Rhode Island State Briefing Book for Low-Level Radioactive Waste Management

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DOE/ID/01570--T52

RHODE ISLAND STATE BRIEFING BOOK ON LOW-LEVEL RADIOACTIVE-WASTE MANAGEMENT

DOE/ID/01570--T52

DE82 015277

July 1981

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Washington, D.C. 20036

Prepared for EG&G Idaho, Inc.
Under Subcontract No. K-7666

ABSTRACT

The Rhode Island State Briefing Book is one of a series of State briefing books on low-level radioactive waste management practices. It has been prepared to assist State and Federal agency officials in planning for safe low-level radioactive waste disposal. The report contains a profile of low-level radioactive waste generators in Rhode Island. The profile is the result of a survey of radioactive material licensees in Rhode Island. The briefing book also contains a comprehensive assessment of low-level radioactive waste management issues and concerns as defined by all major interested parties including industry, government, the media, and interest groups. The assessment was developed through personal communications with representatives of interested parties, and through a review of media sources. Lastly, the briefing book provides demographic and socioeconomic data and a discussion of relevant government agencies and activities, all of which may affect waste management practices in Rhode Island.

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1. INTRODUCTION[1]

The Rhode Island State Briefing Book on Low-Level Radioactive Waste Management is one of a series of State briefing books being prepared to assist State and Federal agency officials in planning for safe low-level radioactive waste disposal. The Rhode Island Briefing Book provides State officials with basic information related to low-level radioactive waste management practices in the State. A comprehensive assessment of management issues and concerns as defined by all major interested parties--including industry, government, the media, and interest groups--and a profile of generators who ship low-level radioactive waste are the primary focuses of the briefing book. The briefing book also includes demographic and socioeconomic data and a discussion of relevant government agencies and their activities as they relate to the processing, handling, and disposal of low-level radioactive waste.

Commercial burial capacity for low-level radioactive waste has significantly declined in recent years. Of six commercial low-level radioactive waste disposal sites that have operated within the United States, only three are currently accepting additional waste, and steps are being taken to limit the volume and types of waste these sites accept. Table 1-1 illustrates this situation. Projections of total national low-level radioactive waste generation and the capacity of existing commercial disposal facilities indicate that if no change in present practices or trends occurs, the current disposal sites will probably be filled by the mid-1990s. However, recent limitations of yearly burial quantities and waste types to be accepted by disposal sites located in the States of South Carolina and Washington will reduce the availability of burial space. South Carolina, which accounted for approximately 80 percent of the waste buried, is limiting the acceptance of waste to 50 percent of the 1979 volume or 2,832 cubic meters monthly by October 1981. The State of Washington has passed legislation, effective July 1981, restricting out-of-State low-level radioactive waste to that which is medically related. (The legislation is being challenged in court.) Therefore, it is quite probable that by the mid-1980s there will be more waste volume generated per year than can be

TABLE 1-1. COMMERCIAL SHALLOW LAND BURIAL SITES[2,3]

Location	Year First Licensed	Site Operator	Licensing Authority	Current Operation
Barnwell, SC	1971	Chem-Nuclear Systems, Inc.	State and NRC	Significantly reduced volume accepted since 1979
Beatty, NV	1962	Nuclear Engineering Company	State	Open
Richland, WA	1965	Nuclear Engineering Company	State and NRC[a]	Only accepting medically related waste from out-of-State after June 1981.
Maxey Flats, KY	1962	Nuclear Engineering Company	State	Closed 1977
Sheffield, IL	1967	Nuclear Engineering Company	NRC	Closed 1978
West Valley, NY	1963	Nuclear Fuel Services	State and NRC	Closed 1975

a. State maintains license for by-product materials and Nuclear Regulatory Commission (NRC) licenses for special nuclear materials. At time of report writing, Nuclear Regulatory Commission license was being contested by the site operator. Negotiations are currently underway to resolve the conflict between the Nuclear Regulatory Commission, the State and the site operator.

buried. Table 1-2 illustrates the amount of low-level radioactive waste buried at each site since 1971.

The use of low-level radioactive material and of processes and equipment that generate low-level radioactive waste have become commonplace in utilities, industry, hospitals, and research institutions. The uses of low-level radioactive material are illustrated in Table 1-3 which highlights the sources of radioactive material and the resulting low-level waste. The U.S. Department of Energy has been given the responsibility for coordinating the development of a national low-level radioactive waste management program, including assessments of specific State and industry situations. These assessments will help form the basis for the Department of Energy's technical and resource assistance to States to help them resolve low-level radioactive waste disposal issues. State briefing books on low-level radioactive waste management practices are also being prepared as part of the process leading to a national low-level waste management plan.

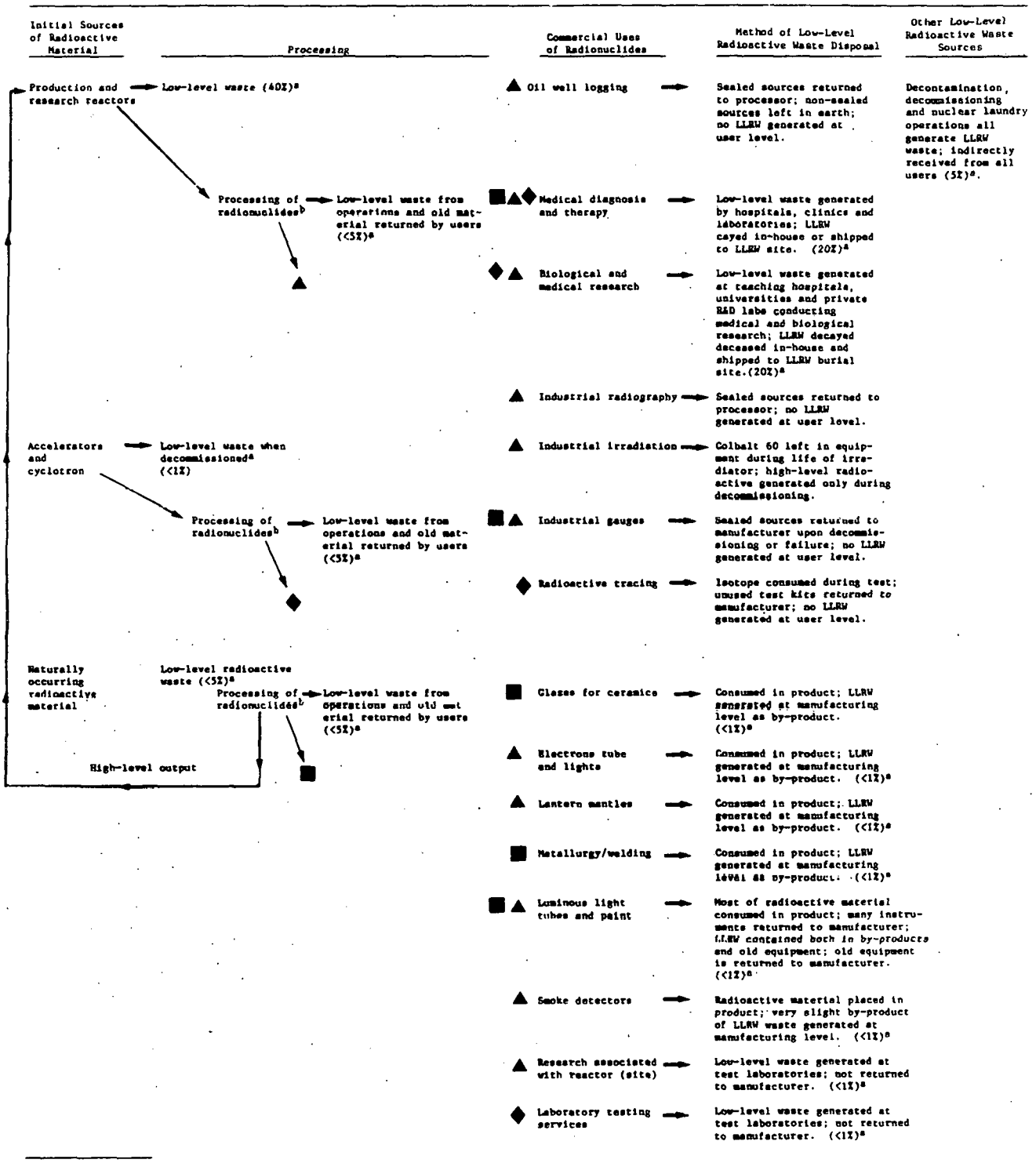
Section 2 of this briefing book reviews both low-level radioactive waste management in Rhode Island and trends potentially affecting low-level radioactive waste management. The demographic characteristics of the State are briefly described in Section 3. An overview of the State's governmental structure, particularly as it pertains to low-level waste management issues, is covered in Section 4. Sections 5 and 6 cover the concerns of national and State interest groups and the media coverage given to low-level radioactive waste issues in the State. The survey methodology and the State profile of shipped low-level waste, developed from responses to a survey of radioactive material licensees, are discussed in Section 7. Appendices to this briefing book include State laws concerning low-level radioactive waste management, some representative media coverage on the issues, a current list of radioactive material licensees in the State, and a glossary of terms.

TABLE 1-2. VOLUME OF WASTE DISPOSED: 1971-1981[4,5,6,7,8]
(cubic meters)

Year	Disposal Site						National Annual Total
	Kentucky	Nevada	South Carolina	Illinois	New York	Washington	
1971	13,171	3,584	1,171	4,430	6,362	584	29,302
1972	15,577	4,301	3,757	5,956	7,054	654	37,299
1973	10,072	4,076	15,839	8,524	7,497	1,033	47,041
1974	8,897	4,103	18,244	12,373	8,574	1,411	53,602
1975	17,109	4,943	18,072	14,116	1,889	1,500	57,629
1976	13,783	3,864	40,227	13,480	--[a]	2,867	74,221
1977	428	4,742	46,563	17,643	--	2,718	72,089
1978	--[a]	8,827	61,566	102	--	7,422	77,917
1979	--	6,491	63,443	--[a]	--	9,980	79,914
1980	--	12,732	54,725	--	--	24,824	92,281
1981 (estimated)	--	6,000	40,040	--	--	10,000	56,040

a. Suspended operations

TABLE 1-3. LOW-LEVEL RADIOACTIVE WASTE: GENERATION AND DISPOSAL[9,10]



a. Estimated volume of total commercial low-level radioactive waste generated at that point.

b. Radium, cobalt 60, uranium and accelerator produced radionuclides are imported directly by manufacturers at the processor level.

▲ Reactor generated material

◆ Accelerator generated isotope

■ Natural occurring radioactive materials (radium)

LLRW - Low-level radioactive waste

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9. Centaur Associates, Inc., An Economic Study of the Radionuclides Industry, prepared for the Nuclear Regulatory Commission under Contract NRC-07-78-431, February 15, 1980, pp. 7-28.

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2. OVERVIEW OF LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT PRACTICES IN RHODE ISLAND

Low-level radioactive waste management has recently become a subject of increasing concern for State and Federal governments, waste generators, and in some cases, the media and interest groups. This section provides an overview of low-level radioactive waste management practices in Rhode Island. It is divided into four parts: (a) background material, including a summary profile of radioactive material licensees in the State, (b) generator activities related to low-level radioactive waste, (c) State activities in low-level radioactive management, and (d) trends in low-level radioactive waste generation.

2.1 Background

Rhode Island generates a moderate amount of low-level radioactive waste, ranking 25th among the States in terms of volume and 41st in terms of radioactivity in 1979.[1] Generation will decline rapidly over the next few years as the decommissioning of the United Nuclear Corporation facility is completed (see below). In addition, the Electric Boat facility at Quonset Point generates low-level waste which is disposed of at a U.S. Department of Energy site.

Currently, the largest single generator of low-level radioactive waste in Rhode Island is the United Nuclear Corporation uranium reclamation plant. This facility began operating in 1966, and at the time was heralded as the first piece of a major center of nuclear fuel production. In 1973, however, the New England Electric Power Company launched an unsuccessful effort to build a commercial nuclear reactor at an abandoned U.S. Naval station in Charlestown. This gave rise to a number of vocal anti-nuclear organizations in the local area. When it was reported in 1980 that U.S. geological surveys conducted in 1976 and 1977 had found the groundwater to be slightly contaminated with radioactivity, this opposition focused on the United Nuclear Corporation.

The closing of the plant was not solely due to this public opposition. Rather, a condition of their license renewal was made that United Nuclear Corporation discontinue use of the wastewater lagoons

from which the groundwater pollution resulted. Alternatives to these lagoons were not economically feasible, so the plant was shut down, and is currently being decommissioned, (i.e., being dismantled and all the radioactive or toxic material removed). The United Nuclear Corporation originally set April 1981 as the date by which this was to be accomplished. In September 1980, however, inspectors at the Beatty, Nevada site turned away six truckloads of ostensibly dry waste from United Nuclear Corporation because several of the shipped drums were leaking. The United Nuclear Corporation was then prohibited from shipping its waste to Nevada until its packing procedures had been improved and reviewed by a Nevada consultant. At the same time Governor Garrahy temporarily denied United Nuclear Corporation permission to ship radioactive waste over Rhode Island highways. This situation was resolved in December 1980. However, the decommissioning will probably go on for a year or more because of the large volume of low-level radioactive waste involved and because of the restrictions imposed by the disposal sites.

Rhode Island is an agreement State in which all radioactive material licenses are administered by the State Radiation Control Agency. There are 56 facilities in the State which hold licenses. A list of these licensees is included in Appendix A. In order to develop a profile of these licensees, a survey was conducted which focused primarily on shippers of low-level radioactive waste to commercial disposal sites (the results of the survey are presented in Section 7). Of the 56 license holders, 36 (64.3 percent) responded. Of the facilities which responded, 10 indicated that they ship waste to commercial disposal sites. Table 2-1 presents a breakdown of licensees by type of facility and response to the questionnaire. Fourteen of the respondents are medical facilities, and 13 are industrial facilities. Educational institutions account for two of the respondents, while governmental institutions account for the remaining seven.

The disposal methods used for low-level radioactive waste are shown in Table 2-2. Since some facilities use more than one disposal method, the columns in the table indicating the number of facilities using each

TABLE 2-1. USE OF COMMERCIAL LOW-LEVEL WASTE DISPOSAL FACILITIES

Type of Facility	No. of Licensees	Respondents		Shippers		
		No.	Percent	No.	Percent of Shippers	Percent of All Respondents
Medical	22	14	63.6	4	40.0	30.8
Educational	3	2	66.7	2	20.0	100.0
Industrial	22	13	59.1	2	20.0	14.3
Governmental	9	7	77.8	2	20.0	28.6
Total	56	36	64.3	10	100.0	27.8

TABLE 2-2. DISPOSAL METHOD USED FOR LOW-LEVEL RADIOACTIVE WASTE

Type of Facility	No. of Respondents	Ship to Commercial Low-Level Waste Disposal Site		Release to Sewer		Combine with Refuse		Vent to Atmosphere		Return to Vendor		No Waste Generated	
		No.	Percent of All Respondents	No.	Percent of All Respondents	No.	Percent of All Respondents	No.	Percent of All Respondents	No.	Percent of All Respondents	No.	Percent of All Respondents
Medical	14	4	28.6	4	28.6	7	50.0	2	14.3	3	21.4	2	14.3
Educational	2	2	100.0	2	100.0	0	0.0	0	0.0	0	0.0	0	0.0
Industrial	13	2	15.4	0	0.0	0	0.0	0	0.0	4	30.8	7	53.8
Governmental	7	2	28.6	2	28.6	0	0.0	0	0.0	2	28.6	3	42.9
Total[a]	36	10	27.8	8	22.2	7	19.4	2	5.5	9	25.0	12	33.3

a. Some facilities receive radioactive materials from more than one source; thus the columns indicating the number of respondents add to a number greater than the total number of respondents.

disposal method do not total to the number of respondents. Twelve of the 36 survey respondents indicated that they generate no waste. Among those that generate waste, shipping to a commercial disposal site is the most commonly used method of disposal (10 respondents) closely followed by "return to vendor" (9 respondents) and releasing the waste to the sewer (8 respondents).

2.2 Generator Activities Related to Low-Level Radioactive Waste Management

The major issue now facing low-level radioactive waste generators in Rhode Island is the availability of safe and economical waste disposal methods. As discussed in Section 1, the three operating disposal sites are restricting the amount and type of low-level radioactive waste they will accept. As the process to find a permanent solution to waste disposal gets underway, low-level radioactive waste generators in Rhode Island are undertaking a number of management activities. These activities relate first to their own facilities and second to the broader issues of low-level radioactive waste management.

2.2.1 In-house Activities

Due to the rapidly increasing cost of low-level radioactive waste disposal, and the occasional absence of disposal capacity, Rhode Island waste generators are examining their procedures to identify ways both to produce less waste and to reduce the volume of waste already generated. Minimization of waste generated is taking place via careful planning of radioactive material use and via more rigorous waste-sorting procedures to ensure that only radioactive waste is treated as such. Volume reduction is also being achieved by use of compaction and/or incineration.

Brown University, for example, has initiated a comprehensive volume reduction program. This includes improved sorting procedures, so that radioactive wastes are effectively segregated from other wastes and so that waste which can be allowed to decay to background levels and then disposed with common refuse is not shipped. This, it is estimated, will reduce the volume of shipped waste by 15 percent. Also, they plan to incinerate some of their low-level waste, which will reduce their total

shipped waste volume by another 35 percent. Because of the potential for community opposition to incineration, they have held public meetings and kept community leaders informed about their plans. To date, this approach has been successful.(2)

A number of other generators who ship low-level radioactive waste are considering incineration, although at least one expressed the opinion that in their case it was infeasible because of the local opposition it would generate. Several generators are either planning or investigating increasing their interim or long-term storage. Some facilities, partially in reaction to the 1979 closure of the three commercial disposal sites, have planned or implemented as much as several years worth of storage capacity. For certain facilities, however, continued shipping appears to pose the least risk of public opposition.

2.2.2 Concerns of the Generator Community

Rhode Island generators contacted during this study evinced concern over the following issues:

- a long-term solution to low-level radioactive waste disposal (a regional or State facility);
- when the State Radiation Control Agency would follow the Nuclear Regulatory Commission and "deregulate" tritium and carbon-14;
- public perceptions of low-level waste, and confusion of low-level with high-level and other hazardous waste (especially in light of the United Nuclear Corporation facility's problems and public concern about improper management of hazardous waste; and
- classification of waste by level of radioactivity and source (separating institutional and industrial waste from power plant waste, and further differentiating between, for example, spent resins and contaminated trash).

As a general rule, low-level radioactive waste ranks a distant second to hazardous waste as a public concern in Rhode Island, so that public perceptions are not now a major issue. However, the continuing adverse publicity that the United Nuclear Corporation facility is receiving was cited by some generators as a factor that might change this. The actual availability of disposal capacity is now the most significant concern of low-level radioactive waste generators.

2.3 State Activities Related to Low-Level Radioactive Waste Management

The single most important development in Rhode Island State activities vis-a-vis low-level radioactive waste management has been the State's assumption of agreement State status. As described below, this gives the State authority over by-product, source material and small quanitites of special nuclear material. Other State activities included the State's involvement in the United Nuclear Corporation facility decommissioning (see Section 4.3) and in discussions on a New England regional site.

Representatives of the State attended a conference in March 1981 sponsored by the Joint Legislative Committee on Radioactive Waste Management Policy of the State of New Hampshire. Other States represented at the conference were Connecticut, Maine, Massachusetts, New Hampshire, Pennsylvania, and Vermont. (Although invited, representatives from New Jersey and New York did not attend.) The conference included a presentation of a report to the Governor of Massachusetts prepared by the Massachusetts Advisory Council on Radiation Protection. This report recommends that "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."(3) The report goes on to make more specific recommendations about the development of a low-level radioactive waste management program and includes several appendices which discuss related issues, for example, siting considerations.

The conference also included a roundtable discussion. The consensus of that discussion was "to encourage Massachusetts:

1. to implement its policy of developing a low-level radioactive waste disposal facility.

2. to accept similar waste from other States in the northeast region on a mutually acceptable basis.

3. to work with these same States to develop a plan for the regional disposal of low-level radioactive waste.

4. to consider the use of interstate compacts to provide long term stability to the management process."(4)

Follow up to the March meeting is expected to include further regional meetings.

2.4 Population and Economic Trends Potentially Affecting Low-Level Radioactive Waste Generation and Management

The current uses of radioactive material are extensive. Radioactive material is used directly in products and indirectly in the manufacturing process in virtually every sector of the national economy. The main generators of radioactive waste are nuclear medicine, biomedical research, and commercial power reactors. Combined, these three sectors generate an estimated 90 percent of the nation's commercially buried waste.(5) Preliminary estimates for the State of Rhode Island indicate that all shipped waste results from medical applications, research and fuel reprocessing.(6) A brief summary of the effect of the United Nuclear Corporation facility decommissioning on Rhode Island's low-level radioactive waste generation was presented above. Analysis of trends will primarily focus on the former two types of waste generators.

2.4.1 Medical Waste

The volume of medical waste, consisting primarily of scintillation liquids and solid laboratory trash, has greatly increased during the past ten years. Several factors come into play when projecting trends

in future waste volumes from medical procedures. These factors are: population size and age profile, number of tests per patient, and the volume of waste per test.

Radiopharmaceuticals are utilized in the diagnosis of a wide range of medical disorders. General demand for nuclear medical procedures is closely correlated with general demand for medical services, which, in turn, is highly affected by population size and age profile. Future demand for medical services, including nuclear diagnosis and therapy, is a function of population size. Population growth projections for the State of Rhode Island indicate a growth of 0.34 percent annually from 1980 to 1990, well below the national average of 0.9 percent. This will result in an increase of 284,916 persons by 1990 (see Section 3.4), which can be expected to translate directly into a very slight increase in demand for nuclear medical services.

In addition, Rhode Island's population, like that of the rest of the nation, is taking on a more mature age profile. A resulting increase in demand for nuclear medical procedures can be anticipated over the next two decades. Rhode Island currently has a population slightly older than the national average.

Nationally, the per capita number of applications of nuclear medicine has greatly increased during the past decade, due to new and improved applications, particularly diagnostic applications of radioisotopes. Nuclear medicine developments in <u>in vivo</u> diagnostic techniques have been dominated by the increased use of Technetium-99 and of scintillation cameras, among radiopharmaceuticals and equipment respectively. The development and growth of radioimmunoassay and the equipment used with it are the most outstanding trends for <u>in vitro</u> diagnosis. Developments in therapeutic applications have been relatively minor.(7)

The value of sales of medical procedures including both diagnosis and therapy applications increased from $920 to $2,440 million between 1967 and 1978.(8) Capital expenditures by medical operations for radiopharmaceutical equipment increased from $60 million to $160 million between 1967 and 1978.(9) Most of this growth resulted from increased use of diagnostic radiopharmaceuticals rather than therapy applications.

Sales of radiopharmaceuticals increased from $9.8 million to $111.5 million between 1967 and 1976.[10] The number of in vivo diagnostic procedures increased from 1.2 million to 7.6 million annually.[11]

The last relevant trend is the decrease in the level of waste shipped per test. Two main factors have contributed to reducing the volume of waste shipped to burial sites per application of nuclear medicine. First, there has been a shift toward using isotopes with shorter half-lives. This is due to the development of new isotopes and more sensitive laboratory equipment which facilitate temporary in-house storage of waste and its eventual disposal with non-radioactive waste. Second, there has been an increase in the use of volume reduction techniques. These techniques take the form of both improved procedures, e.g., a more aggressive waste-sorting policy, and technological innovations, e.g., mini scintillation vials. Volume reduction techniques are a response to rising disposal costs, increased difficulty in disposing of waste, and the problems created by waste disposal. It should be noted that most hospitals currently decay waste in-house and dispose of it with common refuse.

2.4.2 Reactor Generated Waste

There is currently one small research reactor operating in Rhode Island. This reactor is operated at the Rhode Island Nuclear Science Center by Rhode Island Atomic Energy Commission and the University of Rhode Island. This facility generates minimal volumes of waste annually (approximately 50 cubic feet) and no changes in the volume of waste generated or shipped are anticipated.

The United Nuclear Corporation uranium reprocessing center closed in 1979 and is undergoing decommissioning, as described above. This will reduce the volume of waste shipped on a regular basis from the State. However, the decommissioning of the facility over the next several years will generate on a one time basis an extremely large volume of waste. Incineration and solidification of waste will reduce this volume. However an estimated 2,000 cubic meters still require shipment to a burial site.

2.4.3 Research

Radioactive materials are used extensively for research at several university and hospital laboratories in Rhode Island. Research-related waste in Rhode Island consists primarily of scintillation liquids, laboratory trash, and contaminated animal carcasses. Much of this waste has recently been deregulated by the Nuclear Regulatory Commission.

Nationally, the use of radioisotopes has increased greatly during the past decade and continued growth is expected. The number of individuals directly associated with research using radioisotopes increased from 44,547 to 68,262 between 1969 and 1979 or by over 5 percent annually.(12) Approximately 85 percent of this activity was related to biomedical research.

In Rhode Island, the increase in the use of radioisotopes reflects the national trend. This increase is due to both increased use of traditional isotopes and new uses of previously unutilized isotopes. There is every indication that this trend will continue and the associated low-level waste generated can be expected to increase.

The volume of waste generated by the increased use of radioisotopes for research is expected to be more than offset by volume reduction techniques. The major waste generators are aware of waste disposal problems and are implementing volume reduction procedures including better sorting of radioactive waste, dehydration in a kiln and compaction.

Additional industrial applications of radioactive material in Rhode Island include industrial control measurement devices, measurement gauges, and industrial radiography. However, these applications generate extremely small volumes of radioactive waste; no major changes in their level of use are anticipated.

In summary, the uses of radioactive material in Rhode Island are expected to increase during the next ten years and the volume of waste generated at the user level is expected to increase proportionally. However, the net volume of waste shipped to burial sites will be greatly reduced by the extensive application of volume reduction techniques. Table 2-3 summarizes the anticipated changes in the use of

TABLE 2-3. TRENDS IN WASTE GENERATION AND DISPOSAL FOR RHODE ISLAND

Generators of Low-Level Radioactive Waste	Material Use	Waste Management	Waste Shipped
Medical Diagnosis and Therapy	Slight increase due to population increase, older age profile and new applications	Reductions in volume of Low-Level waste shipped per test	Decrease in volume shipped
Nuclear Reactors	Only one small research reactor--no new reactors planned	No major changes	No change
Research	Increase in bio-medical applications at universities	Major volume reduction planned, including incineration and dehydration	Decrease in volume shipped
Industrial	No major changes	No major changes	No change
Reprocessing Facilities	Decommissioning taking place	Volume reduction being utilized on liquids	Large increase on a one time basis in early 1980s

radioactive material, the trends in the volume of waste shipped relative to the level of waste generated, and the net level of waste shipped. It must be kept in mind that the waste from the United Nuclear Corporation reprocessing facility decommissioning dwarfs the volume of all other waste.

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4. (See Reference 3.)

5. (See Reference 1, pp. 1-2.)

6. (See Reference 1, pp. 81-82.)

7. Arthur Young and Company, Determination of the Economic Parameters of the Radionuclide and Radionuclide Devices Industry with Special Reference to the Nuclear Medical Market, prepared for the Nuclear Regulatory Commission under Contract NRC-12-77-193, June 2, 1978, pp. 1-3.

8. Centaur Associates, Inc., An Economic Study of the Radionuclides Industry, prepared for the Nuclear Regulatory Commission under Contract NRC-07-78-431, February 15, 1980, p. 127.

9. (See Reference 8.)

10. (See Reference 7, Table IV-1.)

11. (See Reference 7, Table H-1.)

12. (See Reference 8.)

3. DEMOGRAPHY

This section describes Rhode Island in terms of its population, economy, agriculture, schools, hospitals, and Federal laboratories. It also provides background information on land use and some of the State's natural features. Supporting documentation is provided in Appendix B.

3.1 Location

Rhode Island, the smallest of the 50 States, is located in New England. It is bordered by Massachusetts on the north and east, by the Atlantic Ocean on the south, and by Connecticut on the west. It extends for 50 miles from north to south and has an average width of about 30 miles. The total area of the State is 1,497 square miles, including Block Island, which is 10 miles offshore, and Narragansett Bay, which makes up approximately 25 percent of the State. As shown in Figure 3-1, the State is divided into five counties which range in size from 25 to 416 square miles.

3.2 Topography[1]

There are three topographical sections in Rhode Island as Figure 3-2 illustrates. A narrow coastal plain with an elevation of less than 100 feet above sea level lies along the Atlantic shore and Narragansett Bay. A second section containing gently rolling hills of up to 200 feet elevation lies to the north and east of the coastal plain. The remainder of Rhode Island comprises the third section. It is characterized by hilly forested uplands with elevations of 200 to 600 feet above sea level. The highest point in the State, 812 feet above sea level, lies in this section.

A prominent feature of the topography of Rhode Island is Narragansett Bay, which cuts inland from the Atlantic Ocean for approximately 30 miles and contains several islands with beautiful cliffs and beaches. It has a very irregular shoreline, with many sheltered lagoons and coves. The Blackstone River, Rhode Island's principal river, empties into the northern end of Narragansett Bay. Other small rivers empty into Narragansett Bay or into Long Island Sound.

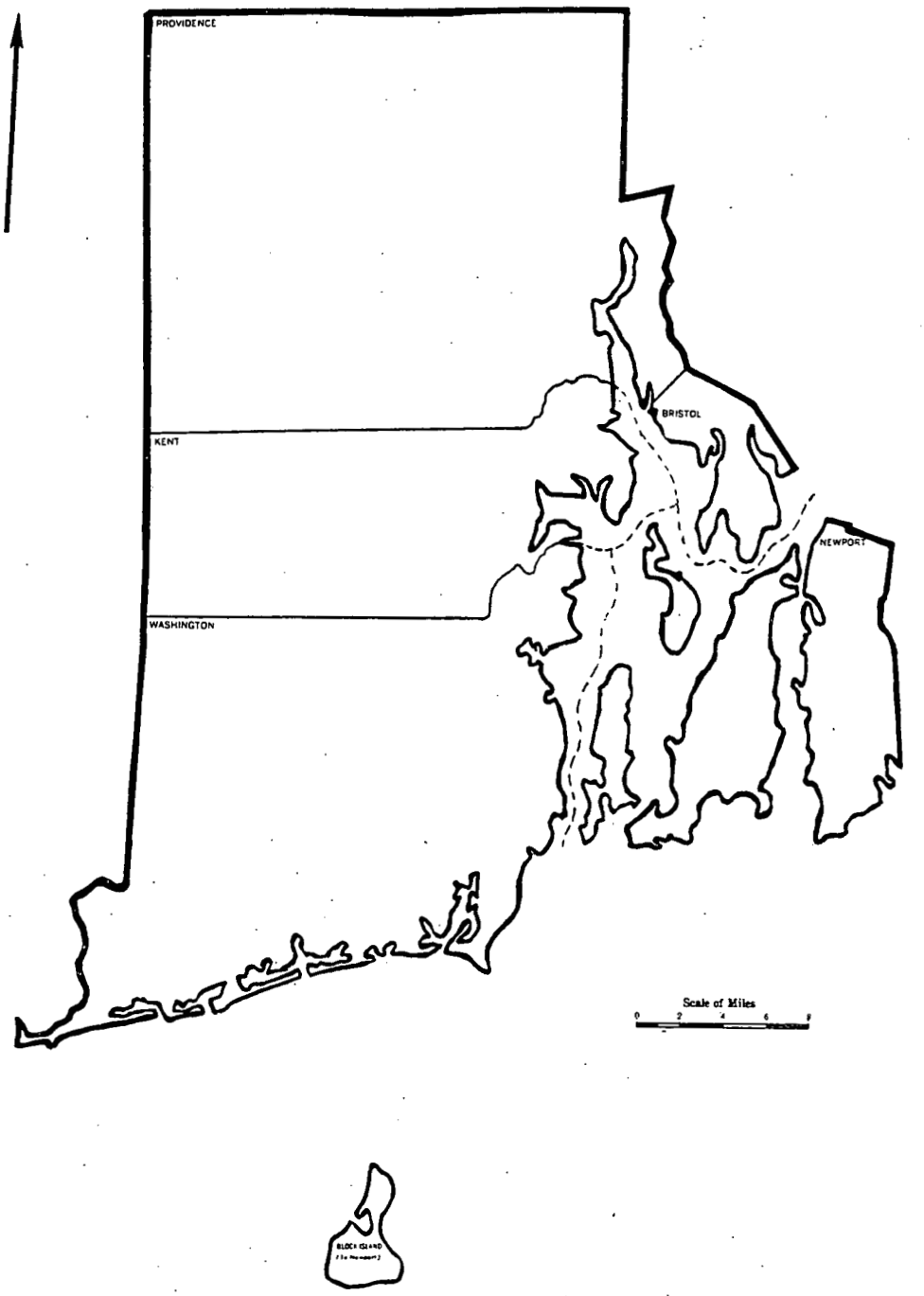

FIGURE 3-1. COUNTIES OF THE STATE OF RHODE ISLAND

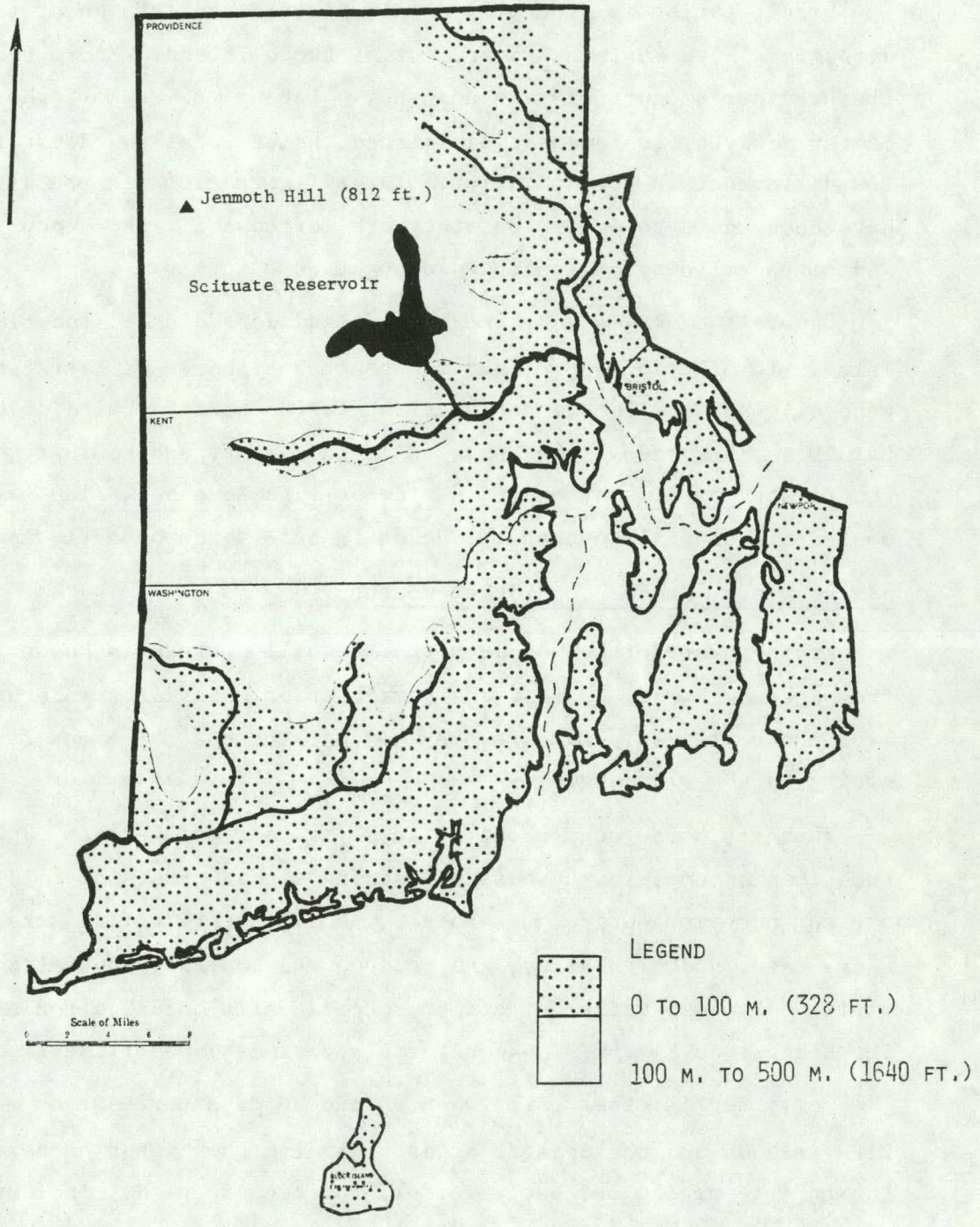

FIGURE 3-2. MAJOR TOPOGRAPHICAL FEATURES: RHODE ISLAND[35]

3.3 Climate[2]

3.3.1 Precipitation

Precipitation is generally evenly distributed throughout the year, averaging 42 to 46 inches over most of Rhode Island. Storm fronts bring the heaviest amounts of rain and snow. During the summer, when storm center activity is somewhat diminished, brief local thunderstorms supply the difference in precipitation. Large fluctuations in precipitation have been known to occur, but they are infrequent. As a result, neither widespread floods nor prolonged droughts are common.

Snowfall averages vary in Rhode Island depending on location. Block Island, 10 miles offshore, and the southeast shores of Narragansett Bay generally have 20 inches per year, while the western third of the State has 40 to 55 inches. Most snow falls in January and February, although the first snowfall may occur in mid- or late November. The last measurable snowfall generally occurs in late March or early April.

3.3.2 Winds, Storms, and Other Weather

From December through March the prevailing winds in Rhode Island are from the northwest. During the remainder of the year, winds are usually from the southwest. Onshore breezes cool the coastal areas from late spring to the mid-autumn.

Thunderstorms occur about 20 days per year on average. They are sometimes accompanied by hail and strong winds. Freezing rain storms are not uncommon during the winter. "Northeasters" bring strong winds, heavy rain, and high tides, and produce the heaviest snowfalls in the winter. Floods, while not common, occasionally occur, especially along the Blackstone River. Thunderstorms sometimes cause flash flooding.

Heavy fog is observed between 25 and 50 days per year on average, with islands and the coastal areas recording the higher number of days. During late spring and early summer, fog occurs one day in four on Block Island. Tornadoes are rare in Rhode Island. Only one was recorded in the period 1956-1975.

3.4 Population[3,4,5,]

Rhode Island, the 39th most populous State in the nation, had a population of 945,835 in 1980. In 1970, 87.1 percent of Rhode Island's population lived in urban areas as compared to 86.4 percent in 1960. (A breakdown of population by urban and rural areas for 1980 was not available at the time this report was prepared.)

As Figure 3-3 indicates, Rhode Island's population is heavily concentrated in Providence County in the northern part of the State. The county had a 1980 population of 570,358 or 60.3 percent of the total State population. Kent County, adjacent to Providence County, is the second most populous county in the State with a 1980 population of 153,957 or 16.3 percent of total State population. Rhode Island is the most densely populated State with an average of 902 persons per square mile.

Rhode Island's population increased from 859,488 to 945,835 or 10 percent between 1960 to 1980, considerably below the national increase of 23.6 percent. During the years 1960 to 1970, Rhode Island's population increased from 859,488 to 949,723 or 10.5 percent. During the same period the national population increased by 13.4 percent. Between 1970 and 1980, Rhode Island experienced a slight decline in population. The population declined from 949,723 to 945,835 or 0.4 percent. During the same period, the national population increased 9.0 percent.[6] During the period 1970 to 1980, Rhode Island experienced a -5.2 percent net migration[7] which was responsible for the decline in population. There were 139,439 births[8,9,10,] and 100,253 deaths[11,12,13] for a net increase of 39,226 between 1970 and 1980. The average birth rate for the period was 14.3 per 1,000[14] and the average mortality rate was 9.7 per 1,000[15]. Between 1970 and 1979 the birth rate declined from 16.5 to 13.2 per thousand.[16] The mortality rate declined from 10.0 per thousand in 1970 to 9.6 per thousand in 1976 before rising to 10.1 per thousand in 1980.[17]

As illustrated by Figure 3-4, only three of Rhode Island's five counties experienced growth in their populations during the period 1970

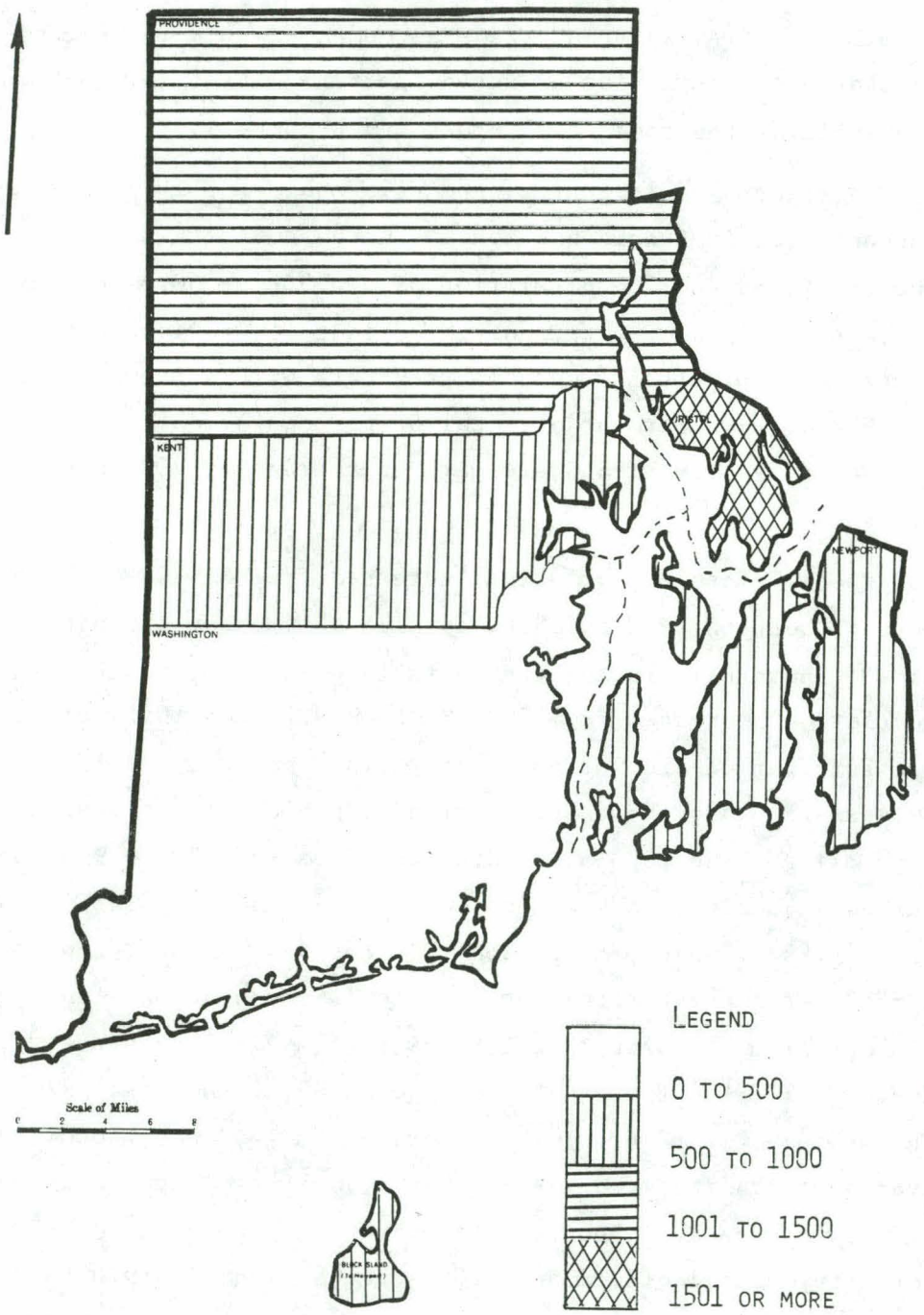

FIGURE 3-3. POPULATION DENSITY BY COUNTY: RHODE ISLAND (1980)[36]

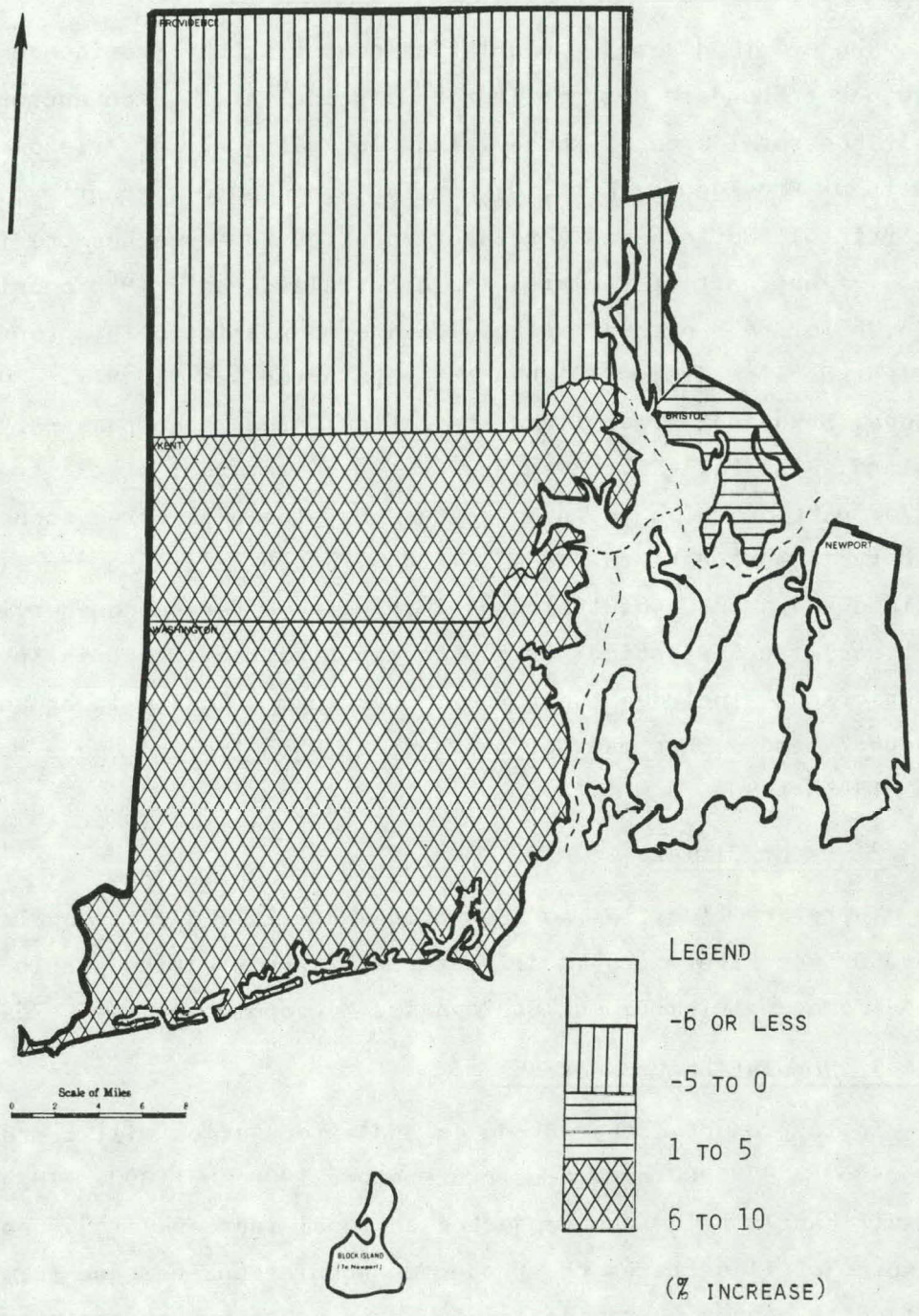

FIGURE 3-4. POPULATION INCREASE BY COUNTY: RHODE ISLAND (1970-1980)(37)

to 1980. Historical and projected population by county are shown in Table 3-1.

3.4.1 Standard Metropolitan Statistical Areas[18]

Rhode Island's major population center is the Providence-Warwick-Pawtucket Standard Metropolitan Statistical Area which encompasses over half the total area of Rhode Island including all of Bristol County, parts of Providence, Kent, Washington, and Newport counties, and parts of Bristol, Norfolk and Worcester counties in Massachusetts (see Figure 3-5). That part of the area in Rhode Island had a 1980 population of 816,065 or 86.3 percent of total State population. This represents a slight decline from 1970 when the population was 816,917. Two additional Standard Metropolitan Statistical Areas encompass parts of Rhode Island. The Fall River Standard Metropolitan Statistical Area, the major part of which is in Massachusetts, includes three towns in Newport County in southeastern Rhode Island. That part of the area in Rhode Island had a 1980 population of 30,826. The New London-Norwich Standard Metropolitan Statistical Area, the major part of which is in Connecticut, includes two towns in Washington County in southwestern Rhode Island. That part of the area in Rhode Island had a population of 24,915 in 1980.

3.4.2 Major Cities

There are 11 cities and towns in Rhode Island with populations over 25,000 (see Figure 3-5). All but one of these cities are located in the Providence-Warwick-Pawtucket Standard Metropolitan Statistical Area.

3.4.3 Population Projections[19]

It is projected that Rhode Island's population will increase from 945,835 to 978,000 or 3.4 percent betwen 1980 and 1990. This is significantly below the projected national increase of 9.6 percent. Figure 3-6 illustrates the projected population increase for Rhode Island by county. Providence County is projected to again experience a loss of population. The county's population is projected to decline from 570,358 to 554,700 or 3 percent. All other counties are projected

TABLE 3-1. HISTORICAL AND PROJECTED POPULATION FOR COUNTIES IN THE STATE OF RHODE ISLAND (1960-1990)[44]

County	Population			
	1960	1970	1980	1990
Bristol	37,146	45,937	46,966	49,400
Kent	112,619	142,382	153,957	167,800
Newport	81,891	94,228	81,371	95,600
Providence	568,778	581,470	570,358	554,700
Washington	59,054	85,706	93,183	110,500
State Total	859,488	949,723	945,835	978,000

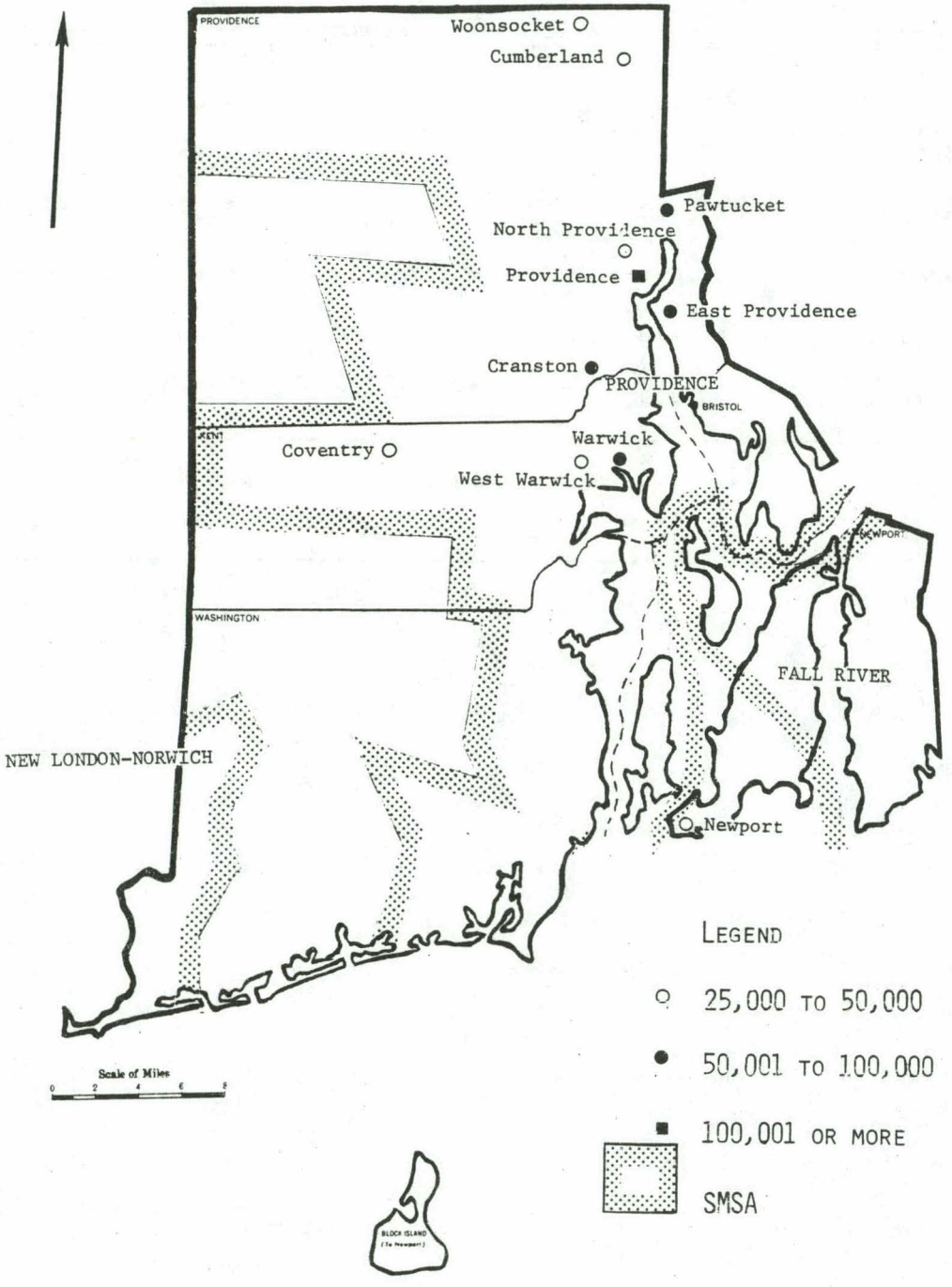

FIGURE 3-5. STANDARD METROPOLITAN STATISTICAL AREAS AND CITIES AND TOWNS OF OVER 25,000: RHODE ISLAND (1980)[38]

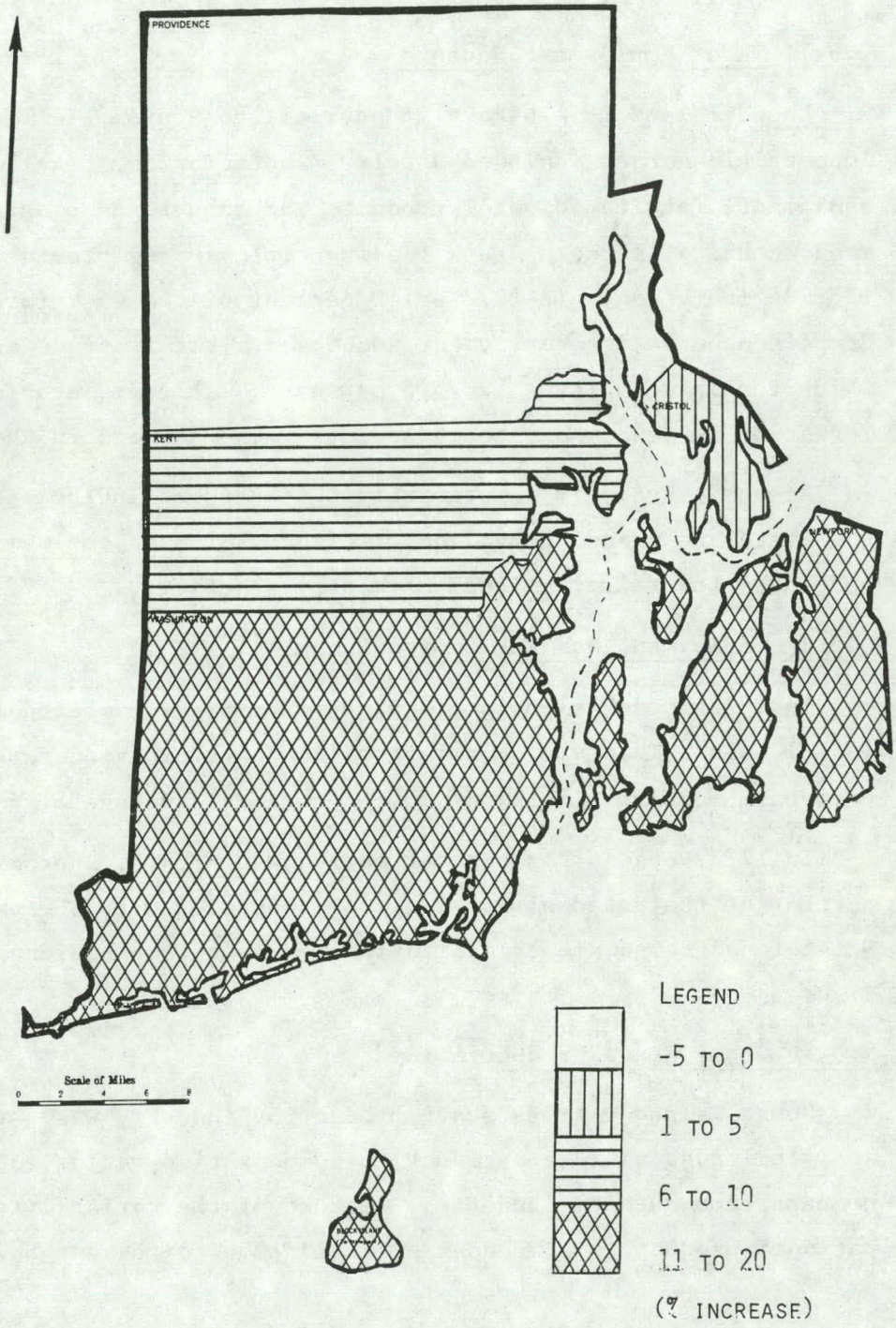

FIGURE 3-6. PROJECTED POPULATION INCREASE BY COUNTY: RHODE ISLAND (1980-1990)[39]

to experience larger increases in population between 1980 and 1990 than they experienced between 1970 and 1980 (see Table 3-1).

3.5 Economy[20]

3.5.1 Major Employment Sectors

Rhode Island is a highly industrialized State. In 1977 major industrial sectors included jewelry manufacturing, textiles, electronic equipment, fabricated metal products and rubber and plastic items. Manufacturing is the State's leading employer and provided jobs for 125,725 individuals in 1977 or 40 percent of the work force. The State's other major employment sectors are retail trade and services which combined employed 120,576 persons. Table 3-2 provides an inventory by county of the major employment sectors in Rhode Island.

Economic activity is primarily concentrated in the eastern part of the State and around Providence. Figure 3-7 maps employment by county and shows the relative level of economic activity.

3.5.2 Employment and Per Capita Income[21]

In 1978 Rhode Island's civilian labor force numbered 433,000 individuals. This yields a labor force participation rate of 61.9 percent which is slightly below the national average of 63.2 percent.

In 1977 personal income per capita was $7,526, approximately 94 percent of the national average. All counties with the exception of Bristol had personal per capita incomes below the national average (see Figure 3-8).

3.5.3 Gross State Product[22,23]

Rhode Island's gross state product by industry was estimated by applying gross national product to compensation ratios to state compensation data by industry. Because of the variability of the national product to compensation ratio among different business sectors

TABLE 3-2. MAJOR EMPLOYMENT SECTORS IN RHODE ISLAND BY COUNTY[45]

Counties	Major Economic Sector
Bristol	Manufacturing: Leather Products, Rubber and Plastic Footware; Retail Trade.
Kent	Manufacturing: Miscellaneous; Retail Trade; Services.
Newport	Manufacturing: Electronic Equipment; Services.
Providence	Manufacturing: Miscellaneous; Retail Trade; Health Services.
Washington	Manufacturing: Textile Products, Electrical Machinery; Retail Trade; Services.

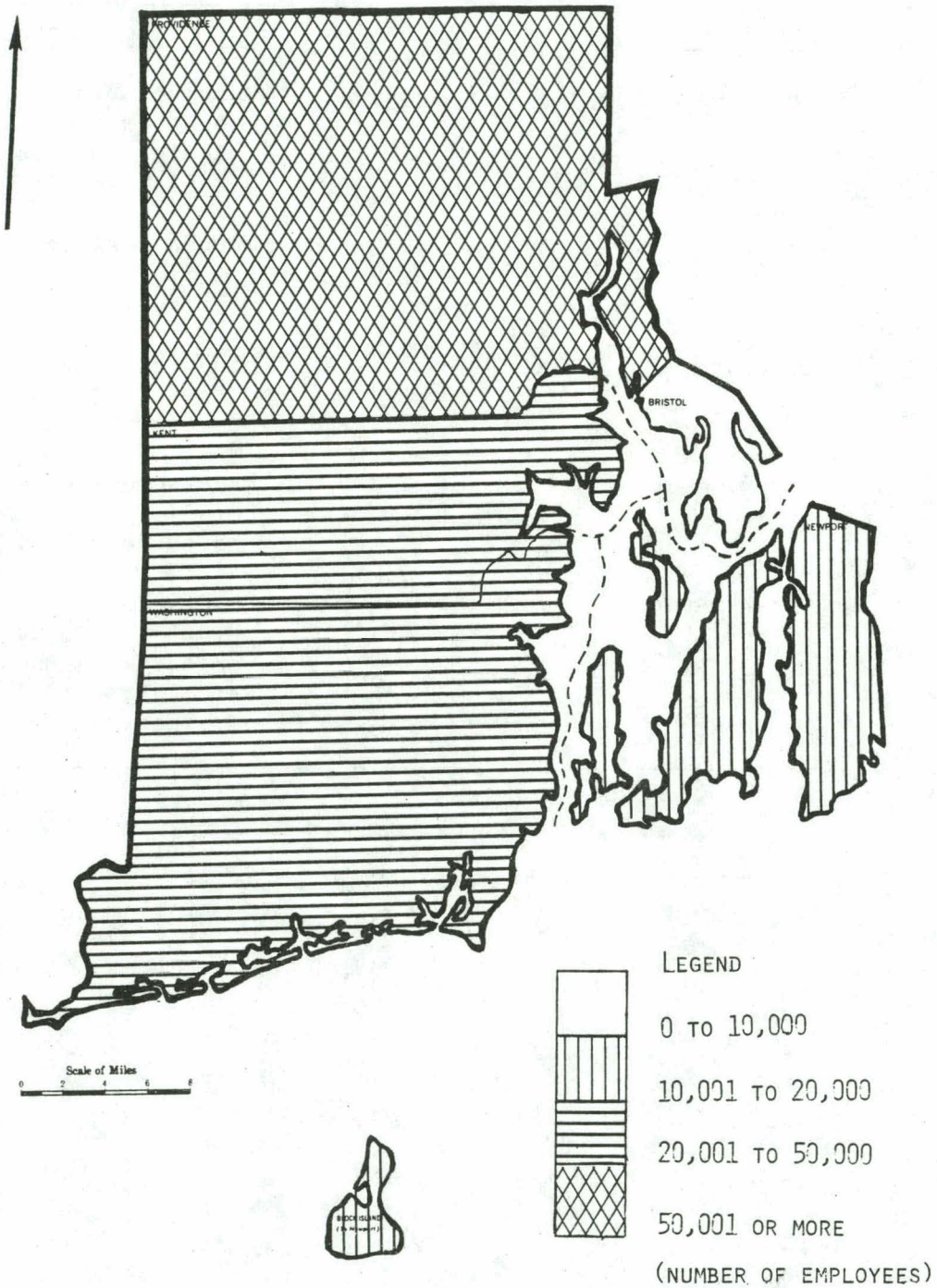

FIGURE 3-7. EMPLOYMENT BY COUNTY: RHODE ISLAND (1977)[40]

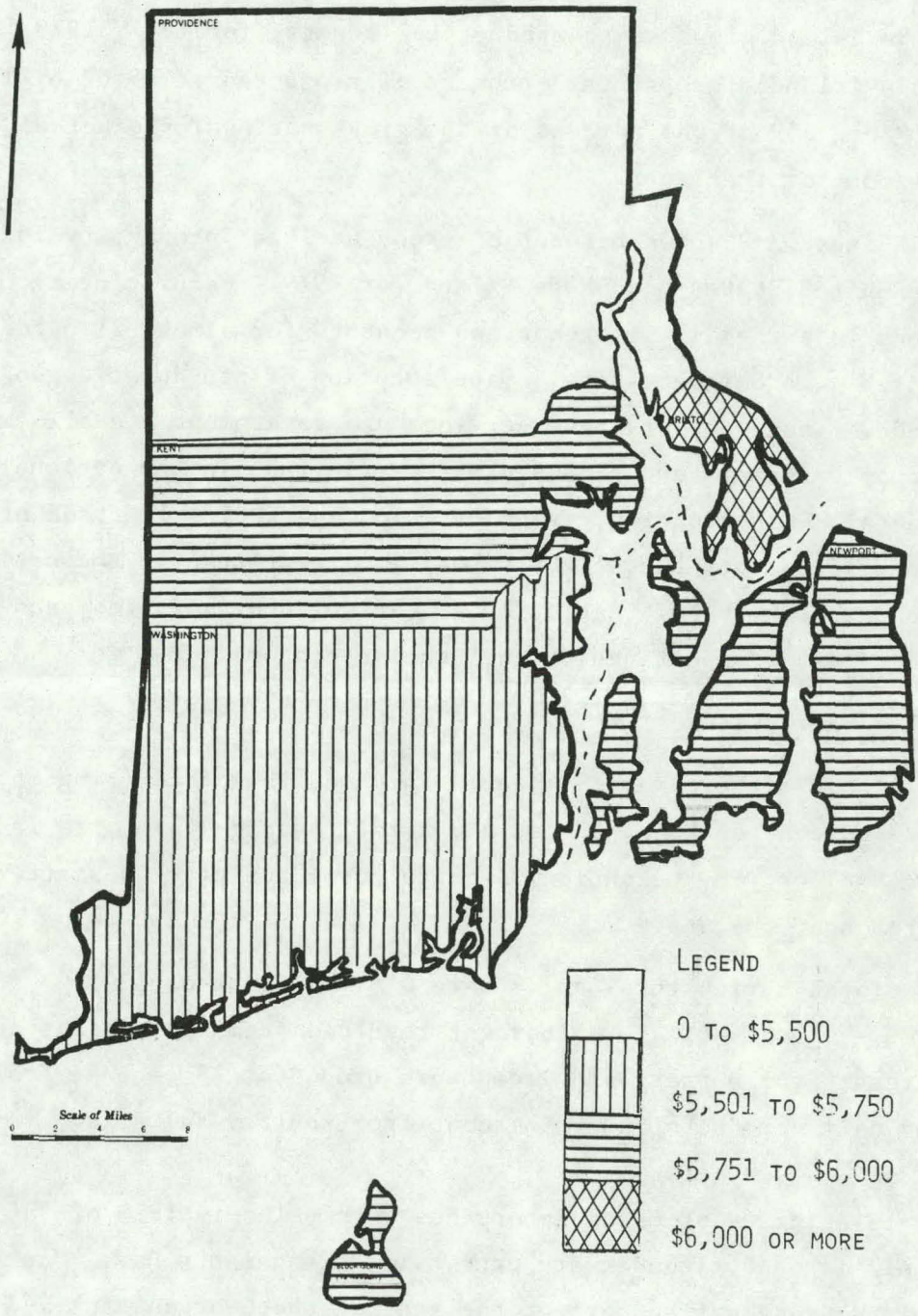

FIGURE 3-8. PER CAPITA INCOME BY COUNTY: RHODE ISLAND (1977)[41]

and from one year to the next, projections were made by industry and for the years 1977, 1978, and 1979.

Table 3-3 presents both employee compensation and the estimated Rhode Island gross state product by industry for 1977, 1978, and 1979. Rhode Island's gross state product is projected at $8.67 billion for 1979 or .359 of one percent of the gross national product of $2,413.9 billion for that year.

Figure 3-9 shows percent of gross national product by industry for the United States and Rhode Island for 1979. Manufacturing of durable goods is extremely important and accounts for almost 21 percent of the States' economic activity. Manufacturing of non-durable goods, retail trade, financial services, services and government are all important economic sectors and play a greater role than in the national economy in general. Construction, transportation and wholesale trade are major economic sectors but slightly less prominent than in the national economy as a whole. Agriculture, agricultural services, and mining are all of minor importance to the State's economy.

3.5.4 Agriculture[24,25]

In 1978 there were 865 farms in Rhode Island covering 75,791 acres or 9 percent of total State land area. Average farm size is 88 acres, the smallest in the nation. Agricultural activity is scattered throughout the State.

Total agricultural sales were $26.4 million or $30,523 per farm in 1978. Of this total, 25 percent resulted from the sale of crops, 35 percent from nursery and greenhouse products, 28 percent from livestock and dairy products and 12 percent from poultry and eggs.

Fishing is of major importance with sales in 1979 of $36 million. Shellfish and flounder are caught in Narragansett Bay. Many Rhode Island vessels fish part of the year on the Georges Bank and land fish in other New England states. There are approximately 160 vessels over 5 tons and an equal number of smaller boats.[26]

TABLE 3-3. EMPLOYEE COMPENSATION AND ESTIMATED GROSS STATE PRODUCT BY INDUSTRY FOR RHODE ISLAND[46]
(Millions of Dollars)

Industry	1977		1978		1979	
	Compensation	GSP	Compensation	GSP	Compensation	GSP
Farms	7	16	9	17	9	19
Agricultural Services	22	29	25	34	27	36
Mining	3	7	4	9	4	11
Construction	204	256	234	365	262	326
Non-Durable Goods	471	793	519	858	562	918
Durable Goods	1,053	1,484	1,183	1,676	1,302	1,798
Transportation and Public Utilities	217	417	235	450	262	483
Wholesale Trade	253	441	284	472	315	540
Retail Trade	454	736	502	737	555	836
Finance, Insurance and Real Estate	249	1,042	284	1,144	319	1,294
Services	833	1,001	949	1,128	1,080	1,287
Government and Government Enterprises	835	985	863	1,020	951	1,125
Total	4,601	7,207	5,091	7,910	5,648	8,673

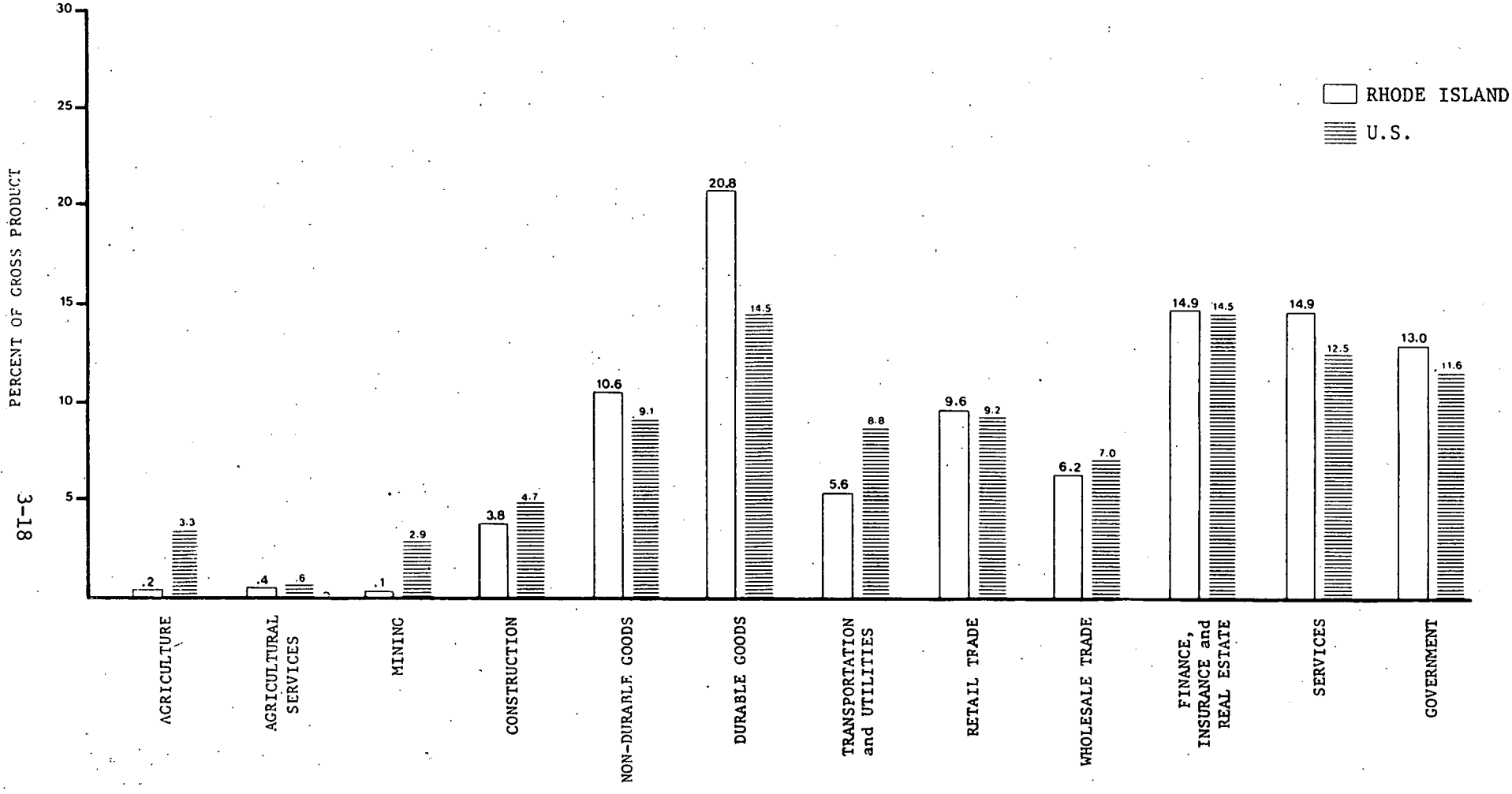

FIGURE 3-9. PERCENT OF GROSS PRODUCT BY INDUSTRY FOR 1979: UNITED STATES AND RHODE ISLAND[42]

3.6 Schools, Hospitals and Federal Laboratories

Rhode Island's schools, hospitals, and Federal laboratories are potential low-level radioactive waste generators. This section identifies the number of radioactive material licensees among these institutions and provides background information.

3.6.1 Schools

Two universities, the University of Rhode Island in Kingston and Brown University in Providence, have licenses to use radioactive material.

In the fall of 1980, there were 178,139 students enrolled in public and private elementary and secondary schools in Rhode Island[27,28] (see Table B-1 in Appendix B for enrollment by county). In addition, there were 65,610 students enrolled in public and private schools of higher education[29] (see Table B-1 for enrollment by county), for a total of 243,749 students of all types enrolled throughout the State.

3.6.2 Hospitals[30]

Fourteen of the twenty-two hospitals have licenses to use radioactive material. Nine are located in Providence County, two each in Newport and Washington counties, and one in Kent County. The 22 provide a variety of health care services in Rhode Island (see Table B-2 in Appendix B for the number of beds by county).

3.6.3 Federal Laboratories

Of the seven Federal laboratories, only the Environmental Protection Agency's Environmental Research Laboratory in Narragansett has a license to use radioactive material.[31] None of the Federal laboratories are under the aegis of the Department of Energy. The Department of Commerce and the Environmental Protection Agency each direct two facilities, while the Veterans Administration and the Department of Health and Human Services operate research facilities in the State. Table B-3 in Appendix B provides details on these laboratories.

3.7 Land Use[32,33]

About two-thirds of Rhode Island is included in one of four Standard Metropolitan Statistical Areas as shown in Figure 3-10. Although it is the smallest of the fifty states in land area, Rhode Island is 39th in population, with a population density of 902 people per square mile. One major urban community, Newport, with a population of 29,266, lies outside a Standard Metropolitan Statistical Area (see Section 3.4 for a discussion of Rhode Island's population).

Forests cover about two-thirds of the State, but are not used commercially. Agriculture is of minor importance, covering about nine percent of the land area.[34]

Twenty-one State parks form the Rhode Island park system. There are also six wildlife sanctuaries and preserves and several management areas which restrict development.

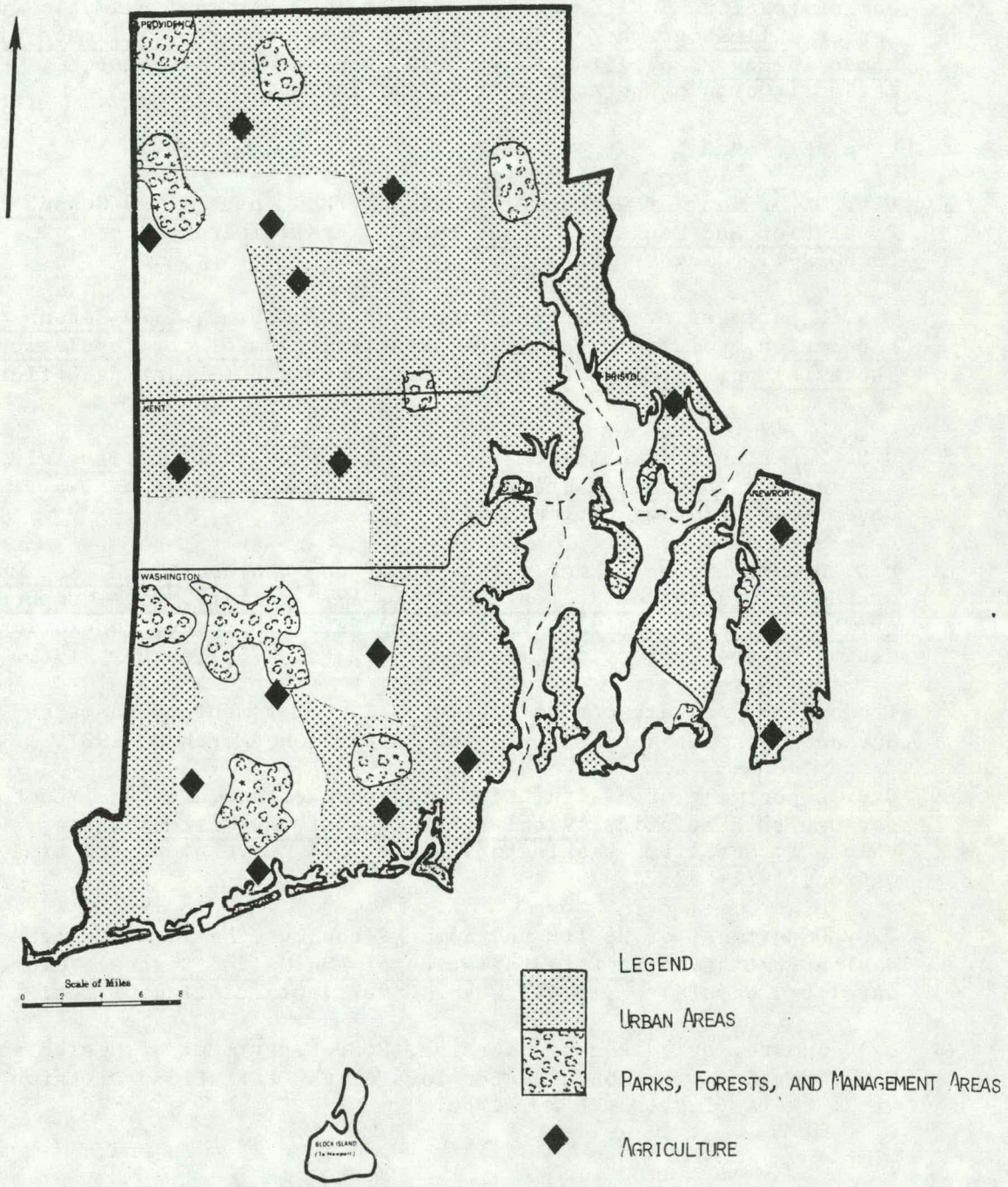

FIGURE 3-10. LAND USE: RHODE ISLAND[43]

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14. (See References 7,8,9.)

15. (See References 10,11,12.)

16. (See References 7,8,9.)

17. (See References 10,11,12.)

18. A Standard Metropolitan Statistical Area is an area designated by the Office of Management and Budget consisting of a county or group of counties containing at least one city (or "twin cities") of 50,000 or more population plus any adjacent counties which are metropolitan in character and economically and socially integrated with the central county or counties.

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40. (See Reference 20.)

41. (See Reference 20.)

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42. (See References 22 and 23.)

43. (See References 32 and 33.)

Tables

44. (See References 4 and 19.)

45. (See Reference 20.)

46. (See References 22 and 23.)

4. GOVERNMENT STRUCTURE

This section presents an overview of Rhode Island State government and identifies the government institutions and agencies with statutory authority or informal responsibilities affecting the generation, handling, and disposal of radioactive waste within the State. Federal initiatives pending are also discussed.

4.1 Major Political Parties[1]

All Rhode Island Federal and State legislators are affiliated with either the Democratic or Republican Party. Democrats hold 43 seats and Republicans hold 7 seats in the State Senate. In the lower legislative body, Democrats hold 82 and Republicans 18 seats. All the elective State officers in the executive branch of State government are Democrats. One of Rhode Island's senators and one of its Congressional representatives belong to the Democratic Party; one senator and one representative belong to the Republican Party.

4.2 Congressional Delegation[2]

Rhode Island's two United States senators are John H. Chafee and Clairborne Pell. Senator Chafee serves on the Environmental and Public Works, Intelligence, Finance, and Banking Housing and Urban Affairs Committees. Senator Pell serves on the Foreign Relations, Labor and Human Resources, and Rules and Administration Committees. The senators' committee assignments are provided in more detail in Table 4-1.

Senator Pell, in particular, has expressed concern over the problems experienced by United Nuclear Corporation at its Charlestown facility (see Section 2.1). In this regard he supported the Low-Level Waste Policy Act and favors regional and/or Federal initiatives in this area.[3] Senator Pell's complete statement on low-level radioactive waste is included in Appendix I.

Figure 4-1 shows the congressional districts in Rhode Island. Rhode Island's representatives are Fernand St. Germain and Claudine Schneider. Representative St. Germain serves on the Banking, Finance and Urban Affairs, Government Operations, and Small Business Committees. Representative Schneider serves on the Merchant Marine and Fisheries, and Science and Technology Committees.

Table 4-1. RHODE ISLAND MEMBERS OF THE UNITED STATES CONGRESS(10)

State Delegate	District	Party Affiliation	Beginning of Present Service	Committee Assignments
Senate:				
Claiborne Pell	Statewide	Democrat	1981	Foreign Relations Committee - Arms Control, Oceans, International Operations and Environmental - European Affairs Labor and Human Resources Committee - Education, Arts and Humanities - Employment and Productivity Joint Library Committee Rules and Administration Committee
John H. Chafee	Statewide	Republican	1976	Environment and Public Works Committee - Environmental Pollution - Regional and Community Development - Transportation Select Committee on Intelligence - Intelligence Rights of Americans - Collection and Foreign Operations Finance Committee - Savings, Pensions and Investment Policy - International Trade - Taxation and Debt Management Banking, Housing and Urban Affairs Committee - Consumer Affairs - International Finance - Economic Policy

TABLE 4-1. RHODE ISLAND MEMBERS OF THE UNITED STATES CONGRESS (continued)

State Delegate	District	Party Affiliation	Beginning of Present Service	Committee Assignments
House of Representatives:				
Fernand J. St. Germain	First	Democrat	1961	Banking, Finance and Urban Affairs Committee - Economic Stabilization - Consumer Affairs - Housing and Community Development - Financial Institutions Supervision, Regulation and Insurance Government Operations Committee Small Business Committee
Claudine Schneider	Second	Republican	1981	Merchant Marine and Fisheries Committee - Oceanography - Fisheries and Wildlife Conservation and the Environment Science and Technology Committee - Energy Development and Applications - Natural Resources, Agriculture, Research and Environment.

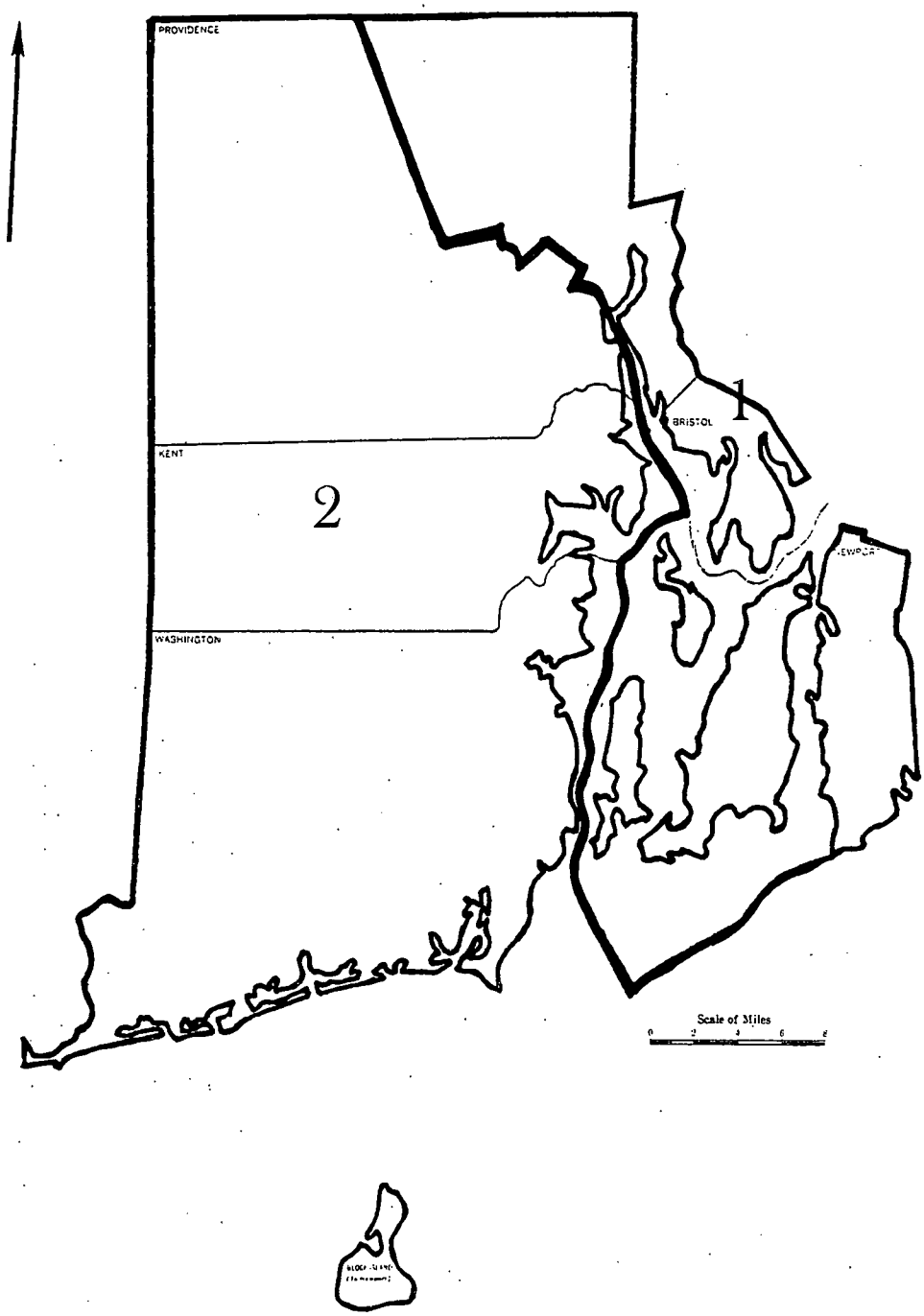


FIGURE 4-1. CONGRESSIONAL DISTRICTS: RHODE ISLAND[9]

Congressional interest in radioactive waste issues has continued in the 97th Congress with ten House bills and two Senate bills pending at the committee level. Table 4-2 summarizes the objectives and status of this legislation and includes a summary of the Rhode Island delegation's potential ties to the legislation. No Rhode Island member of Congress has introduced or co-sponsored legislation related to radioactive waste disposal. However, Representatives St. Germain and Schneider currently serve on the committees and subcommittees reviewing six of the House bills.

4.3 State Government

The Constitution of the State of Rhode Island, adopted in 1842, provides the framework for government in the State. It divides the powers of government among three departments: executive, legislative and judicial.

4.3.1 Executive Department

The executive department, headed by the Governor, includes four other elected officials: the Lieutenant Governor, the Secretary of State, the Attorney General, and the General Treasurer. It is supported by the State departments and numerous related agencies, boards and commissions.

Governor. The Governor of the State of Rhode Island is J. Joseph Garrahy. He was elected governor in November 1980, and his term expires in January 1983. The Office of the Governor has been a focal point for State activities with regard to low-level radioactive waste management. In particular, Dante Ionata of this office has been involved in discussions on the feasibility of a New England regional low-level radioactive waste disposal site (see Section 2.3). Malcolm Grant has been serving as the Governor's representative in responding to the problems encountered by the United Nuclear Corporation (see Section 2.1). Governor Garrahy has also appointed a citizens advisory commission to monitor the United Nuclear Corporation facility shutdown.

Lieutenant Governor. The Lieutenant Governor presides in the State Senate and in the Grand Committee of the General Assembly and in the case of a tie vote, has the right to cast the deciding ballot. He or she is an elected general officer of the State, and succeeds the Governor upon his death, resignation or removal from office.

TABLE 4-2. SUMMARY OF LEGISLATION RELATING TO RADIOACTIVE WASTE INTRODUCED IN THE 97TH CONGRESS[11]

Bill Number	Title of Legislation	Description of Legislation	Sponsoring Member	Committee Jurisdiction	Rhode Island Members Serving on Committee	Legislative Status
HR 29	A Bill to Require a Study of the Effects of Past Ocean Dumping of Radioactive Waste	Requires the Dept. of Commerce to conduct a study on the effects of radioactive waste disposal in ocean waters from 1946-1970 on marine and human life. Requires that the sites be located and surveyed.	Anderson (CA)	1) Merchant Marine and Fisheries Subcommittee on Oceanography 2) Science and Technology Subcommittee on Agricultural Research and Environment	Claudine Schneider Claudine Schneider	Referred to committees-no action. Received favorable comment from Dept of Commerce.
HR 751	Nuclear Energy Reappraisal Act of 1981	Requires the blocking of new licenses and the termination of renewal licenses for nuclear power plants pending a 5-year study to OTA. Study is to include safety and environmental hazards and waste disposal problems.	Fish (NY)	1) Foreign Affairs Subcommittee on International Security and Subcommittee on International Economic Policy and Trade 2) Interior and Insular Affairs Subcommittee on Energy and Environment 3) Energy and Commerce Subcommittee on Energy Conservation and Power	None None None	Referred to committees-no action.
HR 1106	Radioactive Waste Management Act of 1981	Requires the Secretary of Energy to notify any State of any investigation to construct a radioactive waste storage site and allow the State to prevent siting by a State referendum or action by the State Legislature.	Hinson (MS)	1) Energy and Commerce Subcommittee on Energy Conservation and Power 2) Interior and Insular Affairs Subcommittee on Energy and Environment	None None	Referred to committees-no action.
HR 1412	New Jersey Radium Pollution Control Act of 1981	Authorizes the Department of Energy to determine sites in NJ where radium pollution has occurred. Renedial action is to be undertaken to limit health hazards of identified sites.	Minish (NJ)	1) Interior and Insular Affairs Subcommittee on Energy and Environment	None	Referred to committees-no action.

TABLE 4-2. SUMMARY OF LEGISLATION RELATING TO RADIOACTIVE WASTE INTRODUCED IN THE 97TH CONGRESS (continued)

Bill Number	Title of Legislation	Description of Legislation	Sponsoring Member	Committee Jurisdiction	Rhode Island Members Serving on Committee	Legislative Status
HR 1720	A Bill to Require a Task Force to Identify Ocean Sites and Nature of Radioactive Waste Dumped in the Ocean	Establishes an Interagency Task Force to prepare an inventory of ocean sites at which radioactive waste has been dumped, assess adverse effects, and develop a plan for monitoring such sites.	Hughes (NJ)	1) Merchant Marine and Fisheries Subcommittee on Oceanography 2) Science and Technology Subcommittee on Natural Resources and Subcommittee on Energy Research and Production	Claudine Schneider Claudine Schneider	Referred to committees-no action. Received comment from GAO and NRC.
HR 1993	Radioactive Waste Research, Development and Policy Act	Provides for the development of a plan for disposal of radioactive waste. Requires construction of a demonstration dry storage facility, establishment of Federal waste policy, and development of a disposal siting study.	Lundine (NY)	1) Energy and Commerce Subcommittee on Energy Conservation and Power and Subcommittee on Energy Research and Production 2) Interior and Insular Affairs Subcommittee on Energy and Environment	None None	Referred to committees-no action.
HR 1909	Nuclear Waste Research, Development and Demonstration Act of 1981	Accelerates the Department of Energy research, development, and technology demonstration of radioactive waste disposal. Includes the establishment of a high-level demonstration storage site.	Goldwater (CA)	1) Science and Technology Subcommittee on Energy Research and Production	Claudine Schneider	Hearing held by full committee Feb. 26, 1981.
HR 2500	Nuclear Reactor Moratorium and Nuclear Waste Prohibition Act	Prohibits the Nuclear Regulatory Commission from issuing new or renewal licenses for power reactors until an OTA study is completed. Prohibits any nuclear disposal site near densely populated areas.	Oaker (OH)	1) Energy and Commerce Subcommittee on Energy Conservation and Power 2) Interior and Insular Affairs Subcommittee on Energy and Environment	None None	Referred to committees-no action.

TABLE 4-2. SUMMARY OF LEGISLATION RELATING TO RADIOACTIVE WASTE INTRODUCED IN THE 97TH CONGRESS (continued)

Bill Number	Title of Legislation	Description of Legislation	Sponsoring Member	Committee Jurisdiction	Rhode Island Members Serving on Committee	Legislative Status
HR 2840	Nuclear Waste Policy Act	Establishes a program of Federal storage of fuel from power plants including a Federal interim storage and disposal facility	Huckaby (LA)	1) Interior and Insular Affairs Subcommittee on Energy and Environment	None	Referred to committee-no action.
				2) Energy and Commerce Subcommittee on Energy Conservation and Power	None	
HR 2881	Nuclear Waste Management Policy Act	Establishes permanent repositories for trans-uranic and high-level waste and fuel.	Derrick (SC)	1) Energy and Commerce Subcommittee on Energy Conservation and Power	None	Referred to committee-no action.
				2) Interior and Insular Affairs Subcommittee on Energy and Environment	None	
				3) Science and Technology Subcommittee on Natural Resources, Agricultural Research and Environment	None	
Senate 95	Nuclear Waste Management Reorganization Act of 1981	Reorganizes Federal gov. to strengthen programs and policy with respect to Nuclear Waste Management Planning Council.	Percy (IL)	Government Affairs Subcommittee on Energy, Nuclear Proliferation and Government Processes	None	Referred to committee-no action.
Senate 637	Nuclear Waste Policy Act	Establishes a program for Federal storage of spent nuclear fuel and develops a program to address nuclear waste disposal issues.	Johnson (LA)	Energy and Natural Resources Committee	None	Referred to committee-no action.

Thomas R. DiLuglio was elected Lieutenant Governor in 1980, and his term runs until January 1983.

Secretary of State. The Secretary of State is responsible for a variety of governmental activities. He or she is the general recording officer of the State and serves as the secretary of the State Senate; prepares and compiles annually the Public Laws of the State; keeps all corporate records; administers the commercial code; and performs a number of other related functions. Robert F. Burns, the current Secretary of State, was elected in 1980 to a two-year term.

Attorney General. The Attorney General is charged by law with the prosecution and/or defense of all actions and proceedings for and against the State, and for the general supervision of legal affairs of State government. Dennis J. Roberts is currently serving as Attorney General for Rhode Island, having been elected in November 1980.

General Treasurer. The Office of the General Treasurer is the focal point for the handling of all cash transactions of the State. This includes all receipts, disbursements, and transfers of cash, such as the sale of bonds, the maintenance of records of property owned or held in trust by the State, and administration of the State retirement system. Anthony J. Solomon is serving as General Treasurer. His term expires in January 1983.

State Departments. There are 13 State departments which are listed in Appendix C. In addition, there are numerous unaffiliated agencies, boards and commissions. Several of the State agencies have direct responsibilities in low-level radioactive waste management. These include:

Department of Health, Division of Occupational Health and Radiation Control (James E. Hickey, Chief). As described in Section 4.4 below, this department regulates the use, disposal, and to a lesser extent the transportation of low-level radioactive waste. Mr. Hickey attended the March meeting on a New England regional low-level radioactive waste disposal site as one of Rhode Island's representatives.

Department of Environmental Management (W. Edward Wood, Director). This department regulates the storage and transportation of low-level radioactive waste under its hazardous waste rules and regulations.

Division of Public Utilities and Carriers' Public Utilities Commission (Edward F. Burke, Chairman). The commission regulates the transportation of high-level and some low-level waste.

Other State agencies with a potential interest in low-level radioactive waste management include the Coastal Resources Management Council (John A. Lyons, Chairman), the Office of Statewide Planning (Daniel W. Varin, Chief), and the Department of Economic Development (Scott Eubanks, Director).

4.3.2 Legislative Department

Legislative power in the State of Rhode Island is vested in the Senate and House of Representatives. Together they form the State's General Assembly. The Senate has 50 members elected biennially in even-numbered years from a single member district. There are currently 43 Democrats and 7 Republicans in the Senate. The House of Representatives has 100 members, 82 Democrats and 18 Republicans. They also are elected biennially from single member districts.

During the 1981 session of the General Assembly, several pieces of legislation potentially related to low-level radioactive waste issues were introduced. Most of these had to do with facilitating or restricting the siting of disposal facilities. None were passed.

4.3.3 Judicial Department

The Rhode Island Judicial System consists of: the Supreme Court, which includes a Chief Justice and four Associate Justices elected by the General Assembly in Grand Committee for a term of life tenure; the Superior Court, which includes a Presiding Justice and 14 Associate Justices appointed by the Governor and confirmed by the Senate for a term of life tenure; the Family Court, which includes a Chief Judge and six Associate Justices, similarly appointed and confirmed; the District Court, which includes a Chief Judge and 12 Associate Judges appointed by the Governor and confirmed by the Senate for a term of ten years; and 39 Probate Courts.

4.4 State Rules and Regulations

The State of Rhode Island became an "agreement State" in 1980. Under Section 274 of the Atomic Energy Act, the Nuclear Regulatory Commission is authorized to enter into agreements under which States assume regulatory responsibility over by product, source material and small quantities of special nuclear material (this includes responsibility for low-level radioactive waste). Before entering into such an agreement, the Nuclear Regulatory Commission must be assured that the State regulatory body has sufficient statutory authority, adequate budget, trained staff and appropriate regulation. The Nuclear Regulatory Commission maintains continuing oversight of agreement State radiation control programs.

The Rhode Island Department of Health, Division of Occupational Health and Radiation Control carries out the State radiation control program. In addition, low-level radioactive waste is regulated by the Department of Environmental Management and the Public Utilities Commission. These regulations are described below:

Rhode Island Rules and Regulations for the Control of Radiation[4] (Radiation Control Agency, Division of Occupational Health and Radiation Control, Rhode Island Department of Health). With regard to low-level radioactive waste, these regulations address:

- the licensing of all radioactive material for any and all uses, including measuring, gauging, and controlling devices, calibration and reference sources, medical diagnostic uses, in-vitro testing, and other uses;
- the preparation of radioactive material for transport; and the actual transport of the material and;
- the disposal of radioactive material.

A general license is provided for users of certain quantities of source material, and for users of certain devices and equipment such as measuring, gauging, and controlling devices or of certain materials for diagnostic uses or testing. A general license is also issued to any private or common carrier to transport radioactive material within Rhode

Island provided that the appropriate U.S. Department of Transportation regulations have been met. (These regulations do not apply in cases where transportation is already subject to U.S. Department of Transportation regulations.) Other users are required to apply for specific licenses.

Radioactive waste disposal must be by transfer to an authorized (licensed) recipient, or by release into sanitary sewerage systems, burial or incineration, under certain conditions. Procedures for the disposal of radioactive materials must have been approved by the Radiation Control Agency.

These regulations were adopted in accordance with the Rhode Island Radiation Control Act, Title 23, Chapter 1.3, of the General Laws and the Administrative Procedures Act, Title 42, Chapter 35 of the General Laws and the Administrative Procedures Act, Title 42, Chapter 35 of the General Laws, and are compatible with the equivalent Nuclear Regulatory Commission regulations.

Hazardous Waste Generator Rules and Regulations[5] (Department of Environmental Management). Under these rules and regulations, hazardous waste is defined to include "all radioactive wastes except high level radioactive waste." The regulations address the storage (provided that waste is stored for more than 90 days) and transportation of hazardous waste by generators. They require among other things that a manifest system be maintained, that waste containers be appropriately labelled, and that the Department be notified in case of accidental spills. These and the following rules and regulations are in accordance with the General Laws of Rhode Island, Chapters 42-35 and 42-17.3; and the Public Laws of Rhode Island, 1978, Chapter 229.

Hazardous Waste Transporter Rules and Regulations[6] (Department of Environmental Management). These rules and regulations are analogous to those described immediately above, with the exception that they apply to transporters rather than generators. In addition, they require that:

- Any person wishing to transport hazardous waste--with a few exceptions-- must first obtain a Hazardous Waste Transporter Permit from the Department;
- A transporter is prohibited from transporting "extremely hazardous waste" on certain roads. "Extremely hazardous waste" may include radioactive waste; and

- Any storage of hazardous waste in excess of 48 hours must meet certain standards and will require a storer's permit.

Rules and Regulations Governing the Transportation of Radioactive Material[7] (Division of Public Utilities and Carriers, Public Utilities Commission). These regulations apply to high-level wastes and to some low-level waste (either a "large quantity" as specified by the Nuclear Regulatory Commission in 10 CFR, Part 71, or if the waste is required in 10 CFR or 49 CFR to have a placard). Any shipment of such waste over Rhode Island highways requires a permit from the Public Utilities Commission. An application for a permit must include a description of what is being transported and of the route that will be followed, and the time, origin and destination of the shipment. In addition, the shipper must certify that the waste has been packaged in accordance with all applicable Federal regulations. The regulations prohibit the transportation of this material during rush hour (i.e., 7-9 a.m. and 4-6 p.m., Monday through Friday), and the shipper is required to notify the Public Utilities Commission of any incident within 24 hours. The Public Utilities Commission is authorized to regulate the transportation of radioactive material under the provisions of Chapter 12, Title 39 of the General Laws of Rhode Island.

4.5 Federal Activities on Low-Level Radioactive Waste Management In Rhode Island

Currently, in part because Rhode Island is an agreement State, the Federal Government has little or no involvement in low-level radioactive waste management in Rhode Island. However, the Rhode Island congressional delegation, State officials and United Nuclear Corporation officials have all requested Federal assistance in the disposal of the United Nuclear Corporation's low-level radioactive waste. The U.S. Department of Energy was requested to allow the use of Federal disposal sites for this waste. To date this request has been denied. The United States Geological Survey has been and is conducting groundwater tests at the United Nuclear Corporation site.[8]

In other activities, the Federal government is considering Rhode Island as a possible site for the permanent storage of high-level radioactive wastes. Rhode Island is one of 16 States under consideration in the hard rock program and will be studied as to its capacity to store nuclear wastes in granite formations.

REFERENCES

Text

1. Joint Committee on Printing, Congressional Directory 1981, 97th Congress, Washington, D.C.: U.S. Government Printing Office.

2. (See Reference 1.)

3. Senator Claiborne Pell, private communication, April 2, 1981.

4. "Rules and Regulations for the Control of Radiation," Radiation Control Agency, Division of Occupational Health, Department of Health, February 1979.

5. "Hazardous Waste Generator Rules and Regulations," Effective 20 December 1979; Amended 23 November 1980.

6. "Hazardous Waste Transporter Permit Rules and Regulations," Effective 6 July 1980; Amended 23 November 1980.

7. "Rules and Regulations Governing the Transportation of Radioactive Materials as Herein Defined," Effective June 20, 1978.

8. Eric Schaefer, private communication, Representative Schneider's office, May 18, 1981.

Figures

9. (See Reference 1.)

Tables

10. (See Reference 1.)

11. House Legislative Office, computer printout, "Pending Legislation Relating to Radioactive Waste," Washington, D.C.: U.S. Capitol, May 8, 1980, pp.1-25.

5. INTEREST GROUPS CONCERNED WITH LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT

A number of national, State, and local interest groups are concerned about the management of low-level radioactive waste. This section identifies some of these energy and environmental organizations and their particular areas of concern.

5.1 National Groups

National groups were contacted for two reasons; first, to assist in the development of a list of Rhode Island interest groups, and second, to assess some of the national concerns surrounding low-level radioactive waste management. Groups were identified through the use of the Encyclopedia of Associations[1] and through the Library of Congress' National Referral Service. The national groups contacted made referrals to other national as well as State and local groups with a potential interest in the low-level radioactive waste issue. Ultimately, 22 national groups were contacted (see Appendix E for a listing).

Most of the groups contacted were concerned with the issue of radioactive waste, particularly high-level waste. However, few had an official position on low-level radioactive waste management. Only two groups, the League of Women Voters of the United States and the American Public Health Association, supplied position papers. These papers are discussed below:

League of Women Voters of the United States.[2] The paper by the League of Women Voters of the United States outlines its position on nuclear issues and is designed to supply guidance to State and local Leagues. The paper makes no specific mention of low-level radioactive waste management, although the management of high-level waste is discussed at some length. In a related activity, the League of Women Voters Education Fund recently published a booklet entitled "A Nuclear Waste Primer" which offers the lay person an introduction to the issues of nuclear waste.[3] It provides information on the issues and highlights key points of view, but does not advocate any one choice for managing nuclear waste. Low-level radioactive waste, its transporta-

tion, and other management issues are addressed in the primer as part of the nuclear waste question.

American Public Health Association (APHA).[4] The American Public Health Association supplied a 1978 position paper entitled "The Public Health Impact of Energy Policy" which represents the current consensus of the Association's membership. The paper makes no mention of low-level radioactive waste management, but states that "waste disposal activities should either be operated by or very closely supervised by the federal government."

5.2 State and Local Groups

The list of State and local groups identified as potentially having an interest in low-level radioactive waste management issues is included in Appendix E. The following discussion identifies the background, concerns, and activities of some of these organizations.

Among the several Rhode Island groups which have indicated an interest in low-level waste issues, a number originated as part of the opposition to a proposed commercial nuclear reactor in Charlestown. The United Nuclear Corporation facility was undoubtedly one factor in choosing this site for the reactor, and ironically, the same groups which opposed the reactor are now the focal point of opposition to the United Nuclear Corporation facility. The principal groups that can so be described are Concerned Citizens of Rhode Island and Rhode Islanders for Safe Power. Emma Sacco, president of Rhode Islanders for Safe Power, was recently quoted as opposing the Nuclear Regulatory Commission's deregulation of tritium and carbon-14. Ms. Sacco expressed the opinion that this change in the regulations would make it more difficult to prosecute persons who illegally dispose of radioactive material because it would be difficult to prove how much radioactivity was in the material at the time it was dumped.[5]

Two other groups involved in the opposition to the United Nuclear Corporation facility are the Rhode Island Public Interest Research Group and the Coalition for Consumer Justice. These are broader-based environmental interest groups with a particular interest in United

Nuclear Corporation's problems. The Coalition for Consumer Justice is based in Providence but has a branch in Charlestown. This group has supported legislation designating specific routes for radioactive waste shipments. The Rhode Island Public Interest Research Group is based at the University of Rhode Island in Kingston.

Other statewide interest groups, such as the Conservation Law Foundation, have also expressed interest in low-level radioactive waste issues. The Conservation Law Foundation monitors environmental actions around the State and is particularly concerned with legal aspects of environmental issues. They were involved in drafting the hazardous waste legislation which gave the Department of Environmental Management the authority to promulgate the regulations described in Section 4.4. They have expressed the opinion that, in light of the publicity that the United Nuclear Corporation facility is receiving, transportation of low-level radioactive waste is becoming a matter of public concern in Rhode Island.(6)

REFERENCES

1. Encyclopedia of Associations: National Organization of the U.S., Volume I, Detroit: Gale Research, 1979.

2. League of Women Voters of the United States, "Guidance on Nuclear Issues Under Positions of the League of Women Voters of the United States," memorandum, April 1, 1980.

3. League of Women Voters Education Fund, "A Nuclear Waste Primer," Pub. #391, 1980.

4. American Public Health Association, "The Public Health Impact of Energy Policy," Washington, D.C., 1978.

5. "NRC Expected to Ease Some Rules on Radioactive Waste," Providence Bulletin, January 16, 1981.

6. John Jewett, private communication, Conservation Law Foundation, April 14, 1981.

6. PRINTED MEDIA REVIEW OF LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT ISSUES

The purpose of the printed media review was to identify the types of issues related to low-level radioactive waste management discussed in general circulation newspapers in Rhode Island. Newspaper articles were collected from the clipping files of The Providence Journal and Bulletin, and the Nuclear Regulatory Commission. These sources covered relevant articles from all major newspapers throughout the State.(1) The time period covered by the search was approximately one year, April 1980 through March 1981, although the review of the clipping files at the Nuclear Regulatory Commission only covered the six-month period from late September 1980 through early March 1981. Articles written prior to 1980 were noted only if they discussed issues or material not represented in later stories.

Three general observations can be made about the coverage of low-level radioactive waste management issues by Rhode Island newspapers. First, issues appear in articles devoted solely to low-level waste concerns, as well as in articles of broader scope (e.g., nuclear energy and radiation safety), where specific low-level issues can become linked with the broader issues in the public's mind. The broader scoped articles are the more frequent, but it is important to note that in Rhode Island, direct reporting on low-level issues does occur. Second, although national and regional stories are reported, stories which cover State or local interests are more numerous. Third, articles on low-level radioactive waste and related issues focus on many aspects of the topic, e.g., generic, regulatory, and specific studies.

During the period in question, Rhode Island newspaper coverage of low-level radioactive waste management issues focused on the following topics:

- The decommissioning of the United Nuclear Corporation uranium reprocessing center in Charlestown, R.I.: including groundwater pollution traced to the plant; problems the corporation has encountered in trying to dispose of the low-level radioactive

waste generated by the decommissioning; protests mounted by local groups against the plant; reported violations of safety rules at the plant; and other issues.

- The Nuclear Regulatory Commission's "deregulation" of low-level waste generated in biomedical research;

Examples of the articles are presented in Appendix F.

In addition to the articles and editorials on low-level radioactive waste issues, a number of letters and editorials on nuclear energy in general appeared. Many of these editorials discuss the November 1980 vote taken in Maine on nuclear power, and express support for or opposition to nuclear power. A few discuss alternatives to nuclear power such as coal and hydroelectric power. Examples of the editorials on nuclear power are included in Appendix F.

Several other topics related to radioactive material have received newspaper coverage. These are linked either directly or by implication to low-level radioactive waste issues and indicate the broader context in which the subject is presented and discussed in newspapers. These topics include:

- high-level radioactive waste: the U.S. Department of Energy proposed Rhode Island as a site for storage of high-level radioactive waste; potential hazards of transporting high-level waste shipments through the State;
- public discussion of the issues, including Three Mile Island, and other general discussion of nuclear power.

Examples of articles on ancillary topics are also included in Appendix F.

REFERENCES

1. Other major newspapers covered in the review include:

   The Pawtucket Valley Daily Times;

   The Westerley Sun; and

   The Townsman Weekly.

7. PROFILE OF LOW-LEVEL RADIOACTIVE WASTE GENERATORS

In order to develop a profile of low-level radioactive waste generators in Rhode Island, a survey was conducted of facilities having a license from either the Rhode Island Department of Health, Division of Occupational Health and Radiation Control or the Nuclear Regulatory Commission to use radioactive material (Rhode Island is an agreement State). The results of that survey are the subject of this section. Surveys were sent to 56 facilities identified as license holders by the Nuclear Regulatory Commission. Responses were received from 36 facilities (65 percent). A list of all licensed facilities in Rhode Island is included in Appendix A. Table 7-1 presents the response to the survey by type of facility. Disposal methods used by all respondents are shown in Table 2-2. The discussion below focuses on respondents who indicated that they ship waste to commercial disposal sites.

7.1 Source of Shipped Waste

7.1.1 Type of Facility Shipping Waste

Ten facilities identified themselves as shippers of low-level radioactive waste to commercial disposal sites. Table 7-2 shows the number of shippers by type of facility.

7.1.2 Source of Radioactivity in Shipped Waste

The source of radioactivity in shipped waste is shown in Table 7-3. Since some facilities receive radioactive material from more than one source, the total number of responses is greater than the number of shippers.

7.2 Volume of Shipped Waste

Table 7-4 presents the volume of waste shipped in 1978, 1979, and 1980 by type of facility. These data may underestimate actual shipments in 1978 and 1979, since only generators who shipped as of the date of the survey are included. (This is also true of the data presented in Table 7-6). Approximately 90 percent of the volume shipped in 1979 and 1980 was due to the decommissioning of the United Nuclear Corporation plant.

TABLE 7-1. RESPONSE TO SURVEY BY TYPE OF FACILITY

Type of Facility	No. of Licensees	Respondents		
		Number	Percent of Facility Type	Percent of Total
Medical	22	14	63.6	38.9
Educational	3	2	66.7	5.6
Industrial	22	13	59.1	36.1
Governmental	9	7	77.8	19.4
Total	56	36	64.3	100.0

TABLE 7-2. TYPE OF FACILITY SHIPPING WASTE

Type of Facility	Shippers		Percent of All Shippers
	Number	Percent	
Medical			
Hospital	4	100.0	40.0
Educational			
University	2	100.0	20.0
Industrial			
Product Use	1	50.0	10.0
Other (Uranium Reprocessing Plant)	1	50.0	10.0
Governmental			
Federal	1	50.0	10.0
State	1	50.0	10.0
Total	10	100.0	100.0

TABLE 7-3. SOURCE OF RADIOACTIVITY RESULTING IN SHIPPED WASTE

Type of Facility	No. of Shippers Responding	Nuclear Reactor		Sealed Sources		Unsealed Radioactive Material		Cyclotron or Synchroton		Natural Ores or Mill Tailings		Other	
		No.	Percent of Shippers Responding	No.	Percent of Shippers Responding	No.	Percent of Shippers Responding	No.	Percent of Shippers Responding	No.	Percent of Shippers Responding	No.	Percent of Shippers Responding
Medical	4	0	0.0	1	10.0	4	40.0	1	10.0	0	0.0	0	0.0
Educational	2	0	0.0	1	10.0	2	20.0	1	10.0	0	0.0	0	0.0
Industrial	2	2	20.0	1	10.0	0	0.0	0	0.0	1	10.0	1	10.0
Governmental	2	1	10.0	0	0.0	2	20.0	0	0.0	0	0.0	0	0.0
Total	10	3	30.0	3	30.0	8	80.0	2	20.0	1	10.0	1	10.0

a. Some facilities receive radioactive materials from more than one source thus the columns indicating the number of respondents add to more than the total number of respondents.

TABLE 7-4. VOLUME OF SHIPPED WASTE
(1978, 1979, 1980)

Type of Facility	No. of Shippers Responding	Volume Shipped					
		1978		1979		1980	
		Cubic Meters	Percent of Total	Cubic Meters	Percent of Total	Cubic Meters	Percent of Total
Medical	4	27.0	24.4	39.3	6.2	56.1	6.0
Educational	2	22.8	20.6	24.1	3.8	21.8	2.3
Industrial	2	56.6	51.2	566.4	89.4	849.6	91.2
Governmental	2	4.2	3.8	3.6	0.5	3.9	0.4
Total	10	110.6	100.0	633.4	100.0	931.4	100.0

The volume of waste projected to be shipped in 1981, 1985, and 1990 by type of facility is shown in Table 7-5. These estimates indicate a rapid decline in the volume of waste shipped.

7.3 Activity of Shipped Waste

The activity of waste shipped in 1978, 1979, and 1980 is shown in Table 7-6. The radioisotopes shipped in these years are shown in Table 7-7.

7.4 Physical Characteristics of Shipped Waste

Some form of onsite processing is used by eight of the ten shippers in Rhode Island. The methods of onsite processing used are shown in Table 7-8. Absorption, which is used by six facilities, is the most common method.

The type of shipping containers used to package low-level radioactive waste is shown in Table 7-9. Most facilities (seven) indicated that they use 55-gallon drums to ship some or all of their waste.

Table 7-10 shows the physical form of shipped waste. Dry, solid waste is the form most frequently shipped. Table 7-11 shows the nonradiological hazard characteristics of shipped waste. Seven facilities indicated that some of their shipped wastes are chemically toxic.

TABLE 7-5. PROJECTED VOLUME OF SHIPPED WASTE
(1981, 1985, 1990)

Type of Facility	No. of Shippers Responding	Projected Volume Shipped					
		1981		1985		1990	
		Cubic Meters	Percent of Total	Cubic Meters	Percent of Total	Cubic Meters	Percent of Total
Medical	4	60.1	2.9	58.7	78.2	63.9	79.4
Educational	2	23.9	1.2	14.2	18.9	14.2	17.6
Industrial	2	1982.2	95.6	0.05	<0.1	0.05	<0.1
Governmental	2	2.5	0.1	2.1	2.8	2.4	3.0
Total	10	2068.7	100.0	75.0	100.0	80.5	100.0

TABLE 7-6. ACTIVITY OF SHIPPED WASTE
(1978, 1979, 1980)

Type of Facility	No. of Shippers Responding	Activity Shipped					
		1978		1979		1980	
		Curies	Percent of Total	Curies	Percent of Total	Curies	Percent of Total
Medical	4	0.348	16.2	0.654	19.7	0.767	33.8
Educational	2	1.240	57.8	0.376	11.3	0.281	12.4
Industrial	2	0.508	23.7	2.226	67.0	1.160	51.1
Governmental	2	0.047	2.2	0.068	2.0	0.061	2.7
Total	10	2.143	100.0	3.324	100.0	2.269	100.0

TABLE 7-7. RADIOISOTOPES IN SHIPPED WASTE
(1978, 1979, 1980)

	Activity (curies)														
	Total			Medical			Educational			Industrial			Governmental		
Isotope	1978	1979	1980	1978	1979	1980	1978	1979	1980	1978	1979	1980	1978	1979	1980
^{14}C	0.087	0.092	0.408	0.007	0.005	0.001	0.080	0.087	0.406	0.000	0.000	0.000	<0.001	<0.001	<0.001
^{3}H	0.832	0.122	0.108	0.018	0.013	0.013	0.807	0.106	0.084	0.000	0.000	0.000	0.001	0.003	0.004
^{125}I	0.026	0.035	0.062	0.025	0.035	0.038	0.001	0.000	0.024	0.000	0.000	0.000	0.000	0.000	0.000
^{59}Fe	0.001	<0.001	0.028	<0.001	<0.001	<0.001	0.000	0.000	0.026	0.000	0.000	0.000	<0.001	<0.001	<0.001
^{60}Co	0.008	0.005	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.005	0.006
^{32}P	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004
^{51}Cr	0.013	0.006	0.001	0.002	0.002	0.000	0.006	0.004	<0.001	0.000	0.000	0.000	0.005	0.000	0.001
^{75}Se	<0.001	<0.001	0.000	<0.001	<0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
^{109}Ca	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000
^{57}Co	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
^{99}Mo	0.020	0.020	0.022	0.020	0.020	0.022	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
^{133}Xe	0.030	0.030	0.025	0.030	0.030	0.025	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
^{141}Ce	0.003	0.003	<0.001	0.003	0.003	<0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
^{113}Sn	0.000	0.001	<0.001	0.000	0.001	<0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
^{103}Ru	0.000	0.002	<0.001	0.000	0.002	<0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
^{124}Sb	0.000	0.005	<0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	<0.001
^{125}Sb	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.000
^{134}Cs	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
^{152}Eu	0.000	0.001	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.004
^{154}Eu	0.003	<0.001	<0.001	0.000	0.000	0.000	0.003	<0.001	0.000	0.000	0.000	0.000	0.000	0.001	<0.001
^{133}Ba	0.000	0.000	<0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	<0.001
^{182}Ta	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.000
^{115m}Cd	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.000
^{228}Th	<0.001	0.000	0.000	0.000	0.000	0.000	<0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
^{232}U	<0.001	0.000	0.000	0.000	0.000	0.000	<0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
^{85}Kr	0.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	1.000	0.000	0.000	0.000

TABLE 7-7. RADIOISOTOPES IN SHIPPED WASTE (continued)
(1978, 1979, 1980)

	Activity (curies)														
	Total			Medical			Educational			Industrial			Governmental		
Isotope	1978	1979	1980	1978	1979	1980	1978	1979	1980	1978	1979	1980	1978	1979	1980
^{90}Sr	0.000	0.010	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.010	0.000	0.000	0.000
^{47}Pm	0.000	0.150	0.150	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.150	0.150	0.000	0.000	0.000
^{95}Nb	0.000	0.002	<0.001	0.000	0.002	<0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
^{85}Sr	0.002	<0.001	0.000	0.002	<0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
^{46}Sc	0.001	0.002	<0.001	0.001	0.002	0.001	0.000	0.000	0.000	0.000	0.000	6.000	0.000	0.000	0.000
^{54}Mn	<0.001	<0.001	<0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	<0.001	<0.001	<0.001
^{65}Zn	0.016	0.005	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.016	0.005	<0.001
^{110m}Ag	0.000	0.005	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.001
Mixtures	0.952	1.609	0.537	0.101	0.364	0.537	0.343	0.179	0.000	0.508	1.066	0.000	0.000	0.000	0.000

TABLE 7-8. ONSITE PROCESSING OF SHIPPED WASTE

Type of Facility	No. of Shippers Responding	None		Mechanical Compaction		Solidification/ Evaporation		Absorption		Other	
		No.	Percent of Shippers Responding	No.	Percent of Shippers Responding	No.	Percent of Shippers Responding	No.	Percent of Shippers Responding	No.	Percent of Shippers Responding
Medical	4	0	0.0	0	0.0	0	0.0	3	30.0	0	0.0
Educational	2	1	10.0	1	10.0	1	10.0	1	10.0	0	0.0
Industrial	2	1	10.0	0	0.0	1	10.0	1	10.0	1	10.0
Governmental	2	0	0.0	0	0.0	1	10.0	1	10.0	0	0.0
Total[a]	10	2	20.0	1	10.0	3	30.0	6	60.0	1	10.0

a. Some facilities use more than one type of onsite processing; thus the columns indicating the number of respondents add to more than the total number of respondents.

TABLE 7-9. TYPE OF SHIPPING CONTAINER USED

Type of Facility	No. of Shippers Responding	55-gal. Drums		30-gal. Drums		Shielded Casks		Wooden Boxes		Other	
		No.	Percent of Shippers Responding	No.	Percent of Shippers Responding	No.	Percent of Shippers Responding	No.	Percent of Shippers Responding	No.	Percent of Shippers Responding
Medical	4	2	20.0	3	30.0	0	0.0	0	0.0	0	0.0
Educational	2	2	20.0	0	0.0	0	0.0	0	0.0	0	0.0
Industrial	2	1	10.0	0	0.0	1	10.0	1	10.0	1	10.0
Governmental	2	2	20.0	1	10.0	0	0.0	0	0.0	0	0.0
Total[a]	10	7	70.0	4	40.0	1	10.0	1	10.0	1	10.0

a. Some facilites use more than one type of shipping container; thus the columns indicating number of respondents add to more than the total number of respondents.

TABLE 7-10. PHYSICAL FORM OF SHIPPED WASTE

Type of Facility	No. of Shippers Responding	Dry		Solidified or Absorbed Liquids, Sludges, and Resins		Biological Waste		Sealed Sources		Other	
		No.	Percent of Shippers Responding	No.	Percent of Shippers Responding	No.	Percent of Shippers Responding	No.	Percent of Shippers Responding	No.	Percent of Shippers Responding
Medical	4	3	75.0	2	50.0	2	50.0	0	0.0	2	50.0
Educational	2	2	100.0	2	100.0	1	50.0	1	50.0	1	50.0
Industrial	2	1	50.0	1	50.0	0	0.0	1	50.0	0	0.0
Governmental	2	2	100.0	1	50.0	0	0.0	0	0.0	1	50.0
Total[a]	10	8	80.0	6	60.0	3	30.0	2	20.0	4	40.0

a. Waste at some facilities takes more than one form; thus the columns indicating the number of respondents add to more than the total number of respondents.

TABLE 7-11. NONRADIOLOGICAL HAZARD CHARACTERISTICS OF SHIPPED WASTE

Type of Facility	No. of Shippers Responding	Type of Potential Hazard: Chemically Toxic — No.	Chemically Toxic — Percent of Shippers Responding	Combustible — No.	Combustible — Percent of Shippers Responding	Explosive — No.	Explosive — Percent of Shippers Responding
Medical	4	3	30.0	3	30.0	1	10.0
Educational	2	2	20.0	1	10.0	0	0.0
Industrial	2	1	10.0	0	0.0	0	0.0
Governmental	2	1	10.0	1	10.0	0	0.0
Total	10	7	70.0	5	50.0	1	10.0

APPENDIX A

RADIOACTIVE MATERIAL LICENSE HOLDERS IN RHODE ISLAND

APPENDIX A

USES OF RADIOACTIVE MATERIAL IN RHODE ISLAND

Potential Generators of Low-Level Waste	Not Present in State	Small User of Radioactive Materials	Major User of Radioactive Materials
Medical Therapy (including research)		X	
Medical Diagnosis (including research)			X
Commercial Power Reactors	X		
Experimental or Research Reactor			X
Industrial Irradiation	X		
Dismantling of Accelerators (includes medical, research, and industrial)	X		
Well Logging	X		
Industrial Radiography		X	
Industrial Gauges and Measurement Devices		X	
Non-Medical Research		X	
Smoke Detector Manf.	X		
Luminous Paints and Dial Lighting Manf.	X		
Educational Laboratory Aids		X	
Uranium Enrichment, Fabrication, and Reprocessing			X
Nuclear Laundry	X		
"Other" Uses[a]		X	

a. "Other" includes analytical services, gas chromatography, pollution monitoring, carbon 14 dating, civil defense training, etc.

RADIOACTIVE MATERIAL LICENSE HOLDERS IN RHODE ISLAND

	Type of Facility
American Hoechst Corporation 129 Quidnick Street Coventry, RI 02816	Industrial
Amtrol, Inc. 1400 Division Road West Warwick, RI 02893	Industrial
ARCO Petroleum Products Company 3144 Passyunk Avenue Philadelphia, PA 19101	Industrial
Atlantic Tubing and Rubber Company Mill Street Cranston, RI 02905	Industrial
Paul W. Bernstein, M.D. 285 Governor Street Providence, RI 02906	Medical
*Bristol Metal Company, Inc. 58 Broad Common Road Bristol, RI 02809	Industrial
*Brown University Providence, RI 02912	Educational
*Ciba-Geigy 180 Mill Street Cranston, RI 02905	Industrial
*Cranston General Hospital 1763 Broad Street Cranston, RI 02905	Medical
*Frances P. Conklin, M.D. 1 Randall Square Providence, RI 02904	Medical

	Type of Facility
Corning Glass Works 1193 Broad Street Central Falls, RI 02863	Industrial
*City of Cranston Water Control Facilities 140 Pettaconsett Avenue Cranston, RI 02920	Governmental
*City of East Providence Sewage Treatment Plant East Providence, RI 02916	Governmental
Department of the Navy Naval Regional Medical Center Newport, RI 02840	Governmental
*Environmental Protection Agency Environmental Research Laboratory South Ferry Road Narragansett, RI 02882	Governmental
Stephen I. Frater, M.D. 195 George Street Providence, RI 02906	Medical
*John E. Fogarty Memorial Hospital Eddie Dowling Highway North Smithfield, RI 02895	Medical
*Fulflex, Inc. Franklin Street Bristol, RI 02809	Industrial
*General Dynamics - Electric Boat Division Quonset Point Facility North Kingstown, RI 02852	Industrial

	Type of Facility
*General Signal Corporation BIF Unit 1600 Division Road West Warwick, RI 02893	Industrial
*C. I. Hayes, Inc. 800 Wellington Avenue Cranston, RI 02910	Industrial
Nicholas Iannuccilli, M.D. Bristol County Medical Center 1180 Hope Street Bristol, RI 02809	Medical
*Indev Control Systems 88 Boyd Avenue East Providence, RI 02914	Industrial
*ITT Grinnell Corporation 260 West Exchange Street Providence, RI 02910	Industrial
Kent County Memorial Hospital 455 Toll Gate Road Warwick, RI 02886	Medical
The Memorial Hospital Prospect Street Pawtucket, RI 02860	Medical
Midland Chemical Company 85 Globe Street Providence, RI 02903	Industrial
*Miriam Hospital 164 Summit Avenue Providence, RI 02906	Medical
*Newport Hospital Friendship Street Newport, RI 02840	Medical

	Type of Facility
New England Malleable Iron Company 380 Jefferson Blvd. Warwick, RI 02886	Industrial
Nondestructive Test Engineering Division Hartford Steam Boiler Inspection and Insurance Company Essex Plaza P.O. Box 818 Essex, Connecticut 06426	Industrial
*Providence College Providence, RI 02918	Educational
*Raytheon Company P.O. Box 360 Portsmouth, RI 02871	Industrial
*RFR Corporation One Main Street Hope, RI 02831	Industrial
RI Defense Civil Preparedness Agency Radiological Systems Maintenance Facility State House Providence, RI 02903	Governmental
*RI Department of Health Childhood Lead Poisoning Control Program 107 Cannon Building 75 Davis Street Providence, RI 02908	Governmental
*Department of Health Laboratory 50 Orms Street Providence, RI 02908	Governmental
*RI Department of Transportation Division of Public Works Materials Section 302 State Office Building Providence, RI 02903	Governmental

	Type of Facility
*RI Hospital 593 Eddy Street Providence, RI 02903	Medical
*RI Nuclear Science Center Atomic Energy Commission South Ferry Road Narragansett, RI 02882	Governmental
*RI Psychiatric Research and Training Center P.O. Box 8281 Cranston, RI 02920	Medical
*Roger Williams General Hospital 825 Chalkstone Avenue Providence, RI 02908	Medical
John Roque, M.D. 795 Park Avenue Cranston, RI 02910	Medical
*Rosenthal Metceram Corporation 100 Niantic Avenue Providence, RI 02907	Industrial
St. Joseph's Hospital 200 High Service Avenue North Providence, RI 02904	Medical
*Schlumberger Well Services 5000 Gulf Freeway P.O. Box 2175 Houston, Texas 77001	Industrial
Scott-Brass, Inc. 1637 Elmwood Avenue Cranston, RI 02910	Industrial
*Bertram Selverstone, M.D. Moshassuck Medical Center 1 Randall Square Providence, RI 02904	Medical

	Type of Facility
*South County Hospital 95 Kenyon Avenue Wakefield, RI 02879	Medical
*Sanford C. Spraragen, M.D. 140 Cindy Ann Drive East Greenwich, RI 02818	Medical
*Toll Gate Radiology, Inc. 390 Toll Gate Road Warwick, RI 02886	Medical
*United Nuclear Corporation Fuel Recovery Operation Wood River Junction, RI 02894	Industrial
*University of RI Kingston, RI 02881	Educational
*Banice M. Webber, M.D. 790 North Main Street Providence, RI 02904	Medical
Westerly Hospital Wells Street Westerly, RI 02891	Medical
*Woonsocket Hospital 115 Cass Avenue Woonsocket, RI 02895	Medical

*Responded to survey.

APPENDIX B

DEMOGRAPHY: SUPPORTING DOCUMENTATION

TABLE B-1. SCHOOL ENROLLMENT IN RHODE ISLAND, FALL 1980(1,2,3)

County	Elementary[a]		Secondary[b]		Higher Education		Total
	Private	Public	Private	Public	Private	Public	
Bristol	683	3,432	458	4,110	2,858	0	11,541
Kent	3,050	12,233[c]	2,274	13,819[c]	0	7,042	38,418
Newport	1,122	7,010	945	7,236	1,792	200	18,305
Providence	9,668	40,004	10,321	43,453	25,710	13,336	142,492
Washington	628	8,426[c]	627	8,600[c]	0	14,672	32,973
TOTAL	15,151	71,125	14,625	77,218	30,360	35,250	243,729

a. Kindergarten through sixth grade.

b. Seventh through twelfth grade plus special education, vocational education, post graduate, regular upgraded and prekindergarten.

c. Exeter - West Greenwich School District lies in Kent and Washington counties. Half of its enrollment in each category was attributed to each county.

TABLE B-2. HOSPITAL BEDS IN RHODE ISLAND BY COUNTY[4]

County	Number of Beds
Kent	309
Newport	283
Providence	5,992
Washington	241
TOTAL	6,825

TABLE B-3. FEDERAL LABORATORIES IN RHODE ISLAND[5]

Agency:	Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service
Name of Facility:	Atlantic Environmental Group
Location:	Narragansett
Major Mission:	Conducts marine environmental studies, provides portrayals and interpretations of oceanographic and meteorological data, and investigates interrelations for use in fisheries and environmental forecasting.

Agency:	Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service
Name of Facility:	Narragansett Laboratory
Location:	Narragansett
Major Mission:	Conducts research on the inter- and intra-specific associations affecting actual and potential production of the fish biomass of the northwest Atlantic. Studies tropic exchange among benthos, plankton, and nekton and oceanographic dynamics to provide estimates of fish production and forecast biomass levels.

Agency:	Department of Defense, U.S. Navy
Name of Facility:	Naval Underwater Systems Center
Locaton:	Newport
Major Mission:	Principal Navy research, development, testing, and evaluation center for submarine warfare and submarine weapon systems.

TABLE B-3. FEDERAL LABORATORIES IN RHODE ISLAND (continued)

Agency:	Environmental Protection Agency
Name of Facility:	Environmental Research Laboratory
Location:	Narragansett
Major Mission:	Conducts marine water research.
Agency:	Environmental Protection Agency
Name of Facility:	Laboratory Building
Location:	Kingston
Major Mission:	Conducts research and development of environmental pollution control technology.
Agency:	Department of Health and Human Services, Food and Drug Administration
Name of Facility:	Northeast Technical Services Unit
Location:	Davisville
Major Mission:	Provides technical assistance to States and regional offices and conducts research on public health aspects of shellfish sanitation.
Agency:	Veterans Administration Medical Research Service
Name of Facility:	Veterans Administration Hospital
Location:	Providence
Major Mission:	Conducts biomedical research, health services research and development, and rehabilitative engineering research and development.

REFERENCES

1. State of Rhode Island, Department of Education, "Private and Independent Schools," n.d.

2. State of Rhode Island, Department of Education, Statistical Tables, 1979-1980, December 1980.

3. State of Rhode Island, Department of Education, Bureau of Postsecondary Education, "Rhode Island Institutions of Higher Education: Fall Enrollment, 1980," n.d.

4. American Hospital Association, Guide to the Health Care Field, Chicago: American Hospital Association, 1980.

5. U.S. Congress, House, Committee on Appropriations, Subcommittee on Agriculture and Related Agencies, Investigative Report on "Utilization of Federal Laboratories," 95th Cong., 2nd sess., Washington, D.C.: U.S. Government Printing Office, 1978.

APPENDIX C

GOVERNMENT STRUCTURE: SUPPORTING DOCUMENTATION

RHODE ISLAND STATE DEPARTMENTS

DEPARTMENT OF ADMINISTRATION
Don H. Rohrer, Director
118 State House
Providence, RI 02903
(401) 277-2280

DEPARTMENT OF BUSINESS REGULATION
Thomas J. Caldarone, Jr., Director
169 Weybosset Street
Providence, RI 02903
(401) 277-2246

DEPARTMENT OF COMMUNITY AFFAIRS
Frederick C. Williamson, Director
150 Washington Street
Providence, RI 02908
(401) 277-2850

DEPARTMENT OF CORRECTIONS
John J. Moran, Director
75 Howard Avenue
Cranston, RI 02920
(401) 464-2611

DEPARTMENT OF EDUCATION
Thomas C. Schmidt, Commissioner 199
Promenade Street
Providence, RI 02908
(401) 277-2057

DEPARTMENT OF EMPLOYMENT SECURITY
Mary C. Hackett, Director
24 Mason Street
Providence, RI 02903
(401) 277-3732

DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
W. Edward Wood, Director 85 Park Street Providence, RI 02908
(401) 277-2771

DEPARTMENT OF HEALTH
Joseph E. Cannon, Director
401 Cannon Building
75 Davis Street
Providence, RI 02908
(401) 277-2438

DEPARTMENT OF LABOR
Romeo A. Caldarone,
CIC Complex
235 Promenade Street
Providence, RI 02908
(401) 277-2741

DEPARTMENT OF MENTAL RETARDATION AND HOSPITALS
Joseph J. Bevilacqua, Director
The Aime J. Forand Building
600 New London Avenue
Cranston, RI 02920
(401) 464-3201

DEPARTMENT OF SOCIAL AND REHABILITATIVE SERVICES
John J. Affleck, Director
The Aime J. Forand Building
600 New Landon Avenue
Providence, RI 02920
(401) 464-2121

DEPARTMENT OF STATE LIBRARY SERVICES Jewel Drickamer, Director 95 Davis Street
Providence, RI 02908
(401) 277-2726

DEPARTMENT OF TRANSPORTATION
Wendall J. Flanders, Director
210 State Office Building
Providence, RI 02903
(401) 277-2481

MEMBERS OF THE RHODE ISLAND SENATE, 1981-1982

Member	Party Affiliation	District
Donald R. Hickey	Democrat	1 Providence
Lila M. Sapinsley	Republican	2 Providence
Richard A. Licht	Democrat	3 Providence
Rocco A. Quattrocchi	Democrat	4 Providence
James S. D'Ambra	Democrat	5 Providence, Johnston, North Providence
William B. Zuccarelli	Democrat	6 Providence
John J. Bevilacqua	Democrat	7 Providence
John Orabona	Democrat	8 Providence
John R. O'Leary	Democrat	9 Providence
Richard R. Patterson	Democrat	10 Providence
David Sholes	Democrat	11 Cranston
Richard McAllister	Democrat	12 Cranston
John C. D'Amico	Democrat	13 Cranston
Eleanor Sasso	Democrat	14 Cranston
Gloria Kennedy Fleck	Democrat	15 Warwick
J. William Inglesby	Democrat	16 Warwick
Thomas A. Lynch	Democrat	17 Warwick
John C. Revens, Jr.	Democrat	18 Warwick
Bruce Q. Morin	Democrat	19 Warwick
Walter J. Mruk	Democrat	20 Coventry, West Warwick
Jonathan K. Farnum	Republican	21 Coventry, Exeter, Jamestown, North Kingstown
John A. Romano	Republican	22 East Greenwich, Warwick, North Kingstown
Robert T. Motherway	Republican	23 North Kingstown
William C. O'Neill	Democrat	24 Narragansett, South Kingstown
Edward C. Marth	Democrat	25 Charlestown, Richmond, Hopkinton, South Kingstown, Exeter
James J. Federico, Jr.	Democrat	26 Westerly, New Shoreham
Irene P. Smith	Democrat	27 Burrillville, Foster, Glocester
Thomas A. DiLuglio	Democrat	28 Johnston
Michael J. Flynn	Republican	29 Smithfield, Scituate
James G. Hagan	Democrat	30 Woonsocket, North Smithfield
Jerome Smith	Democrat	31 Woonsocket
Alphonse F. Auclair	Democrat	32 Woonsocket, Cumberland
Paul E. Hanaway	Democrat	33 Cumberland
John W. Lyle, Jr.	Republican	34 Lincoln, Cumberland, Woonsocket

MEMBERS OF THE RHODE ISLAND SENATE, 1981-1982 (continued)

Member	Party Affiliation	District
John J. Gilgun	Democrat	35 Central Falls
Anthony R. Marciano	Democrat	36 North Providence
Leo J. Gannon	Democrat	37 Pawtucket
John F. McBurney III	Democrat	38 Pawtucket DL
John A. Sabatini	Democrat	39 Pawtucket, Central Falls
Lowell W. Kinch	Democrat	40 Pawtucket
Marilyn Shannon	Democrat	41 Pawtucket, East Providence
William A. Castro	Democrat	42 East Providence
William A. Bowen	Democrat	43 East Providence
Robert J. Janes	Republican	44 Barrington, East Providence
George C. Lima	Democrat	45 Bristol, Warren
Gardner F. Seveney	Democrat	46 Warren, Bristol Portsmouth
Guido J. Canulla	Democrat	47 Warren, Tiverton Little Compton
Joseph J. Chaves	Democrat	48 Middletown
David P. Carlin, Jr.	Democrat	49 Newport
Robert J. McKenna	Democrat	50 Newport

MEMBERS OF THE RHODE ISLAND HOUSE OF REPRESENTATIVES, 1981-1982

Member	Party Affiliation	District
Joseph L. Casinelli	Democrat	1 Providence
Joseph M. Lima	Democrat	2 Providence, East Providence
Frederick Lippitt	Republican	3 Providence
Victoria Lederberg	Democrat	4 Providence
Vito A. Saritelli	Democrat	5 Providence
Dominick J. Ruggerrio	Democrat	6 Providence
Albert R. Forte	Democrat	7 Providence
Armand E. Batastini	Democrat	8 Providence, North Providence
John H. Skeffington, Jr.	Democrat	9 Providence
Kevin A. McKenna	Democrat	10 Providence, North Providence
Alfred W. Cardente	Democrat	11 Providence, Johnston
Anthony Carnevale, Jr.	Democrat	12 Providence
Frank J. Fiorenzano	Democrat	13 Providence, Cranston
Aldo Freda	Democrat	14 Providence
Anthony Marcolivio	Democrat	15 Providence
Robert W. Gemma	Democrat	16 Providence
Matthew J. Smith	Democrat	17 Providence
Elizabeth Morancy	Democrat	18 Providence
Leonard E. Walker	Democrat	19 Providence
George A. Castro	Democrat	20 Providence
Bambino Shiapo	Democrat	21 Cranston
Anthony De Luca	Democrat	22 Cranston
Robert V. Bianchini	Democrat	23 Cranston
Paul R. Durfee	Republican	24 Cranston
Joseph A. De Lorenzo, Jr.	Democrat	25 Cranston
William T. Henry	Republican	26 Cranston
Irving H. Levin	Democrat	27 Cranston
William P. McKenna	Democrat	28 Cranston, Warwick
Marion G. Donnelly	Democrat	29 Warwick
Paul V. Sherlock	Democrat	30 Warwick
Anthony J. Carcieri	Democrat	31 Warwick
Michael V. D'Ambra	Democrat	32 Warwick
Helena E. McDermott	Democrat	33 Warwick
Kevin D. McCarthy	Republican	34 Warwick
Zygmunt J. Friedeman	Democrat	35 Warwick
Lorraine L. Kane	Republican	36 Warwick, North Kingstown
Maureen E. Maigret	Democrat	37 Warwick
Thomas A. Lamb	Democrat	38 West Warwick
Robert J. Carley	Democrat	39 West Warwick, Warwick
Robert S. Tucker	Democrat	40 West Warwick
John R. Assalone	Democrat	41 Coventry
Francis H. Sherman	Democrat	42 Coventry
Stephen R. Deutsch	Republican	43 East Greenwich
John A. McFarland, Jr.	Democrat	44 North Kingstown

MEMBERS OF THE RHODE ISLAND HOUSE OF REPRESENTATIVES, 1981-1982
(continued)

Member	Party Affiliation	District
Harold D. Cutting, Jr.	Republican	45 North Kingstown
Norma B. Willis	Republican	46 Jamestown, North Kingstown
Charles Ted Wright	Democrat	47 South Kingstown, Narragansett
James V. Aukerman	Democrat	48 South Kingstown
John D. Hamilton	Democrat	49 Exeter, South Kingstown
Henry R. Boeniger	Democrat	50 Westerly
Edward P. Morrone	Democrat	51 Westerly, New Shoreham, Charlestown
John A. Gilman	Democrat	52 Charlestown, Richmond, Hopkinton
Bradford Gorham	Republican	53 Coventry, Glocester, Foster, West Greenwich
Richard A. Blaine	Republican	54 Glocester, Scituate
John F. Vanner, Jr.	Democrat	55 Johnston
Donald J. Ferry	Democrat	56 Johnston
Joseph De Angelis	Democrat	57 Smithfield
George Kilsey	Republican	58 Lincoln, Smithfield
Robert B. Tucker	Republican	59 Lincoln
Lester N. Sherman	Democrat	60 Burrillville
Albert J. Vanasse	Republican	61 North Smithfield
Albert G. Brien	Democrat	62 Woonsocket
Richard P. Kearns	Democrat	63 Woonsocket
Camillo A. Pierannunzi	Democrat	64 Woonsocket
Roger N. Begin	Democrat	65 Woonsocket
Charles C. Baldelli	Democrat	66 Woonsocket
Donald Large	Republican	67 Cumberland, Woonsocket
Frederick C. Crowley	Democrat	68 Cumberland
William F. Hobson	Democrat	69 Cumberland
Frank J. Anzeveno, Jr.	Democrat	70 North Providence
Vincent J. Mesolella, Jr.	Democrat	71 North Providence
Maurice N. Hamel	Democrat	72 Central Falls
Robert R. Brousseau	Democrat	73 Central Falls
R. Kevin Horan	Democrat	74 Pawtucket
William D. Durand	Democrat	75 Pawtucket
John B. Harwood	Democrat	76 Pawtucket
Andrew E. McConnell	Democrat	77 Pawtucket
George T. Panichas	Democrat	78 Pawtucket
Robert W. Lynch	Democrat	79 Pawtucket
Maurice Caron, Jr.	Democrat	80 Pawtucket
Mary F. McMahon	Democrat	81 Pawtucket
William L. Drapeau	Democrat	82 East Providence
Joseph Quathucci	Democrat	83 East Providence
Henry J. Connors	Democrat	84 East Providence

MEMBERS OF THE RHODE ISLAND HOUSE OF REPRESENTATIVES, 1981-1982

(continued)

Member	Party Affiliation	District
Antonio SaoBento, Jr.	Democrat	85 East Providence
George D. Caruolo	Democrat	86 East Providence
Arthur M. Read 2nd.	Republican	87 Barrington
Ann H. Hanson	Republican	88 Barrington
Michael J. Urban, Jr.	Democrat	89 Warren
Gaetano D. Parella	Republican	90 Bristol, Warren
Thomas H. Byrnes, Jr.	Democrat	91 Bristol
Edward J. Smith	Democrat	92 Tiverton
Jesse T. Ferreira	Democrat	93 Portsmouth
Allen J. Wiant	Democrat	94 Little Compton, Portsmouth, Tiverton
Bruce J. Long	Republican	95 Middletown
Stephen P. Erickson	Republican	96 Middletown
Jeffrey J. Teitz	Democrat	97 Newport
Jeanne N. O'Rourke	Democrat	98 Newport
Christopher Boyle	Democrat	99 Newport
Paul W. Crowley	Democrat	100 Newport

APPENDIX D

STATE LEGISLATION AND REGULATIONS

APPENDIX D

RHODE ISLAND STATE LEGISLATION AND REGULATIONS

As is noted in Section 4.3.2, there is no pending legislation in Rhode Island potentially related to low-level radioactive waste management, although several bills dealing with hazardous waste management facilities were introduced in this session.

State regulations affecting low-level radioactive waste management are sufficiently extensive that they could not be reproduced within the scope of this report. Citations for these regulations are reproduced below:

"Rules and Regulations for the Control of Radiation," Radiation Control Agency, Division of Occupational Health, Department of Health. February, 1979. (Radiation Control Agency, Division of Occupational Health and Radiation Control, Department of Health).

"Hazardous Waste Generator Rules and Regulations," Effective 20 December 1979; Amended 23 November 1980. (Department of Environmental Management).

"Hazardous Waste Transporter Permit Rules and Regulations," Effective 6 July 1980; Amended 23 November 1980. (Department of Environmental Management).

"Rules and Regulations Governing the Transportation of Radioactive Materials as Herein Defined," Effective June 20, 1978. (Public Utilities Commission, Division of Public Utilities and Carriers).

APPENDIX E

INTEREST GROUPS

APPENDIX E

NATIONAL INTEREST GROUPS WITH POTENTIAL CONCERN WITH LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT

AMERICAN ASSOCIATION
OF PHYSICISTS IN MEDICINE
335 East 45th Street
New York, NY 10017
(212) 661-9404

AMERICAN COLLEGE OF
NUCLEAR PHYSICIANS
1101 Connecticut Avenue, N.W.
Washington, DC 20036
(202) 857-1135

AMERICAN HOSPITAL ASSOCIATION
444 North Capitol Street, N.W.
Suite 500
Washington, DC 20001
(202) 638-1100

AMERICAN NUCLEAR ENERGY COUNCIL
1750 K Street, N.W., Suite 300
Washington, DC 20006
(202) 484-2670

AMERICAN NUCLEAR SOCIETY
2029 K Street, N.W., Suite 501A
Washington, DC 20006
(202) 463-7220

AMERICAN PUBLIC HEALTH ASSOCIATION
1015 15th Street, N.W.
Washington, DC 20005
(202) 789-5600

ATOMIC INDUSTRIAL FORUM
7101 Wisconsin Avenue
Washington, DC 20014
(202) 654-9260

CONSERVATION FOUNDATION
1717 Massachusetts Avenue, N.W.
Washington, DC 20036
(202) 797-4300

CRITICAL MASS ENERGY PROJECT
P.O. Box 1538
Washington, DC 20013
(202) 546-4790

ENVIRONMENTAL ACTION COALITION
157 Fifth Avenue, Suite 1130
New York, NY 10010
(212) 929-8481

ENVIRONMENTAL ACTION, INC.
1346 Connecticut Avenue, N.W.
Room 731
Washington, DC 20036
(202) 833-1845

ENVIRONMENTAL DEFENSE FUND
1525 18th Street, N.W.
Washington, DC 20036
(202) 833-1484

ENVIRONMENTAL LAW INSTITUTE
1345 Connecticut Avenue, NW
Sixth Floor
Washington, DC 20036
(202) 452-9600

LEAGUE OF WOMEN VOTERS
OF THE UNITED STATES
1730 M Street, N.W.
Washington, DC 20036
(202) 296-1770

MOBILIZATION FOR SURVIVAL
3601 Locust Walk
Philadelphia, PA 19104
(215) 563-1512

NATIONAL ASSOCIATION OF
TOWNS AND TOWNSHIPS
1527 18th Street, N.W.
Washington, DC 20036
(202) 452-8100

NATIONAL INTEREST GROUPS WITH POTENTIAL
CONCERN WITH LOW-LEVEL RADIOACTIVE
WASTE MANAGEMENT (continued)

NATIONAL WILDLIFE FEDERATION
1412 16th Street, N.W.
Washington, DC 20036
(202) 797-6800

NATURAL RESOURCES DEFENSE
COUNCIL
122 East 42nd Street
New York, NY 10017
(212) 949-0049

NATIONAL AUDUBON SOCIETY
950 Third Avenue
New York, NY 10022
(212) 832-3200

SIERRA CLUB
530 Bush Street
San Francisco, CA 94108
(415) 981-8634

SOCIETY OF NUCLEAR MEDICINE
475 Park Avenue
New York, NY 10016
(212) 889-0717

UNION OF CONCERNED SCIENTISTS
1208 Massachusetts Avenue
Cambridge, MA 02138
(617) 547-5552

RHODE ISLAND STATE AND LOCAL
GROUPS WITH POTENTIAL CONCERN
WITH LOW-LEVEL WASTE MANAGEMENT ISSUES

CONCERNED CITIZENS OF
RHODE ISLAND
Box 525
Charlestown, RI 02813

RHODE ISLANDERS FOR
SAFE POWER
P.O. Box 69
Wakefield, RI
Emma Sacco
(401) 783-4138

AMERICAN FRIENDS SERVICE
COMMITTEE
2 Stimson Ave.
Providence, RI

CONSERVATION LAW FOUNDATION
1910 Industrial Bank Bldg.
Providence, RI
John Jewett
(401) 861-7550

SAVE THE BAY
154 Frances St.
Providence, RI

COALITION FOR CONSUMER
JUSTICE
622 Charles St.
Providence, RI

RHODE ISLAND PUBLIC INTEREST
RESEARCH GROUP
URI Campus Center
Kingston, RI

LEAGUE OF WOMEN VOTERS
41 Seeknok St.
Providence, RI 02906

AUDUBON SOCIETY OF RHODE
ISLAND
40 Brown St.
Providence, RI

ENVIRONMENTAL COUNCIL OF
RHODE ISLAND
40 Bowen St.
Providence, RI

ECOLOGY ACTION FOR
RHODE ISLAND
286 Thayer St.
Providence, RI 02906

APPENDIX F

REPRESENTATIVE NEWSPAPER ARTICLES ON LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT ISSUES

Series on Nuclear power, weapons planned

A Rhode Island group, Women for a Non-Nuclear Future will sponsor a 7-part study series for women this autumn on nuclear power and nuclear weapons. The series, modeled after a highly successful series last spring, will feature such speakers as the internationally-known physician and anti-nuclear activist, Dr. Helen Caldicott.

The seven sessions of the series will be held on alternate Wednesday evenings beginning September 17. Each session will be held at the Spring Green Memorial Baptist Church, 1350 Warwick Ave., in Warwick, beginning at 7:30 p.m. There is no fee for the series. The study series is intended primarily for women, but men also may attend.

"Nuclear power and nuclear weapons have a profound impact upon our lives," said Carol Bragg, one of the organizers of the series. "For too long, women have left decisions about the arms race and energy resources to men. We believe that women have a responsibility to themselves, to their families, and to future generations to learn about these issues."

The 7-part series is designed to provide basic information about nuclear weapons and nuclear power. The first session (September 17) is entitled "Basic Physics" and will be led by Dr. Geraldine Dettman, Radiation Safety Officer at Brown University. The second session (October 1) will cover the nuclear fuel cycle and will be led by Anna Gyrogy, author of *No Nukes: Everyone's Guide to Nuclear Power*.

Other sessions will examine the topics of "Solar Renewable Energy" (October 15), "Nuclear Weapons Systems and the Soviet Threat" (October 29), "The Militarization of Our Economy" (November 12), and "The Medical Implications of Nuclear Technology" (December 3). Dr. Helen Caldicott will be the featured speaker at the December 3 program.

Participants are strongly encouraged to attend the entire 7-part series but may attend only certain sessions if they wish. Pre-registration is not required. Additional information on the series may be obtained by calling Women for a Non-Nuclear Future at 751-4488.

Name: Townsman
City: Coventry
Edition: Weekly
Circulation: 21,641
Date: September 17, 1980

Nuclear outlook dim despite Maine victory

By MICHAEL A. HILTZIK
Journal-Bulletin Staff Writer

In the nation's poorest state, the nuclear industry survived one of its stiffest tests yesterday — Maine's statewide referendum that threatened to shut down an operating nuclear power plant.

But while the vote saved the state's only nuclear plant — Maine Yankee, the eight-year-old, 830-megawatt plant near Wiscasset — it highlighted the dismal outlook that the industry faces today.

"We look upon this as a vote of confidence in the Maine Yankee plant, but we do not look at it in any way as a mandate to build future plants," said Elwood W. Thurlow, president of Central Maine Power Co., Maine Yankee's principal owner, after the returns were in.

And Raymond Shadis, 38, the teacher-sculptor-gentleman farmer who started the initiative campaign from his century-old house two miles from Maine Yankee, argued that the results represented "a mandate for the nuclear industry to leave the State of Maine alone."

* * *

AS EXPECTED, the proposal to ban all electric generation by nuclear fission within the state's borders attracted a record vote (390,000) for a ballot initiative in Maine. Opponents of nuclear power produced a better showing than most polls had forecast; still their defeat was by a 3-to-2 margin. The count was 230,780 to 159,761.

Their proposal would have required Maine Yankee to cease operating within about 60 days.

"These people have given the national nuclear industry a well-deserved kick in the ass by coming in so close," Shadis proclaimed last night over the roar of what could have passed for a victory celebration in the Augusta office of the Maine Nuclear Referendum Committee. "We think you'll see another referendum."

Defeat of anti-nuclear proposal still leaves Maine with a legislative moratorium on new nuclear plants until the technology for disposing of nuclear wastes is proved satisfactory. And there were indications during the latest campaign that, but for the threat to Maine Yankee, the state's voters would have approved a total ban.

"But the point is that all moratoriums are ridiculous," Shadis said. "They simply mean you're not going to add new threats. If a new plant is dangerous, isn't an old plant more dangerous? The whole question of moratoriums is based on the dollar bill."

* * *

YESTERDAY'S VOTE notwithstanding, many observers in this country believe nuclear energy will never live up to its supporters' earliest expectations — countrysides dotted with generating stations churning out power too cheap to meter, as the line went in the 1950s and '60s.

Since those days the public has become far more sensitive, if not to the hazards of nuclear generation, at least to its uncertainties and the hidden costs of waste disposal, uranium production and plant decommissioning. The March, 1979, accident at Three Mile Island, say these experts, served to bring those concerns into sharp focus.

"There is definitely a de facto moratorium on nuclear power in this country," argued I. C. Bupp, a nuclear-power specialist on the faculty of Harvard Business School. "Virtually every utility in the country, with the exception of Commonwealth Edison in Chicago, has made the decision to end nuclear planning. There are about 90 plants under construction, and virtually all are being delayed... and in a lot of cases, the companies

Name: Bulletin
City: Providence
Edition: Evening
Circulation: 142,773
Date: September 24, 1980

R.I. among states eyed for N-dump

By CHRISTOPHER SCANLAN
Journal-Bulletin Staff Writer

Rhode Island, which once produced great quantities of the finest granite in the world, is one of 16 Eastern and Great Lakes states whose granite formations are being studied by the U.S. Department of Energy as potential sites for the nation's first permanent high-level atomic waste dump.

Besides Rhode Island, a draft report of potential sites targeted for the Energy Department by Dames & Moore Consulting Co. of Cincinnati also lists Minnesota, Wisconsin, Michigan, Maine, Vermont, New Hampshire, Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Virginia, North Carolina, South Carolina and Georgia.

Both the department and the federal consultant cautioned that the search for an atomic waste dump site is still in a preliminary stage.

"This listing should only be construed as a general illustration of the types of crystalline intrusive rock areas that are present within the United States," the draft report said. "These areas may or may not be suitable for repository siting and, therefore, should only be considered as a starting point for the future evaluation of areas."

* * *

THE GRANITE formation sites were identified from U.S. geological surveys, said Energy Department spokesman Ben McCarty. The report does not specify the location of the sites in Rhode Island and Massachusetts, he said. However, a commercial granite industry once thrived in the Westerly-Bradford area, and "Westerly granite" has been described by geologists as "probably the best known rock in the world."

No on-site studies have been made in any of the states where granite formations are located, and the sites have not yet been evaluated, said McCarty, who added that field studies of the formations won't begin for at least a year. In the meantime, he said, the department hopes to exchange information about the sites with geological experts in each of the states.

Granite formations are among a variety of of rock types that the agency wants to identify as a possible medium for the nation's first permanent nuclear-waste repository.

Under the guidelines of President Carter's new nuclear waste management plan, the Energy Department must nominate four or five potential sites in various types of rock by December, 1985. The choices would then be narrowed down to the best. However, under the Carter plan, the first permanent waste repository would not be selected, built and licensed before the end of the century.

Name: Bulletin
City: Providence
Edition: Evening
Circulation: 142,773
Date: October 2, 1980

Unit No. 1 at TMI should be returned to service

Hearings are now going on before a licensing board of the Nuclear Regulatory Commission on whether Unit No. 1 at Three Mile Island should be returned to service. Unless some evidence of overriding importance is produced to show that the operation would not be safe, the NRC ought to get that nuclear reactor back on line as soon as possible.

Unit No. 1 has not had any trouble. Unit No. 2 was the one that suffered a serious accident in March of last year. No. 1 was shut down at the time for refueling, and the NRC has not permitted it to be operated since then.

Eight antinuclear groups are presenting testimony against the reopening. Some of their arguments are that Metropolitan Edison, the operating utility, has had a long list of maintenance problems.

But Three Mile Island's accident has made a sharp difference to all nuclear power stations in the country. The NRC has adopted a long list of stricter regulations. Private utilities have instituted more-intensive training programs. Inspection by NRC staffers has been stepped up. Safety enforcement has been tightened all along the line.

Metropolitan Edison has been caught in a financial squeeze as a result of the accident. Not only has it lost the use of Unit No. 2 — and, thus far, Unit 1 — but it has had to purchase power from other utilities to meet the needs of its customers. In addition, it faces still uncertain costs for the cleanup of Unit 2.

If MetEd has financial problems, they should be cause for even closer NRC inspection and enforcement of regulations at the remaining reactor when it is put back in service. Thus, the operation there might be safer than at many other reactors in the country. But the NRC cannot rely on presumptions: only thorough monitoring of the reactor will reassure both the NRC and the public that there is no danger.

Unit No. 2 is still a major problem. Crews are just beginning the long job of decontaminating it. (A small step was taken Thursday when workers opened a jammed door to the main airlock.) Only the NRC can make an objective judgment on whether that job will in any way threaten Unit No. 1.

It will be helpful to the TMI area and to the country if the undamaged unit can be put back in service and oil-fired generation of electricity decreased by that much. The issue for the country is not so much financial as a matter of alternatives to oil. Some residents of the TMI area may be disturbed at the prospect; but the overall benefit to the country and to the utility should weigh heavily against vague fears, however intense they may have been in the period after the accident at Unit 2.

Name: Journal
City: Providence
Edition: Morning
Circulation: 71,593
Date: October 16, 1980

Nuclear waste returns to R.I. after rejection by Nev. dump

By LINDA MEGATHLIN
Journal-Bulletin Staff Writer

CHARLESTOWN — The first of four truckloads of low-level radioactive waste rejected by a Nevada disposal site arrived at the United Nuclear Corp.'s Wood River Junction reprocessing plant yesterday afternoon.

Santo Amato, chief of the state Civil Preparedness Agency, said two state health inspectors and two officials from his office were standing by when the shipment arrived.

The trucks moved through Rhode Island using a permit issued by the state Public Utilities Commission to carry radioactive materials on state highways. The permit prohibits the trucking of radioactive materials on state highways during morning and evening rush hours and requires the carrier to specify its route.

★ ★ ★

DANTE G. IONATA, Governor Garrahy's chief policy associate for energy, said the trucks would be locked and sealed until they are inspected by the state and the Nuclear Regulatory Commission. He said Governor Garrahy has ordered the inspection before steps are taken to recertify United Nuclear to ship its materials to the disposal site in Beatty, Nev.

The four trucks were sent back to Rhode Island by Nevada officials when two containers in the shipment, a 55-gallon drum and a box, were found to be leaking. Nevada prohibits the burial of nuclear waste that is in liquid form and of waste containers that are leaking. NRC officials said at the time that the level of radiation in the liquid was "not significant" and posed no hazard.

The leaking containers were repacked and sealed in larger containers, and all four truckloads were approved for interstate shipment. Two other trucks on their way to Nevada from the Wood River Junction plant turned back after Nevada revoked United Nuclear's certification to ship its wastes there. Those trucks arrived back in Charlestown last week.

★ ★ ★

THE TWO CONTAINERS were part of a shipment of about 270 drums and boxes. Bowers said the drums contain waste from holding lagoons at the plant, which recovers uranium from materials discarded by the nuclear industry. The boxes are used to ship equipment, scraps and rags associated with that process. He said shipments from the plant undergo a stringent inspection, but the system failed.

The company also ships low-level radioactive materials to a dumping site in South Carolina, and Bowers said United Nuclear would prefer to ship its waste there because of the shorter distance. However, South Carolina officials limit the amount of radioactive waste they accept.

Name: Bulletin
City: Providence
Edition: Evening
Circulation: 142,773
Date: October 15, 1980

Garrahy tells N-waste safety plan

By PETER LORD
Journal-Bulletin Staff Writer

PROVIDENCE — Governor Garrahy today announced a program designed to ensure that there are no more leakages of radioactive material from containers shipped out of state by the United Nuclear Corp. (UNC) in Charlestown.

"My sole objective is the removal of all radioactive materials from the UNC site as quickly as possible," Garrahy said. He called on UNC and the Nuclear Regulatory Commission (NRC) to work with state officials to ensure that the materials are removed safely and with no more problems.

Four truckloads of radioactive materials shipped from UNC were rejected by a Nevada disposal site a week ago because two containers in the shipment were found to be leaking. All the trucks were sent back to the UNC plant in Charlestown. The last truck was expected to arrive there today.

UNC is shutting down its nuclear waste processing plant. The move requires the firm to clean up lagoons and equipment at its plant and ship thousands of containers of contaminated materials to disposal sites out of state.

Garrahy said he has asked the NRC to investigate the leaks from the two containers, and has asked the division of radiological control in the state Department of Health to try to determine the cause of the leaks as well.

He said state experts, along with NRC officials and members of a citizens advisory group he created two months ago to oversee operations at UNC, will study the firm's processing and packaging procedures and make recommendations for improvements, if necessary. (Westerly, Charlestown, Richmond and Hopkinton were invited to name representatives to the advisory panel. So far, only one person has been appointed, by Charlestown.)

Garrahy also asked that every container shipped by UNC be individually inspected before leaving the plant, and asked for a review of the way commercial truckers handle the materials when they are being shipped.

UNC officials have said they take numerous precautions in shipping the materials and they still don't know why the two containers leaked.

Name: Bulletin
City: Providence
Edition: Evening
Circulation: 142,773
Date: October 17, 1980

United Nuclear waste banned from R.I. roads

By DAVE REID
Journal-Bulletin State House Writer

PROVIDENCE — At Governor Garrahy's request, the state Division of Public Utilities yesterday banned from Rhode Island highways shipments of radioactive wastes from the United Nuclear Corporation's plant in Charlestown.

Specifically, the division refused to issue a license for such shipments until federal and state officials investigate the company's procedures for processing and packaging its wastes.

Garrahy's action came after the state received a preliminary report from the Nuclear Regulatory Commission on the shipping containers that were turned away from a nuclear-waste burial site in Nevada earlier this month.

Six truckloads of wastes were ordered back to Rhode Island because two containers in the shipment were found to be leaking. The new NRC report noted indications of further leakage and improper packaging, Garrahy said.

United Nuclear is shutting down its nuclear waste processing plant in the Wood River Junction section of Charlestown. The move requires the company to ship thousands of containers of contaminated wastes to disposal sites out of state.

Nevada, one of only three states with burial sites for low-level nuclear waste, requires that the waste be in solid form — a sort of concrete — and that there be no leaks so that groundwater is not threatened with contamination.

* * *

THE PRELIMINARY REPORT from the Nuclear Regulatory Commission showed that there were two more barrels and two more boxes with "signs of leakage" in the packages that returned from Nevada, Garrahy's office reported.

In addition, eight other barrels and one other box had liquids inside, "a violation of NRC and Nevada disposal regulations," the governor said.

"Our earlier concerns that United Nuclear's waste-packaging procedures do not provide for adequate quality assurance appear to have been justified," the governor said.

"That this many inadequately packaged containers would be found in only six truckloads of waste material is clearly and completely unacceptable and suggests very strongly that a major and immediate overhaul of United Nuclear's processing procedures is imperative," he added.

He asked the NRC to hold a regulatory hearing in Rhode Island as soon as possible, in addition to a study of packaging and processing procedures at the plant that he requested earlier this month.

United Nuclear officials could not be reached for comment.

Name: Journal
City: Providence
Edition: Morning
Circulation: 71,593
Date: October 29, 1980

United Nuclear neighbors urged to have wells tested

By LINDA MEGATHLIN
Journal-Bulletin Staff Writer

CHARLESTOWN — The Citizen Advisory Committee named by Governor Garrahy to monitor the shutdown of United Nuclear Corp.'s [illegible] is urging those who live near the plant to have their wells tested for possible radioactive contamination.

Samuel Seely, Charlestown's representative to the committee, said, "It's our guess there's no problem. But we know there is contamination at the plant site and it just makes good sense to have the wells tested."

He said that so far there has been no real test of how serious or how far the contamination from lagoons at the plant spreads, and that state and federal officials are anxious to test private wells to get some of that information.

* * *

SEELY SAID the committee, which met for the first time this week, agreed to work with the officials to draw up a list of wells to be tested. Between 20 and 30 families live in a sparely populated quarter-mile radius of the plant.

The testing will be done by the state Health Department in cooperation with the Nuclear Regulatory Commission. Residents interested in having their wells tested should contact their committee representative through their town hall. There will be no charge for the tests.

State Health Department officials will be looking for the presence of both nitrates and radioactive isotopes in the wells that are tested since that was the type of contamination found on the plant site.

In 1976 and 1977, the U.S. Geological Survey turned up the contamination in test wells on the site. Subsequent tests have shown the radioactive contamination is decreasing near the lagoons. But nitrate levels are still well above acceptable drinking water standards.

Nitrates are of concern because they are said to cause methemoglobinema or "blue baby" disease, a condition apparent a birth which is caused by low levels of hemoglobin in the blood.

In addition to the testing of private wells, state and NRC officials plan to have United Nuclear drill a deep well near one of the lagoons to try and gauge the extent of contamination. But officials have said it could be the end of the year before final specifications for that well are drawn up and the drilling begins.

Seely said he is personally "very unhappy" with the location of that well. If the aquifer is as fast-flowing as state and federal officials have indicated, he said, it is very possible that the contamination will have moved much closer to the Pawcatuck River by the time the well is drilled. "To have picked that site is totally wrong," he said.

Name: Journal
City: Providence
Edition: Morning
Circulation: 71,593
Date: November 22, 1980

United Nuclear may be unable to ship wastes to Nevada dump until April

By MICHAEL A. HILTZIK
Journal-Bulletin Staff Writer

CHARLESTOWN — United Nuclear Corp. may be prevented from shipping radioactive waste material from its uranium reclamation plant here to a key Nevada dumping site until April — the company's original deadline for clearing the site of all radioactive material and closing the plant down.

Dante Ionata, a special assistant to Governor Garrahy, said yesterday that authorities in Nevada said it might take that long to have an inspection team examine the operations of each of 800 firms now shipping nuclear waste to a dumpsite in Beatty, Nev.

Nevada authorities closed the site to shipments from United Nuclear in September after several drums of ostensibly dry waste were found to be open and leaking liquids. Since then, Nevada has instituted a wide ranging inspection program for the site's customers.

Ionata made the disclosure before more than 150 South County residents gathered at Charlho Regional Vocational High School for an informational meeting on the planned closing of the United Nuclear plant. It became clear during the more than 2½-hour session that the company's schedule for "decommissioning" the plant's 1,140-acre site near rural Wood River Junction has been thrown thoroughly into confusion by the waste shipment problem.

"This has obviously altered our schedule," said Dennis Spurgeon, a group vice president for United Nuclear. He said, however, that the company has set no new closure deadline because the schedule "depends on circumstances out of our control" — notably the waste-shipment problem.

THE GATHERING heard representatives from the U.S. Nuclear Regulatory Commission, the state Department of Environmental Management and the governor's office describe efforts to ensure that United Nuclear leaves the site thoroughly uncontaminated when the 1963-vintage plant shuts down.

NRC officials said, however, that they were still investigating many aspects of two important apparent violations of NRC rules by the company: the faulty waste shipment to Nevada and the processing of radioactive material from 1976 to 1980 that the plant was not authorized to handle at all. George H. Smith, chief of NRC's regional fuel facilities and material safety branch, said that one focus of the investigation is whether the company committed the violations "willfully."

"Was the shipment to Nevada accidental?" he remarked. "Or were they trying to slip something through on the sly? That's what we have to determine." If the faulty shipment was willful, he said, penalties against the company "could go all the way up to criminal."

Although Energy Department spokesmen have said that the unauthorized shipments to United Nuclear after 1976 came only from the government's naval reactor program in Schenectady, N.Y.,

Listeners at last night's meeting repeatedly jeered the government officials every time they conceded that previous investigation of United Nuclear may have been imperfect, or when they showed confusion over what was known about the extent of environmental contamination from the plant site.

At one point, Smith showed William F. Crow, a Washington-based NRC supervisor responsible for United Nuclear's operation, a crucial letter about the plant's performance just as a local anti-nuclear activist in the audience began reading it aloud.

"Now, that's the first I've heard of this," Crow said, somewhat sheepishly.

* * *

UNDERGROUND WATER supplies beneath and around the plant site have been contaminated by radioactive elements traced directly to the plant. State and federal officials tried last night to offer residents assurances that the contamination levels detected so far are of little concern.

Many residents took cold comfort, arguing that United Nuclear's record was one of dishonesty and sloppiness.

Name: Journal
City: Providence
Edition: Morning
Circulation: 71,593
Date: December 3, 1980

Easing of rules on radioactive waste endorsed, assailed by R.I. interests

By C. EUGENE EMERY Jr.
Journal-Bulletin Medical-Science Writer

Hoping to reduce the amount of radioactive waste going to federal dump sites, the Nuclear Regulatory Commission is expected to adopt new regulations later this year that will treat some radioactive wastes as if they were not radioactive at all.

The proposal, which would primarily involve low-level wastes used in biomedical research, has been endorsed by radiation safety experts at Rhode Island Hospital and Brown University.

However the president of Rhode Islanders for Safe Power, an anti-nuclear group, expressed concern that the proposed change would open the door to abuses in the disposal of radioactive waste.

The NRC is trying to deregulate tritium, a form of hydrogen, and carbon-14, which is produced naturally in the atmosphere. Currently, the bodies of research animals exposed to these isotopes must be specially packed and shipped to federally licensed dump sites.

Another proposed change would deregulate volatile liquids used to measure small amounts of radioactivity. Unlike the isotopes, these "scintillation media" could not be simply thrown out, despite deregulation, because the disposal of some of the liquids are controlled by hazardous substance laws.

* * *

GERALDINE DETTMAN, radiation safety officer at Brown University, said the proposed rule changes would reduce the volume of Brown's radioactive waste by about 40 percent. The university currently ships ten 55-gallon drums a month to Washington state at a cost of $150 per barrel.

Colin Orton, chief of radiation physics at Rhode Island Hospital, said the materials that would be affected are not dangerous because they decay quickly. "Half of it's gone every six hours," he explained. "A lot of centers store it and let it decay and then dispose of it by normal means."

But Emma Sacco, president of Rhode Islanders for Safe Power, said that the move is part of an attempt by NRC to "decontrol nuclear waste as much as possible and turn the problem to the private sector."

She said looser regulations would make it harder to prosecute people who dump illegally because it would be difficult to prove how much radioactivity was in the material at the time it was dumped. "The NRC," Mrs. Sacco contended, "is silently moving to pass on these problems to unknowing communities."

"Basically, NRC is washing its hands of the matter," commented Charles McMahon, supervising radiation control officer for the state Department of Health. "It would fall on people dealing with air or water pollution."

McMahon said his only concern is the plan to deregulate the scintillation media. Critics have expressed the fear that the liquids, once no longer considered radioactive, will be illegally dumped down the sink. Some of the scintillation liquids are suspected cancer agents, Dr. Dettman said.

But Barry W. Muller, principal engineer for the division of air and hazardous materials, expressed confidence that researchers will dispose of the scintillation liquids properly.

THE EXPERTS welcomed the NRC proposals because there's a need to conserve space in the nation's few radioactive waste dumps.

Name: Journal
City: Providence
Edition: Morning
Circulation: 71,593
Date: January 16, 1981

APPENDIX G

SURVEY METHODOLOGY

APPENDIX G

SURVEY METHODOLOGY

Low-level radioactive waste generators in Rhode Island were surveyed as part of this project in order to determine low-level waste management practices in general and the characteristics of shipped low-level waste in particular. The waste generator survey was conducted in two steps. The first step consisted of mailing the survey form shown in Figure G-1 to all generators. The second step consisted of site visits to generators.

The information requested by the survey form included:

- type of facility;
- disposal method(s) for all low-level waste;
- sources of all radioactive waste;
- amount and destination of low-level waste shipped;
- physical form of shipped waste;
- onsite processing of shipped waste;
- quantity of shipped waste; and
- disposal cost of shipped waste.

The questionnaire was designed to minimize the time and effort required to fill it out (e.g., most possible answers were provided). In addition, the questions asked were limited to those which have a direct bearing on the overall characterization of waste management practices within the State, rather than on a detailed characterization of each facility.

A list of licensees was obtained from the Nuclear Regulatory Commission[1] and because Rhode Island is an agreement State, from the

FIGURE G-1. SURVEY FORM

PLEASE RETURN TO: CENTAUR ASSOCIATES, INC.
1120 Connecticut Ave., N.W.
Suite 465
Washington, D.C. 20036
ATTN: Michael Frankel

LOW-LEVEL 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.)

INDUSTRIAL

- ☐ Incorporates Radioactivity Into Products
- ☐ Uses Radioactivity In Process Control
- ☐ Commercial Power Reactor
- ☐ Pharmaceutical Manufacturer
- ☐ Other (Specify) _____

MEDICAL

- ☐ Hospital
- ☐ Medical Research/Education
- ☐ 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 Employ.)

- ☐ Ship To Commercial Low-Level Waste Disposal Site (Direct Or Through Broker)
- ☐ 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) _____

PART III - SOURCE AND DESTINATION 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 And Its Destination.)

SOURCE OF RADIOACTIVITY	PERCENT OF TOTAL WASTE VOLUME SHIPPED	WHERE 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 Waste, You Have Completed The Questionnaire. Thank You. If You Do Ship, Please Continue With The Questions On The Reverse Side.

OVER...

FIGURE G-1. SURVEY FORM (continued)

PART IV - PHYSICAL FORM OF SHIPPED WASTE

(Check Each Form Of Waste Which You Ship And Indicate The Percentage Of Your Total Shipped Waste Volume Each Form Represents.)

FORM OF WASTE	PERCENT OF TOTAL 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 Shipped Contain Any Material Which Is Potentially:

☐ Chemically Toxic ☐ Combustible

☐ Corrosive ☐ Explosive

What Shipping Containers Do You Use?

☐ 55 Gallon Steel Drums

☐ 30 Gallon Steel Drums

☐ Shielded Casks

☐ Wooden Boxes

☐ Other (Specify) _____

_____

What On-Site Processing Of Shipped Waste Do You Employ?

☐ None

☐ Mechanical Compaction

☐ Incineration

☐ Solidification Or Evaporation Of Liquids

☐ Absorption Of Liquids

☐ Other (Specify) _____

PART V - WASTE QUANTITY AND DISPOSAL COSTS

(Indicate Total Yearly Volume [In Cubic Feet] And Disposal Costs of Waste Shipped To A Commercial Disposal Facility.)

	Cubic Feet Of Waste Shipped	Total Cost
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 of Waste To Be Shipped
Estimated Shipped In 1981	_____
Estimated Shipped In 1985	_____
Estimated Shipped In 1990	_____

(Indicate The Quantity Of Radioactivity [In Curies] In Waste Shipped To A Commercial Facility In The Years 1978, 1979 And 1980.)

ISOTOPE	Quantity Of Waste Shipped (Curies) In: 1978	1979	1980

THANK YOU.

State of Rhode Island Department of Health. To encourage recipients to respond, the questionnaire was accompanied by:

- a cover letter explaining the purpose of the study and questionnaire, and identifying a person at Centaur Associates, Inc. who would be available to respond to questions (see Figure G-2);
- simple instructions on filling out the questionnaire, which addressed, among other things, the way the respondent should include the effects of the Nuclear Regulatory Commission's recent changes in the low-level waste disposal rules in his or her answers; and
- a self-addressed, stamped envelope in which the questionnaire was to be returned.

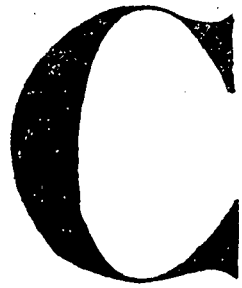
In addition, about two weeks after the survey was sent out, a postcard was sent to those firms from whom completed forms had not been received, reminding them about the questionnaire.

The second part of the waste generator survey consisted of site visits to low-level radioactive waste generators. These visits were used to verify and supplement the information received from the questionnaire. The sites visited were chosen on the basis of size and type of facility to provide a representative sample of waste generators in the State.

Waste generators visited were initially contacted by letter to explain the purpose of the study and proposed visit. This letter was followed by a telephone call to set a date and time for the visit. In a few cases, when site visits could not be arranged due to schedule conflicts or other factors, these interviews were conducted by telephone.

The information obtained from the survey and site visits is presented in tabular form in Section 7 of this briefing book. The degree of response to each question is shown in Table G-1.

FIGURE G-2. COVER LETTER



Centaur Management Consultants, Inc. *Suite 465*
1120 Connecticut Avenue, N.W.
Washington, D.C. 20036
202/296 4100

March 27, 1981

Dear Licensee:

To assist in planning for safe low-level radioactive waste disposal, Centaur Associates, Inc. is conducting a survey of nuclear material licensees in Rhode Island for the U.S. Department of Energy's Idaho National Engineering Laboratory. The survey is part of a larger DOE effort to develop a national low-level radioactive waste management program. A state briefing book on low-level radioactive waste management is being prepared for Rhode Island as part of the national management plan. The survey results will be used to develop a profile of low-level radioactive waste generated in Rhode Island which will be included in the Rhode Island State Briefing Book.

Your organization has been included in the survey because it has a current license to use reactor generated radioactive materials. Please answer the questions as they relate to all of your Rhode Island licenses for possession of radioactive materials and return the survey form to us in the enclosed envelope by April 23, 1981. All survey results will be aggregated and no information will be attributed to a single organization.

Questions concerning the Rhode Island State Briefing Book on Low-Level Waste Management, the survey form or its use should be directed to me at (202) 296-4100. Questions concerning the U.S. Department of Energy's Low-Level Waste Management Program should be directed to Edward Jennrich at EG&G Idaho, Inc., (208) 526-9490. We look forward to receiving your response to the survey form.

Sincerely,

C. M. Niemczewski

Christopher M. Niemczewski

Enc.

TABLE G-1. DEGREE OF RESPONSE TO SURVEY QUESTIONS

Type of Facility	No. of Licensees	Part I: Type of Facility		Part II: Disposal Method		Part III: Source of Radioactive Waste		Part III: Destination of Waste	
		No.	Percent of Licensees	No.	Percent of Licensees	No.	Percent of Licensees	No.	Percent of Licensees
Medical	22	14	63.6	14	63.6	7	31.8	3	13.6
Educational	3	2	66.7	2	66.7	2	66.7	1	33.3
Industrial	22	13	59.1	13	59.1	9	40.9	2	9.1
Governmental	9	7	77.8	7	77.8	6	66.7	0	0.0
Total	56	36	64.3	36	64.3	24	42.9	6	10.7

TABLE G-1. DEGREE OF RESPONSE TO SURVEY QUESTIONS (continued)

Type of Facility	Part IV							
	Physical Form		Hazardous Characteristics		Onsite Processing		Shipping Container Used	
	No.	Percent of Licensees	No.	Percent of Licensees	No.	Percent of Licensees	No.	Percent of Licensees
Medical	3	13.6	3	13.6	3	13.6	3	13.6
Educational	2	66.7	2	66.7	1	33.3	1	33.3
Industrial	2	9.1	2	9.1	2	9.1	2	9.1
Governmental	2	22.2	2	22.2	2	22.2	2	22.2
Total	9	16.1	9	16.1	8	14.3	8	14.3

TABLE G-1. DEGREE OF RESPONSE TO SURVEY QUESTIONS (continued)

	Part V							
	Actual Waste Shipped		Shipping Cost		Projected Waste Shipped		Isotopes	
	No.	Percent of Licensees	No.	Percent of Licensees	No.	Percent of Licensees	No.	Percent of Licensees
Medical	3	13.6	3	13.6	3	13.6	3	13.6
Educational	2	66.7	1	33.3	2	66.7	2	66.7
Industrial	2	9.1	1	4.5	1	4.5	2	9.1
Governmental	2	22.2	2	22.2	2	22.2	2	22.2
Total	9	16.1	7	12.5	8	14.3	9	16.1

REFERENCES

1. The Nuclear Regulatory Commission licenses nuclear reactors and users of special nuclear, source, and by-product materials. Potential generators of low-level waste were identified from the list of licensees.

APPENDIX H

GLOSSARY

APPENDIX H

GLOSSARY

activity	A measure of the rate at which a material emits nuclear radiation, usually given in terms of the number of nuclear disintegrations occurring in a given length of time.
Agreement State	A State that has entered into an agreement with the Nuclear Regulatory Commission to assume regulatory responsibility for radioactive materials under Section 274 of the Atomic Energy Act of 1954 as amended.
alpha particle	A positive charged particle emitted in the radioactive decay of certain isotopes. Made up of two protons and two neutrons bound together, it is identical to the nucleus of a helium atom. It is the least penetrating of the three common types of radiation--alpha, beta, and gamma radiation.
B (shipment type)	A classification (10 CFR 71) of shipments of radioactive material depending on the amount of radioactivity contained; broadly characterized, type B shipments contain more radioactivity than type A shipments of similar radioactivity and potential hazard. Federal regulations also specify standards for the packaging of shipments according to type.
background radiation	Radiation in the environment produced by naturally occurring radioactive materials in the crust of the earth, cosmic radiation, and the fallout from nuclear weapons tests.
beta particle	A negative charged particle emitted in the radioactive decay of certain isotopes; a free electron. Beta is one of the three types of radiation.
canister	A container, usually cylindrical, for remotely handled waste, spent fuel, or high-level waste. The waste will remain in this canister during and after burial. A canister affords physical containment but not shielding; shielding is provided during shipment by a cask.

cask	A large shipping container providing shielding for highly radioactive material and holding one or more canisters.
commercial disposal site	A facility at which nondefense low-level radioactive waste is buried under license of the Nuclear Regulatory Commission and/or an Agreement State.
commercial waste	Low-level radioactive waste generated by commercial power plants, manufacturing industries, and institutions (hospitals, universities, research institutions).
contact-handled waste	Waste that does not require shielding other than that provided by its container.
contamination	The uncontrolled and undesirable deposition of radioactivity on an object, material, or area. This contamination can be either transferable or fixed. Radiation penetrating the walls of a waste package from within is not contamination.
controlled landfill	Conceptually, a landfill similar to a commercial landfill for municipal waste, considered for the disposal of appropriate solid low-level waste.
curie	The standard unit for measuring radioactivity. It is equal to 37 billion nuclear transformations per second, or the radioactivity contained in one gram of radium.
decommissioning	The process of removing a facility from operation. It is then mothballed, entombed, decontaminated, and dismantled or converted to another use.
decontamination	The removal of unwanted material (especially radioactive material) from the surface or from within another material.
defense waste	Nuclear waste deriving from the manufacture of nuclear weapons and the operation of naval reactors. Associated activities such as the research carried on in the weapons laboratories also produce defense waste.
disposal	Operations designed to isolate waste from people and the environment, with no expectation of retrieval after emplacement.

dose (radiation)	A general term indicating the amount of energy absorbed per unit mass from incident radiation.
extended care	Procedures instituted at disposal sites after closure to monitor the long-term performance of the site.
fission	The splitting of a heavy nucleus into two approximately equal parts, each the nucleus of a lighter element, accompanied by the release of a large amount of energy and generally one or more neutrons. Fission can occur spontaneously, but it usually follows the absorption of neutrons.
fissionable	Describes an isotope that undergoes fission on absorption of a neutron of energy over some threshold energy.
gamma rays	Short-wavelength electromagnetic radiation emitted in the radioactive decay of certain isotopes. Gamma rays are the same as gamma particles. Of the three types of radiation, gamma rays are considered the most serious because of their ability to penetrate other materials.
half-life	The time required for the activity of a group of identical radioactive nuclei to decay to half its initial value. Each radioisotope has a unique half-life.
high-level waste	Discarded, unreprocessed spent reactor fuel or the radioactive wastes produced during the reprocessing of used reactor fuel. It is characterized by intense, penetrating radiation and by high heat-generation rates. Even in protective canisters, high-level waste must be handled remotely.
Interagency Review Group on Nuclear Waste	A group established by President Carter to review waste management goals, plans, and activities.
isotope	In chemistry and physics, one of two or more atoms having the same atomic number but differing in atomic weight and mass number. The nuclei of isotopes contain identical numbers of protons, equal to the atomic number of the atom, and thus represent the same chemical element, but do not have the same number of neutrons. Thus, isotopes of a given element have identical chemical properties but slightly different physical properties, and very different half-lives, if they are radioactive. Also nuclide.

leaching	The process of extracting a soluble component from a solid by the percolation of a solvent (e.g., water) through the solid.
low-level waste	Radioactive waste other than uranium mine or radioactive waste mill tailings, spent fuel, or high-level radioactive waste. Low-level waste contains radioisotopes emitting primarily beta and/or gamma radiation and less than 10 nanocuries per gram of transuranic elements.
microcurie	One one-millionth curie. The maximum in permissible body burden for persons exposed to radium risks is set at 0.1 microcurie.
millicurie	One one-thousandth curie.
nanocurie	One one-billionth curie.
Nuclear Regulatory Commission	Federal government agency established in 1974 by the Energy Reorganization Act to assume regulation of the commercial use of nuclear energy.
nuclide	Isotope.
radiation	The process of emitting radiant energy in the form of waves or particles.
radioactive decay	The decrease in the number of radioactive nuclei present in a radioactive material due to their spontaneous transmutation, which results in a decrease of the radioactive atoms in a sample. Also, the transmutation of a radioisotope into another isotope by the emission of a charged particle. All radioactive material is contantly decaying.
radioactivity	The property possessed by some atoms of spontaneously emitting alpha and beta particles and sometimes also gamma rays, by the decay of the nucleus of the atom.
radioactive isotope	Any species of atom having an unstable nucleus that decays emitting radiation, until stability is reached. It thus has a defined half-life. The stable end product is a non-radioactive isotope of another element. Also radioisotope, radioactive nuclide, or radionuclide.

rem	Abbreviation for "roentgen equivalent man." The unit for measuring radiation doses received by people.
repository	A facility for the storage or disposal of radioactive waste.
scintillation liquids	Organic chemical solutions that produce light when bombarded with radiation. These liquids are a major component of institutional low-level waste.
spent fuel	Nuclear-reactor fuel that, through nuclear reactions, has been sufficiently depleted of fissile material to require its removal from the reactor.
spent fuel storage pool	A water-filled and cooled basin in which spent fuel is stored before being sent away for reprocessing or disposal.
storage	Temporary disposition in a repository. Use of the word storage implies keeping open the possibility of retrieving the waste for reprocessing, for moving it elsewhere, etc. Storage usually implies the need for continued surveillance.
transuranic isotope	An isotope with an atomic number greater than that of uranium (92). All transuranic isotopes are produced artificially and are radioactive.
volume reduction	Various methods of waste treatment, such as evaporation for liquids or compaction for solids, aimed at reducing the volume of waste.
waste matrix	The material that surrounds and contains the waste and to some extent protects it from being released into the surrounding rock and groundwater. Only material within the canister that contains the waste is considered part of the waste matrix.

APPENDIX I

STATEMENT BY SENATOR CLAIBORNE PELL ON LOW-LEVEL RADIOACTIVE WASTE

STATEMENT BY SENATOR CLAIBORNE PELL

ON LOW-LEVEL RADIOACTIVE WASTE

There are few issues that have caused greater concern among the public today than the problems of nuclear waste disposal. Unfortunately, in this regard, Congress has been unable, since the beginning of the nuclear age 35 years ago, to enact a national waste management program - one of my primary concerns.

Although hi-level radioactive waste is not an issue that we are immediately assocaited with in Rhode Island, the issue of low-level radioactive waste has been very much on the minds of Rhode Islanders since the decision by United Nuclear Corporation to close its plant in Charlestown. This decision by the company raised very serious questions on groundwater contamination as well as the process for decommissioning the plant and disposal of this low-level waste, sludge and equipment.

Since the initial concerns were raised about the United Nuclear Corporation last year, some progress has been made towards addressing the problems of the Charlestown facility. In this regard, Nuclear Regulatory Commission officials have advised me that surveys taken to date have not shown any hazard to public water supplies. Considerable concern over groundwater contamination remains, however, and monitoring of reservoirs in the area by NRC and USGS will continue for several years. In addition, small quantities of low-level radioactive waste including equipment and sludge from the plant have been shipped to one commercial facility for disposal.

Unfortunately, this process has been slow and points out clearly that a Federal policy is essential to permit the expansion, either on the private or Federal level, of storage capacity for low-level waste.

Last year Congress passed the Low-Level Waste Policy Act, now Public Law 96-573, which I supported, that provides for a process for States to act on the disposal of low-level wastes from such facilities as medical labs and university reactors. It also permits states to form regional compacts for the disposal of low-level waste material.

While this is a positive step in the direction of a national waste program, the Federal government must still decide whether to permit the expansion of commercial capability for low-level waste disposal or for the Department of Energy to assume the responsibility of accepting such low-level radioactive waste as part of its overall hi-level waste storage program.

The problem of low-level waste storage is only one aspect of public concern over nuclear waste which must be addressed as soon as possible if nuclear power is to be considered as a serious option for the '80's.