESTIONNAIRE RESPONSE	TYPE OF FACILITY	SHIPS WASTE	COMMENTS
Cape Cod Hospital 27 Park Street Hyannis, Mass. 02601	Y	Y	M	N	
Norwood Hospital 800 Washington Street Norwood, Mass. 02062	Y	N	M		
Marlborough Hospital 57 Union Street Marlborough, Mass. 01752	Y	N	M		
ASTRA Pharmaceutical Product, Inc ASTRA Research Laboratory P.O. Box 1089 Framingham, Mass. 01701	Y	N	I		
Smith Kline Clinical Lab., Inc. Leary Laboratory Division 343 Winter Street Waltham, Mass. 02154	Y	Y	M	Y	
St. John's Hospital 14 Bartlett Street Lowell, Mass. 01852	Y	N	M		
Raytheon Company 141 Spring Street Lexington, Mass. 02173	Y	Y	I	N	
Sea Farm Research Foundation Incorporate 60 Carlton Road Waban, Mass. 02168	N	N	I		
Veterans Administration Hospital 200 Springs Road Bedford, Mass. 01730	Y	N	M		

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	DELIVERED	RESPONSE			
Walter Kidde & Co., Inc. Fenwal Div. 400 Main Street Ashland, Mass. 01721	Y	N	I		
Fairview Hospital 24 Lewis Street Great Barrington, Mass. 01230	Y	Y	M	N	
Dept. of the Army Water Quality Lab. Corps of Enginers Barre Falls DAM, R.F.D. #1 Hubbardston, Mass. 01452	Y	Y	G	N	
Nashoba Comm. Hospital Dept. of Nuclear Medicine 200 Groton Road Ayer, Mass. 01432	Y	Y	M	N	
Glover Memorial Hospital Needham, Mass. 02192	Y	Y	M	N	
ION Track Instruments 109 Terrace Hall Avenue Burlington, Mass. 01803	Y	N	I		
Radiology Associates of Framingham, Inc. 475 Franklin Street Framingham, Mass. 01701	Y	N	I		
Central Hospital 26 Central Street Somerville, Mass. 02143	Y	Y	M	N	
GTE Laboratories, Inc. 40 Sylvan Road Waltham, Inc. 02154	Y	Y	I	Y	

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE DELIVERED	QUESTIONNAIRE RESPONSE	TYPE OF FACILITY	SHIPS WASTE	COMMENTS
Norris Industries, Inc. Hesse-Eastern Division 1123 Pearl Street Brockton, Mass. 02401	Y	Y	I	N	
South Shore Hospital Dept. of Radiology South Weymouth, Mass. 02190	Y	Y	M	N	
Boston Medical Lab. Incorp. 15 Lunda Street Waltham, Mass. 02154	Y	Y	M	N	
Mt. Auburn Hospital Dept. of Radiology 330 Mt. Auburn Street Cambridge, Mass. 02138	Y	N	M		
ITEK Corp. Optical Systems Division 10 Maguire Road Lexington, Mass. 02173	Y	N	I		
Bedford Engineering Corp. 124 South Road Bedford, Mass. 01730	Y	N	I		
Reitzel Associates 10 Kendall Place Boylston, Mass. 01505	Y	N	I		
Suffolk University Biology Dept. 41 Temple Street Boston, Mass. 02114	Y	Y	E	Y	
New England Apple Products Co. Harvard Road Littleton, Mass. 01460	Y	Y	I	N	

LICENSEE NAME AND ADDRESS	QUESTIONNAIRE		TYPE OF FACILITY	SHIPS WASTE	COMMENTS
	DELIVERED	RESPONSE			
Springfield Technical Comm. College 1 Armory Square Sprinfield, Mass. 01105	Y	N	E		
Addison Gilbert Hospital 298 Washington Street Gloucester, Mass. 01930	Y	Y	M	N	
Serono Laboratories, Inc. 11 Brooks Drive Braintree, Mass. 02184	Y	Y	I	Y	
Analog Devices Semiconductor 829 Woburn Street Wilmington, Mass. 01887	Y	Y	I	N	
Galileo Electro-Optics Corp. Galileo Park Sturbridge, Mass. 01518	Y	N	I		
Marine Research, Inc. 141 Falmoutn Heights Road Falmouth, Mass. 02540	Y	N	I		
RIA Products, Inc. 411 Waverly Oaks Road, Box 914 Waltham, Mass. 02154	Y	Y	M	Y	
Spire Corp. Nuclear Science Dept. Patriots Park Bedford, Mass. 01730	Y	N	I		
Noble Hospital 115 West Silver Street Westfield, Mass. 01085	Y	Y	M	N	

APPENDIX B: "LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT IN MASSACHUSETTS," a Report to the Governor of Massachusetts by the Massachusetts Advisory Council on Radiation Protection, November, 1980.

LOW LEVEL RADIOACTIVE WASTE MANAGEMENT IN MASSACHUSETTS

Report to the Governor of Massachusetts

by the

Massachusetts Advisory Council on Radiation Protection

November, 1980

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SUMMARY

Low Level Waste (LLW),i.e. waste containing small amounts of radioactivity, is generated in the Commonwealth of Massachusetts from medicine and medical research, university and industrial research, and industry including nuclear power generation. In the very near future, this waste, now shipped at great expense, to three distant, but reluctant states, will have to be disposed of either regionally or within the Commonwealth. The amount of radioactivity is low and the volume is far smaller than the volume of other hazardous waste and of solid waste. The management of LLW, therefore, can be much simpler and less costly than the management of other waste forms. In addition, the management of LLW can be conducted in an economical and proper manner that protects the environment and the health and safety of the public.

To continue the benefits that accrue to the Commonwealth (employment and taxes, advances in medicine and research) it is necessary to be able to continue the disposal of LLW. Because the volume of LLW generated in Massachusetts is the eighth largest in the nation and represents 40 - 50% of all that is generated in New England, it is recommended that a LLW management program be initiated immediately within the Commonwealth. Eight additional recommendations are given in this report to set forth the conditions for implementing the program and to assure a satisfactory LLW management program. In particular, it is recommended that an education program be instituted to give everyone the opportunity to understand the LLW problem and the proper management of LLW and, hence, to support, constructively, the implementation of this necessary program.

This report consists of a short account of the problem and the set of recommendations. Details of the technical considerations in LLW management are contained in six appendices.

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Laurence Robbins*
Massachusetts General Hospital

Patric Scavotto
West Roxbury, Massachusetts

Carlisle Smith
Department of Public Safety

Shields Warren*
New England Deaconess Hospital

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* Deceased, 1980

MEMBERSHIP

Ad hoc Committee on Low Level Waste
Advisory Council on Radiation Protection

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Massachusetts Institute of Technology

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Harvard University

James D. Stellato
Executive Office of Environmental Affairs

1. INTRODUCTION

Extensive use of radioactive materials in the Commonwealth over the past 35 years has provided employment and taxes and has led to advances in medicine and research. Currently, an estimated 5000 persons, employed in hospitals, universities and industry, are directly involved with the use of radionuclides.

As an example, in order for a hospital to be accredited it must have a formal nuclear medicine program. At least 30 percent of the people who enter hospitals benefit directly from a wide variety of radiopharmaceuticals or devices using radionuclides for diagnosis or treatment. Nearly all patients benefit indirectly from basic medical research in which radionuclides play an important role.

Similarly, radionuclides are used in many fields of research in universities and in industrial research centers providing a variety of benefits to society. As examples, these benefits include studies on the absorption of food in the nutrition field, on the flow of waters in the civil enginnering field, on the function of cells in the biology field, on the reduction of friction in the mechanical engineering field, and on improved components in the electrical engineering field.

In the normal life processes, all societies produce waste, from the production and use of food, transportation, energy, and other goods and services. Waste includes human waste (sewerage), solid waste (municipal and industrial), and hazardous waste (toxic chemicals and metals). The magnitude of the waste disposal problem is indicated by the volumes generated in the last two classes. In Massachusetts, an estimated 500,000,000 cubic feet of solid waste and 5,000,000 cubic feet of hazardous waste are generated each year.

In similar fashion, all uses of radionuclides, including the production of electricity with nuclear power, lead to some waste that must be disposed of in a safe manner. The radioactive waste discussed in this report contains small amounts of radioactivity and is called low level waste (LLW). The volume of LLW currently generated in Massachusetts is estimated to be 170,000 cubic feet per year, about 3% of the volume of hazardous waste, 0.03% of solid waste. Procedures for transporting and disposing of this LLW safely are well known.

These procedures can be implemented within the Commonwealth without subjecting the general public, including those nearest the disposal operations, to radiation of any significance compared with natural radiation to which we are all exposed.

This report describes and discusses the LLW problem facing Massachusetts. The report also presents the actions that the Commonwealth must take to assure the proper handling of LLW within its borders and, hence, to assure the continued benefits that derive from the use of radionuclides. The next section addresses the nature of the problem and the need for action, while the third section sets forth the recommendations to initiate and institute a LLW program.

This short report is followed by a series of appendices that describe, in detail, the technical aspects of LLW management. These appendices include information on waste classification; the magnitude and handling of the waste, criteria for packaging, transport and processing; recycling and reclamation; and siting considerations for waste disposal facilities. The last appendix, of special importance, discusses the need for an education program to describe the nature of the problem, and to give a perspective to all interested parties on such issues as the radioactivity involved, the considerations for siting a facility, and the health and other benefits obtained from the use of radionuclides. With this background, everyone can play a constructive role in the implementation of a LLW management program in the Commonwealth as soon as possible.

2. STATEMENT OF THE PROBLEM

The temporary closings of the LLW disposal sites recently in the states of South Carolina, Nevada and Washington have dramatically pointed out the serious consequences that can affect the continued use of radionuclides in medicine, research, and industry. The reopenings of these sites, under considerably more stringent requirements and controls, emphasizes the probability that these three states will no longer continue to act as the sole receivers of LLW for the United States. It is quite clear now, as it has not been before, that all the states, individually or regionally, must participate in and contribute to the solution of LLW disposal.

LLW is in many respects similar to municipal wastes - consisting largely of paper, glassware, scrap materials and some solvents - except that it is contaminated with small amounts of radioactivity. Because the volume is small by comparison and the concentration of radioactivity is low (on average, not much different from radioactivity concentrations occurring naturally, including those in the human body) the difficulty associated with the disposal of LLW is not much greater than that of the proper handling and disposal of municipal wastes.

The disposal of LLW has always been under regulatory control. Regulations developed by the U. S. Atomic Energy Commission have been continued and improved by its successor agencies, the Energy Research and Development Agency, the Department of Energy, and the Nuclear Regulatory Commission as well as by the Environmental Protection Agency and the Massachusetts Department of Public Health. These regulations require that all users of radioactive materials be trained to follow prescribed rules for disposal of LLW. Adherence to these rules is monitored by the Nuclear Regulatory Commission and the Department of Transportation and by the states with LLW burial sites. These regulations, with proper inspection and enforcement, should ensure the safe operation of LLW disposal facilities and burial sites.

It is important to consider the economic impact of the development of local or regional disposal sites. The cost of the disposal of LLW is currently absorbed as part of normal operations involving radioactive naterial. This cost is increasing

rapidly primarily because of the spiraling costs of fuel and the long distances required for transportation and because of unreasonably escalating burial fees. Thus, the cost of disposal would be significantly reduced with shorter shipping distances, and the savings could be applied to the establishment of local or regional disposal facilities. In addition to maintaining manageable disposal costs, funds and fees and the accompanying creation of jobs would accrue to the host community as important economic benefits.

Waste management is the process by which waste is handled from its generation to its final disposal. The several steps involved in this process are: (1) appropriate choice of production or laboratory operations to produce less waste volume, (2) recycling, if possible, (3) radioactive decay where practical, until waste material is no longer radioactive, (4) mechanical volume reduction, and (5) further volume reduction by physical or chemical means, and finally, (6) proper disposal of residues by burial requiring technically sound procedures that involve waste forms compatible with the characteristics of the chosen sites. Criteria for choosing sites, in turn, must consider geological, geographical, environmental, demographic, and economic factors.

The solution to the problem, therefore, is to improve LLW management and to establish and operate processing facilities with land burial capacity for disposal nearby. The 47 remaining states have a limited grace period to demonstrate that they will not expect the present three states to be the only sites for LLW disposal, and that, in fact, they are ready to assume responsibility for their own wastes or share in a regional program. Thus, the real solution to this problem must include a definite and enlightened understanding by all concerned, the public as well as the administrators and the lawmakers, that we must take care of the wastes generated in the Commonwealth by properly managing and disposing of them within our own geographical area.

The Advisory Council on Radiation Protection has deemed the subject of LLW disposal to be of primary concern for the Commonwealth of Massachusetts, eighth in the nation in LLW volume production. The Council has prepared this report to provide the background in and recommendations for policy and and technical solutions that the Commonwealth, through the Governor and the Legislature, might use to develop and implement a plan for LLW management. For the normal continuation of all those operations that use radioactive materials, it is imperative that the State address this issue immediately and effectively.

3. RECOMMENDATIONS

The Advisory Council believes that the LLW problem is solvable and that it is important for the Commonwealth of Massachusetts to start on the solution immediately.

There may well be advantages for regional participation in which several states share costs, facilities and sites. However advantageous, the legal considerations are complex and Congressional action will be required for the states to enter into contracts that protect each others rights. Because resolution of the legal problems and enactment of Congressional legislation will take a few years, immediate action by Massachusetts to solve its own problem is the best course to follow. Should regional legislation be enacted, Massachusetts can enter into appropriate regional agreements in an advantageous and strong bargaining position.

The LLW problem of Massachusetts is well-defined: the generators are known by license; the nature, volume, and radioactivity of the waste are known; the techniques for safely processing and disposing the waste are known; and the regulations are on record. The hazardous waste problem, on the other hand, is just beginning to be addressed in Massachusetts with the passage of the hazardous waste legislation. Eventually, it may be advantageous to combine the two waste forms. However, at this time, it would be a disservice to the citizens of the Commonwealth to tie the two types of waste together and, hence, delay action on LLW disposal.

When possible, the Commonwealth should take advantage of financial and technical assistance offered by several federal agencies.

The specific recommendations of the Council to the Commonwealth are as follows:

1. Encourage the immediate initiation of a program for low level waste management within the state.
2. Require that site selection and facility development and operations be conducted in a thorough manner to protect the health and safety of the public and to protect the environment, in accord with applicable regulations.

3. Institute an education program, to give perspective to the public on the contributions to society of the services and products that produce LLW, and on the practical and safe means of LLW disposal.
4. Encourage and support the management of LLW disposal by organizations qualified from the standpoints of expertise, economics, and long term stability, and require financial responsibility for current operations in LLW management.
5. Set up a mechanism for an escrow fund, to be supported by the income of operation, for potential post-closure contingencies.
6. Require that generators be financially responsible for problems arising from improper packaging and accidents.
7. Encourage volume reduction techniques.
8. Set up a review body, consisting of qualified experts and of members of the public, to audit the operation of the LLW disposal program and to review proposals on new techniques for handling LLW.
9. Consider making appropriate state land available for use as a LLW disposal operations site.

As a final comment, the development of a program of LLW disposal will have to include the public, allowing it to play an integral role in the planning and implementation. To be effective in this regard, the public must be informed about the benefits from the use of radioactive materials, the need for proper disposal, the safety of proper disposal and the consequences of having no proper disposal available. In addition, the public should understand that the location of geologically suitable sites is not a matter of individual choice, but of geological evolution, that at least one site must be chosen, and that support for the necessary zoning changes will be needed. In short, the role of the public should be constructive and supportive in finding an acceptable solution for LLW disposal.

APPENDICES

APPENDIX A. WASTE CLASSIFICATION

For purposes of disposal, radioactive material is normally classified as Low Level Waste(LLW), Transuranic Waste (TRU) and High Level Waste (HLW).

All radioactive waste that does not fit into either the TRU or HLW categories is classified as LLW. Essentially all of the radioactive waste now generated in Massachusetts or in the New England region is LLW. This waste includes material from academic institutions, hospitals, radiopharmaceutical manufacturers, industry and nuclear power stations (excepting reactor spent fuel).

The Nuclear Regulatory Commission (NRC) has recently proposed (NRC,1979b) further classification limits, within the LLW category, that would define waste acceptable for shallow land burial. This classification system is based on concentration limits that are related to the potential hazard of critical radionuclides. Waste not acceptable for shallow land burial would have to be disposed of by intermediate depth burial or some other method providing an equivalent degree of isolation.

Waste material containing quantities of radionuclides with atomic number greater than 92 (i.e., plutonium, americium, etc.) in excess of 0.001 microcuries[1] per gram is presently classified as transuranic waste. This TRU waste is currently stored in retrievable storage facilities pending ultimate disposal. The new classification system described above will include TRU waste and thus define the method of disposal to be used. Waste containing concentrations of transuranics or other radionuclides unacceptably high for shallow land burial results from spent reactor fuel reprocessing or weapons production. High level waste consists of either the liquid or solid waste generated by the reprocessing of this fuel. The HLW program is being addressed by the federal government.

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[1] A curie is a unit of radioactivity equal to 37,000,000,000 nuclear transformations per second. A microcurie is 1/1,000,000 of a curie and is equal to 37,000 nuclear transformations per second.

APPENDIX B. MAGNITUDE AND HANDLING OF LOW LWVEL WASTE

B1. Volume and Radioactivity

The volume and radioactivity of LLW and the distribution of users is given in Table 1. The information presented in this table is taken from the licensed user reports (NRC, 1979a) supplied to regulatory agencies in the eighteen-month period from January, 1978 through June, 1979. The data have been normalized for an effective 1979 year to show the impact of a full year. There are approximately 410 U. S. Nuclear Regulatory licensees registered in the Commonwealth of Massachusetts. Information was obtained on 202 of these registered. The processors are divided into the following categories: commercial power, industrial, academic and hospital. LLW from university research reactors is included in the academic waste category. There are also a few government facilities conducting research with radioactive materials and these have been included in the industrial category. The remaining 208 licensees, whose information was not available for this report, are considered small producers of LLW and their contribution would change the data very little.

LLW from all producers consists of paper trash, clothing, glassware, equipment, chemicals, filters, solidified waste, scintillation vials, animal carcasses and other contaminated materials. A single container can have radioactive materials ranging from a millionth of a curie to hundreds of curies of some radionuclides. A full 55-gallon (7.3 cubic feet) steel container can weigh anywhere from 50 to 400 pounds.

Transportation of LLW is limited to 40,000 pounds per vehicle due to requirements of various states. Current unit cost of disposal of LLW ranges between $150 and $750 per 55-gallon drum, for a total of several million dollars per year for Massachusetts generators. Other charges are added on when weight, quantity of radioactivity and radiation levels exceed specified limits.

Records of the 202 producers indicate that 35 different radionuclides are used routinely, eleven of these predominating in medical and research use.

One of the two major industrial producers contributes 24,300 cubic feet of LLW containing 85,000 curies (mostly hydrogen-3). The second produces 59,400 cubic feet containing 60 curies of depleted uranium.

Table 1. Low Level Radioactive Waste Shipped from Massachusetts[a]

Category	Power	Industrial	Academic	Hospital	TOTAL
Licenses Reviewed	2	77	24	99	202
Licenses above That Report No Waste is Produced	___	37	11	48	96
Large Volume[b]					
- Producers	2	2	___	___	4
- Cubic Feet	50,000	84,000	___	___	134,000
- Curies[c]	1,000[d]	83,000	___	___	84,000
Small Volume					
- Producers	___	38	13	51	102
- Cubic Feet	___	7,400	8,100	19,000	34,500
- Curies	___	81	44	18	143

GRAND TOTAL

Volume: 168,500 cubic feet; radioactivity: 84,143 curies

[a] Data have been adjusted for operations over one year.

[b] This category includes those who produce more than 5000 cubic feet/year and 50 curies/year.

[c] A curie is a unit of radioactivity equal to 37,000,000,000 nuclear transformations per second.

[d] Quantity depends on shutdowns and core changes.

About 50% of the producers report that no LLW is sent to burial sites. These producers hold their radionuclides for 10 to 15 half lives[2] and dispose the decayed products through conventional commercial methods.

The size of the New England LLW disposal problem (and that including New York)is indicated by the reported volumes of waste shipped from the neighboring states. Table 2 indicates that the Massachusetts LLW volume is between 20 - 30% of the regional volume and 40 - 50% of the New England volume. These percentages should be sufficient incentive for Massachusetts to take a leadership role in seeking a solution to LLW disposal.

B2. Criteria For Packaging

All low-level waste accepted for disposal by land burial is packaged in DOT approved containers and complies with all applicable regulations of the U. S. Nuclear Regulatory Commission (NRC) and Department of Transportation (DOT) and of the Commonwealth of Massachusetts through the Department of Public Health.

The waste form must be packaged to prevent fires through friction, absorption of moisture or spontaneous chemical change, and, if by some chance ignited, must not burn so vigorously and persistently as to create a hazard during handling, storage, and disposal. In addition, LLW containing pathogenic, infectious or other biological material must be treated, prior to packaging, to minimize the potential hazard of this material.

The following classes of LLW are identified under the criteria of the existing burial sites: 1. dry solids, 2. absorbed liquids, 3. liquid scintillation vials, 4. animal carcasses, 5. gasses, and 6. resins For each class there are specific packaging requirements.

Some changes in packaging criteria would be advisable if volume reduction by incineration were adopted as part of a local disposal operation. One of the primary considerations would be to minimize the handling of waste to be

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[2] A half life is the time required for the activity of a radionuclide to decay to one half the initial value.

Table 2. Low Level Waste Volumes Shipped from Massachusetts and from States Neighboring Massachusetts[a]

State	Volume (cubic feet)
Connecticut	114,000
Maine	30,000
Massachusetts	119,000[b]
New Hampshire	12,000
New York	239,000
Rhode Island	6,000
Vermont	11,000
TOTAL	531,000
New England TOTAL	292,000

[a] Data are taken from EGG, 1980, and are for the year 1979.

[b] Note that the volume for Massachusetts obtained in the present review (Table 1) is larger than the above value which has been obtained from the preliminary EGG report.

incinerated so as to minimize both the radiation exposure to operating personnel and the potential for radioactive contamination. It would be desirable, therefore, to package combustible LLW in combustible packaging, sized suitably for direct injection into the incinerator. Present DOT regulations allow the shipment of radioactive materials in combustible packaging, in fact, most radionuclides as initially purchased are shipped in combustible packaging.

APPENDIX C. TRANSPORT AND PROCESSING OF LOW LEVEL WASTE

C1. Transport

Packaged low-level radioactive waste is transported from the Massachusetts "generator" to one of the three remaining LLW repositories in the U. S., where it is buried under the full control of a permanent curator. Such transportation is by truck, usually in full "exclusive-use" trailer loads. The majority of LLW generated in Massachusetts is currently shipped to the Hanford site in Richland, Washington, or to Barnwell, South Carolina. Low-volume generators of LLW usually contract with a middle-man or "broker", who collects the packaged waste from several such generators, warehousing as necessary until full trailer-loads are accumulated. A significant factor in the recent cost escalation in this entire process is associated with the distant locations for burial. Those involved in this business over the past few years recall shipping to West Valley, New York; to Sheffield, Illinois; to Morehead, Kentucky; to Barnwell, South Carolina; to Beatty, Nevada; and now to Richland, Washington.

The location of an appropriate site for operation of a facility and for burial in Massachusetts should take into consideration the transport routes that would be involved in getting the LLW to the site. While the transportation of LLW does not pose a significant hazard, proper routing, including the use of all of the Commonwealth's major highways, should minimize unnecessary transport through communities.

C2. Processing

The bulk of the material included in the LLW volume is suitable for incineration in terms of both its combustible nature and of its radioactivity content. The cost of initiating an appropriate incineration program would be high for the individual generator, when the requirements of the federal, state and local air pollution control laws are factored into the equipment design. The technology is available, however, to incinerate this material safely and properly on a large scale, if the combustible LLW from many generators could be efficiently pooled for this purpose. In fact, proven incineration techniques are available that result in a 5-10% residue bound in impervious materials such as glass or iron slag, yielding not only greatly

reduced volumes, but much less leachable disposal forms. Compared with the current cost of LLW disposal, a cooperative central facility or commercial operation with these volume reduction capabilities would be economically feasible in this state.

Such a facility could operate in one of several ways. (1) It could process (incinerate, compact) all waste from various generators, to reduce volumes as much as possible for ultimate burial at one of the existing sites. (2) It could receive only combustible LLW from various generators to incinerate and, thereby, to reduce volumes for ultimate burial elsewhere. (3) It could receive all waste as in No. 1 above, and process and bury it on site after obtaining appropriate licenses and clearances. (4) It could operate in combined fashion, whereby an incinerator with capacity and capability to handle combustible LLW waste could also handle toxic chemical wastes that can be suitably treated by incineration, with the ultimate burial of the residue to be arranged elsewhere or on site. (5) It could be primarily an incineration site, designed large enough to handle all combustible LLW and all toxic chemical waste as well as all municipal waste from the community or region in which it is located, with arrangements for the ultimate burial of the radioactive and toxic residues elsewhere or on site, if the site meets the appropriate requirements.

The fifth mode would be the ideal and most effective approach to take. However, for practical reasons involving time, effort and money, this mode would not solve the LLW problem for Massachusetts in time to satisfy the demands for early relief by the three states now accepting waste.

The most practical solution, therefore, is the third mode, processing and burial on the same site. Since sites geologically satisfactory for hazardous waste disposal have been found in Massachusetts, these sites or similar ones might be adequate for LLW disposal. Licensing for LLW incineration is a relatively short term (6 months - 1 year) effort so that incineration could proceed soon. While pursuing licensing for burial, a 1-to 3-year process, the incinerator residue could be transported for burial to the existing out-of-state sites. Such a solution demonstrates to these states that Massachusetts is taking appropriate action and, at the same time, is transporting and requesting burial for smaller volumes of much less leachable waste.

APPENDIX D. RECYCLING AND RECLAMATION FOR VOLUME REDUCTION

This section is included in this report to show that there are other potential means for reducing the quantity of LLW for disposal.

One alternate method includes recycling, i.e., the recovery and reprocessing for reuse of both the radioactive and non-radioactive components, or either one, of a radioactive material normally be scheduled for disposal. However, the separation of radionuclides from solutions, from complex compounds, or from fabrications that fail to meet quality assurance standards, is in an early stage of development. The incentive to investigate such separation processes is governed by economics, manpower, and new technology, none of which appear promising at this time.

The ability to remove radionuclides from materials varies according to the specific nuclide to be isolated, to its incorporation in particular compounds or materials, and to the quantity of the non-radioactive atoms of the same element present in the compound or material that will compete in the process because both the radioactive and non-radioactive atoms of an element behave chemically in the same manner. Current experience in chemical separation processes, such as distillation, evaporation, and column techniques, has resulted in up to 90 percent separation of the radioactive component. The degree of acceptance of the separated products depends on the purity and concentration of the radionuclide and on the degree of residual radioactive contamination of the component that is normally non-radioactive.

Radionuclides can also be reclaimed from devices that contain them. For this purpose, the requirements of the process include dedicated space and equipment that might not be considered cost effective for a single or a few recovery operations. For example, to reclaim a quantity of cesium-137 from an obsolete sealed source requires the additional facilities of an enclosure with filtered exhaust ventilation ports to prevent release of radioactivity to the environment, remote tools to minimize radiation exposure of the workers, and chemicals to bring the radiocesium back to an acceptable raw-material state. In the process of isolating a large fraction of the radiocesium, however, it is possible that the volume of contaminated waste to be disposed of could become larger than the small volume of the original waste source.

Recycling and reclamation processes ought to be investigated further with increased effort and ingenious methods. For the most effective volume reduction, such processes should be considered for incorporation in the original production processes.

APPENDIX E. SITING CONSIDERATIONS FOR PROCESSING AND BURIAL

The siting of a LLW disposal facility encompasses all steps from the development of site criteria to the licensing of the proposed facility. It includes the survey of prospective sites and their evaluations, leading to the selection of an acceptable location for the proposed facility. This section briefly describes the major considerations that must be addressed during this process.

The size of the site required for a low-level waste burial facility will depend on the volume of LLW in the state or in the region to be served, the desired length of time the facility will be operational and the desired exclusion area surrounding the active site. Typical sites may range from less than a hundred acres to several hundred acres, depending on how much land is already available for a buffer zone. The space requirements for a waste volume reduction/solidification facility would be much less, and the licensing effort for this type of processing plant would be significantly less than that for a burial site whether on the same site or elsewhere. For this reason most of the discussion below pertains to the siting of waste burial facilities.

Until the present time, private industry has taken the initiative in seeking, selecting, licensing, and operating new commercial low-level waste disposal sites. The land on which these disposal facilities are located has been deeded to the Federal or State government. The private company, or operator, is then responsible for assuring safety during use of the facility and the appropriate government agency is responsible for long-term care. The Interagency Review Group, however, has recently recommended (IRG,1979) that the"Department of Energy (DOE) assume responsibility for developing and coordinating the needed national plan for LLW..." This IRG Report further states that future sites could be developed and operated by individual states or the the federal Government. If the facility is sited on state-owned land, title could be transferred to the Federal Government upon termination of the facility license. Responsibility for siting a new waste facility may therefore reside with either a private company or a government agency. The siting process itself however, will be relatively independent of whoever assumes this responsibility.

Much of the groundwork in developing a methodology for siting a LLW facility has been completed by the New England Regional Commission (NERCOM,1979) for the purpose of disposing hazardous wastes. This study points out the importance of allowing the maximum number of parties to participate in the decision-making process with the underlying assumption that "some final siting decision has to be made". Massachusetts now has siting legislation for hazardous waste (CCM,1980) that defines the decision-making process quite clearly with respect to community participation and the procedures to overcome a potential impasse. Many parts of this law apply to the siting considerations of LLW disposal.

The site must be selected to meet both short-term, or operational, considerations, and long-term performance objectives. The proximity of established transportation routes to facilitate the safe and economic transport of LLW, the quantity of land available, the ease of acquisition, and public acceptance must all be considered as short-term conveniences. The long-term performance objective of the disposal facility after closure is to assure that all LLW is contained within the facility for the required lifetime of that waste.

This long-term performance objective will be met by a site-specific system of barriers to LLW migration including the specified form of the buried waste, engineered barriers, natural characteristics of the site and its environs, and control over the use of the land upon which the site is located.

Sufficient funds must be made available to provide for: (1) decommissioning of the disposal facility, including dismantling surface structures on the site, (2) stabilization of the site and the buried waste to preclude ongoing active maintenance, and (3) the provision of surveillance and monitoring activities over a period long enough to show that the site conforms to expectations. The National Conference of Radiation Control Program Directors has recommended bonding and perpetual care trust funds as a means of assuring such funding (CRCPD,1976). The NRC, in their proposed regulation (NRC,1979) concurs with this concept and discusses several financial surety arrangements, such as bonds, cash deposits, certificates of deposit and letters of credit, which would be acceptable.

The characteristics of a proposed site must be investigated in sufficient scope and detail to assure that the objectives discussed above can be met, as well as allowing a thorough evaluation of the site. These characteristics include, but are not limited to, demography, hydrology, geology and meteorology, and are discussed below:

a. For an adequately sized site, the facility should be sited in a relatively low population area and must be evaluated with respect to the present and future character and activities of the population in this area. This evaluation should also include the present and projected uses of the land, water and other natural resources of the area, and the proximity and type of transportation routes available for the shipment of LLW.

b. The site should be chosen so that the hydrogeologic environment of the area surrounding the disposal site will act to prevent or minimize the migration of waste through groundwater pathways. Site characteristics desirable in achieving this include low groundwater flow rates and soil properties which would adsorb the waste material, if it were released.

c. The facility should not be located in an area where surface geologic processes such as erosion, landsliding or weathering could significantly enhance the hydrogeological transport of LLW from the site. The site should not be located near a capable fault such that the migration of waste could increase as a result of seismic activity.

d. The local meteorology must be studied to assure that rain-water intrusion or wind erosion will not enhance the migration of waste to an unacceptable level. This study will also characterize local atmospheric dispersion to allow assessment of the off-site environmental impact from airborne releases.

The application for a LLW facility license will include a safety and environmental report to meet the requirements of the NRC and the National Environmental Policy Act (NRC,1979b). This report will contain a full evaluation of the candidate sites and the rationale for choosing the proposed site. The results of the technical and environmental studies, as described above, will be documented in this license application, along with a complete description of the proposed method of operation.

APPENDIX F. THE NEED FOR EDUCATION

Sucess of a LLW management program hanges on securing a suitable means of treatment and a site for disposal. Although waste volume reduction requires less space and less long-term monitoring than a shallow landfill operation, the task of securing an appropriate location for either operation is likely to be difficult when there is widespread fear of anything radioactive or nuclear. Any LLW management proposal should include a plan that will help change this misconception, reducing fear through better understanding of the issues. Thus, an education program must be an integral part of the overall program for waste management.

F1. Perspective on Radiation and Radioactivity

While the use of radioactive materials must be strictly controlled to prevent excessive releases to the environment, it should be borne in mind that the environment is naturally radioactive. One of the ways to assess the significance of the disposal of LLW is to compare the radioactivity of LLW with this naturally occurring radioactivity. The latter radioactivity includes radioactivity in the air as radioactive gases or particles, in the ground, in rain water and ground water, in building materials, in food, and in the human body. The amounts and concentrations of this radioactivity vary appreciably in different locations. The naturally occurring radionuclides also differ greatly in their toxicities, and include some radionuclides that rank among the most hazardous as well as others that rank among the least hazardous.

Natural radioactivity in the environment originates from a variety of sources. The most significant are the radionuclides potassium-40, uranium-238, and thorium-232, produced when the universe was created billions of years ago, and remain in significant quantities today because of their long half lives (greater than a billion years). When they decay, they are followed by additional radioactive products with shorter half lives, such as radium-226 (1600 years) radon-222 (3.8 days), polonium-214 (0.00016 seconds), and polonium-210 (138 days). Except for potassium-40, the preceding radionuclides emit alpha radiation and are considered to be highly toxic.

All of the above radionuclides except one are solids and are distributed throughout the ground, from which they are taken up by vegetation or dissolved in ground water. One radioactive decay product, radon-222, is a noble gas. While it originates from the decay of the radium in the ground, it diffuses out of the ground and reaches significant concentrations in the atmosphere, particularly when the air is still. Radon also diffuses into homes, where the concentrations depend on the ventilation. The highest concentrations occur in homes that have little air exchange with the environment, such as homes in cold climates sealed to reduce heat losses. The decay of each radon atom is followed by 6 successive decays, producing radionuclides which emit alpha, beta and gamma radiation. The decay products are found in the ground, food, and water, and form radioactive aerosols in the air which are breathed in and retained in the lungs.

Radionuclides are also generated continuously from the action of cosmic radiation on elements in the atmosphere. The most significant are carbon-14 and hydrogen-3 (tritium). Both emit very low-energy beta particles and are among the least hazardous of radioactive materials. The radiation dose to each person from carbon-14 is 0.7 mrem[3]/year and from tritium, 0.001 mrem/year.

The cosmic radiation and the gamma radiation emitted by radioactive materials in the ground are responsible for large differences in radiation doses in different places. For example, at an altitude of 1.6 km (1 mile), the annual cosmic-ray dose of 45 mrem is greater by 17 mrem/year than that at sea level. Annual radiation doses in the U. S. (including both terrestrial and cosmic radiation) range in various locations from 32 mrem to 197 mrem, a total difference of 165 mrem. Residents of the city of Denver receive a whole body dose of 125 mrem/year compared to 65 mrem/year for inhabitants of the Atlantic and Gulf coastal states and 80 mrem/year for the majority of the U. S. population. Neutrons, not included in the above dose values, contribute an additional annual 30 mrem at 1.6 km and 6 mrem at sea level.

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[3] The quantity of radiation dose that places all radiations on a common basis for assessing biological effects is called the dose equivalent. The unit of the dose equivalent is a rem. 1 mrem = 1 millirem = 1/1000 rem.

There are also large differences in radioactivity in the air, due primarily to the naturally occurring radioactive gas radon-222. Concentrations of radon-222 in outdoor air range from 20-1000 picocuries[4]/cubic meter. The corresponding average dose rates to the lungs range from 20 mrem/year to 1000 mrem/year. Variations in radium-226 content in the diet produce variations in the dose to bone of about 10 mrem/year around an average bone dose of 100 mrem/yr.

Typical levels of radioactivity in the ground and in the air are given in Table 3. These levels are quite significant, and it is important to note that these radionuclides are not encased in containers but are truly accessible to ground water, to food crops, and to the atmosphere.

Despite the large differences in radiation levels, very few people give any thought to natural radioactivity in selecting a place to work or live. There is no evidence that these variations are significant in affecting the incidence of cancer or other diseases. In any event, there is little one can do to control population exposures from these sources.

Because of the natural abundance of radioactive materials, the disposal of sufficiently small quantities of radioactive materials in the ground and via the air would not produce changes that would be considered significant in view of the variations in the existing levels. The highest radiation dose to which any member of the public would be exposed by a properly managed LLW program should not exceed 5 mrem/year.

Of course, the existence of natural levels of radioactivity does not give license to pollute indiscriminately. The potential release of low levels of radioactivity should be weighed against the benefits to society from the activities that produced this radioactivity. Finally, releases should be reviewed for compliance with the ALARA principle which requires that the discharge of pollutants to the environment be kept As Low As Reasonably Achievable and not merely in compliance with pollution regulations.

Inclusion of this discussion on natural background radiation serves as an example of the kind of information needed in an education program to improve understanding on the safe disposal of LLW.

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[4] A picocurie is 1/1,000,000,000,000 of a curie and is equal to 0.037 nuclear transformations per second.

Table 3. Radioactivity in the Environment and in People from Naturally Occurring Long-Lived Radianuclides[a]

Radionuclide	Half-life	Global Inventory	Activity in Soil to depth of 2 meters		Concentration		Activity in Body
			1 acre	1 square kilometer	Air	Water	
	years	millions of curies[b]	milli-curies[c]	milli-curies	picocuries[d] per cubic meter	picocuries per cubic meter	picocuries
Alpha-Particle Emitters							
Uranium-238	4.5 billion		10	2,500	0.00012		26
Thorium-232	14 billion		10	2,500	0.00003		
Radium-226	1600		10	2,500	0.00012	1,000-10,000 (well water)	120
Radon-222	3.82 days	25 (atmosphere)			70.		48
Polonium-210	138 days	20	13	3,200	0.0033	100	200
Beta-Particle Emitters							
Potassium-40	1.3 billion		80	43,000			130,000
Carbon-14	5730	300					87,000
Hydrogen-3	12,4	34 (natural) 1700 (fallout, 1980)			0,038	6,000-24,000	
Lead-210	22.3						

[a] Sources: UNSCEAR (1977); NCRP (1975)

[b] See footnote No. 1 for definition.

[c] A millicurie is 1/1000 of a curie and is equal to 37,000,000 nuclear transformations per second.

[d] See footnote No. 4 for definition.

F2. Implementation of Education Program

A single state agency should be charged with design of the education program, coordination of information and implementation of the plan. Although a consortium of users might provide educational services, the public is more likely to trust a state agency with fewer specific stakes in the outcome. Funds for the program, however, might be provided partially or wholly by a consortium of users. Responsibility for this program demands more than public relations skills; the coordinator of the effort must be included in technical and policy discussions to understand the issues and goals of the LLW management program.

F3. Audience

The education program should reach several sectors of society: the general public and state and local officials, few of whom understand the issues or the impacts of failure to act. So the LLW generators, who should be encouraged to consider a full range of treatment and disposal options.

The aim of the education of the general public should be to dispel the widely believed myths about anything labeled radioactive or nuclear and to provide a perspective on society's need to handle its wastes properly. Most believe all radioactive products to be equally threatening to public health and the environment. Many believe that the solution to radioactive waste disposal is simply to cease production of all waste, unaware that LLW is a by-product of quality-of-life maintenance and safeguards: health care, research and a number of consumer goods. The public should realize how failure to assume this responsibility would affect their lives.

Local and state officials, who will ultimately make decisions about location and operation, need to be informed about the technological soundness and the safety of processing and disposal facilities. Mechanisms that reduce risks and that offer safeguards and benefits to potential host communities should be explored by the appropriate decision-makers.

F4. Approach to Public Education

An emerging question in the public mind might well be: "Why are we concerned about LLW treatment and disposal now"? That question should be

answered truthfully: present disposal sites are thousands of miles away and closing their services to out-of-state wastes. Massachusetts has not taken responsibility for its own waste in the past, and is now forced to do so.

Unfortunately, this awareness effort comes at the same time as an awareness effort for hazardous waste, and neither can wait for the other to be resolved. Although the two might be handled technologically as one, with common issues and solutions, it may be that neither can bear the millstone of public fear of the other. Responsible officials in each area believe that management plans will be more readily implemented if the programs "go public" separately. Because the volume and variety of LLW is much less than that of hazardous chemical waste, the public might be more receptive to dealing with LLW.

The primary goals of the public education program are (1) to assuage public fears about radioactivity and (2) to explain why in-state or regional treatment and disposal are necessary. Dissemination of information for the enlightenment of the public may include several routes, as follows:

a. Talent bank and speaker's bureau of advocates who are not known advocates of other nuclear uses: hospital personnel, researchers and other users as well as people who do not have a private stake in the issue. These advocates might appear before a variety of group meetings, offering a new perspective.

b. Workshop for media people to inform writers and commentators of the spectrum of issues that surround LLW management.

c. Contact with environmental groups and trade organizations and their publications, offering information and articles about LLW generation and solutions to treatment and disposal problems.

d. Displays in public places of consumer goods and health care uses that produce LLW.

FS. Education Relative to Facility Siting

Although a public education program might successfully convince people that an in-state or regional waste managment facility is needed, it does not counter the typical "But not in my town" response. Any particular facility

proposal is likely to face local opposition as communities weigh their stakes in the issue. Any specific proposed community perceives local costs from hosting the facility (in the form of possible property value losses, public service costs, and the fear engendered by the proposal) to be greater than local benefits. Total benefits are dispersed throughout the state, benefiting all who might have suffered from improper disposal, and more directly, eliminating the cost and inconvenience of hauling long distances.

Although NRC (NRC,1979b) specifies that disposal facilities shall be sited on land owned by the federal or state government, and does not specifically require local approval, local opposition to any proposal can be expected, employing a variety of effective techniques to discourage site assignment. To effect a change in local attitude, the balance of costs and benefits to communities must be changed allowing specific benefits to accrue to the community under consideration.

Greatest costs to a specific community are in the real and perceived risks inherent in any treatment or disposal facility proposal. Historically communities have been offered little compensation for assuming these risks. The proper approach to local siting lies in reducing the risks (which cannot be reduced to zero) of hosting the facility through prescribed conditions and monitoring agreements, and also in increasing the benefits to the community to make the proposal attractive for local consideration.

A variety of mechanisms to reduce risks and to compensate communities for taking risks have been summarized in "Siting Options for Hazardous Waste Facilities" (Stellato and O'Hare, 1980); these include: assuring proper construction and operation of the facility through regulations; technical planning assistance and expertise of state officials; mitigation techniques of over-design, monitoring and paying the cost of public service impacts; compensation through recreation facilities, employment programs, public works projects and payment in-lieu of taxes or handling fees; and insurance for health, liability and property value losses.

By using a process of negotiating for conditions agreeable to the community and the developer, the community will receive a properly controlled and supervised facility with appropriate compensation for costs incurred. In

return, the developer should not be tied up in court fighting obstructionist suits, nor forced to pay exorbitant compensation.

Negotiations for conditions and compensation should take place between the facility operator and the community involved, establishing a line of communication that may be the key to siting and to cooperation during operation. Compensation should be paid by the facility operator, who can legitimately pass costs along to the consumers of the waste generators, the consumers being beneficiaries of the host community's agreement to host the facility. The caveat to this scheme is cost containment by all parties, communities requesting only realistic compensation. LLW generators operate within given budgets and too great demands on their resources could result in reduced services, affecting the production of consumer products.

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APPENDIX C: REGULATIONS PERTAINING TO RADIOACTIVE WASTE MANAGEMENT IN MASSACHUSETTS

TABLE OF CONTENTS

A. Purpose

A.1 These rules and regulations are established for the protection of the general public and individuals against radiation hazards associated with the use, transportation, storage, packaging, sale, distribution, production, and disposal of radioactive materials and with the use of machines which emit ionizing radiation. It is the intent and purpose of these regulations to minimize the subjection of individuals to ionizing radiation and, where controllable, to maintain absorbed doses of ionizing radiation received by individuals as far below the doses specified by the Radiation Protection Guides (RPG) of these regulations (Section F) as is reasonable and practicable.

B. Scope and Application

B.1 These regulations apply to all persons who receive, possess, use or transfer radioactive materials or machines which emit or may emit ionizing radiation in the Commonwealth except as exempted by the provisions of Section D of these regulations.

B.2 These rules and regulations are in addition and supplementary to any other legal rules and regulations adopted by the Department or other legally empowered agency or political subdivision of the Commonwealth.

B.3 In the course of its inspections relative to and enforcement of these regulations, it is the intention of the Department to cooperate with and coordinate its activities with those of the Department of Labor and Industries of the Commonwealth and to concern itself, in the area of employee protection, primarily with those users registered with it under the provisions of Section E of these regulations.

B.4 Nothing in these regulations shall limit the kind and amount of ionizing radiation that may be intentionally administered to an individual for diagnostic, therapeutic, or medical research purposes by or under the direction of a physician, dentist, or chiropodist (podiatrist).

C. Definitions

Because the precise meaning given to one or more critical terms frequently determines the interpretation of a statement, the following definitions are given for certain words and phrases as they are used in these regulations or as they may be interpreted by the Department relative to radiological health matters. The list is not intended to be a complete glossary of radiation terminology.

ABSORBED DOSE means the amount of energy imparted to matter by ionizing radiation per unit mass of irradiated material at the place of interest (a unit of absorbed dose is the rad). In these regulations the absorbed dose in rem is the RBE dose.

--Internal absorbed dose means an absorbed dose resulting from radioactive substances within the body.

--External absorbed dose means an absorbed dose resulting from a source(s) of ionizing radiation located external to the body.

ACCIDENT means an unforeseeable event or occurrence.

ADDED FILTER means the filter added to the inherent filtration.

AIRBORNE RADIOACTIVE MATERIAL means any radioactive material dispersed in the air in the form of dusts, fumes, mists, vapors or gasses.

AIRBORNE RADIOACTIVITY AREA means:

a. any room, enclosure, or operating area in which airborne radioactive material exist in concentrations in excess of the Radioactivity Concentration Guide (RCG); or,

b. any room, enclosure, or operating area in which airborne radioactive material exists in concentrations which, averaged over the number of hours in any week during which individuals are in the area, exceed 25 percent of the RCG.

ALUMINUM EQUIVALENT means the thickness of aluminum affording the same attenuation, under specified conditions, as the material in question.

ATMOSPHERE means the gaseous fluid surrounding the earth; the air.

ATTENUATION means the process by which a beam of ionizing radiation is reduced in intensity when passing through material.

BARRIER -- See PROTECTIVE BARRIER.

BEAM means the unidirectional or approximately unidirectional flow of ionizing radiation.

CALENDAR QUARTER means:

a. a period of time not less than 12 consecutive calendar weeks and not greater than 14 consecutive calendar weeks; or,

b. a period of time of 3 consecutive calendar months.

CONSTANT POTENTIAL (cp) means, in radiological practice, a unidirectional potential (or voltage) which has little or no periodic variation.

CONTROLLED AREA means a defined area access to which is controlled for the purpose of radiation protection.

CURIE — See RADIOACTIVITY.

DEAD-MAN SWITCH means a switch so constructed that a circuit-closing contact can only be maintained through continuous pressure exerted by the operator.

DEPARTMENT means the Department of Public Health of the Commonwealth of Massachusetts.

DIAGNOSTIC-TYPE PROTECTIVE TUBE HOUSING means an x-ray tube housing so constructed that the leakage radiation at a distance of 1 meter from the target cannot exceed 100 milliroentgens in 1 hour when the tube is being operated at any of its specific ratings.

ENVIRONMENT means all portions of man's earthly surroundings (including the atmosphere) frequentable and/or utilized directly or indirectly by man.

EXPOSURE DOSE means the dose potential to deliver an absorbed dose at a specific place or location.

FILM BADGE means a packet of appropriately sensitized material and filters used to determine amounts of ionizing radiation.

FILTER means a device which when placed in a beam of ionizing radiation will absorb preferentially the less penetrating ionizing radiations.

HALF-VALUE LAYER (hvl) means the thickness of an absorber required to reduce a beam of ionizing radiation to one-half its incident intensity.

HIGH RADIATION AREA means any area, accessible to and visitable by individuals, in which there exists ionizing radiation at such levels that a major portion of the body could receive in any one hour an absorbed dose in excess of 100 millirem.

INCIDENT means a foreseeable event or occurrence.

INDIVIDUAL means any human being.

INHERENT FILTRATION means filtration in the usable beam caused by the window of the x-ray tube and any permanent tube enclosure or components thereof.

INSTALLATION means a source(s), with its associated equipment and the space in which it is located and/or used.

INTERNAL ABSORBED DOSE — See ABSORBED DOSE.

IONIZING RADIATION means any electromagnetic or particulate radiation capable of producing ions, directly or indirectly, in its passage through matter.

KILOVOLTS PEAK (kvp) means the crest value in kilovolts of the potential of a pulsating potential generator. When only one-half of the wave is used, the value refers to the useful half of the wave.

LEAD EQUIVALENT means the thickness of lead affording the same attenuation, under specified conditions, as the material in question.

LEAKAGE RADIATION means all ionizing radiation coming from within the tube housing except the usable beam.

MAXIMUM PERMISSIBLE ACCUMULATED DOSE (MPAD) means the absorbed dose which, if accumulated during the lifetime of an individual and on the basis of present knowledge, is acceptable to the Department.

MILLIROENTGEN (mr) means one-thousanth of a roentgen.

MINOR means any human being who has not reached the eighteenth anniversary of his or her birth date.

MONITORING means the determination of the amount of ionizing radiation or radioactive contamination present in an area or of the exposure dose received by an individual.

OCCUPANCY FACTOR means the factor which, for purposes of evaluating the hazards from ionizing radiation, may be used when making allowances for the percentage of time an individual occupies a specified area.

OCCUPATIONAL DOSE means the absorbed dose received by an individual whose duties of employment directly or indirectly may result in exposure to ionizing radiation in the course of said employment.

OPERATOR'S CONTROL STATION means an area provided with protective barriers, including a patient-viewing device and a means of communicating audibly and clearly with the patient, to permit operation without causing the operator occupationally involved with ionizing radiation to receive an absorbed dose in excess of the RPG of these regulations.

PERSON means an individual, partnership, association, syndicate, company, firm, trust, corporation, department, bureau, agency, organization, institution, political subdivision, or any other entity recognized by law as the subject of rights and duties.

PERSONNEL MONITORING EQUIPMENT means devices designed to be worn or used for the purpose of evaluating the exposure dose of individuals (e.g., film badges, pocket chambers, pocket dosimeters, and film rings).

PROTECTIVE BARRIER means a barrier of attentuating materials used to reduce radiation exposure.

---Primary protective barrier means a barrier sufficient to attenuate the usable beam to the required degree.

---Secondary protective barrier means a barrier sufficient to attenuate stray radiation to the required degree.

QUALIFIED EXPERT means an individual having the knowledge and training necessary to measure ionizing radiation and to advise regarding ionizing radiation and decontamination.

RAD means "radiation absorbed dose" and is a measure of the energy imparted to matter by ionizing radiation per unit mass of irradiated material at the place of interest. "One rad is the measure corresponding to the absorption of 100 ergs per gram of matter; one millirad (mrad) = 0.001 rad."

RADIATION --See IONIZING RADIATION.

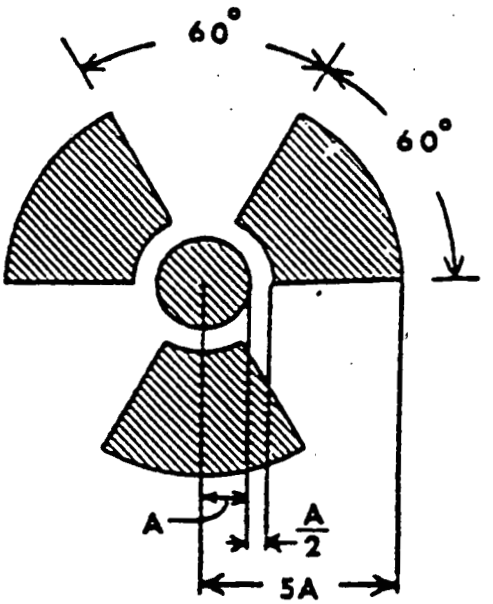
RADIATION AREA means any area accessible to individuals in which there exists ionizing radiation at such levels that a major portion of the body of such individuals could receive an absorbed dose in excess of:

a. 5 millirem in any one hour; or,

b. 100 millirem in any five consecutive days.

RADIATION CAUTION SYMBOL means the conventional three-bladed design shown below with dimension ratios and colors employed as here specified:

a. Design:



b. Colors employed: the cross-hatched area of the symbol and required lettering shall be colored magenta or purple and the background of the label or sign upon which it appears shall be colored yellow.

RADIATION MACHINE means any device capable of producing ionizing radiation when operated.

RADIATION PROTECTION GUIDE (RPG) means the absorbed dose which shall not be exceeded intentionally without approval of the Department and only after careful consideration of the reasons for doing so. Every effort and precaution should be taken to keep the absorbed dose as far below this guide as is practicable.

RADIATION SURVEY means the evaluation of the ionizing radiation hazards in and around an installation. It customarily includes a physical survey of the arrangement and use of the source(s) and measurements of the exposure rates under expected operating conditions.

RADIOACTIVE MATERIAL means any material (solid, liquid, or gaseous) which spontaneously emits ionizing radiation.

RADIOACTIVITY is the distinguishing physical characteristic of radioactive materials which shall be measured in terms of disintegrations per unit time or in curies. One curie (c) = 3.7×10^{10} disintegrations per second (dps) = 2.2×10^{12} disintegrations per minute (dpm). A commonly used sub-multiple of the curie is the microcurie (μc). One μc = 10^{-6}c = 3.7×10^{4}dps = 2.2×10^{6} dpm.

RADIOACTIVITY CONCENTRATION means the amount of radioactivity due to a radionuclide or radionuclides quantitatively and qualitatively present in a specified unit volume or weight of matter.

RADIOACTIVITY CONCENTRATION GUIDE (RCG) means that concentration of a radionuclide or radionuclides in the air, water, or foodstuffs of man's environment averaged over a period of 13 consecutive weeks which would result in an exposure dose equal to the absorbed dose of the Radiation Protection Guides (RPG) for portions of the human body of concern. Where and when more than one radionuclide is present in the concentration the gross effect of the mixture shall be considered.

RBE DOSE means the "relative biological effectiveness" dose due to different types of ionizing radiation. It is numerically equal to the product of the dose in rads and an agreed conventional (RBE) factor acceptable to the Department with respect to a particular form of ionizing radiation.

RCG --- See RADIOACTIVITY CONCENTRATION GUIDE.

REM means a unit of the RBE dose.

ROENTGEN (r) is the unit of exposure dose of x- or gamma radiation. One roentgen is an exposure dose of x- or gamma radiation such that the associated corpuscular emission per 0.001293 gram of air produces, in air, ions carrying 1 electrostatic unit of quantity of electricity of either sign.

RPG --- See RADIATION PROTECTION GUIDE.

SCATTERED RADIATION means ionizing radiation that, during passage through matter, has been deviated in direction. It may also have been modified by a decrease in energy.

SEALED SOURCE means any radioactive material and the permanent container encasing it in a manner intended to prevent leakage of the radioactive material which is intended for use in its entirety as a source.

SECONDARY RADIATION means ionizing radiation emitted by an irradiated material.

SEMI-PERMANENTLY ATTACHED means devices attached by simple mechanical means (spring clips, etc.) which are removable but not likely to become detached during ordinary usage.

SHALL denotes that the ensuing recommendation is necessary or essential to meet the currently accepted standards of protection.

SHOULD, or IS RECOMMENDED, indicates advisory recommendations that are to be applied when practicable.

SHUTTER means a device, generally of lead, attached to an x-ray tube housing to intercept the usable beam.

SOURCE means radioactive material or a radiation machine.

STRAY RADIATION means ionizing radiation not serving any purposeful use. It includes leakage and secondary radiation.

THERAPEUTIC-TYPE PROTECTIVE TUBE HOUSING means an x-ray tube housing so constructed that the leakage radiation at a distance of 1 meter from the target cannot exceed 1 roentgen in 1 hour and at a distance of 5 cm. from any point on the surface of the housing accessible to the patient cannot exceed 30 roentgens in 1 hour when the tube is being operated at any of its specified ratings.

TOTAL FILTER means the sum of the inherent and added filters.

USABLE BEAM means the ionizing radiation which passes through the window, aperture, cone, or other collimating device of the source.

USE FACTOR means the fraction of the workload during which the usable beam is pointed in the direction under consideration.

USER means a person having administrative and/or responsible control over one or more installations.

WORKLOAD is a measure of the radiation output of a radiation machine expressed in milliampere minutes per week or roentgens per week at 1 meter from the source.

X-RAY APPARATUS means any radiation machine designed to produce x-rays.

D. Exemptions and Exceptions.

D.1 The following materials, machines, and conditions are exempt from these regulations:

a. Radioactive materials of an equivalent specific radioactivity not exceeding that of natural potassium (10^{-9}c per gm.)

b. Quantities of radioactive materials not exceeding the amounts set forth in Table 1, provided the user does not possess more than 10 such quantities and also provided the dose rate to the whole body, gonads, active blood-forming organs, head and trunk, or lens of eye at the point of nearest approach to such sources does not exceed 0.5 rem per year. The manufacture of sealed sources shall not be exempt.

c. Radioactive material or materials in combination or not with non-radioactive material having a radioactivity concentration not exceeding the RCG.

d. Domestic television receivers (except during production testing and servicing with the shield removed), provided the dose rate at 5 cm. from any outer surface is less than 0.5 mrem per hour.

e. Electrical equipment that produces ionizing radiation incidental to its operation for other purposes, provided the dose rate to the whole body, gonads, active blood-forming organs, head and trunk, or lens of eye (under conditions of use) at the point of nearest approach to such equipment does not exceed 0.5 rem per year. The production testing or factory servicing of such equipment shall not be exempt.

f. Radiation machines in a state or condition such as to render them not capable of being used to produce ionizing radiation. (For example, x-ray machines in transport or electrical equipment in storage.)

g. Any radioactive material being transported intrastate or in intrastate transport in conformance with regulations of any governmental agency having a jurisdiction over safety during interstate transportation, provided that regulations of said agency meet the ionizing radiation protection requirements of these regulations.

h. Time pieces, instruments, novelties, or devices containing self-luminous materials in amounts not greater than those set forth in Column 1 of Table 1, except during manufacture or repair of the self-luminous components themselves.

TABLE 1.

EXEMPT QUANTITIES OF RADIONUCLIDES

	Column 1 Unsealed Sources (μc)	Column 2 Sealed Sources (μc)		Column 1 Unsealed Sources (μc)	Column 2 Sealed Sources (μc)
Actinium 227	0.1	1	Iron 55	10	100
Americium 241	0.1	1	59	1	10
Antimony 124	1	10	Krypton 85	1000	10,000
Arsenic 73	10	100	Lanthanum 140	10	100
74	10	100	Lead 203	10	100
76	10	100	210 + dtrs	0.1	1
77	10	100	Lutecium 177	10	100
Astatine 211	0.1	1	Manganese 52	10	100
Barium-			54	10	100
lanthanum 140	1	10	56	10	100
Beryllium 7	100	1000	Molybdenum 99	10	100
Bromine 82	10	100	Nickel 59	10	100
Cadmium-			63	10	100
silver 109	10	100	Niobium 95	10	100
Calcium 45	1	10	Palladium-		
Carbon 14	1000	10,000	rhodium 103	10	100
Cerium-prasco			Palladium		
dymium 144	1	10	silver 109	10	100
Cesium-			Phosphorus 32	10	100
barium 137	10	100	Platinum 191	10	100
Chlorine 36	10	100	193	10	100
Chromium 51	100	1000	Plutonium 239	0.1	1
Cobalt 58	10	100	Polonium 210	0.1	1
60	10	100	Potassium 42	10	100
Copper 64	10	100	Praseodymium 143	10	100
Curium 242	0.1	1	Promethium 147	10	100
Europium 154	1	10	Radium 226	0.1	1
Fluorine 18	100	1000	Rhenium 183	10	100
Gallium 72	10	100	186	10	100
Germanium 71	100	1000	Rhodium 105	10	100
Gold 196	10	100	Rubidium 86	10	100
198	10	100	Ruthenium 103	10	100
199	10	100	Ruthenium-		
Holmium 166	10	100	rhodium 106	1	10
Hydrogen			Samarium 151	1	10
(Tritium) 3	1000	10,000	153	10	100
Indium 114	1	10	Scandium 46	10	100
Iodine 131	1	10	47	10	100
132	10	100	48	10	100
Iridium 190	10	100	Silver 105	10	100
192	10	100	110	10	100
			111	10	100

	Column 1 Unsealed Sources (μc)	Column 2 Sealed Sources (μc)		Column 1 Unsealed Sources (μc)	Column 2 Sealed Sources (μc)
Sodium 22	10	100	Thorium nat.	100	1000
24	10	100	Thorium-protactinium 234	1	10
Strontium 89	1	10	Thulium-ytterbium 170	1	10
Strontium-yttrium 90	0.1	1.0	Tin 113	10	100
Sulfur 35	10	100	Tungsten 181	10	100
Tantalum 182	10	100	185	10	100
Technetium 96	1	10	Uraninum 233	0.1	1
99	1	10	natural	1000	10,000
Tellurium 127	10	100	Vanadium 48	10	100
129	10	100	Ytterium 91	1	10
Thallium 200	10	100	Zinc 65	10	100
201	100	1000	Zirconium-niobium 95	10	100
202	10	100			
204	10	100			

D.2 In conformance with Section B.3, such portions of these regulations as pertain to records and reports on employees do not apply to users of sources specifically registered with the Department of Labor and Industries of the Commonwealth, if the user complies with pertinent and compatible provisions of Industrial Bulletin No. 5 of said Department of Labor and Industries.

D.3 The Department may, upon request of any person or upon its own initiative, make such exemptions and/or exceptions to these regulations as it may deem appropriate.

E. Registration.

E.1 Any existing user, other than one required to be registered with the Department of Labor and Industries of the Commonwealth of Massachusetts, shall register his installation with the Department on or before August 1, 1962, and after August 1, 1962, any proposed installation shall be registered by the user thereof prior to receipt of the source. The application for registration shall be submitted on a form provided by the Department.

E.2 Dental radiographic installations under the control of a dentist registered under the provisions of Chapter 112 of the General Laws as amended shall be deemed to be registered under the provisions of this section.

E.3 Installation(s) in hospitals licensed by the Department under the provisions of Section 71 of Chapter 111 of the General Laws as amended shall be deemed to be registered under the provisions of this section.

E.4 The user shall notify the Department in writing within 30 days after any changes with respect to his registered installation which may increase its potential as a source of ionizing radiation.

E.5 Acknowledgment of registration shall not imply the Department's approval of the conditions described in the registration.

F. Radiation Protection Guides (RPG) and Radioactivity Concentration Guides (RCG) and Application Thereof.

F.1 Each user shall control all sources of ionizing radiation for which he is responsible in such a way as to provide reasonable assurance that no individual shall receive an absorbed dose in excess of the RPG set forth in this section. All absorbed doses of ionizing radiation that individuals are allowed to receive and amounts of radioactive materials released to the environment shall be kept to reasonable minimums in conformance with the purpose of these regulations.

F.2 The RPG values set forth in this section are in addition to those received by the individual from all sources of ionizing radiation naturally present in the environment and from that intentionally administered for diagnostic and therapeutic purposes.

F.3 Radiation Protection Guides (RPG) -- Occupational

F.3.1 The RPG's for individuals occupationally involved with ionizing radiation are set forth in Table 2.

F.3.2 The RPG's for any minor, whether or not occupationally involved directly with ionizing radiation, are set forth in Table 3.

F.4 Radiation Protection Guides (RPG) -- Non-Occupational and Minors.

F.4.1 The RPG's for individuals not occupationally involved with ionizing radiation are set forth in Table 3.

F.4.2 The RPG's for any minor, whether or not occupationally involved directly with ionizing radiation, are set forth in Table 3.

TABLE 2.

RADIATION PROTECTION GUIDES (RPG) — OCCUPATIONAL-ADULT

ABSORBED DOSES TO ADULT INDIVIDUALS

OCCUPATIONALLY INVOLVED WITH IONIZING RADIATION

Portion of the Body of Individuals Occupationally Involved with Ionizing Radiation	RPG for Total Dose Resulting from both External and Internal Exposure		RPG Limitations on that Portion of the Total Dose Resulting from Internal Exposure	
	Absorbed Dose Rems/year	Maximum Rate of Accumulation Rems in 13 weeks	Absorbed Dose from Air Breathed Rem/13 weeks	Absorbed Dose from Water or Foodstuffs Consumed Rem/13 weeks
Whole Body	5*	3	1.25	0.125
Gonads	5*	3	1.25	0.125
Active Blood-Forming Organs	5*	3	1.25	0.125
Head and Trunk	5*	3	1.25	0.125
Lens of Eye	5*	3	1.25	0.125
Skin of Whole Body	30	10	7.5	0.75
Thyroid	30	10	7.5	0.75
Hands and Forearms	75	25		
Feet and Ankles	75	25		
Other Organs	15	5	3.75	0.375
Bone	28**	7**	7**	0.7

*Formula: This RPG limit of 5 rem may be exceeded provided that:

(*a*) the user has determined the individual's previously accumulated occupational dose, and

(*b*) the dose, when added to the previously accumulated occupational dose, does not exceed the maximum permissible accumulated dose (MPAD) calculated according to the formula:
MPAD = 5 (N-18) rems, where N is the individual's age in full years; and,

(*c*) during any period of 13 consecutive weeks, the maximum dose of 3 rems is not exceeded.

**28 rem/year, corresponding to an average absorbed dose rate of 0.56 rem per week, which is the dose expected to result from a body burden of 0.1 μgm of Ra^{226} plus 30% of its daughter products or their biological equivalent

TABLE 3.

RADIATION PROTECTION GUIDES (RPG) — NON-OCCUPATIONAL AND MINORS

ABSORBED DOSES TO INDIVIDUALS NOT OCCUPATIONALLY INVOLVED WITH IONIZING RADIATION AND MINORS

Aspect of the General Environment in and/or from Which an Individual Might Be Exposed to Ionizing Radiation	RPG Absorbed Dose to Indicated Portions of the Body of a "Standard Man"					
	External Exposure Dose Only To Whole Body	Total Dose Resulting from Both External and Internal Exposures* to				
		Whole Body Gonads Act. Bl.-Form. Organs Head and Trunk Lens of Eye	Skin of Wh. Body Thyroid	Hands and Forearms Feet and Ankles	Other Organs	Bone
Ambient Air Space (External Exposure)	0.5 rem/yr.					
Air Breathed and Water and Foodstuffs Consumed (Internal Exposure)		Not more than 0.125 rem in 13 consec. wks.	Not more than 0.75 rem in 13 consec. wks.	Not more than 1.875 rem in 13 wks.	Not more than 0.375 rem in 13 wks.	Not more than 0.7 rem in 13 wks.

*Not more than 0.5 rem/yr. of the indicated total yearly doses shall result from external exposure.

F.5 Radioactivity Concentration Guides (RCG).

F.5.1 The RCG referred to in these regulations is that concentration of a radionuclide or mixture of radionuclides in the air, water, or food portions of man's environment which, calculated on the basis of most recent scientific knowledge and assumptions acceptable to the Department, would cause an absorbed dose or doses of ionizing radiation equal to the occupational or non-occupational RPG (whichever is of indicated concern) of these regulations. Such recommendations of recognized authorities, such as the National Committee on Radiation Protection and Measurements, as may, from time to time, be acceptable to the Department may be used in the calculation or determination of the applicable RCG, but said recommendations are not to be construed as part of these regulations. In the application of the RCG, the user shall take cognizance of all sources from which any individual may, or is likely to, receive an absorbed dose, and the total absorbed dose from all such sources shall not exceed the RPG.

F.6 Application of Radiation Protection Guides (RPG) and Radioactivity Concentration Guides (RCG).

F.6.1 When radioactive materials are released to the environment and may cause an internal absorbed dose, the radioactivity concentration in that portion of the environment from which the radioactive material may be absorbed by the body shall be controlled by limiting the amounts and rates at which such materials are released to the environment. In the application of this section, the radioactivity concentration in the air, water, or foodstuffs taken into the body, averaged over any period of 13 consecutive weeks, shall not exceed the RCG.

F.6.2 When the external absorbed dose to the tissues of the body results from radioactivity concentrations in the atmosphere, the radioactivity concentration shall be controlled by limiting the amounts and rates at which such materials are released to the atmosphere and such concentrations shall not exceed the RPG.

F.6.3 When the external absorbed dose to the tissues of the body results from ionizing radiation from sources located in controlled areas, the absorbed dose to the individual shall be controlled through utilization and application of exposure, occupancy, and shielding factors and shall not exceed the RPG.

F.6.4 In meeting the requirements for the protection of individuals against hazards associated with sources of ionizing radiation subject to responsible control and/or radioactive material escaping controlled areas or being discharged to the environment, the user may make reasonable allowances for exposure and occupancy factors and man-made or natural environmental phenomena.

F.6.5 Recommendations of the National Committee on Radiation Protection and Measurements may be used as guides or as bases for calculating to obtain or maintain adequate protection for the general public and individuals against hazards associated with sources of ionizing radiation within the meaning of these regulations, but said recommendations shall not be considered, in whole or in part, as a portion of these regulations.

G. Responsibility.

G.1 The user shall be responsible for and shall establish operating rules and procedures which will provide reasonable assurance that the other provisions of these regulations will be carried out, and the user should keep himself informed on procedures and methods based upon current developments and recommendations of knowledgable authorities such as the National Committee on Radiation Protection and Measurements.

G.2 Where necessary to assure compliance with the other provisions of these regulations, the user shall provide, or have readily available at his disposal, properly maintained and calibrated instruments adequate for the detection and measurement of ionizing radiation.

G.3 The user shall provide and require use of safety devices and equipment, for protection against the hazards of ionizing radiation, to and by every individual (including visitors) admitted to his installation and shall enforce all ionizing radiation safety rules that concern or affect said individual's conduct and shall provide, or cause to be provided, any necessary instruction concerning the attendant ionizing radiation hazards.

G.4 The user shall make an evaluation of his installation's nuclear incident potential, take appropriate steps to guard against such an occurrence, and establish an emergency plan, as may be indicated, to minimize the hazard from ionizing radiation to his employees and the general public and damage to private and public property that may result from such an incident. The user shall inform the Department of his emergency plan and, in the event of such an incident, shall notify the Department and institute such portions of his plan as may be deemed reasonable and advisable. Such action as the user may take in conformance with such a plan submitted to and approved by the Department shall not be deemed in violation of these regulations.

G.5 In the event of an accident that may result in a nuclear occurrence, the user shall appraise the situation and take such reasonable and appropriate steps as may be indicated on the basis of information available, to minimize the hazard from ionizing radiation and danger to his employees and the general public. Such reasonable action as may be taken under this section shall not be considered a violation of these regulations.

H. Surveys and Monitoring.

H.1 The user shall provide for adequate surveys and monitoring of areas both inside and outside the area under his control, sufficient to assure compliance with other sections of these regulations, and shall maintain records thereof.

H.2 The user shall provide for personnel monitoring of all occupationally exposed individuals within a controlled area. However, such monitoring shall not be required if:

a. the dose to which any said individual is exposed can be demonstrated to be predictable and, for adults, less than 25 per cent of the RPG (Table 2) and, for minors, less than 50 per cent of the RPG (Table 3); and,

b. reasonable assurance can be given that an accident causing exposure in excess of the RPG will not occur.

I. Records and Reports.

I.1 The user shall keep exposure records such as may be required in Section H and shall preserve these records on each individual whose name is on the user's employee roster for a period of time of 5 years after termination of employment unless extended by the Department. When an individual's employment is permanently terminated, the user, upon request of the Department or said individual, shall provide the Department and the former employee with a summary of the records for each calendar year of employment. These records shall include the individual's Social Security number.

I.2 The user shall record the details of any circumstances wherein any individual receives an absorbed dose, as a result of sources under his control, in excess of the RPG. This regulation shall not apply to absorbed doses resulting from ionizing radiation administered to an individual for diagnostic or therapeutic medical purposes by a physician, dentist, or chiropodist (podiatrist).

I.3 The user shall keep records showing the date, amount, and kind of radioactive materials received at his premises from other users and an inventory of such radioactive materials at his installation.

I.4 The user whose installation contains or employs facilities capable of producing radioactive materials (as in the case of a reactor or particle accelerator) shall keep a record of the kinds and amounts of radioactive products intentionally produced.

I.5 The user shall keep records showing the date, amount, and kind of radioactive materials shipped from his installation.

I.6 The user shall keep sufficient records of the kinds and amounts of radioactive materials released from his installation to the environs to demonstrate compliance with other sections of these regulations.

I.7 When it is known or believed that an individual(s) may have received an absorbed dose in excess of the applicable RPG, the user shall report to the Department by letter, within 7 days of the discovery, all of the facts relevant to the incident or accident and shall place a copy of the report in that individual's personnel file if he be an employee. Absorbed doses in excess of 5 times the annual allowable RPG shall be reported immediately. This regulation shall not apply to absorbed doses resulting from ionizing radiation administered to an individual for diagnostic or therapeutic medical purposes by a physician, dentist, or chiropodist (podiatrist).

I.8 Except as approved by the Department, the user shall report to the Department within 24 hours (said report to be confirmed by letter) any release of radioactive material to the environs of:

a. a concentration which, when averaged over 24 hours, exceeds 500 times the RCG; or,

b. a total quantity, in any 24-hour period, which exceeds 100 times the amount set forth in Column 1 of Table 1 of these regulations.

I.9 The loss or theft of or damage by fire, explosion, natural phenomena, or accident to any source shall be reported by telephone to the Department within 24 hours, and said report shall be confirmed by letter.

I.10 All records referred to in Sections H and I shall be made available to the Department upon request.

J. Storage of Radioactive Materials.

J.1 Radioactive materials shall be kept or stored in a manner that will provide reasonable assurance that no individual will receive an absorbed dose in excess of the RPG. In this regard, precautions to minimize exposure to ionizing radiation of any individual in the event of fire, earthquake, flood, windstorm, explosion, or other emergency should be taken, and the storage facilities should be suitably designed with respect thereto.

J.2 Any radioactive material in storage shall be secured against unauthorized removal from the place of storage.

J.3 The user shall notify the local fire department of the presence on his premises of any radicactive material that may present special fire-fighting problems or require special precautionary measures in case of fire or other natural catastrophe. and he shall establish effective liaison with the fire department in regard to this matter.

K. Radioactive Contamination Control and Removal.

K.1 All work with radioactive materials shall be carried out under such conditions as to minimize the possibility of any contamination that would result in any individual receiving an absorbed dose in excess of the RPG.

K.2 Every person using radioactive material other than a sealed source shall have on hand or immediately available an instrument(s), properly calibrated and maintained, suitable for the detection and measurement of contamination in accordance with the requirements of this section. The Department may require the same or similar instrumentation for users of sealed sources.

K.3 The Department may require a suitable pattern of work rules applicable to individual users, as may be indicated.

L. Use of Caution Signs, Labels, and Signals.

L.1 The user shall indicate the presence of ionizing radiation in certain areas by posting conspicuous signs or labels which bear the radiation caution symbol and appropriate wording (as set forth in Table 4) to explain the nature and indicate the existence of the hazard. The use of such signs for other than this express purpose is prohibited, and the user shall remove all such signs and labels when no longer required by the provisions of these regulations. This regulation shall not apply to areas used for medical, dental, chiropodal, and veterinary x-ray diagnosis or therapy.

L.2 Each high radiation area shall be equipped with an internal control circuit which shall either cause the level of ionizing radiation to be reduced below that at which an individual might receive an absorbed dose of 100 mrem in any one hour when in the area or shall energize a conspicuous visible or audible alarm signal or a barricade suitably labeled in such a manner that the individual, when entering the area, and the responsible person in charge are made aware of the individual's entry into said area. If an area is a high radiation area for a period of time of 30 consecutive days or less, a control circuit is not required provided that a barricade (such as a fence or rope) is erected, the required caution signs are posted, and the area is kept under surveillance by the user or his designated representative.

L.3 All machines and devices capable of emitting ionizing radiation and all containers, source holders, manufactured products, or other things containing a quantity of radioactive material in an amount greater than the quantities set forth in Table 1 shall be provided with and bear a durable, clearly visible label on which are imprinted the radiation caution symbol and suitable and descriptive words of caution.

L.4 In addition to providing the standard radiation-hazard symbol, each container of radioactive material shall be labeled in such a manner that the kind and quantity of material, date of measurement, and the name of the person designated responsible for the material can be easily and quickly determined.

TABLE 4.

CAUTION SIGN AND SIGNAL DEVICE REQUIREMENTS

(Where Required and Description Thereof)

Area of Concern	Required		
	Caution Signs Containing		
	Radiation Caution Symbol	Cautioning Words	Additional Requirement
a) Radiation Areas	Yes	Caution (or Danger) Radiation Area	None
b) High Radiation Area	Yes	Caution (or Danger) High Radiation Area	See Sect. L.2
c) Airborne Radioactivity Area	Yes	Caution (or Danger) Airborne Radioactivity Area	See Sect. L.2 if area is also a High Radiation Area
d) Entrance to areas or rooms in which radioactive material is used or stored in an amount exceeding 10 times the amount of radioactive material exempted by Table I.	Yes	Caution (or Danger) Radioactive Material(s) (and, where practical, describe the quantities and kinds of radioactive materials involved)	None
e) Radiation Machine*	Yes	Caution (or Danger) Radiation	Label placed on the control panel
*In the case of x-ray machines only	Yes	Caution (or Danger) X-ray Area	

L.5 Exemptions from Posting and Labeling Requirements.

L.5.1 Rooms or other areas in hospitals are not required to be posted with caution signs because of the presence of patients containing radioactive material(s) provided that attendant personnel are adequately instructed as to the precautions necessary to prevent the exposure of any individual to ionizing radiation or airborne radioactive materials in excess of the limits established by these regulations.

L.5.2 Caution signs are not required to be posted at rooms and areas containing radioactive material(s) for periods of less than 8 hours, provided that such material(s) are so attended during such periods that there is no chance that any individual could enter the area or room without knowing that a hazard exists.

L.5.3 The labeling requirement provisions set forth in Section L.3 do not apply if:

a. the radioactivity concentration does not exceed the RCG; and

b. the absorbed dose to an individual will not exceed the RPG (Non-Occupational and Minors) set forth in Table 3; and

c. the quantity of the radioactive material involved does not exceed such quantities of radioactive materials as are exempt under the provisions of these regulations; or

d. in the case of laboratory containers (e.g, beakers, flasks, and test tubes, used transiently in laboratory procedures), the user is present; or

e. the source is a radiation machine in a controlled area of a medical, dental, chiropodal, or veterinary installation.

M. Disposal of Radioactive Materials and Wastes.

M.1 No user shall release radioactive material(s) into the air or water or dispose of such material(s) by burial in such a manner that it may result in any individual receiving an absorbed dose

of ionizing radiation in excess of the RPG. In the application of and the conforming with the provisions of this regulation, the user shall investigate the possibility of the discharge(s) of radioactive wastes to the same environs by another user(s) and, upon becoming cognizant of such common use of the environs, shall cooperate with said other user(s) in establishing and adhering to mutually agreeable pro-rata limitations upon their respective releases and file with the Department a statement setting forth the terms of such an agreement. If such an agreement is not executed within a reasonable time, the Department may arbitrarily assign quantitative limits and/or conditions of such releases to the users severally.

M.2 Each user shall control the release or discharge of radioactive materials to the atmosphere, inland or tidal waters, sewerage systems, etc., on the following basis:

The average radioactivity concentration of the airborne or waterborne radionuclide(s) at points of release from control of the user shall not exceed the RCG. However, with the approval of the Department, the user may exceed the RCG after demonstrating to the satisfaction of the Department the necessity therefor and the appropriateness of making reasonable use of and allowances for occupancy, dilution, dispersion, and the environmental and other factors, provided (1) the radioactive material being discharged to inland or tidal waters or to a sewer system is soluble in water, (2) the average radioactivity concentration of the radionuclide(s) created in the environment (or portions thereof) at points frequented or used by individuals does not exceed the RCG, and (3) the total quantities of the radionuclide(s) released in any period of 24 consecutive hours shall not exceed 100 times the quantities listed in Table 1, Column 1.

M.3 No radioactive material in an amount in excess of that contained in Table 1 shall be disposed of by burial in the ground or in or on a land dump or stored (contained or uncontained) in or on unenclosed ground without the approval thereof by the Department.

M.4 The user shall keep records of all sales, transfers, and/or disposal or any source(s).

M.5 Nothing in these regulations shall be construed as permitting the release or disposal of materials in a manner which would be unlawful for other reasons.

N. General Requirements.

N.1 A user should require an employee or potential employee to submit to an appropriate medical examination prior to the employee's assignment to an operation where he may receive, or is likely to receive, an absorbed dose in any calendar quarter in excess of 25 per cent of the RPG, or said employee will be, or is likely to be, exposed to airborne radioactive material(s) in an average concentration in excess of 10 per cent of the RCG and thereafter as may be required by the user, and shall provide the employee with a copy of the report of said medical examination upon the employee's request.

N.2 No food, including candy and beverages, should be brought into, and smoking should be prohibited in, any area where unsealed source(s) of radioactive material are being used, handled, processed, or transferred, or stored in a manner which does not prevent leakage of the radioactive material(s). Specific notice to this effect should be posted conspicuously in such areas.

N.3 After establishment of specific periods of time to be employed by a user as a calendar quarter, the user should make appropriate notation in his pertinent records of any change therein.

N.4 The user should formulate suitable emergency plans as may be indicated to protect his employees and the public against potential hazards due to his specific source(s), and should make known the details and existence of such plans to the Department and such other public agencies having a concern, such as boards of health, fire departments, and police departments.

X. Severability

Insofar as the Department may provide, each section or part thereof of these regulations shall be construed as separate, to the end that, if any section, sentence, clause, or phrase shall be held invalid for any reason, the remainder of these regulations shall continue in full force.

CHAPTER 663*

An Act Authorizing the Department of Public Health to Control the Hazards of Ionizing Radiation.

Be it enacted, etc., as follows:

Chapter 111 of the General Laws is hereby amended by striking out Section 5B, inserted by Chapter 335 of the Acts of 1955, and inserting in place thereof the following section:—

Section 5B. The department may require registration of sources of ionizing radiation and shall, from time to time, after a public hearing, prescribe and establish rules and regulations to control the radiation hazards of radioactive materials and of machines which emit ionizing radiation for the purpose of protecting the general public and individuals against hazards associated with the use, transportation, storage, packaging, sale, distribution, production, and disposal thereof. Such rules and regulations shall not limit the kind and amount of radiation that may be intentionally administered to a person or animal for diagnostic, therapeutic or experimental purposes by or under the direction of a physician, dentist, chiropodist (podiatrist), veterinarian or other person licensed to so administer radiation under the laws of the commonwealth. Such rules and regulations shall be filed with the Massachusetts commission on atomic energy at least thirty days prior to their effective date and shall become effective upon filing with the state secretary, unless a later effective date is specified by the department. Whoever violates any such rule or regulation shall be punished by a fine of not less than ten nor more than fifty dollars. Whoever, after due notice, continues to violate any such rule or regulation shall be punished by a fine of not less than one hundred dollars nor more than five hundred dollars to the use of the Commonwealth for each offense. Each day of such violation after such notice shall constitute a separate offense. The supreme judicial court or superior court upon application of the department, or upon application of any party interested, with the approval of the department, may enforce such rules and regulations, and restrain the use or occupation of premises or such portion thereof as the department may specify until such rules and regulations have been complied with.

*This Section 5B of Chapter 111, as provided by Chapter 633 of the Acts of 1960, supersedes Section 5B of Chapter 111 as placed in the General Laws by Chapter 335 of the Acts of 1955, as amended by Chapter 495 of the Acts of 1966.

Nothing in this section shall prevent the department of labor and industries from establishing rules and regulations for the protection of the health and safety of employees against ionizing radiation in any place of employment as defined in section one of chapter one hundred and forty-nine. Said department of labor and industries shall consult with the department of public health at least thirty days prior to the adoption or modification of any rules or regulations insofar as they pertain to the health aspects of ionizing radiation. The department of public health shall approve, modify, or disapprove all proposed rules and regulations of political subdivisions of the commonwealth insofar as they pertain to the health aspects of ionizing radiation and no such rules and regulations which do not have the approval of the department shall be adopted.

Approved August 30, 1960.

THE COMMONWEALTH OF MASSACHUSETTS

Advance Copy 1980 Acts and Resolves

MICHAEL JOSEPH CONNOLLY, State Secretary

Chap. 474. RELATING TO THE REGISTRATION OF SOURCES OF NONIONIZING RADIATION.

Be it enacted, etc., as follows:

Chapter 111 of the General Laws is hereby amended by striking out section 5B, as most recently amended by section 15 of chapter 443 of the acts of 1970, and inserting in place thereof the following section:-

Section 5B. The department may require registration of sources of ionizing and nonionizing radiation and shall, from time to time, after a public hearing, prescribe and establish rules and regulations to control the radiation hazards of radioactive materials and of machines which emit ionizing and nonionizing radiation for the purpose of protecting the general public and individuals against hazards associated with the use, transportation, storage, packaging, sale, distribution, production and disposal thereof. Such rules and regulations shall not limit the kind and amount of radiation that may be intentionally administered by a person licensed to so administer radiation under the laws of the commonwealth. Such rules and regulations shall be filed with the state secretary at least thirty days prior to their effective date and shall become effective thirty days thereafter unless a later effective date is specified by the department. Whoever violates any such rule or regulation shall be punished by a fine of not less than ten nor more than fifty dollars. Whoever, after due notice, continues to violate any such rule or regulation shall be punished by a fine of not less than one hundred dollars nor more than five hundred dollars to the use of the commonwealth for each offense. Each day of such violation after such notice shall constitute a separate offense. The supreme judicial court or superior court, upon application of the department, or upon application of any party interested, with the approval of the department, may enforce such rules and regulations, and restrain the use or occupation of premises or such portion thereof as the department may specifiy until such rules and regulations have been complied with.

Nothing in this section shall prevent the department of labor and industries from establishing rules and regulations for the protection of the health and safety of employees against ionizing radiation in any place of employment as defined in section one of chapter one hundred and forty-nine. Said department of labor and industries shall consult with the department of public health at least thirty days prior to the adoption or modification of any rules or regulations insofar as they pertain to the health aspects of ionizing and nonionizing radiation.

COMMONWEALTH OF MASSACHUSETTS

DEPARTMENT OF PUBLIC WORKS

HAZARDOUS MATERIALS REGULATIONS

TITLE 720 SECTION 8.00
(CODE OF MASSACHUSETTS REGULATIONS)

SECTION 8.01 Purpose

These regulations prescribe the requirements of the Massachusetts Department of Public Works (hereinafter the Department) governing the transportation of hazardous materials in commerce on state highways. The regulations are adopted to establish comprehensive regulation of the shipping, packaging, marking, labelling, placarding, handling and transportation of hazardous materials in commerce. They are established in order to protect the general public, their lives and their property in a manner consistent with the regulations issued by the United States Department of Transportation. The regulations apply to all common, contract and private carriers and shippers of hazardous materials being transported in commerce over state highways.

SECTION 8.02 Scope

(1) The regulations adopted herein shall be applicable as state regulations to common, contract and private carriers and to shippers when they transport hazardous materials in intrastate commerce, interstate commerce or both over Massachusetts state highways.

(2) The regulations adopted herein shall apply to all motor vehicles transporting hazardous materials in commerce on Massachusetts state highways. The regulation shall apply whether the hazardous material is being transported as a cargo or part of a cargo.

(3) Whenever the term "interstate" is used in the Federal regulations adopted herein it shall, for the purpose of these regulations, mean and include both interstate and intrastate transportation in commerce on Massachusetts state highways.

(4) Whenever the term "state highway" is used in these regulations it shall include all so-called railroad bridges transferred to the Department in accordance with Chapter 634 of the Acts of 1971. Said bridges are made state highways by Chapter 92 of the Acts of 1978.

SECTION 8.03 Adoption and Incorporation of Federal Regulations as State Regulations.

Parts 171, 172, 173, 177, 178 and 179 of Title 49, Chapter 1, Code of Federal Regulations, revised as of October 1, 1977, are hereby adopted as the Department's regulations governing the transportation of hazardous materials upon the state highways of Massachusetts, subject to the exceptions provided in Section 8.05. Said Parts of Title 49 are hereby incorporated by reference into these regulations and they shall be subject to the explanations and modifications provided herein.

No person shall offer, accept or transport a hazardous material in commerce on Massachusetts state highways unless the material is properly classed, described, packaged, marked, labelled, handled, placarded and in proper condition for shipment in accordance with these regulations.

SECTION 8.04 Determination of Unsafe Materials and Substances.

Hazardous materials and substances as defined in these regulations and the regulations incorporated herein are hereby declared to be unsafe materials and substances. They shall not be transported on state highways unless the material or substance is properly classed, described, packaged, marked, labelled, handled, placarded and in proper condition for shipment as required by these regulations.

SECTION 8.05 Portion of Federal Regulations Excluded from Adoption.

The following requirements of Parts 171, 172, 173, 177, 178 and 179 of the Federal regulations are excluded and not adopted by the Department:

(i) Any portion of the Federal regulations governing transportation of hazardous materials by air, water, rail or pipeline, and

(ii) Any portion of the Federal regulations governing or requiring the reporting of hazardous material incidents, including, but not limited to, Section 171.15 and 171.16.

SECTION 8.06 Federal Exemptions.

Without the necessity of further action or case-by-case review on its part, the Department hereby accepts the validity of any exemption or renewal thereof issued by the United States Department of Transportation under Section 107, Subpart B of Title 49. Any person operating under a current, valid exemption or renewal thereof under said Section 107 shall be deemed to be in compliance with those

portions of these regulations to which the exemption applies, provided that the person is complying with the terms of the exemption.

SECTION 8.07 Cargo Tank Vehicles - Retail Delivery of Fuel Oil.

(a) Cargo tank vehicles engaged in the retail delivery of fuel oil shall be exempted from the shipping paper requirements contained in Section 172, Subpart C.

(b) Cargo tank vehicles engaged in the retail delivery of fuel oil shall comply with the placarding requirements contained in Section 172, provided however that prior to September 1, 1980, the rule shall not apply to any such cargo tank with block lettered "FLAMMABLE" placards or markings in accordance with Fire Prevention Regulation 7, Section 4(e) of the Massachusetts Board of Fire Prevention Regulations.

SECTION 8.08 Penalty for Violation of these State Regulations.

The penalty for violation of the regulations adopted herein shall be those contained in the provisions of Massachusetts General Laws Chapter 85 Section 2B and Chapter 90 Section 31A and any other applicable state law. Each violation shall be treated separately. When the violation is a continuing one, each day of the violation constitutes a separate offense.

SECTION 8.09 Conflict with other State Regulations.

These regulations establish minimum standards which must be complied with in conjunction with the transportation of hazardous materials. Therefore, in the event of a conflict between this regulation and any other state regulation, the stricter, more stringent standard shall apply and govern.

SECTION 8.10 Amendment.

These rules and regulations may be amended from time to time in accordance with the applicable provisions of Massachusetts General Law Chapter 30A.

SECTION 8.11 Severability.

If any provision or clause of these regulations to any person or circumstance is held invalid, such invalidity shall not affect other provisions or applications of the regulation which can be given effect without the invalid provision or application. To this end the provisions of this regulation are declared to be severable.

SECTION 8.12 Waiver

These rules and regulations or any portion or portions thereof may be waived by the Department if after consideration of the facts involved it is determined that a particular situation warrants such waiver.

SECTION 8.13 Effective Date.

These rules and regulations shall take effect on the date they are filed with the Secretary of the Commonwealth and shall remain in effect until repealed, replaced or amended by other rules and regulations.

AUTHORITY: M.G.L. C. 6, s. 91(4), C. 85, s. 2, C. 85, s. 2B, C. 85, s. 2E, C. 90, s. 31A.

IN WITNESS WHEREOF the following duly authorized Officers have caused these rules and regulations to be approved and adopted as rules and regulations of the Massachusetts Department of Public Works at a duly convened meeting of the Public Works Commission of the Massachusetts Department of Public Works held on November 8, 1978.

A true copy attest:

Secretary, Public Works Commission

Commissioners:

MASSACHUSETTS

Massachusetts Turnpike Authority
Suite 3000, Prudential Center
Boston, Massachusetts 02199

Radioactive shipments are allowed to move, under permit, on the Massachusetts Turnpike. Transportation of radioactive materials are prohibited from travel through the Callahan and Sumner Tunnels.

Source: Compendium of Regulations - Shipments of Radioactive Materials over Toll Roads, Bridges and Tunnels - February 1974 - Compiled by: International Bridge, Tunnel & Turnpike Association, Inc.

MASSACHUSETTS

Massachusetts Port Authority
Administration Building
Charlestown, Massachusetts 02129

Maurice J. Tobin Memorial Bridge

Radioactive shipments are allowed to travel on the Maurice Tobin Bridge, provided they conform to the applicable regulations of the Atomic Energy Commission, the United States Department of Transportation and the Interstate Commerce Commission.

Source: Compendium of Regulations - Shipments of Radioactive Materials over Toll Roads, Bridges and Tunnels - February 1974 - Compiled by: International Bridge, Tunnel & Turnpike Association, Inc.

APPENDIX D: ROSTER OF DAILY NEWSPAPERS IN MASSACHUSETTS

AMHERST (D3) Hampshire County

AMHERST MORNING RECORD ..... Ind.
109 Main Street
Amherst, MA 01002
413-256-8331

Circulates in Amherst and Northern Hampshire, Southern Franklin Counties.

Day of Pub	Daily (AM), No Sat.
Circulation	5,008 PO (9/30/79)
Printed	Offset
Press Rel. Deadline	Noon day before publication
Adv. Deadline	3 PM day before publication
Adv. Rate PCI	$2.10/Comm./Comb.
Adv. Page Size	8 col. x 21"
Adv. Col. Width	9 1/2 picas/10 1/2 picas
Wire Services	UPI
Own Mag.	Focus
Published	Friday

Content: Weekend entertainment guide with full week TV listing & calendar of local cultural events.
Special Editions: Welcome Back (College Students): 1; Bridal Section: 2; Create an Ad: 2; House Hunter: 3, 4, 5; Graduation Section: 6; Summer Fun: 7; Welcome Students: 9; Newcomers: 10; Christmas: 11, 12.

ATHOL (F2) Worcester County

ATHOL DAILY NEWS ..... Ind.
225 Exchange Street
Athol, MA 01331
617-249-3535

Circulates in Athol, Orange, Warwick, Erving, Wendell, New Salem, Royalston, Phillipston, Petersham.

Publication	Daily (PM), Saturday (AM)
Circulation	5,449 PO (9/30/79)
Printed	Offset
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	24 hrs. before pub.
Adv. Rate PCI	$2.20
Adv. Page Size	8 col. x 21"
Adv. Col. Width	11 picas/11 3/4 picas
Wire Services	AP; UPI
Own Mag.	TV Guide
Published	Saturday

Content: TV listings & News.

ATTLEBORO (J5) Bristol County

THE SUN CHRONICLE ..... Rep., Ind.
34 South Main Street
Attleboro, MA 02703
617-222-7000

Circulates in Attleboro, Foxboro, Mansfield, Norfolk, North Attleboro, Norton, Plainville, Rehoboth, Wrentham, Seekonk.

Publication	Daily (PM), Saturday (AM)
Circulation	22,475 PD (12/79)
Printed	Offset
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	48 hrs. before pub.
Adv. Rate PCI	$3.36/Comb.
Adv. Page Size	8 col. x 21"
Adv. Col. Width	10 1/2 picas/11.25 picas
Wire Services	UPI; Christian Science Monitor
Own Mag.	TV Log/Showtime
Published	Saturday

Content: Week's listings of TV; features both local & network, television programming, & movies, music.
Special Editions: Washington's Birthday Auto: 2; Bridal: 3; Leisure: 5, 11; Back to School: 8; Football: 9; Home Improvement: 10.

BEVERLY (L2) Essex County

THE BEVERLY TIMES ..... Ind.
Dunham Road
Beverly, MA 01915
617-922-1234

Circulates in Beverly, Boxford, Danvers, Hamilton, Ipswich, Topsfield, Wenham, Manchester.

Publication	Daily (PM), Saturday (AM)
Circulation	10,411 ABC (12/79)
Printed	Offset
Press Rel. Deadline	24 hrs. before Pub.
Adv. Deadline	48 hrs. before pub.
Adv. Rate PCI	$3.70/Comm./Comb.
Adv. Page Size	8 col. x 21"
Adv. Col. Width	11 picas/11.5 picas
Wire Services	UPI
Own Mags.	Calendar/North Shore
Published	Saturday/Saturday

Content: Weekly calendar of events: feature stories, classified and Weekend Calendar.
Special Editions: Survival: 1; Auto: 2; Wedding & Outdoor: 3; Home Garden: Real Estate: Diving: 4; Guide to North Shore: 6; Back to School: 8; Football & Home Improvement: 9; Car Care Real Estate & New Car Care: 10; Cook Book: 11.
Essex County Newspaper Group

BOSTON (K3) Suffolk County

BOSTON GLOBE ..... Ind.
135 Morrissey Boulevard
Boston, MA 02107
617-929-2000; Telex: 94-6374 (General); Telex: 94-0980 (Editorial); TWX: 710-333-0294 (Advertising)

Circulates throughout New England.

Publication	Daily (All Day Newspaper).
Circulation	482,578 ABC (9/30/79)
Printed	DiLitho
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	48 hrs. before pub.
Adv. Rate PCI	$51.80/Comm./Comb.
Adv. Page Size	9 col. x 22 3/4"
Col. Width	9.6 picas/10 picas
Wire Services	AP; UPI; Reuter; Knight-Ridder; Washington Post - Los Angeles Times; Data Feature; Dow Jones

Special Editions: Sections planned only four months before publication; call for information.

BOSTON HERALD AMERICAN ..... In
300 Harrison Avenue
Boston, MA 02106
617-426-3000

Circulates throughout New England.

Publication	Daily (AM)
Circulation	277,819 ABC (3/31/79)
Printed	Letterpress
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	24 hrs. before pub.
Adv. Rate PCI	$28.42/Comb.
Adv. Page Size	9 col. x 21"
Adv. Col. Width	9.9 picas/10 picas
Wire Services	New York Times; AP; UPI

Special Editions: Brides: 2; Home Furnishings: 2; Home and Garden: 4; Red Sox: 4; Cookbook.: 11.

BOSTON (cont'd)

THE CHRISTIAN SCIENCE MONITOR ..... Ind.
One Norway Street
Boston, MA 02115
617-262-2300; Telex: 94-0589/94-0590

Circulates throughout New England, the United States and the world.

Publication	Daily (AM), no Sat.
Circulation	174,300 ABC (10/1/79)
Printed	Offset
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	48 hrs. before pub.
Adv. Rate PCI	$23.10 (N.E. Rate)/Comm.
Adv. Page Size	6 col. x 14 9/32" (tab)
Adv. Col. Width	10.2 picas/12.2 picas
Wire Services	UPI; Reuters
Own Mag.	The Regional Edition
Published	Friday - New England
Content: Ads & News	

Special Editions: Midwinter Vacation: 1; Food: 2; Spring Fashion: 2; International Travel: 3; Switzerland: 3; Fed. Republic of Germany: 3; Home Improvement: 3; British Isles: 4; Canada: 4; Arts & Antiques: 4; Automotive: 4; Summer vacation: 5; Summer Fashion: 5; Summer Entertainment: 6; Summer Food: 6; Home Furnishings: 7; Fall Food: 8; Fall Fashion: 9; International Travel (Cruise Section: 9; Arts & Crafts: 9; Banking & Saving: 10; Automotive: 10; Holiday Food: 10; Winter Vacation: 11; Savings for Retirement: 11.

BROCKTON (K4) Plymouth County

BROCKTON DAILY EVENING ENTERPRISE AND TIMES ..... Ind.
60 Main Street
Brockton, MA 02403
617-586-6200

Circulates throughout Plymouth County, Avon, Easton, Holbrook, Randolph, Stoughton, Raynham, Taunton, Lakeville, Norton, Mansfield, Abington, Bridgewater, Carver, Duxbury, East Bridgewater, Halifax, Hanover, Hanson, Kingston, Marshfield, Middleboro, Norwell, Pembroke, Plympton, Rockland, Wareham, West Bridgewater, Whitman

Publication	Daily (PM)
Circulation	60,491 ABC (12/79)
Printed	Letterpress
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	72 hrs. before pub.
Adv. Rate PCI	$6.45
Adv. Page Size	8 col. x 21"
Adv. Col. Width	9.9 picas/10.5 picas
Wire Services	AP; UPI
Synd. Mag.	Family Weekly

Special Editions: Business & Banking Review: 1; Valentine's Day: 2; Washington's Birthday: 2; Bride's Section: 3; Car Care Tab: 4; Home Improvement & Outdoor Living: 5; Back to School: 8; Back to School Safety: 8; Football Tab: 9; Fall & Winter Car Care Section: 9; 1980 Fall Festival Auto Section: 11; Christmas Greetings: 12.

CHELSEA (K3) Suffolk County

CHELSEA RECORD ..... Ind.
270 Broadway
Chelsea, MA 02150
617-884-2416

Circulates in Chelsea.

Publication	Daily (PM), no Sat.
Circulation	5,000 PD (2/1/80)
Printed	Offset
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	24 hrs. before pub.
Adv. Rate PCI	$2.00/Comb
Adv. Page Size	8 col. x 21 1/2"
Adv. Col. Width	11 picas/12.5 picas
Wire Services	UPI

Special Editions: Vacation: Summer; Washington's Birthday: 2.

CLINTON (H3) Worcester County

THE CLINTON DAILY ITEM ..... Ind.
156 Church Street
Clinton, MA 01510
617-368-0176

Circulation	4,190 paid, PO; 75 Free, PO (10/9/79)
Printed	Offset
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	24 hrs. before pub.
Adv. Rate PCI	$2.05/Comb.
Adv. Page Size	8 col. x 21"
Adv. Col. Width	11 picas/12 picas
Wire Services	UPI

Special Editions: Car Care: Fall, Spring; Bridal: 1, 6; Home Improvement: 4, 9; Back to School: 8; Christmas Edition: 12.
Coulter Press Group

DEDHAM (K4) Norfolk County

DAILY TRANSCRIPT ..... Ind.
420 Washington Street
Dedham, MA 02026
617-329-5000

Circulates in Dedham, Needham, Norwood, Westwood.

Publication	Daily (PM), no Sat.
Circulation	11,019 ABC (9/30/79)
Printed	Offset
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	48 hrs. before pub.
Adv. Rate PCI	$6.16/Comm./Comb.
Adv. Page Size	9 col. x 21"
Adv. Col. Width	9.5 picas/10.5 picas
Wire Services	UPI

Special Editions: Bride & Groom: 2; Auto Dealer's Open House: 2; Spring Fashion: 3; Newcomer's Magazine: 3; Real Estate Preview: 4; Better Living: 4; Bride & Groom: 5; Flag Code: 6; Better Living: 9; Business & Industry Review: 10; Holiday Magazine: 11.
Transcript Newspaper Group

FALL RIVER (K6) Bristol County

FALL RIVER HERALD NEWS ..... Ind.
207 Pocasset Street
Fall River, MA 02722
617-676-8211

Circulates in Fall River, Freetown, Somerset, Swansea, Westport, Little Compton (RI), Portsmouth (RI), Tiverton (RI).

Publication	Daily (PM)
Circulation	41,495 ABC (10/79)
Printed	Letterpress
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	72 hrs. before pub.
Adv. Rate PCI	$4.34
Adv. Page Size	8 col. x 22 3/4"
Adv. Col. Width	10 picas/11 picas
Wire Services	New York Times News Service
Synd. Mag.	Family Weekly

Special Editions: Bride: 2; Industrial: 3; Home & Garden: 5; Automotive: 5, 11.

FITCHBURG (G2) Worcester County

FITCHBURG-LEOMINSTER SENTINEL & ENTERPRISE ..... Ind.
808 Main Street
Fitchburg, MA 01420
617-343-6911

Circulates in Fitchburg, Leominster, Ashburnham, Ashby, Ayer, Groton, Lunenburg, Shirley, Sterling, Townsend, Westminster, Greenville (NH), New Ipswich (NH).

Publication	Daily (PM)
Circulation	24,404 ABC (12/31/78)
Printed	Offset
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	72 hrs. before pub.
Adv. Rate PCI	$3.82
Adv. Page Size	8 col. x 21 1/2"
Adv. Col. Width	10 picas/10 picas 10 points
Wire Services	AP

Special Editions: Progress Edition: 1; Bride's Section: 2; Spring Summer Car Care: 3; Home Improvement: 3, 9; Cookbook: 10.

FRAMINGHAM (J3) Middlesex County

THE MIDDLESEX NEWS ..... Ind.
33 New York Avenue
Framingham, MA 01701
617-872-4321

Circulates in Framingham, Acton, Ashland, Bellingham, Boxborough, Concord, Franklin, Holliston, Hopkinton, Hudson, Lexington, Lincoln, Marlboro, Maynard, Medfield, Medway, Milford, Millis, Northboro, Sherborn, Southboro, Stow, Sudbury, Waltham, Wayland, Westboro, Weston, Upton, Hopedale, Mendon.

Publication	Daily (PM), Sat. (AM)
Circulation	51,050 ABC (12/15/79)
Printed	Offset
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	72 hrs. before pub.
Adv. Rate PCI	$7.35
Adv. Page Size	9 col. x 21"
Adv.Col. Width	9.9 picas/10.5 picas
Wire Services	AP; UPI; Christian Science Monitor

Special Editions: Bride's: 1, 2; Financial: 3; Fashion: 4.

GARDNER (G2) Worcester County

THE GARDNER NEWS ..... Ind.
309 Central Street
Gardner, MA 01440
617-632-8000

Circulates in Gardner, Ashburnham, Baldwinville, East Templeton, Hubbardston, Otter River, Templeton, Westminster, Winchendon.

Publication	Daily (PM)
Circulation	7,684 ABC (6/30/79)
Printed	Offset
Press Rel. Deadline	Morning of pub.
Adv. Deadline	24 hrs. before pub.
Adv. Rate PCI	$3.00/Comm.
Adv. Page Size	8 col. x 21 1/2"
Adv. Col. Width	10 1/2 picas/11 1/4 picas
Wire Services	AP

Special Editions: Home Fix Up: 4; Auto Care: 6; Back to School: 8; Christmas Guide: 12; Christmas Greetings: 12.

GLOUCESTER (M2) Essex County

THE GLOUCESTER DAILY TIMES ..... Ind.
Whittemore Street
Gloucester, MA 01930
617-283-7000

Circulates in Gloucester, Essex, Manchester, Rockport.

Publication	Daily (PM), Sat. (AM)
Circulation	11,764 ABC (12/79)
Printed	Offset
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	48 hrs. before pub.
Adv. Rate PCI	$3.70/Comb.
Adv. Page Size	8 col. x 21"
Adv. Col. Width	11 picas/11.5 picas
Wire Services	UPI
Own Mags.	Calendar/Cape Ann Summer Sun
Published	Saturday/Friday

Content: Weekly Calendar of events/Guide to weekend activities, restaurants, touring.

Special Editions: Survival: 1; Auto: 2; Wedding: 3; Outdoor: 3; Home & Garden: 4; Real Estate: 4; Dining: 4; Guide to North Shore: 6; Back to School: 8; Football: 9; Fall Home Improvement: 9; Car Care: 10; Real Estate: 10; New Car Care: 10; Cookbook: 11.

Essex County Newspaper Group

GREENFIELD (D2) Franklin County

GREENFIELD RECORDER ..... Ind.
14 Hope Street
Greenfield, MA 01301
413-772-0261

Circulates throughout Franklin County, Amherst, Hinsdale (NH), Winchester (NH), Vernon (VT).

Publication	Daily (PM), Sat. (AM)
Circulation	15,286 ABC (9/30/79)
Printed	Offset
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	48 hrs. before pub.
Adv. Rate PCI	$3.50/Comm/Comb.
Adv. Page Size	8 col. x 21 3/8"
Adv. Col. Width	9.6 picas/10 picas
Wire Services	AP

Special Editions: Bridal Section: 1; Auto Section: 2; Cookbook: 3; Home & Garden: 4; Summer '80: 5; Back to School: 8; Fall Sports: 9; Fall Home Improvement: 10; Christmas Section: 11; Winter Section: 12

HANOVER (L4) Plymouth County

SOUTH SHORE NEWSDAY ..... Ind.
One Mayflower Drive
Hanover, MA 02339
617-878-1111

Circulates in Hanover, Rockland, Pembroke, Hanson, Abington, Norwell, Marshfield, Kingston.

Publicaton	Daily (PM), No Sat.
Circulation	3,842 PD (10/79)
Printed	Offset
Press Rel. Deadline	48 hrs prior to pub.
Adv. Deadline	24 hrs prior to pub
Adv. Rate PCI	$3.00/Comm./Comb.
Adv. Page Size	9 col. x 21"
Adv. Col. Width	9 1/2 picas/10 1/2 picas
Wire Services	UPI

Special Editions: Spring Gardening: 4; Summer Sign Post: 6; Back to School: 8; Home Improvement Energy Saving: 9; Wedding: 10; Auto Buying Guide: 10; Christmas: 11.

Franklin Publishing Group

HAVERHILL (K1) Essex County

HAVERHILL GAZETTE ..... Ind.
447 West Lowell Avenue
Haverhill, MA 01830
617-374-0321

Circulates in Haverhill, Amesbury, Georgetown, Groveland, Merrimac, Newburyport, West Newbury, Salisbury, Atkinson (NH), Brentwood (NH), Danville (NH), Exeter (NH), Fremont (NH), Newton (NH), Plaistow (NH), Seabrook (NH), Epping (NH), Raymond (NH), Hampton (NH), North Hampton (NH).

Publication	Daily (PM), Sat. (AM)
Circulation	19,570 ABC (7/79)
Printed	Offset
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	72 hrs. before pub.
Adv. Rate PCI	$4.55
Adv. Page Size	8 col. x 21 1/2"
Adv. Col. Width	10.6 picas/11.6 picas
Wire Services	UPI

Special Editions: Business & Finance: 1; Washington's Birthday New Car: 2; Bridal: 2; Design & Adv.: 4; Progress Issue: 4; Sports Tab: 4; Real Estate: 4; Mother's Day: 5; Outdoors: 5; Vacation Auto Guide: 6; Real Estate Guide: 7; Back To School: 8; Home Improvement-Energy: 9; Car Care: 9; Cooking School: 10; New Car Announcement: 10; Cookbook: 11; Christmas Special Issue: 12; Gift Guide (daily): 11; 12.

HOLYOKE (D4) Hampden County

TRANSCRIPT-TELEGRAM ..... Ind.
120 Whiting Farms Road
Holyoke, MA 01040
413-536-2300

Circulates in Holyoke, Belchertown, Chicopee, Easthampton, Granby, South Hadley, Southampton

Publication	Daily (PM), Sat. (AM)
Circulation	29,590 ABC (9/30/79)
Printed	Offset
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	48 hrs. before pub.
Adv. Rate PCI	$4.25
Adv. Page Size	8 col. x 21 1/2"
Adv.Col. Width	11 picas/11.5 picas
Wire Services	AP; UPI
Own Mag.	TV
Published	Saturday

Content: TV listings.

Special Editions: Bridal: 1; Profiles: 2; Washington's Birthday Automotive Section: 2; Spring Fashion: 3; Spring Car Care: 3; Spring Home Improvement: 4; Vacation & Travel: 5; Profiles: 6; Back to School: 8; Fall Home Improvement Care: 9; Fall Car Care: 9; New Car: 10; Design an Ad: 10; Christmas: 11.

HUDSON (H3) Middlesex County

THE HUDSON DAILY SUN ..... Ind.
16 Washington Street
Hudson, MA 01749
617-562-5200

Circulates in Hudson, Berlin, Bolton, Maynard, Stow, Sudbury.

Publication	Daily (PM)
Circulation	2,634 ABC (9/79)
Printed	Offset
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	48 hrs. before pub.
Adv. Rate PCI	$2.50/Comm./Comb.
Adv. Page Size	8 col. x 21"
Adv. Col. Width	11 picas/12 picas
Wire Services	UPI

Special Editions: Annual Business Review: 1; Spring Auto Buyers Guide: 3; Fall Auto Buyers' Guide: 10.

Enterprise Sun Publications Group

HYANNIS (N6) Barnstable County

CAPE COD TIMES ..... Ind.
319 Main Street
Hyannis, MA 02601
617-775-1200

Circulates in Barnstable, Bourne, Brewster, Chatham, Dennis, Eastham, Falmouth, Harwich, Hyannis, Mashpee, Orleans, Provincetown, Sandwich, Truro, Wellfleet, Wareham, Yarmouth, Nantucket, Martha's Vineyard.

Publication	Daily (PM), Sat. (AM)
Circulation	34,294 ABC (9/79)
Printed	Offset
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	48 hrs. before pub.
Adv. Rate PCI	$4.95
Adv. Page Size	8 col. x 21"
Adv. Col. Width	9.2 picas/10.2 picas
Wire Services	Los Angeles Times; Washington Post; New York Times; Ottaway News Service; UPI

Special Editions: Tax Tips: 1; Create an Ad Contest: 2; Cookbook: 3; Home Improvement: 4; Summer Preview: 5; Back to School: 8; Financial Planning: 9; Fall Auto: 10; United Fund: 10; Early Christmas: 11; Christmas Gift Guide: 11; Christmas Story Book: 12.

Ottaway Newspapers, Inc. (NY)

LAWRENCE (K2) Essex County

LAWRENCE EAGLE-TRIBUNE ..... Ind.
P.O. Box 100
Lawrence, MA 01842
617-685-1000, Telecopier: 685-1588

Circulates in Lawrence, Andover, Georgetown, Groveland, Methuen, Middleton, Newbury, North Andover, North Reading, Reading, Atkinson (NH), Londonderry (NH), Pelham (NH), Windham (NH), Salem (NH), Derry (NH), Plaistow (NH).

Publication	Daily (PM)
Circulation	51,811 PD (9/30/79)
Printed	Offset
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	48 hrs. before pub.
Adv. Rate PCI	$6.10/Comb.
Adv. Page Size	9 col. x 21 1/4"
Adv. Col. Width	9.6 picas/9.75 picas
Wire Services	UPI

Special Editions: Accent on Finances: 1; Accent on Brides: 2; Automotive Section: 2; Washington's Birthday: 2; Fashion: 3; Accent on New Season: 4; Progress Edition: 4; Accent on House and Garden: 5; Accent on Summer: 6; Accent on Brides: 7; Energy Section: 8; Back to School: 8; Home Improvement: 9; Restaurant and Dining Guide: 10; Holiday Cook Book: 11; Gift Guides: 12; Real Estate Tab: Spring-Summer-Fall.

LOWELL (J2) Middlesex County

THE SUN ..... Ind.
15 Kearney Street
Lowell, MA 01852
617-458-7100; Telex: 94-7493

Circulates in Lowell, Acton, Ayer, Bedford, Billerica, Boxborough, Burlington, Carlisle, Chelmsford, Concord, Dracut, Dunstable, Groton, Harvard, Littleton, Maynard, Pepperell, Tewskbury, Shirley, Townsend, Tyngsboro, Westford, Wilmington.

Publication	Daily (PM)
Circulation	56,045 ABC (12/31/79)
Printed	Dilitho
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	48 hrs. before pub.
Adv. Rate PCI	$6.45/Comb.
Adv. Page Size	9 col. x 21 1/2"
Adv. Col. Width	9 picas/10 picas
Wire Services	AP; UPI

Special Editions: Financial Review: 1; Valentine's Day: 2; Automobile Section: 2; Bridal: 3; Frozen Food Section: 3; Home Improvement: 3; Spring Real Estate Review: 4; Greater Lowell Chamber of Commerce Section: 5; Truck Section: 6; Salute to Westford, Chelmsford: 6; Salute to Littleton, Ayer: 6; Salute to Pelham, NH, Nashua, NH: 7; Salute to Billerica, Tewksbury: 7; Salute to Tyngsboro: 7; Interior Fashions: 8; Teachers Announcements: 8, 9; Fall Car Care: 9; Restaurant Guide: 10; Shopping Around: 10; Industrial In Review: 11; Football: 11; Christmas Gift Guide: 12; Christmas Church Page: 12.

LYNN (L3) Essex County

DAILY EVENING ITEM ..... Ind.
38 Exchange Street
Lynn, MA 01903
617-593-7700

Circulates in Lynn, Lynnfield, Marblehead, Nahant, Peabody, Revere, Salem, Saugus, Swampscott, Chelsea, Winthrop.

Publication	Daily (PM)
Circulation	30,663 ABC (3/79)
Printed	Letterpress
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	48 hrs. before pub.
Adv. Rate PCI	$8.50/Comb.
Adv. Page Size	8 col. x 21 1/4"
Adv. Col. Width	10.6 picas/11.3 picas
Wire Services	UPI

Special Editions: Autos: 2; Business Profiles: 2; Brides: 3; Home & Garden: 4; Car Care: 4, 10; Restaurant Guide: 6; Restaurant Guide: 11.

MALDEN (K3) Middlesex County

MALDEN EVENING NEWS ..... Ind.
277 Commercial Street
Malden, MA 02148
617-321-8000

Circulates in Malden, Everett, Medford, Melrose.

Publication	Daily (PM), no Sat.
Circulation	9,339 paid, CAC; 1,861 non-paid, CAC (1/79)
Printed	Offset
Press Rel. Deadline	12 hrs. before pub.
Adv. Deadline	48 hrs. before pub.
Adv. Rate PCI	$3.90/Comm./Comb.
Adv. Page Size	8 col. x 21"
Adv. Col. Width	11 picas/12 picas
Wire Services	UPI

Special Editions: Business Review: 1; Washington's Birthday: 2; Spring Spectacular: 3; Dining Guide: 4; Sidewalk Sale: 6; 7; Back to School: 8; Fall Festival Football: 9; Dining Guide: 10; Thanksgiving Football: 11; Christmas Carol Song Book: 12.
3M Network Group

MARLBORO (H3) Middlesex County

MARLBORO ENTERPRISE ..... Ind.
250 Maple Street
Marlboro, MA 01752
617-481-5441

Circulates in Marlboro, Northboro, Southboro.

Publication	Daily (PM)
Circulation	4,449 PD (9/79)
Printed	Offset
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	48 hrs. before pub.
Adv. Rate PCI	$2.50/Comm./Comb.
Adv. Page Size	8 col. x 21 1/2"
Adv. Col. Width	11 picas/12 picas
Wire Services	UPI

Special Editions: Annual Business Review: 1; Spring Auto Buyers Guide: 3; Fall Auto Buyers Guide: 10.
Enterprise Sun Publications Group

MEDFORD (K3) Middlesex County

MEDFORD DAILY MERCURY ..... Ind.
Zero Governors Avenue
Medford, MA 02155
617-321-8000

Circulates in Medford, Arlington, Malden, Somerville, Winchester.

Publication	Daily (PM), no Sat.
Circulation	7,042 paid, CAC; 1,658 non-paid, CAC (1/79)
Printed	Offset
Press Rel. Deadline	12 hrs. before pub.
Adv. Deadline	48 hrs. before pub.
Adv. Rate PCI	$3.60/Comm./Comb.
Adv. Page Size	8 col. x 21"
Adv. Col. Width	11 picas/12 picas
Wire Services	UPI

Special Editions: Business Review: 1; Washington's Birthday: 2; Spring Spectacular: 3; Dining Guide: 4; Sidewalk Sale: 6, 7; Back to School: 8; Fall Festival: 9; Football: 9; Dining Guide: 10; Thanksgiving: 11; Football: 11; Christmas Carol Song Book: 12.
3M Network Group

MELROSE (K3) Middlesex County

MELROSE EVENING NEWS ..... Ind.
414 Main Street
Melrose, MA 02176
617-321-8000

Circulates in Melrose, Saugus, Wakefield.

Publication	Daily (PM), no Sat.
Circulation	2,161 paid, CAC; 1,439 non-paid, CAC (1/79)
Printed	Offset
Press Rel. Deadline	12 hrs. before pub.
Adv. Deadline	48 hrs. before pub.
Adv. Rate PCI	$2.75/Comm./Comb.
Adv. Page Size	8 col. x 21"
Adv. Col. Width	11 picas/12 picas
Wire Services	UPI

Special Editions: Business Review: 1; Washington's Birthday: 2; Spring Spectacular: 3; Dining Guide: 4; Sidewalk Sale: 6; 7; Back to School 8; Fall Festival: 9; Football: 9; Dining Guide: 10; Thanksgiving: 11; Football: 11; Christmas Carol Song Book: 12.
3M Network Group

MILFORD (H4) Worcester County

MILFORD DAILY NEWS ..... Ind.
159 S. Main Street
Milford, MA 01757
617-473-1111

Circulates in Milford, Bellingham, Franklin, Holliston, Hopedale, Hopkinton, Medfield, Medway, Mendon, Millis, Upton, Uxbridge, Northbridge, Ashland.

Publication	Daily (PM)
Circulation	13,823 ABC (6/79)
Printed	Offset
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	48 hrs. before pub.
Adv. Rate PCI	$3.65
Adv. Page Size	9 col. x 21 1/2"
Adv. Col. Width	9.08 picas/10.08 picas
Wire Services	UPI; New York Times News Service

Special Editions: Spring Bridal: 2; Spring Car Care: 3; Lawn & Garden: 4; Fall Bridal: 9; Fall Car Care: 10.
Alta Group (ME)

NEW BEDFORD (L6) Bristol County

THE STANDARD-TIMES ..... Ind.
555 Pleasant Street
New Bedford, MA 02742
617-997-7411

Circulates in New Bedford, Acushnet, Assonet, Buzzards Bay, Carver, Dartmouth, Fairhaven, Freetown, Lakeville, Marion, Mattapoisett, Middleboro, Rochester, Wareham, Westport.

Publication	Daily (PM), Sat. (AM)
Circulation	48,983 PD (9/30/79)
Printed	Offset
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	72 hrs. before pub.
Adv. Rate PCI	$7.31
Adv. Page Size	6 col. x 21 1/2"
Adv. Col. Width	12.4 picas/13.4 picas
Wire Services	AP; Dow Jones; Ottaway Newspapers; New York Times

Special Editions: Industrial Business Section: 2; Recipe Contest: 3; Home & Garden: 4; Seaside: 6; Bride Pictorial: 7; Back to School: 8; Today's Women: 9; Christmas Layaway: 11; Gift Guide: 12.

NEWBURYPORT (L1) Essex County

THE DAILY NEWS ..... Ind.
23 Liberty Street
Newburyport, MA 01950
617-462-6666

Circulates in Newburyport, Amesbury, Merrimac, Newbury, Rowley, Salisbury, West Newbury, Seabrook (NH), Georgetown, Groveland.

Publication	Daily (PM), Sat. (AM)
Circulation	10,210 ABC (12/79)
Printed	Offset
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	48 hrs. before pub.
Adv. Rate PCI	$3.64/Comm./Comb.
Adv. Page Size	8 col. x 21
Adv. Col. Width	11 picas/11.5 picas
Wire Services	UPI
Own Mags.	Calendar/North Shore
Published	Saturday/Saturday

Content: Weekly Calendar of Events/Feature stories, classified, and weekend calendar.
Special Editions: Survival: 1; Auto: 2; Wedding: 3; Outdoor: 3; Home & Garden: 4; Real Estate: 4; Dining: 4; Guide to North Shore: 6; Back to School: 8; Football: 9; Fall Home Improvement: 9; Car Care: 10; Real Estate: 10; New Car Care: 10; Cookbook: 11.
Essex County Newspapers Group

NORTH ADAMS (B2) Berkshire County

THE TRANSCRIPT ..... Ind.
124 American Legion Drive
North Adams, MA 02147
413-663-3741

Circulates in North Adams, Adams, Cheshire, Williamstown, Southwestern Vermont

Publication	Daily (PM)
Circulation	12,967 paid, ABC; 114 free ABC (9/30/79)
Printed	Offset
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	48 hrs. before pub.
Adv. Rate PCI	$4.00
Adv. Page Size	6 col. x 21 1/2"
Adv. Col. Width	12 1/2 picas/13 1/2 picas
Wire Services	AP

Special Editions: Bridal Section: 2; Home & Garden: 4; Business Review: 4; Interiors: 11; Holiday Gift Guide: 11.

NORTHAMPTON (D3) Hampshire County

DAILY HAMPSHIRE GAZETTE ..... Ind.
115 Conz Street
Northampton, MA 01060
413-584-5000

Circulates throughout Hampshire County.

Publication	Daily (PM), Sat. (AM)
Circulation	19,600 ABC
Printed	Offset
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	48 hrs. before pub.
Adv. Rate PCI	$3.10/Comb.
Adv. Page Size	8 col. x 21 1/2"
Adv. Col. Width	10.9 picas/11.5 picas
Wire Services	AP
Own Mag.	Hampshire Life
Published	Saturday

Content: Weekly Calendar of events, feature articles, TV listings.
Special Editions: Bridal: 3; Spring Fashions: 4; Cookbook: 5; Back to College: 8; Fall Fashions: 9; Christmas Gift Guide: 11;

PEABODY (L2) Essex County

THE DAILY PEABODY TIMES ..... Ind.
54 Main Street
Peabody, MA 01960
617-532-1005

Circulates in Peabody.

Publication	Daily (PM), Saturday (AM)
Circulation	5,190 ABC (12/79)
Printed	Offset
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	48 hrs. before pub.
Adv. Rate PCI	$3.43/Comm./Comb.
Adv. Page Size	8 col. x 21"
Adv. Col. Width	11 picas/11.5 picas
Wire Services	UPI
Own Mags.	Caldendar/North Shore
Published	Saturday/Saturday

Content: Weekly Calendar of events/Feature stories, classified and weekend calendar.
Special Editions: Survival: 1; Auto: 2; Wedding: 3; Outdoor: 3; Home & Garden: 4; Real Estate: 4; Dining: 4; Guide to North Shore: 6; Back to School: 8; Football: 9; Fall Home Improvement: 9; Car Care: 10; Real Estate: 10; New Car Care: 10; Cook Book: 11.
Essex County Newspapers Group

PITTSFIELD (A3) Berkshire County

THE BERKSHIRE EAGLE ..... Inc
33 Eagle Street
Pittsfield, MA 01201
413-447-7311

Circulates in Pittsfield, Adams, North Adams, Williamstown, Cheshire, Dalton, Great Barrington, Hinsdale (NH), Lanesborough, Lee, Lenox, Richmond, Stockbridge, West Stockbridge

Publication	Daily (AM)
Circulation	31,189 paid, ABC; 315 free, ABC (9/30/7
Printed	Offset
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	4 PM, 4 days before pub.
Adv. Rate PCI	$5.50/Comm./Comb.
Adv. Page Size	8 col. x 21 1/4"
Adv. Col. Width	11 picas/11.5 picas
Wire Services	UPI: New York Times Wire Service

Speical Editions: Business & Industry: 1; Washington's Birthd
Auto Section: 2; Spring Fashion Section: 4; Fall Fashion: 9; Di
ing Guide: 10.
The Miller Newspapers Group

QUINCY (K4) Norfolk County

PATRIOT LEDGER ..... In
13 Temple Street
Quincy, MA 02169
617-786-7000

Circulates in Quincy, Abington, Braintree, Canton, Cohass
Dedham, Duxbury, Foxboro, Hanover, Hanson, Hingha
Holbrook, Hull, Kingston, Marshfield, Milton, Needham, Norwe
Norwood, Pembroke, Plymouth, Randolph, Rockland, Scitua
Sharon, Stoughton, Walpole, Westwood, Weymouth, Whitman

Publication	Daily (PM), Sat.(AM)
Circulation	78,998 ABC (12/31/79)
Printed	Letterpress
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	48 hrs. before pub.
Adv. Rate PCI	$10.50
Adv. Page Size	8 col. x 22"
Adv. Col. Width	10 picas, 8 points/11 picas
Wire Services	AP

Special Editions: Economy Cars: 1; Washington's Birthday N
Car: 2; The Wedding: 3; Red Sox Warmup: 4; Spring Garden
& Home Improvement: 4; Leisure Living: 5; Summer Cookbo
6; Fall Fashions & Back to School: 8; New England Patriots W
mup: 8; Energy in the 80's: 9; Home Furniture: 10; The Weddi
10; Winter Activities: 11; Holiday Cookbook: 11.
Mirror Communications Group

SALEM (L2 1/2) Essex County

THE SALEM EVENING NEWS ..... Ind.
155 Washington Street
Salem, MA 01970
617-744-0600

Circulates in Salem, Beverly, Danvers, Hamilton, Ipswich, Marblehead, Middleton, Peabody, Swampscott, Topsfield, Wenham, Boxford, Rowley, Georgetown.

Publication	Daily (PM)
Circulation	30,949 ABC (9/30/79)
Printed	Offset
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	48 hrs. before pub.
Adv. Rate PCI	$9.35/Comb.
Adv. Page Size	8 col. x 21"
Adv. Col. Width	11 picas/12 picas
Wire Services	AP; UPI

Special Editions: Bridal: 2; Washington's Birthday: 2; Frozen Food: 3; Industrial Review: 3; Fashion Forecast: 3; Boating: 4; Home Improvement: 4; Car Care: 5; Home Buyer's Guide: 5; Leisure Living: 6; Summer Returns: 6; Marblehead Race Week: 7; Heritage Days: 8; Football: 9; Home Improvements: 9; Fall Fashions: 9; 100th Anniversary: 10; Car Care: 10; Cars 81: 10; Restaurant Section: 11; Cookbook: 11; 3 Gift Guides: 12.

SOUTHBRIDGE (F4) Worcester County

THE NEWS ..... Ind.
25 Elm Street
Southbridge, MA 01550
617-764-4325

Circulates in Southbridge, Charlton, Sturbridge.

Publication	Daily (PM), Sat. (PM)
Circulation	6,097 PO (1/1/80)
Printed	Offset
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	48 hrs. before pub.
Adv. Rate PCI	$3.80/Comb.
Adv. Page Size	8 col. x 21"
Adv. Col. Width	9 1/2 picas/11 picas
Wire Services	UPI
Own Mag.	Worcester County
Published	Thursday

Content: Feature supplement.

Special Editions: Industrial & Business Review: 2; Spring Fashion: 3; Home Improvement: 4; Fall Fashion: 9; Christmas Gift Guide: 11.

Worcester County Newspapers Group

SPRINGFIELD (D4) Hampden County

THE DAILY NEWS ..... Dem.
1860 Main Street
Springfield, MA 01101
413-788-1000

Circulates in Springfield, Adams, Agawam, Amherst, Belchertown, Chicopee, Dalton, Deerfield, East Longmeadow, Easthampton, Granby, Greenfield, Hadley, Hampton, Hatfield, Holyoke, Longmeadow, Ludlow, Monson, North Adams, Northampton, Palmer, Pittsfield, South Hadley, Southwick, Turners Falls, Ware, West Springfield, Westfield, Wilbraham, Enfield (CT), Suffield (CT).

Publication	Daily (PM)
Circulation	76,706 ABC (3/31/79)
Printed	Dilitho
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	3 days before pub.
Adv. Rate PCI	$10.78 in Comb.
Adv. Page Size	9 col. x 21 1/2"
Adv. Col. Width	8.25 picas/8.625 picas
Wire Services	UP; AP; New York, Times News Service; Newhouse Newswire; Chicago Daily News; Washington Post - Los Angeles Times

Special Editions: Annual Business Review-Forecast: 1, Bride & Groom: 3; Frozen Food Festival: 3; Spring Spruce-Up: 4; Financial Planning and Your Future: 4; Outdoor Living & Summer Vacation: 5; Western MA Football: 8; Furniture-Home Furnishings & You: 10.

Newhouse Group (NY)

SPRINGFIELD (cont'd)

THE MORNING UNION ..... Ind.
1860 Main Street
Springfield, MA 01101
413-788-1000

Circulates in Springfield, Adams, Agawam, Amherst, Belchertown, Chicopee, Dalton, Deerfield, East Longmeadow, Easthampton, Granby, Greenfield, Hadley, Hampton, Hatfield, Holyoke, Longmeadow, Ludlow, Monson, North Adams, Northampton, Palmer, Pittsfield, South Hadley, Southwick, Turners Falls, Ware, West Springfield, Westfield, Wilbraham, Enfield (CT), Suffield (CT)

Publication	Daily (AM)
Circulation	73,684 ABC (3/31/79)
Printed	Dilitho
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	4days before pub.
Adv. Rate PCI	$10.78 in Comb.
Adv. Page Size	9 col. x 21 1/2"
Adv. Col. Width	8.25 picas/8.625 picas
Wire Services	UPI; AP; New York Times News Service; Chicago Daily News; Washington Post - Los Angeles Times; Newhouse Newswire

Special Editions: Annual Business Review-Forecast: 1; Bride & Groom: 3; Frozen Food Festival: 3; Spring Spruce-Up: 4; Financial Planning and Your Future: 4; Outdoor Living & Summer Vacation: 5; Western MA Football: 8; Furniture-Home Furnishings & You: 10.
Newhouse Group (NY)

TAUNTON (K5) Bristol County

TAUNTON DAILY GAZETTE ..... Ind.
5-9 Cohannet Street
Taunton, MA 02780
617-822-7121

Circulates in Taunton, Berkley, Dighton, Lakeville, Middleboro, Norton, Raynham, Rehoboth.

Day of Pub	Daily (PM)
Circulation	14,307 ABC (3/31/79)
Printed	Offset
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	48 hrs. before pub.
Adv. Rate PCI	$3.08/Comm./Comb.
Adv. Page Size	8 col. x 21"
Adv. Col. Width	9.9 picas/11 picas
Wire Services	UPI

Special Editions: Bridal Supplement:1; Progress Edition: 2; Outdoor Recreation: 6; Cookbook: varies-8 or 10; Back To School: 8; Fall Fix-Up: 9; Christmas Shopping Guide: 11.

WAKEFIELD (K2 1/2) Middlesex County

THE WAKEFIELD DAILY ITEM ..... Rep.
26 Albion Street
Wakefield, MA 01880
617-245-0080

Circulates in Wakefield, Lynnfield, Melrose, Reading, Stoneham.

Publication	Daily (PM), no Sat.
Circulation	6,605 paid, PO; 90, free, PO (10/12/79)
Printed	Offset
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	24 hrs. before pub.
Adv. Rate PCI	$2.75/Comb.
Adv. Page Size	8 col. x 21
Adv. Col. Width	10 1/2 picas/11 1/2 picas
Wire Services	UPI

Special Editions: Washington's Birthday Auto Issue: 2: Spring Has Arrived: 3; Car Care Issue: 4; Home Improvement Issue: 5; July 4th Issue: 7; Football Preview Issue: 8; Football, 1980 (High School Sports): 9; Christmas Gift Guide: 12.
Wakefield Daily Item Group

WALTHAM (J3) Middlesex County

NEWS-TRIBUNE ..... Ind.
18 Pine Street
Waltham, MA 02154
617-893-1670

Circulates in Waltham, Belmont, Newton, Watertown, Weston.

Publication	Daily (PM), no Sat.
Circulation	13,756 ABC (9/30/79)
Printed	Offset
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	48 hrs. before pub.
Adv. Rate PCI	$4.76/Comm./Comb.
Adv. Page Size	9 col. x 21"
Adv. Col. Width	9.5 picas/10.5 picas
Wire Services	UPI

Special Editions: Bride & Groom: 2; Auto Dealer's Open House: 2; Spring Fashion: 3; Newcomer's Magazine: 3; Real Estate Preview: 4; Bride & Groom: 5; Flag Code: 6; Better Living: 9; Business & Industry Review: 10; Holiday Magazine: 11.
Transcript Newspapers Group

WEST SPRINGFIELD (D4) Hampden County

WEST SPRINGFIELD NEWS ..... Ind.
62 School Street
Westfield, MA 01085
413-562-4181

Circulates in West Springfield, Westfield, Blandford, Chester, Granville, Huntington, Montgomery, Russell, Southwick.

Publication	Daily (PM), Sat. (AM)
Circulation	Unavailable
Printed	Offset
Press Rel. Deadline	12 hrs. before pub.
Adv. Deadline	24 hrs. before pub.
Adv. Rate PCI	$2.50/Comm./Comb.
Adv. Page Size	8 col. x 21"
Adv. Col. Width	9.5 picas/10.5 picas
Wire Services	UPI
Own Mags.	Food Guide/Wheels
Published	Wednesday/Friday

Content: Homemaking supplement/Automotive information.
Special Editions: Business & Industry Review: 1; George Washington Auto Section: 2; Bride's Guide: 5; Home Improvement: 9.

WESTFIELD (C4) Hampden County

WESTFIELD EVENING NEWS ..... Ind.
62-64 School Street
Westfield, MA 01086
413-562-4181

Circulates in Westfield, Blandford, Chester, Granville, Huntington, Montgomery, Russell, Southwick.

Publication	Daily (PM), Sat. (AM)
Circulation	8,900 PD (1/31/80)
Printed	Offset
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	24 hrs. before pub.
Adv. Rate PCI	$2.50/Comb.
Adv. Page Size	8 col. x 21"
Adv. Col. Width	9 picas/10.5 picas
Own Mags.	Food Guide/Wheels
Published	Wednesday/Friday

Content: Homemaking supplement/automotive information.
Special Editions: Business & Industry Review: 1; George Washington Auto Section: 2; Bride's Guide: 5; Home Improvement: 9.

WOBURN (K3) Middlesex County

THE DAILY TIMES ..... Ind.
25 Montvale Avenue
Woburn, MA 01801
617-933-3700

Circulates in Woburn, Burlington, Winchester.

Publication	Daily (PM), no Sat.
Circulation	11,741 CAC (6/30/79)
Printed	Offset
Press Rel. Deadline	24 hrs. before pub.
Adv. Deadline	24 hrs. before pub.
Adv. Rate PCI	$2.94/Comm./Comb.
Adv. Page Size	9 col. x 21"
Adv. Col. Width	9.9 picas/10.4 picas
Wire Services	UPI
Own Mag.	Middlesex East
Published	Wednesday

Content: All news covering 9 surrounding communities.

WORCESTER (G3) Worcester County

EVENING GAZETTE ..... Ind.
20 Franklin Street
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The Boston Globe Monday, January 8, 1979

The unsolved riddle of radiation danger

By Robert Cooke
Globe Staff

HOUSTON — One of these days it's going to be so nice to have finally some good, clear, simple answers to the question of radiation hazard.

But not yet; so don't hold your breath. Relax, sit back, watch the fuss for awhile, and try to keep an open mind. For openers, you might bone up a bit on the arcane science of statistics.

Some answers, of course, are being offered, but they're awfully tough to make sense of. For example:

One gang — made up of environmentallists, a few doctors, scientists and hangers-on — insists with evangelistic fervor that all radiation, from chest Xrays, nuclear power plants, naval shipyards and nuclear laboratories, is worse than anyone ever imagined and is causing cancer.

The other gang — consisting of the nuclear industry, some government agencies, other scientists and squads of public relations experts — goes around saying, in essence: "There, there, it's not as bad as all that."

Somewhere, still lost in the middle, is the truth. When it will be found remains very uncertain.

At present, much of the argument revolves around an ultracontroversial year-old document knows as the Mancuso Report, which its authors say shows that workers at the US Department of Energy's huge research center at Hanford, Wash., are experiencing higher cancer rates than they should.

Opponents say the report doesn't show that at all. They argue, somewhat convincingly, that a sample of 35,000 workers at Hanford is far too small, and so the conclusion is invalid.

What, then, do we really know about the dangers of low-level radiation?

First, most specialists are convinced that radiation at any level is not good for you. New emphasis is being placed on avoiding Xrays if they're not absolutely necessary, and ditto for other forms of radiation.

Second, whether you can feel it or not, all or us are being irradiated all the time at low levers: by cosmic rays from space, by particles from the sun, and by radiation from rocks. This means we've lived with radiation for a long time without serious damage. Too, it is well-known that there are some natural mechanisms in the body to repair such damage.

Third, even though the hazards of high levels of radiation are rather precisely known, much more research is necessary if we're to sort out the effects of tiny amounts of radiation among all the other ailments that plague man.

According to Dr. Charles Land, from the National Cancer Institute, right now "we probably know more about the carcinogenic (cancer-causing) effects of ionizing radiation than we do about any other environmental carcinogen." The information about the hazards of high doses, indeed, is solid.

"The argument," he said, "is about extrapolating to low doses," and to do studies of the effects of low doses requires "sample sizes that are impracticably large."

This means, he said, that if you're going to study the effects of one rad (a measure of radiation) on health, you'd need one million or more people in the study. Otherwise, statistical analysis would be too weak for confidence.

The authors of the Mancuso Report — George Kneale, Thomas F. Mancuso and Alice Stewart — contend their sample of 35,000 nuclear laboratory workers at Hanford is ample, that they can get some results that are believable.

Indeed, their claim, basically, is that there is an effect 10 times greater than expected and the environmental groups say standards for exposure to radiation should thus be one-tenth what they are. At present, the allowed occupational exposure is 5 rads a year.

Stewart, who became controversial in England for her study of the effects of Xrays on unborn babies, said during a symposium at the annual meeting of the American Assn. for the Advancement of Science:

"Well, here we are, we've found the risk. There is a basic fault in the whole idea of a linear hypothesis. It has a basic fault built into it from beginning.

"I maintain that until you had a population of workers in the nuclear industry to study, no one in the world had a good study."

She was referring to the fact that most of the data on radiation hazard stems from studies of Japanese victims of the bombing of Hiroshima and Nagasaki in World War II. She contended that other ailments related to the bomb blasts tended to cover up the cancers caused by the radiation, so that hazard is not really known accurately.

Epidemiologists — the scientists who specialist in finding out how diseases spread through populations — have found that it's very difficult to select out all of the so-called variables that are important in cancer and radiation.

In shipyard workers, for example, it's not adequate to just count cancer deaths among workers who were involved with nuclear power systems. Other factors, such as exposure to asbestos or other toxic materials, are also important. It's also important to check for accuracy of cancer diagnosis, to compare similar populations and to determine what kinds of tumors the victims died of.

At Hanford, for example, the overall death rates from cancer would be misleading if compared to rates in other areas, because of what is known as the "healthy worker" effect. The workers at Hanford tend to be healthier than the general population outside even in terms of cancer incidence — because they are hired in part on the basis of good health, receive good health care and are closely monitored.

For this reason, it's unwise to compare Hanford workers with those in the general population. They don't match.

Valley Advocate January 15, 1979

Wendell Holds Line on Nuke Waste

Wendell Concerned Citizens, a voluntary organization which seeks to implement a local ordinance prohibiting transportation of radioactive material through its town, has notified the U.S. Materials Transportation Bureau the group wants to testify at MTB's upcoming hearings on the problem.

The MTB, part of the U.S. Department of Transportation, has already received written testimony from the Wendell group. In 1975, Wendell, one of Franklin County's smallest towns, unanimously passed an ordinance prohibiting the transportation of radioactive fuels, waste and weaponry through the town. In August 1978, the town added penalties of $20 per offense to the ordinance.

The ordinance, however, carries little effect because state and federal regulations can overrule it. George Gulick, a member of the WCC, said the group is aware the ordinance is being violated by shipments from the Portsmouth Naval Yard of radioactive materials which pass through the town on the Boston and Maine Railroad.

Written testimony submitted thus far includes the following: "The possibility of a catastrophic accident in the Connecticut River Valley watershed is unacceptable. That it might be prevented or adequately dealt with is not clear. In the third week of December in a test situation a trailer carrying radioactive wastes jack-knived and collided with a car outside Northampton. The collaboration of federal, state and local agencies and health personnel produced a number of negative results, one of which that no one at the accident was capable of reading the monitoring equipment."

South Middlesex
Daily News
Framingham, Ma.
D. 45,000

FEB 9 1979

SOUTH MIDDLESEX
DAILY NEWS
Farmingham, MA
February 9, 1979

Expert will speak on radiation

STOW — In an effort to allay fears and answer technical questions concerning microwave radiation, the local Board of Health has invited an expert from the State Department of Public Health to lead a forum on the subject.

Al Comproni, from the division of radiation control, is expected to speak Feb. 12 at 7:30 p.m. in the Center School Auditorium.

According to the health board's secretary, Florence Chandler, members of the "Citizens for the Protection of Stow" will be contacted and urged to attend.

The group was organized to block construction of Radant Systems, Inc. because of biological dangers feared from microwave radiation which emitted from the on-site testing of radar antennas.

The company has proposed the construction of a three million dollar building off Hudson Road.

Comproni was an invited guest at the Health board's regular meeting last Tuesday and agreed to come before the town with technical data.

The building inspector is on the verge of giving site plan approval to the company pending a legal interpretation of an existing bylaw banning radiation from structures in town.

"Citizens for the Protection of Stow" have threatened a court suit against the town if the bylaw is ignored.

Radant officials have promised to operate on less than one microwatt power but fearful citizens are saying not enough is known about long term effects to allow it.

The group has initiated a legal fund and retained a lawyer to help them block construction of the company. They have also appealed to the State Department of Environmental Quality Engineering for protection.

U.S. Study Asks Caution On Low-Level Radiation

Special to The New York Times

WASHINGTON, Feb. 27 — The Carter Administration advised Americans today to be wary of exposing themselves to low levels of radiation but shied away from seeking to impose stricter standards on permissible amounts.

Joseph A. Califano Jr., the Secretary of Health, Education and Welfare, released "working papers" prepared by the White House Radiation Interagency Task Force on Ionizing Radiation and stressed that more scientific research was needed to settle the issue of hazard.

An increasing number of critics of Federal radiation policy have contended that permissible levels of radiation exposure have been set at too high a level, thus endangering the health of both the general public and workes in the nuclear industry.

"We do not believe that the science is adequate to justify further reductions," Mr. Califano told a news conference at his departmental headquarters.

Further Discussion Sought

The working papers, which do not carry the weight of governmental backing but are intended to provoke discussion, propose such actions as setting guidelines that would make it easier for a nuclear worker claiming radiation injury to file a damage suit, expanding research into radiation hazards, and widening public information efforts to warn the public of overexposing themselves to X-rays and the like.

The draft report must be reviewed by other Federal agencies before finally being sent to the President who ordered the review last May.

Mr. Califano, whose department was designed by President Carter as the coordinating group for the radiation study group, directed the Food and Drug Administration to expedite guidelines for medical and dental procedures that lead to "promiscuous exposure to radiation."

The Secretary noted that the increased popularity of such devices as so-called CAT scanners, which employ low-level radiation for more complete X-rays of the body, is an example of potentially increased hazards.

"I am directing Dr. Donald Kennedy, Commissioner of the Food and Drug Administration, to accelerate F.D.A.'s efforts to reduce unnecessary exposure to radiation from the use of X-ray and nuclear medicine procedures," he said.

Mr. Califano also said that a departmental study of persons present at the "Smoky" atomic test conducted in Utah 22 years ago had suggested "a higher than normal incidence of leukemia."

While imperfectly defined, the term low-level radiation generally is applied to doses of one rem or less. The term rem itself is an acronym for Roentgen Equivalent Man, with roentgen being a standard unit of radiation exposure. An ordinary chest X-ray delivers from 20 to 500 millirems.

About half the radioactivity to which people are exposed stems from natural sources in rocks and sediments and from such effects as cosmic rays from outer space. Collectively, this is called background radiation and varies between 90 and 200 millirems per person per year, depending upon geography. The medical effects of both high and low level radiation may include a variety of different forms of cancer, including leukemia.

The Secretary noted that research programs dealing with the hazards of radioactivity both to the public in general as well as in specific occupations would take at least a year to be assembled.

"The long-range health effects of exposure to low-level ionizing radiation constitute a serious public health issue," Mr. Califano said, adding, "we must also remember the benefits society derives from the use of radiation."

Eckhardt Plans U.S. Inquiry

WASHINGTON, Feb. 27 (AP) — Representative Bob Eckhardt, Democrat of Texas, said today that his Subcommittee on Oversight and Investigations would begin a "full-scale investigation into all phases of radiation health dangers."

Mr. Eckhardt, who held a news conference with Representatives Gunn McKay of Utah and Jim Santini of Nevada, also Democrats, said the inquiry would focus on the cancer deaths that might be associated with testing at the Nevada test site during the 1950's and 1960's.

The hearings will also look into the possibility that people are now being exposed to excessive medical radiation, such as X-rays, and to large radiation doses in the workplace, Mr. Eckhardt said.

DAILY NEW HAMPSHIRE GAZETTE
Northhampton, MA
February 28, 1979

Radiation hazard here downplayed by state

Vehicles carrying low-level radioactive waste which pass within five miles of some 30 Western Masssachusetts communities — including Northampton and Amherst — pose no danger, according to the state Department of Public Health.

The Energy Policy Information Center in Boston yesterday released a report stating that some 250 New England communities are within five miles of a road on which radioactive wastes are transported.

Most of the shipments are of low-level wastes, such as clothing and equipment contaminated with radiation during the operation of nuclear power plants.

These materials carried on trucks are not dangerous in the event of most accidents, said a state Department of Public Health radiation scientist.

A truck would have to burn within a building, creating poisonous fumes, before it would pose a danger to people, he said.

Critics of nuclear power have often expressed concern about the shipment of high-level radioactive waste, such as used fuel rods, on public highways.

They fear an accident involving a vehicle containing that kind of material could be dangerous if the cask containing the material spilled open.

Used, or spent, fuel rods are piling up at many nuclear power plants because the federal government has not decided how to dispose of them.

The federal Department of Energy Monday issued a report naming five proposed temporary storage sites for spent fuel. One was identified as "Greenfield".

However, energy department officials said the name designated an undetermined site and was not the Greenfield in Franklin County.

BROCKTON DAILY
EVENING ENTERPRISE
AND BROCKTON TIMES
BROCKTON, MA.
D. 57,000

APR 26 1979

New
England
Newsclip

BROCKTON DAILY EVENING ENTERPRISE
AND BROCKTON TIMES
Brockton, MA
April 26, 1979

County group asks court to close down N-plant in Plymouth

By JIM HARRINGTON
Enterprise Staff

PAGE ONE

Claiming that residents were "scared stiff," lawyers for the Plymouth County Nuclear Information Committee Inc. asked Judge Henry Chmielinski Jr. in Brockton Superior Court Wednesday to close Boston Edison's Pilgrim nuclear plant until it could be operated safely.

The class action complaint in equity by PCNIC names Boston Edison Co., the state Department of Public Health, state Civil Defense Agency and the Office of Emergency Preparedness, the state Department of Public Works, and the state Department of Environmental Quality Engineering as defendants in the suit. Only Boston Edison was represented Wednesday.

The suit accuses the defendants of negligence, assault and battery, intentional trespass, and eminent domain. The suit asks for a preliminary injunction because of the following reasons:

- Until the plant can and will be operated without any emissions of low level radiation into the biosphere.
- Until an evacuation plan for a 50-mile radius surrounding the plant has been adequately devised, implemented, published and tested by the Civil Defease Agency and the Office of Emergency Preparedness.
- Until the state Department of Public Health personnel are stationed on the site 24 hours per day to monitor the radioactive emissions emanating from the plant.
- Until the state Department of Public Health institutes offsite monitoring of radiation in a 50-mile radius of the plant 24 hours per day.
- Until Nuclear Regulatory Commission personnel are stationed in the control room of the plant at all times during the plant's operation to safeguard against human error and to ensure that plant operating decisions are made in the public interest rather than just in Edison's interest.
- Until adequate and safe provision has been made for storage of highly radioactive spent fuel in a remote unpopulated site rather than Plymouth County.
- Until the transportation of radioactive waste is monitored on a continuous basis over previously prescribed routes and official escorts provided by the Department of Public Works and the Department of Public Health.
- Until the design of the plant conforms to all current Federal safety standards.
- Until Boston Edison Co. notifies all citizens within a 50-mile radius of the plant that low-level radiation is dangerous to their health.

BOSTON—See Page 12

BROCKTON DAILY EVENING ENTERPRISE
AND BROCKTON TIMES
Brockton, MA
April 26, 1979

Boston Edison challenging jurisdiction of Plymouth suit

(Continued From Page One)

• Until Edison agrees to and implements a plan to finance annual medical examinations for anyone so requesting same within a 10-mile radius of the plant.

Judge Chmielinski said he planned to do a lot of reading on the subject before handing down a decision someday next week.

Robert K. Grad III, who represented Boston Edison, said that to comply with the demands of the citizen group would be impossible to meet. He also challenged the right of a Superior Court judge to take action in the case becuase there was no legal authority to reconsider the federal government's decision allowing Pilgrim I to operate. He said only the U.S. Court of Appeals may review that decision.

Grad cited a list of court decisions that ruled the federal government has exclusive power to relegate issues related to radioactivity releases.

However, lawyers for the 600-member citizens group countered with the claim that 1977 amendments to two federal anti-pollution laws specifically allow the state to limit radioactive releases.

The suit blames Edison for being negligent by allowing radioactive particles to circulate with the area.

The suit states that the plaintiffs are in apprehension and fear for an unlawful touching and harm to their person by the discharge into the biosphere of ionizing radiation resulting in assault and battery.

The plaintiffs in alleging intentional trespass say that radioactive emissions and fallout falls upon the plaintiffs' property and person.

In alleging eminent domain, the plantiffs claim that as a direct and proximate result of Edison's release into the air and water and onto the land of plaintiffs of radio active pollutants, plaintiffs have been substantially deprived of their beneficial use and enjoyment of their property. The suit also alleges that properties have dropped in value because of the proximity to the nuclear site.

TAUNTON DAILY
GAZETTE
TAUNTON, MA.
D. 14,991

JUN 2 1979

New
England
Newsclip

TAUNTON DAILY GAZETTE
Taunton, MA
June 2, 1979

Federal, State Officials Differ Over Possible Ill Effects of Radiation in Norton, Attleboro

NORTON — It's getting to be a familiar tune since the accident at the Three Mile Island nuclear power plant, only now it's being sung about nuclear waste discovered in a Norton dump.

The song could be titled "Is it or isn't it dangerous" if anyone were interested in thinking up titles.

According to Nuclear Regulatory Commission spokesman Walter Martin, no, it isn't. According to Massachusetts public health officer George W. Swibel, only if you're standing on top of it. But, according to MIT nuclear physicist Henry W. Kendall, yes, and the contaminated dust could be "enormously toxic" if inhaled.

Even the source isn't really known although it is believed that the nuclear wastes were dumped between 1961 to 1968, accidently Martin believes. The dump was privately owned and closed in 1968 at the death of the opeator. The site is now owned by Mrs. Isadore Shpack and is located next to a playground and about a mile from Chartley center.

Martin, chief of the NRC's Safeguards Branch for this region, claims to have narrowed the possiblities to two: Texas Instruments, considered the most likely source by Martin, or Englehard Minerals and Chemicals Corporation based in New Jersey.

Other waste materials from both firms was discovered at the dump. Nuclear wastes are being analyzed and compared with known products from the two firms as well as from other nuclear manufacturers.

TI merged with Metals and Controls Corporation which had been producing fabricated fuel rods for naval and research reactors since 1955. Production at the plant reportedly dropped to "a very small level" in 1966 according to company spokesman Lon Bonczek.

The material found at the Norton dump consists of radium, uranium oxide, depleted uranium (with fuel components removed) and enriched uranium which is used as a reactor fuel.

Martin gave his theory on how the materials came to end up in the dump. He theorized that soil on the original site of Metals and Controls had been contaminated by spillage from an outdoor stockade on the property where the material was stored or from the filtered incinerator where low-level radioactive waste was burned off.

Later, he said, construction on that site might have resulted in the contaminated soil being dug up and hauled to the Norton dump.

Meanwhile, the state has been conducting its own tests with Swibel, a radiation scientist with the DPH, taking samples for testing.

Swibel has stated that neither the material itself nor the dump generally presents an immediate health hazard. "The pysical significance is zip. The psychological significance is something else again," he said.

He added that fresh bulldozer tracks were evident Friday, indicating that the land was entered from the adjacent Attleboro Landfill, Inc., property, a private, industrial dump that has been closed for the past two months. The disturbance of the area will mean a new series of testing according to Swibel to determine if any of the nuclear waste materials had been removed.

In the meantime, Kendall, a founder of the Union of Concerned Scientists, claimed that he has seen the NRC report on both the Norton site and similar waste found in a swamp adjacent to the Finburg Field playground in Attleboro and has concluded that the public should be banned from both areas.

Dust from the Norton site, Kendall charged, brings a risk of lung cancer, birth defects and similar medical problems and he termed the Norton site as being "hot as a pistol."

On the other hand, Public Health Commissioner Alfred Frehette said in a statement last night, that Norton radiation levels are "so low" that a person would have to stand in one place for 17 hours before there would be cause for concern.

'No problem here'

Officials clean site of alleged radioactive contamination in city

By LEO PELOQUIN
Sun Chronicle Staff Writer

ATTLEBORO – Aided by a radiation scientist from the Mass. Department of Public Health, Mayor Gerald Keane and several city workers Monday removed radioactive soil discovered six months ago at Finberg Field.

Working for six hours in a constant rain, the men removed soil from four sites in a wooded area adjacent to the field's baseball diamond. The soil filled four 55-gallon barrels.

The operation ended a radiation "problem" at the field that local, state, and federal officials claim never existed.

"There's no danger here," said radiation scientist George Swible. "If there was a danger, I'd be wearing protective clothing and I wouldn't let anyone in here but radiation control workers."

Working with a sodium iodide crystal – a device more sensitive to radiation than a Geiger counter – Swible scanned the soil and directed the workers to collect any that showed the slightest sign of radiation.

"If there is anything here, I don't want it here," Swible said, but he emphasized several times that the radioactive material, indentified months ago as natural radium, never posed a health hazard.

"Since this Three Mile Island thing, this anti-nuke stuff has gone crazy," he said. "This is a circus now. It's not real life."

Swible said the highest reading from any of the earth collected was 1.15 millirems, far below the federal exposure limit of 500 millirems per year. The materials giving off the highest readings were a molten glass-like substance and some reddish-orange soil.

The soil is being stored at the city's highway department yard on Wall Street as city officials await word from the state health department, according to Civil

See KEANE, Page 3

SUN CHRONICLE
Attleboro, MA
June 5, 1979

SUN CHRONICLE
Attleboro, MA
June 5, 1979

Keane: City clean

Continued from Page 1

Defense Director William Rollinson.

Keane, dressed in dungarees and a raincoat and toting a shovel, said he decided to have the soil removed because of the publicity it had created last week in the Boston press.

"The local people didn't overreact to the situation, but I really thought that Boston and The Globe overdid it," he said. "So now, Attleboro doesn't have a problem. It's gone."

Swible said the amount of radioactive substances actually contained in any one of the barrels of soil was "the size of two cigarettes."

He said, "You'd have to get someone to stand on the exact spot where the substance was located for something like 170 hours before they would even get to the exposure level allowed by regulations."

The radiation was first detected at the field and at a former private landfill site in Norton six months ago. Although state health officials and the Nuclear Regulatory Commission have assured local officials that no health hazard exists, an MIT professor who is the founder of an anti-nuke group has challenged their position.

Walter Martin, chief of the NRC's Safeguards Branch for this region said a report on the source responsible for dumping the material at the two sites is due in two weeks. He said the most likely candidates are Texas Instruments and the Metals and Controls Corp. it merged with in 1959, and the D.E. Makepeace Company of Plainville, now owned by Engelhard Minerals and Chemicals Corp. of New Jersey.

State Radiation Control Director Gerald Parker said a meeting with Norton officials is slated for next week to decide what to do about the landfill site. It is not yet clear who will pay for the clean-up operations at either site, he said.

JUL 12 1979

SUN CHRONICLE
ATTLEBORO, MA.
D. 13,000

JUN 15 1979 New England Newsclip

Analysis shows Norton water 'well within standards'

By LEO PELOQUIN
Sun Chronicle Staff Writer

NORTON – Lea Shpack's drinking water still falls well within federal drinking standards despite showing more signs of radioactivity than it did in November.

That was the message federal and state radiation officials had for the Board of Selectmen Thursday as Selectmen, meeting as the Board of Health, heard the current status of a Nuclear Regulatory Commission and State Dept. of Public Health investigation of radioactive waste buried in a former private landfill on Union Road.

The officials' report was based on the latest water analysis results from federal and private laboratories which show the contamination to be from 3.8 to 5 picocuries per liter. Last fall's NRC analysis showed 0.8 picocuries per liter.

A picocurie is a unit of radioactivity, and the U.S. Environmental Protection Agency's standard for safe drinking water is 15 picocuries per liter.

Follow up

"We're going to follow up again. It could be just the time of year," said state Radiation Control Director Gerald Parker about the discrepancy in seasonal sample results.

NRC officials meanwhile reiterated their stance of seven months ago that the buried uranium poses no "immediate significant health hazard" to local residents.

Also at the meeting were Attleboro Mayor Gerald J. Keane and Civil Defense Director William Rollinson, State Rep. Leon Lombardi, R-Easton, Brown University researcher Robert Settipane, a representative from Congresswoman Margaret Heckler, and representatives of Texas Instruments Inc., the firm suspected of dumping the waste.

Reassess

"If someone were to go out there and start digging basements for houses, we would have to reassess," said George H. Smith, the NRC's regional chief of fuel facilities and materials safety. "But it is not presently a hazard to any of the citizens of Norton."

Smith said after the meeting he would agree with NRC Deputy Director James Allan's statement seven months ago – when federal officials first met with Selectmen concerning the dump site – that "someone could lie on that property 24 hours a day, seven days a week, and still not receive any significant radiation."

Renewed controversy about the dump arose when a water sample two Brown University students said came from a tap in Mrs. Shpack's home was found to contain "dangerously high levels" of radioactive contamination. The sample was analyzed at Interex Inc. of Natick, the same private laboratory that analyzed the state's samples.

Preliminary results of the most recent state water samples released Wednesday from Interex showed 100 picocuries per liter of well water, but Parker said he asked the laboratory to redo the tests. The final result was 5 picocuries per liter, slightly higher than the NRC's findings of 3.8 picocuries per liter.

Selectmen Chairman Raymond Patenaude said he was satisfied with the officials status report, but he and other selectmen said they wanted to see the dump site problem dealt with quickly with no more delays.

Selectman Leonard Silvia thanked Settipane for "stirring up a hornet's nest."

But, he warned the federal and state officials, "I don't want to get any more information from Brown or Harvard or anyone else. I want to get information from the top dog."

NRC officials blamed the delays on "jurisdictional problems" concerning whether they or the U.S. Department of Energy were responsible for dealing with the uranium and also said they were tied up with the Three Mile Island nuclear accident.

SUN CHRONICLE
Attleboro, MA
June 15, 1979

SUN CHRONICLE
Attleboro, MA
July 12, 1979

Decision on radium expected today

Public Health

ATTLEBORO – City officials today will decide when and where to dispose of radioactive soil collected last week from Finberg Field. The city will pay for the cost – about $200 – of the disposal, according to Mayor Gerald Keane.

Mayor Gerald Keane Thursday discussed with the state Department of Public Health possible licensed disposal areas – in Natick, Worcester, and New York – for the four 55-gallon barrels of soil which have been stored at the Highway Department yard on Wall Street.

"We're going to dispose of it and it has to be outside the city," Keane said.

State Radiation Control Director Gerald Parker said it was up to city officials to choose the licensed disposal site.

"We're just giving them the information as to where they can take it," he explained. "There are several ways to dispose of it and it's up to them to decide which way they want to do it.

It is unclear presently whether the state or the city will have to pay for the disposal.

The radioactive material, discovered seven months ago at the public playground, was removed Tuesday by Keane, a state radiation specialists, and several city workers. Local, state and federal officials have repeatedly stated that the material emitted very low-level radiation and posed no health hazard.

In a development with no apparent connection with the local radiation story, Texas Instruments Inc. has installed a telephone "hot line" linking it with the Nuclear Regulatory Commission in Pennsylvania.

Company spokesman Lon Bonczek said two phones have been installed as part of an NRC program which is an outgrowth of the Three Mile Island nuclear accident. The program requires all firms that do nuclear related work to install the lines, he said.

"It has nothing to do with this local incident," he said. "The program was initiated because of the lack of communication during the Three Mile Island crisis."

Texas Instruments this week was named as the probable source of the radioactive waste found buried at a former private landfill located on Union Road in Norton.

WORCESTER TELEGRAM
Worcester, MA
Nov. 30, 1979

Public Health

Nuke Injury? Hospital Is Ready

MARLBORO — A radioactive accident in Marlboro is unlikely, but if there is, Marlboro Hospital will be ready to deal with patients who have been exposed to radiation.

William J. Bell of the state Department of Public Health conducted a program at the hospital this week to prepare emergency room staff for just such patients.

The biggest problem in treating patients who have been exposed to radiation is overcoming the fear the medical staff itself may feel, he said.

"What happens frequently is everybody gets excited about radiation and forgets about other health needs," he said.

Other injuries may be more serious than the exposure to radiation, but may not be treated quickly because people overreact when they learn about the radiation, he said.

Patients have been turned away from emergency rooms because the staff thinks the building will be contaminated, he said.

The program was offered to educate the staff in case there is such an emergency, said Rita Wright, director of education at the hospital and a member of the hospital's disaster committee.

"We have to dispel myths," she said.

Serious radiation emergencies are unlikely to be brought to the hospital because there are no industries in the area using large amounts of radiation, she said.

The biggest danger in Marlboro would come from accidents involving trucks transporting radioactive materials through the city or to the hospital itself for medical use, Bell said.

Regulatory agencies require hospitals to hold such meetings and to prepare emergency plans, he said.

The beginning of Bell's discussion sounded like a high school physics class as he explained the types, sources, uses and measurements of different kinds of radiation.

The correct treatment and handling of a radiation patient depends on what kind of radiation the person has been exposed to, he said.

Some types of radiation are like the light from a flashlight, he said. When it is on, it is there, and when it is off, it isn't. This is the kind of radiation used for X-rays, he said.

This is called irradiation and needs no treatment, he said.

Patients are contaminated when they are covered with radioactive material, much as they might be covered by chalk dust, he said.

Because the radiation is in a physical form, it can be transmitted by touching or by air.

If there is time, precautions should be taken not to touch a contaminated person, but contamination should not stop medical personnel from treating other injuries that demand attention, he said, because the contamination can be washed off later.

"There are lots of nice things you can do," Bell said, but they shouldn't be done if the person could die from an untreated wound or lack of medical treatment in the meantime.

Nuclear waste: A jobs-and-environment problem

By Jerry Ackerman
Globe Staff

Making it in Massachusetts can have its problems as well as its benefits. Take, for example, radioactive waste.

If the state is to preserve the 5000 jobs associated with nuclear-related businesses, an advisory panel reported last week, it must also be prepared to help get rid of their waste by establishing a nuclear waste site in the commonwealth.

But the major impetus for the report may be, not so much the buildup of nuclear wastes in the Bay State, but the demands of interstate politics.

The report, by a committee of the 15 year-old state Advisory Council on Radiation Protection, quickly won the endorsement of Gov. Edward J. King.

Acting on King's say-so, Public Health Comr. Alfred L. Frechette said the state will soon invite private contractors to make proposals for constructing a low-level nuclear waste facility to serve some 410 federally licensed users of atomic materials in Massachusetts – the bulk of them industries and hospitals.

The actions are, in fact, a response to vigorously stated messages over the past 18 months from the three states in the country that now operate disposal sites for radioactive wastes.

South Carolina, as Gov. Richard Riley put it a year ago, is in no mood to continue being "the nation's garbage dump" for nuclear wastes.

Nevada officials echoed Riley in both words and action, sending away trucks bringing leaking cargoes of nuclear wastes from, among other places, New England.

And Washington state voters, with their otherwise pro-nuclear governor, Dixy Lee Ray, went one step further in November. They passed a referendum which called for closing that state's low-level radioactive waste facility to everything except medical wastes by July 1.

While the Washington measure may be challenged in the courts on grounds that it obstructs interstate commerce, it signaled states producing nuclear waste that they had better prepare their own means of disposing of them.

The special panel's report was careful to never use, in its 27 pages of findings and recommendations, the word "urgent" to describe the need for a low-level waste facility in the state.

Any urgency, Gerald S. Parker, assistant commissioner of public health, said later, "depends on what happens in the other three states," on whether the now abandoned nuclear-waste dump at West Valley, N.Y., can be cleaned up and reopened, and on whether President-elect Ronald Reagan moves to open up federal lands to receive these wastes.

"What we're trying to do," Parker said, "is to prevent, all of a sudden, the governors from the three states with] existing sites from getting together and saying, 'No more.'"

If the message is more political than substantive, it is not going unheard in Washington state, for one.

Lee Gronemeyer, in charge of the transportation and waste management section of the state's Department of Radiological Control, said in a telephone interview that even the issuance of an advisory report could "buy some time" for Massachusetts waste-generators now using the low-level dump in Hanford, Wash.

It would be difficult, should the Hanford site be closed to out-of-state users, for the only other facility in the West, at Beattie, Nev., to pick up the increased burden, he said.

And in South Carolina, Heyward G. Shealy, director of the state bureau of radiological health, said that state's directive to reduce the volume of wastes its Barnwell facility accepts may be more flexible than it appears.

In this context, the traditional Massachusetts watchdogs of environmental and nuclear matters have found themselves hard put to know how seriously to regard the panel's recommendation.

"I don't really know how to take it," said Jeff Bernstein, director of the Legislative Energy Caucus, an organization of some 60 state representatives and senators who have made clear they are skeptical of expansion of nuclear power.

The bulk of low-level radioactive waste in Massachusetts, according to the advisory panel's report, in fact comes from two private companies – New England Nuclear Corp. in Billerica and Boston, a manufacturer of isotopes used in medicine and research, and Texas Instruments, Inc., whose Attleboro plant fabricates uranium for military and power-reactor use.

The state's two power reactors – the Boston Edison Co.'s Pilgrim I plant in Plymouth and the Massachusetts Yankee plant, owned by a consortium of utilities and located in Rowe, contributed less than a third of the state's volume of low-level radioactive wastes during 1978-79, containing but 2 percent of the total radioactivity.

And since then, the two plants, which regularly ship their wastes to South Carolina and Washington state, have further reduced their volume in response to directives by those states.

Yet to oppose out-of-hand the operation of a low-level waste site in Massachusetts "would not be the responsible thing to do," said Gerard Bertrand, president of the 27,000-member Massachusetts Audubon Society.

"Massachusetts can't rely on other states or the federal government to solve its waste disposal problem," said Bertrand. "It is incumbent on this state to try to solve its own problem."

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