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Solid Waste Management State Plan Update 1993 - 2002

Section II: Comprehensive Regulated Medical Waste Management Plan

State of New Jersey
Department of Environmental Protection and Energy
Division of Solid Waste Management



in cooperation with the
Department of Health

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April 1993

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SOLID WASTE MANAGEMENT STATE PLAN UPDATE: 1993 - 2002

SECTION II: COMPREHENSIVE REGULATED MEDICAL WASTE MANAGEMENT PLAN

Executive Summary

I. INTRODUCTION

Medical waste management represents a relatively new aspect of the environmental field. Historically, medical waste was managed along with solid waste from institutions such as hospitals and disposed of primarily at landfills. With the rise of the Acquired Immune Deficiency Syndrome (AIDS) epidemic in the mid to late 1980s, heightened attention was focused upon medical waste. Attention quickly turned into action as wash-ups of syringes, blood vials and other medical debris landed at beaches all along the East Coast during the summers of 1987 and 1988. In response, an unprecedented flurry of regulatory activity took place at the state and federal levels which resulted in both a state and a federal statute and three major sets of regulations, two state and one federal, being enacted within a one-year time period from August 1988 to June 1989.

For New Jersey, a set of emergency regulations was first enacted in August 1988 following a second consecutive season of beach wash-ups of medical waste. This was followed by the passage of the federal "Medical Waste Tracking Act of 1988," which established a two-year demonstration project in which New Jersey participated. In March 1989, the New Jersey Legislature passed the Comprehensive Regulated Medical Waste Management Act (Comprehensive Act) which established the detailed long-term program that the New Jersey Departments of Environmental Protection and Energy (DEPE) and Health (DOH) have been implementing over the past four years. The Comprehensive Act also included the requirement that the state plan which follows be developed by the departments. To complete the initial regulatory program, the United States Environmental Protection Agency (USEPA) passed regulations in early June 1989 to implement the federal demonstration program, and New Jersey promptly passed a final set of regulations which adopted all aspects of the federal demonstration program to ensure consistency, avoid confusion, and structure a long-term management program.

Prior to the advanced regulatory program now in place in New Jersey, little was known about medical waste. Over the past four years, however, a significant body of knowledge has been assembled as presented in this state plan, which sets the stage for full implementation of a long-term management program. In 1993, New Jersey has a universe of over 16,000 generators, 40 transport companies and 66 treatment and destruction facilities registered with the DEPE. We know that approximately 20,000 tons of regulated medical waste (RMW) is produced annually, or roughly 55 tons per day, with 95% of this waste being generated by New Jersey's 101 general hospitals (85%) and 204 laboratories (10%). Less than 5% of the statewide total is generated by the registered medical doctors, dentists and other smaller generators combined. Beyond these facts, it is accurate to conclude that a detailed medical waste program has been successfully

established in New Jersey which includes: generator, transporter and facility registration; routine inspections and compliance monitoring; record-keeping and reporting requirements; standards for RMW segregation, packaging, labeling and tracking; and an ongoing education outreach program to keep the regulated universe informed of their obligations.

Now that an initial program has been established, New Jersey and its 21 counties need to develop and implement long-term plans to achieve statewide goals. The following state plan formally initiates this planning process by providing detailed background information and framing key statewide policy in the areas of source reduction, recycling, regionalization, new technology development and disposal self-sufficiency for medical waste and RMW in particular. The plan stresses major themes of regional medical waste management and achievement of disposal self-sufficiency at in-state facilities within the next 5 years. All RMW generated in New Jersey amounts to approximately 20,000 tons per year. In the context of solid waste management this is a very small quantity amounting to a fraction of one percent of the 14.7 million tons of total solid waste generated each year in New Jersey. As a result, the DEPE strongly endorses regional cooperation and management between counties. Ideally, a single statewide facility could be developed which involves front-end or back-end processing to maximize recycling and a treatment/destruction component (preferably non-incineration) to handle the shortfall of in-state disposal capacity.

The plan also identifies source reduction and recycling goals, primarily with respect to the non-RMW components of the waste stream generated at hospitals, including office, cafeteria and general patient related solid waste. More specifically, since about 80% of the waste stream is municipal solid waste, the established objective for hospitals and other large medical waste generators is to achieve at least a 40% total waste stream recycling rate by December 31, 1995. The plan also sets source reduction goals consistent with general solid waste management objectives to cap per capita or per patient generation of waste at 1990 levels, cap total waste generated at each institution within five years and then reduce total waste generation within ten years. Finally, with the submission to the Governor and Legislature of the RMW State Plan, the Departments of Environmental Protection and Energy and Health will resume consideration of county plan and technical engineering submissions for new commercial facilities. Previously, new commercial facilities were restricted by the Comprehensive Act which placed a moratorium on development during the state planning development process.

Generally, the policies for the management of RMW closely mirror the department's solid waste policies as described in the "Municipal and Industrial Solid Waste State Plan Update: 1993-2002" proposed by the DEPE in the New Jersey Register on February 16, 1993. The basic policy framework of the state shifted in 1990 due to the efforts and guidance of Governor Florio's "Emergency Solid Waste Assessment Task Force." The task force reevaluated the state's solid waste management policies and practices and recommended sweeping changes, focusing on maximizing source reduction, achieving at least a 60% statewide recycling rate by December 31, 1995, developing regional management systems for the residue which is not recycled, and achieving statewide disposal self-sufficiency under a rational management plan. These recommendations were accepted by Governor Florio in November 1990 and served as the

foundation of the overall 1993 State Plan Update of which the following document is part.

The complete 1993 State Plan Update describes New Jersey's current programs and practices for the management of solid waste, sludge and medical waste and sets forth the state's plan for managing those wastes over the next ten years. The development and updating of a statewide plan is a statutory requirement of the New Jersey Solid Waste Management Act. The medical waste portion is in response to the specific direction of the Legislature as outlined in the Comprehensive Act. The plan sets forth broad goals, objectives, criteria and standards by which the county and statewide solid waste planning is conducted. In essence, it serves as the backdrop from which the county/state planning process is administered. This broad 1993 planning initiative will supersede the last adopted municipal and industrial solid waste plan of 1986, update the Statewide Sludge Management Plan of 1987, and represent New Jersey's Comprehensive Regulated Medical Waste Management Plan which immediately follows. Specifically, the 1993 State Plan Update will:

- Outline the state's short and long-term goals for each management program and the legislative, regulatory and policy framework necessary to achieve those goals;
- Describe the current status of solid waste, sludge and medical waste management in the state and evaluate the effectiveness of those programs in light of the requirements of the Solid Waste Management Act; and
- Describe how New Jersey's program fits within the national regulatory scheme for the management of solid waste, sludge and medical waste.

The 1993 State Plan Update is divided into three major sections. Section I, which was published in February 1993, sets forth the state's municipal and industrial solid waste management plan update. Section I addresses almost exclusively the management of municipal and industrial solid waste, and provides only marginal references to sludge and medical waste for relevant issues which overlap. Section II, which follows, sets forth the state's comprehensive regulated medical waste management plan (RMW State Plan) promulgated in accordance with the requirements of the Comprehensive Act. Section III will set forth the state's revised sludge management plan, which focuses on the development of land-based uses for sludge and sludge-derived products.

Because of the complexity, depth and breadth of the 1993 State Plan Update, the solid waste, sludge and medical waste sections will be adopted in phases. The department published a Notice of Availability for Section I, the municipal and industrial solid waste management plan, in the New Jersey Register on February 16, 1993, marking the beginning of the adoption process. A Notice of Availability for Section II, the 1993 Comprehensive Regulated Medical Waste Management Plan, is scheduled for April 19, 1993. Section III, the sludge management plan update, will have a Notice of Availability published in July 1993.

Each section of the 1993 State Plan Update begins with an executive summary to provide

the reader with a broad-based understanding of the goals and objectives for each regulatory program and a description of the plan designed to meet those goals and objectives. After the executive summaries, the specific goals and objectives, current programs and planning initiatives are described in detail and include all documentation and data. The 1993 State Plan Update includes numerous graphics, tables and charts to describe often complex and complicated information in a manageable fashion.

This Executive Summary to the RMW State Plan is designed to orient the reader by providing a concise, general description of 1) the department's objectives, criteria and implementation strategies; and 2) the current medical waste system and management practices. The Executive Summary, however, is not intended to be a substitute for the RMW State Plan, which sets forth the department's entire regulatory program in detail, including all backup data and information. While the Executive Summary provides a convenient synopsis, the reader is encouraged to review the entire RMW State Plan to attain a full understanding of the state's RMW management plan.

II. OBJECTIVES, CRITERIA, STANDARDS AND IMPLEMENTATION STRATEGIES

The departments (DEPE and DOH) have assumed, and will continue to assume, a leadership role in the development and implementation of the RMW regulations. The departments' activities have included establishing an inventory of the number and types of generators, transporters and disposal facilities for RMW, as well as the composition and quantities generated, transported, and disposed of in New Jersey. The departments have used this information to develop or evaluate RMW disposal capacity, self-sufficiency, regionalization opportunities, source reduction and recycling opportunities, the use of new technologies, and an enforcement policy that educates and assures compliance with the RMW regulations. All of these activities are part of the Comprehensive Act's mandate to prepare a statewide medical waste management plan that addresses New Jersey's immediate, interim and long-term needs in regard to the disposal of RMW in a manner that protects public health and the environment. The following describes the objectives, criteria, standards and implementation strategies to achieve the mandates required by the Comprehensive Act:

1. Interrelationship of Solid Waste and RMW Planning

The Comprehensive Act mandates that with the completion of this RMW State Plan, RMW planning will become a primary responsibility of the counties, subject to state review and approval. The DEPE will be responsible for setting disposal rates at commercial RMW facilities, analyzing opportunities for regionalization of RMW systems, developing statewide waste flow rules, and intervening directly in the planning process should any county fail to develop a comprehensive plan.

Since RMW in New Jersey is considered a subset of solid waste, the management practices and objectives are the same for both RMW and solid waste. Consistent with the recommendations of the Emergency Solid Waste Assessment Task Force and the DEPE's draft Statewide Municipal and Industrial Solid Waste Management Plan, the department's primary objectives for the management of RMW are described below. These objectives are also consistent with the conclusions and recommendations of the New Jersey Advisory Council on Solid Waste Management (ACSWM) as contained within its final report entitled "Medical Waste Management in New Jersey." The ACSWM devoted calendar year 1990 to the study of medical waste management and recognized many of the objectives outlined immediately below:

- Achieve in-state self-sufficiency within the next five years;
- Maintain the special handling, tracking and transport requirements of existing law to ensure the proper management of RMW;

- Establish statewide source reduction and recycling strategies for hospitals and other large institutions, primarily for the non-RMW portion of the institutional waste stream;
- Further explore and develop source reduction and recycling opportunities for RMW;
- Rigorously apply a disposal capacity hierarchy in administering the county and state RMW planning process to foster regional facility development and more efficient utilization of existing RMW disposal capacity;
- Maximize the use of wastewater treatment systems for the management and treatment of liquid RMW, such as Class 3 - Bulk Blood and Blood Products;
- Streamline the permitting process and develop efficacy standards for alternative systems to incineration, such as microwaves, chemical disinfection and grinding systems;
- Close down or upgrade existing substandard hospital and other small-scale RMW incinerators across the state;
- Provide counties with a clear, yet suitably flexible, management framework to carry out the RMW planning process as set forth within the Comprehensive Act;
- Pursue and serve as a facilitator for regional RMW planning and facility development;
- Contain costs of both health care and waste disposal for all generators in line with environmental and public health goals; and
- Continue to provide opportunities for education of the regulated community, including generators, transporters and disposal facility operators, as well as home health care patients self-administering insulin or other prescribed drug injections.

2. Self-Sufficiency and Interstate Waste Shipment

With approximately 56 percent of its RMW currently going out-of-state for disposal, New Jersey needs to develop additional capacity or better utilize existing capacity for managing its RMW. The DEPE's goal is to develop sufficient in-state capacity to manage and dispose of all of New Jersey's medical wastes by December 31, 1997. This five-year timeframe is shorter than the targeted seven-year self-sufficiency goal for solid waste, primarily due to the specific provisions of the Comprehensive Act, relatively small volume of RMW produced when compared to municipal solid waste (MSW) and existence of large amounts of underutilized disposal capacity all across the state. These issues are outlined further throughout this RMW State Plan and, in particular, in section C.4.

In terms of the ongoing debate surrounding interstate waste shipment, the DEPE takes the following policy positions concerning RMW:

- The USEPA must complete its final report to Congress as required under the Medical Waste Tracking Act of 1988 as quickly as possible and outline the scope of any future national RMW program. A minimal level of uniform planning requirements and consistent definitions from USEPA should be developed in order to provide more consistency between the management programs in each state;
- Minimum standards for the operation of RMW incinerators and alternate technologies should be developed to ensure appropriate public health and environmental protection;
- The USEPA must take a formal position regarding the landfilling of untreated RMW and develop minimum technical criteria should this practice be considered appropriate;
- The imposition of differential fees by RMW receiving states which earn that right by having EPA authorized programs is supported provided the differential fees are rationally based and uniformly applied;
- Immediate bans or unrestricted differential fees which would place New Jersey in a crisis situation and thwart the initiatives towards self-sufficiency outlined within this RMW State Plan are strongly opposed; and
- Existing contracts for disposal capacity entered by New Jersey generators and transporters should not be curtailed through legislative enactments.

Self-sufficiency will be achieved as the following one-year county planning process components outlined in the Comprehensive Act are implemented:

- (1) The DEPE will transmit a written determination of need to the governing body of each county in which the department has determined that there exists or impends an anticipated RMW capacity shortfall. This will take place in April 1993;
- (2) The DEPE will also issue administrative orders providing for the interdistrict or intradistrict flow of RMW by the end of 1993;
- (3) Within 12 months of the receipt of a written determination of need and notification of a RMW disposal capacity shortfall, the governing body of the affected county shall provide for the RMW disposal requirements of the county as determined by the department. This must be accomplished by April 1994 at the latest;
- (4) A county may provide for its RMW disposal requirements in accordance with any of the following arrangements;

- i. The development of one or more new commercial RMW disposal facilities;
- ii. The development of one or more new noncommercial RMW disposal facilities;
- iii. The more efficient utilization of existing operational facilities; and/or
- iv. The negotiation of an interdistrict agreement providing for the disposal of RMW generated within the county at an out-of-district facility;

(5) In the event that a county has negotiated an interdistrict agreement, the governing body of the county that is the designated recipient of out-of-district RMW shall transmit to the department a copy of the negotiated or proposed interdistrict agreement;

(6) Each affected county shall prepare and adopt an amendment to the district solid waste management plan to incorporate the RMW disposal arrangement selected;

(7) The department shall make a written determination as to whether each county required to provide for its RMW disposal requirements has selected and implemented an appropriate disposal arrangement;

(8) In the event that the department determines that a county has failed to fulfill its RMW disposal responsibilities, the department shall hold a public hearing within 30 days of making the determination. At the public hearing, the relevant county shall have the burden to show that the county has taken timely and significant action toward providing for its RMW disposal requirements and that the determination of the department is unwarranted. Within 45 days of the conclusion of the hearing, the department shall make a final determination, with respect to county failure; and

(9) In the event that the department makes a final determination that a county has failed to fulfill its RMW disposal responsibilities, the department shall have the power to designate and develop in that county one or more appropriate RMW disposal facilities to be utilized by the county or several counties on a regional basis.

In addition to the planning process described above, the DEPE will apply the following general approaches to achieve self-sufficiency. They are as follows:

- Source reduction for general medical waste and RMW to reduce the amount of waste requiring disposal;
- Recycling for all forms of medical facility wastes and RMW where feasible to aid in meeting statewide solid waste recycling goals; and
- Regionalization of disposal facilities to promote efficient cost-effective medical waste disposal.

3. Source Reduction and Recycling Opportunities

In terms of the non-RMW waste stream generated within hospitals and other large facilities, the overall objective for source reduction is to cap per capita generation of waste at 1990 levels, cap total waste generated at each institution within five years and then reduce total waste generated at each institution within ten years. This is consistent with general statewide solid waste policy. Further, there are important regulatory, occupational safety and liability concerns associated with some of the action items noted below which must be considered prior to implementing programs. In terms of RMW, not enough is presently known to justify the establishment of specific statewide goals. Some of the initiatives described below have applicability to both general medical waste and RMW which must receive future attention by large generators toward reducing the amount of RMW produced.

Since over three fourths of all hospital generated waste is non-RMW, and since this waste is similar to waste generated in non-hospital settings, it is appropriate that the state endorse a recycling policy that is consistent with those goals established in the larger non-hazardous solid waste stream. More specifically, since about 80% of the waste stream is municipal (institutional) solid waste, the objective for hospitals and other large medical waste generators is to achieve at least a 40% total hospital waste stream recycling rate by December 31, 1995 consistent with the programs administered in each host county. Strategies to achieve this goal are discussed below. It should also be noted that this is a broad policy objective derived primarily from experience and study of the general solid waste stream. Detailed study of recycling opportunities in hospitals is planned by the New Jersey Hospital Association (NJHA) through a pending DEPE grant. The results of this study may cause modification of the 40% total hospital waste stream recycling goal consistent with the study findings. It must also be recognized throughout the following discussion, that proper patient care and concerns for infection control must take primacy in medical waste management which, in some cases, may limit both source reduction and recycling opportunities.

Strategies to Achieve Program Implementation

Short-term initiatives to achieve the above referenced source reduction and 40% total hospital waste stream recycling rate by December 31, 1995, are summarized below and in greater detail within Section B of this RMW State Plan:

A. Source reduction through the following strategies:

- Waste audits;
- Returning to historically used multiple-use items and reuse of single-use items where practicable;
- Packaging alterations;
- Substitution of nonchlorinated for chlorinated plastics;
- Changes in office procedures;
- Product design optimization;

- Minimizing hazardous materials in the waste stream; and
- Equipment and unused supplies donations.

B. Recycling opportunities through:

- Expanded source separation programs;
- Promotion of recycling of RMW after treatment;
- Procurement initiatives by hospitals and other large generators; and
- Expanded statewide mandates to recycle specific materials.

4. Statewide Disposal Strategy

From 1990 data, approximately 20,000 tons of RMW was generated. In the context of solid waste management this is a very small quantity, amounting to a fraction of a percent of the 14.8 million tons of total solid waste generated throughout New Jersey in 1990. The entire statewide annual generation of RMW requiring daily management is approximately 55 tons per day. Despite the relative small volume of RMW, this waste stream has been managed in an extraordinary fashion over the past five years due to concerns for public health and aesthetics. Further, 1990 data reveal that 56% of all RMW generated continued to be transported out-of-state for disposal, primarily at incineration facilities. Such management is contrary to the department's self-sufficiency goals.

Short-Term Implementation Plan

The department's overriding objectives are to maximize source reduction and recycling of medical wastes which are not considered RMW, source reduce and recycle limited components of the RMW stream where feasible and appropriate, and achieve self-sufficiency in in-state management and disposal within the next five years. The following are the specific plans and timeframes associated with achieving in-state disposal self-sufficiency which seeks to conform to the statutory county/state planning process, while strongly advocating regional planning among multiple counties toward development or better utilization of RMW disposal capacity:

- A. The DEPE will implement the statutory process of the Comprehensive Act that specifies that the county must provide for its RMW disposal requirements in the following ways:
- Development of one or more commercial (for-profit) RMW disposal facilities;
 - Development of one or more non-commercial RMW disposal facilities;
 - Make more efficient use of existing in-county facilities; and
 - Negotiate an "interdistrict agreement" between two or more counties to provide for

the out-of-district treatment and destruction of RMW.

After consideration of the options described above, each county is required to adopt a plan amendment for submission to the department within one-year of the release of this RMW State Plan, or by April 1994 at the latest, to outline the selected disposal plan or plans for RMW. Following completion of the one-year county planning process, that begins with the proposal of this RMW State Plan, the department will make a determination as to whether each county has selected and implemented an appropriate disposal arrangement.

The department notified each county in October 1991 of this statutory process and forwarded data to each county to be used to complete this process.

- B. The departments support and advocate regional development of new capacity or the shared use of existing capacity. Some examples include:
- Development of a multi-county regional or statewide RMW processing and disposal facility to serve a broad area of the state;
 - Expansion of operations at existing hospital facilities with on-site treatment and destruction units to receive RMW from other generators;
 - Conversion of the Ft. Dix Heat Recovery Incinerator to increase disposal of RMW from Burlington County, or on a broader regional basis, at the discretion of the county freeholder board; and
 - Expansion of existing agreements between counties to specifically provide for RMW disposal at existing and planned solid waste facilities.
- C. Continue to support the practice of using wastewater treatment facilities to manage liquid RMW and to avoid the disposal of liquids through solid waste systems. In 1990, approximately three and one-half percent (3 1/2%) of the total RMW generated or 700 tons of liquid waste was disposed of via sanitary sewer. This quantity represents about 500 gallons of sewage flow per day being introduced to the statewide wastewater flow which is measured in hundreds of millions of gallons per day. The department continues to support this practice as domestic treatment works operating in the state are multi-million dollar investments in effective high-technology equipment designed to treat wastewater and appropriately discharge effluent under controlled and permitted conditions.
- D. Continue to work to expedite permitting for new, non-commercial disposal capacity at hospitals and private sector companies for microwaves, chemical disinfection and grinding units and incinerators with advanced air pollution control systems where projects are proposed in line with the disposal strategy hierarchy outlined in G. below;

- E. The department will continue to maintain the following strategies to reduce current and planned dependence upon incineration:
- During the one-year county planning period in 1993/1994, future permit applications will only be permitted if advanced air pollution control devices are used. New small scale and commercial incinerators will only be reviewed when the generator has demonstrated compliance with source reduction and recycling goals of the state and the relevant county, and where such new capacity is proposed for regional use and is otherwise consistent within the host county plan and the DEPE's disposal strategy hierarchy.
 - More stringent air pollution control requirements pertaining to particulate controls, acid gas controls, stack height and monitoring will continue to be imposed upon existing hospital and small scale incinerators;
 - Rigorous enforcement will be applied during inspections. Substandard units will be assessed penalties and be forced to close in the absence of generator commitment and county/state plan consistency toward major facility upgrading.
- F. During the one-year county planning process outlined on pages 6 and 7, the department will consider an option of "system redefinition." The department will consider requests from county governments for amendments to the existing solid waste regulations to provide for the integration of RMW within the solid waste disposal systems of each county. For example, counties may want to use their existing landfills for the disposal of RMW. The department could consider this option provided the existing tracking, packaging, labeling and transportation requirements for RMW were maintained and extraordinary handling and disposal requirements were put into place for landfilling this type of material. These handling and disposal requirements could include landfilling of RMW in separate marked and recorded areas, immediate depositing and covering of RMW upon receipt, and prohibiting the use of heavy equipment to compact the RMW. The redefinition concept would require extensive regulatory changes which would likely take one to two years to complete. As a result, the department frames this concept within the RMW State Plan in Section B.4. as a potential option provided sufficient support is expressed by the counties for merging RMW within existing solid waste disposal systems during the formal one-year planning process. Further, system redefinition would only be pursued after necessary public health and employee protection issues had been addressed and needed safeguards put in place;
- G. The DEPE will rigorously apply a disposal strategy hierarchy in the review of all county plan amendments and permit applications pertaining to new RMW disposal capacity. The hierarchy represents a listing in descending order of the options the DEPE views as the best management practices to safely dispose of RMW in environmentally sound and economical ways and to achieve self-sufficiency as quickly as possible. County plan amendments developed pursuant to this RMW State Plan and the Comprehensive Act

will be reviewed with this hierarchy as a backdrop. Counties will be afforded the opportunity within the one-year planning process, however, to select and implement the RMW disposal strategy which best suits individual circumstances. The DEPE will approve rational county plans which address the various elements of the hierarchy and will only intervene directly in cases where a county has failed to meet its obligations under the Comprehensive Act. The department's disposal strategy hierarchy is as follows:

(1) County management strategies which include regional planning for the use of existing or planned RMW processing/treatment/disposal capacity on a multi-county basis through interdistrict agreements. Ideally, a single statewide facility could be developed which involves front-end or back-end processing to maximize recycling and a treatment/destruction component (preferably non-incineration) to handle the anticipated shortfall of approximate 33 tons per day in 1997;

(2) Strategies which demonstrate the capacity and timeframes for achieving self-sufficiency through more efficient use of existing in-county RMW disposal capacity at state-of-the-art hospitals and other facilities, such as microwaves, chemical disinfection and grinding systems, upgraded incinerators and sanitary sewer systems;

(3) Plans for the development of new commercial or non-commercial disposal capacity at hospitals or other facilities for use on a singular countywide basis;

(4) Plans for the development of new commercial or non-commercial disposal capacity at hospitals or other facilities for use by a single large generator;

(5) Plans which call for the merger of RMW disposal within the existing solid waste infrastructure of the county through revision of existing regulations to allow for the acceptance of RMW; and

(6) Out-of-state disposal, which will only be acceptable as a short-term option pending development of in-state capacity and which will not be authorized for long-term use other than as part of a broad county contingency plan.

H. Upon submission of the RMW State Plan to the Governor and Legislature, the departments will resume consideration of county plan and technical engineering submissions for new commercial facilities. Previously, new commercial facilities were not reviewed because the Comprehensive Act placed a moratorium on the development of new commercial facilities during the state plan development process.

5. Regionalization

Regionalization for RMW management and disposal will be encouraged in order to help the DEPE achieve the goal for New Jersey to become self-sufficient for the disposal of RMW.

Short-Term Implementation Strategy:

In order to implement regionalization for RMW management, the department's short-term goal is to utilize its approval processes such as, planning, permitting and financing for RMW to drive regionalization.

- A. Each county must perform a regionalization analysis. The department has identified four steps, described below, for the counties to follow to perform a regionalization analysis.
 - (1) An analysis by each county of RMW management systems and existing disposal plans including generation trends at hospitals and other RMW facilities, current/future recycling rates at medical facilities, existing and planned capacity, and cooperation between RMW facilities within the county to dispose of RMW;
 - (2) Identification of current capacity deficiencies in the county from the data provided in the RMW State Plan;
 - (3) Identification of two or more counties, hospitals or other large generators as potential regional partners that can satisfy disposal capacity needs; and
 - (4) Contact and meet with candidate partners toward negotiating regional arrangements and contact large facilities toward negotiating an arrangement to accept RMW from generators of small quantities of RMW.
- B. Each county must submit a plan amendment for RMW disposal that includes regionalization and reflects consideration of the following:
 - (1) The current status of existing in-county or in-state regional RMW processing and disposal capacity;
 - (2) A listing of any current interdistrict agreements with other counties and the status of planned regional strategies, as well as any agreements between the county and any other large facilities to accept RMW from generators of small quantities of RMW. This should also include discussion of specific negotiations held to date regarding facility regionalization;
 - (3) Long-term capacity analysis that considers:
 - (a) County RMW generation trends using generation data supplied from the DEPE

analysis of 1990 Annual Generator Report (AGR);

- (b) Recycling rates;
 - (c) Remaining disposal capacity;
 - (d) Planned capacity for in-county or regional use and associated implementation schedules;
- (4) Current and future dependence on out-of-state disposal capacity and associated timeframes;
- (5) Identification of current plan deficiencies and needs which can be satisfied through agreement with other facilities and with other counties;
- (6) Development of new or expanded facilities within the county to receive RMW from other generating facilities as part of a regional plan for RMW, such as:
- (a) New commercial (for-profit) RMW disposal facilities;
 - (b) New noncommercial RMW disposal facilities;
 - (c) The use of existing incinerators; and
 - (d) Making more efficient use of existing in-county facilities.
- (7) Economic analysis and financing considerations.

- C. The department will encourage hospital systems and research centers to consolidate RMW from their sister facilities thereby encouraging regionalization. Currently, there are four central receiving facilities in New Jersey that consolidate waste from one or more of their facilities as further described in Section B of this RMW State Plan.

Long-Term Implementation Strategy:

The department's long-term goals to achieve regionalization are summarized as follows:

- A. To encourage and expedite the development of a regional treatment and disposal system to serve statewide needs which ideally involves front-end or back-end separation equipment to maximize recycling and employs non-burn technology;
- B. To make maximum use of existing treatment and disposal capacity on a regional basis and, when necessary and where appropriate, to phase out incinerators;

- C. To encourage the development and use of alternate technologies to treat and destroy RMW;
- D. To encourage and assist the counties in investigating whether medical wastes in general, and RMWs in particular can be recycled;
- E. To work with the counties to educate RMW generators concerning source reduction; and
- F. To encourage joint purchasing programs to advance source reduction and recycling goals. Through essentially "recycling what you can and purchasing what you recycle," hospitals and other institutions can save money, and help "close the loop" through serving as a market for products made from recycled materials or which otherwise advance environmental themes.

6. Use of New Technology

The use of technologies other than incineration to treat and destroy RMW has been increasing over the past several years. The DEPE's objective is to continue to encourage the use of alternate technologies for RMW management and disposal. By implementing regulatory controls on new technologies, the primary objective of safe disposal of medical wastes can be accomplished.

Short-Term Implementation Strategy

The department's short-term strategy is to allow the use of new technological systems based on the information presented in this plan (see Section D.3.) and a case-by-case permit review of the use of the system at the facility to determine the effectiveness of treating the wastes produced there.

- A. **New Technology Evaluation:** The DEPE and DOH require the following information from each vendor in order to evaluate the technology so that it can be applied in the review of specific applications at each site location for RMW disposal:
 - (1) The basic conditions required for operation at the facility;
 - (2) The capability or lack thereof for the equipment to process or accept all RMW classes;
 - (3) Information on the typical operating and waste handling parameters;
 - (4) Information on the availability of the unit for installation in New Jersey;

(5) Identification of any operating facilities in New Jersey and/or in other states;

(6) Submission of supportive reports and/or assessments showing the ability of the technology to effectively treat RMW. The information should include at a minimum, the following:

- i. Actual quantity of medical waste processed; assessment of how closely this waste resembles waste which would be generated in New Jersey; capacity of the system;
- ii. Costs to generator per unit weight of medical waste processed; estimated costs to the generator to prepare;
- iii. Characterization of the end product, emissions and by-products and results of tests on reduction in infectious nature of waste after treatment; and

(7) Submission of numerical data characterizing the operational efficiency of the equipment from at least one actual, working facility. If such data are not available, then submission of numerical data characterizing the performance of a prototype. Also, submission of actual or projected data on cost of installation and operation.

B. Operational Protocol: The department has developed an operational protocol for some new technologies that allows for the operation of a technology at a site-specific location. The protocol establishes what types of waste may be processed, limitations on the presence of certain organisms, efficacy testing both at start-up and during continuous operation, record-keeping, contingency plans, storage requirements and operator training. In addition, the DOH requires the following information:

(1) Detailed assessment of the manufacturer's technical specifications and operations and maintenance manual;

(2) Detailed review of manufacturer-supplied efficacy testing and Quality Assurance/Quality Control (QA/QC) findings performed by independent laboratories;

(3) A site visit to a facility where the equipment is in operation;

(4) Physical plant site evaluations of all facilities intending to install the equipment;

(5) Consultation with federal agencies such as USEPA on alternate technology assessments;

(6) Consultation with infection control officials in other states which have issued approvals for the equipment;

- (7) Consultation with DOH's Division of Public Health and Environmental Laboratories; and
- (8) Consultation with the DOH Review Committee for Alternate Technology.

The DOH then issues a site operation protocol on a case-by-case basis to ensure safe and effective treatment of the RMW.

The site operation protocol is tailored to the type of equipment being permitted for the treatment/destruction of RMW and to any special conditions of the facility. The protocol specifies the terms and conditions of operation of the equipment, among these:

- (1) Allowable waste in feedstock;
- (2) Efficacy testing covering conditions of feedstock, required test organisms and required time intervals;
- (3) Record-keeping requirements;
- (4) Contingency plans for proper handling and disposal of RMW during planned and unplanned shutdowns;
- (5) RMW storage; and
- (6) Operator training.

Once these reviews by the departments have been completed, the DEPE will require prior to operation:

- (1) Inclusion in the solid waste management plan of the county within which it is located.
- (2) Registration with the DEPE, Division of Solid Waste Management to operate as a RMW facility.
- (3) A site operation protocol by the DOH.
- (4) Any other permits and approvals that may be required for any emissions, such as air, water, radiation and hazardous materials.

While the departments strongly encourage the development and use of alternate technologies, they are not, in all cases, totally proven in terms of efficacy, safety, durability and economy. As a result, proper caution must be taken to ensure that the necessary public health and environmental controls and safeguards are in place. The above noted protocols and requirements

are intended to ensure the appropriate development and use of new technologies.

Long-Term Implementation Strategy

To encourage the use of new technologies for RMW disposal, the department's long-term implementation strategies are:

- (1) To formulate and adopt performance standards regarding treatment efficacy and destruction completeness for each type of technology;
- (2) To continue to research and review new technologies based on current scientific expertise to promote the use of technologies that are efficient and safe from a public health standpoint; and
- (3) To accomplish self-sufficiency in terms of disposal by increasing the residual materials recycled or reused and to decrease the amount currently being disposed of. This would be done in conjunction with the DEPE's continuing research programs to develop new technologies and additional uses for residual materials.

7. Incineration Policy

Incineration is considered a disfavored solid waste management strategy in New Jersey. Incineration requires significant capital investment and raises environmental concerns, primarily in terms of air emissions. As a result, a major shift in policy direction was forged by the solid waste task force and supported by Governor Florio to reduce dependence upon incineration, in favor of a strategy which maximizes source reduction and recycling, and develops new disposal capacity through regional planning and implementation. It is New Jersey's objective to reduce current and planned dependence upon incineration to the maximum extent possible by:

- Continuing to monitor and enforce against hospital and other small-scale incinerator operations to ensure compliance with the incinerator's pollution limits specified in their air pollution control permit. Older systems currently used in some hospitals and private corporations for RMW and other medical waste disposal will be subject to enforcement actions if out of compliance and as a result, can be required to be upgraded or shut down if permit conditions cannot be continually met or the incinerator discharges exceed the limits specified in an applicable air rule;
- Carefully scrutinizing any new or pending applications for RMW incinerators to ensure that maximum efforts are being put forth by the applicant to implement source reduction and recycling programs consistent with the plans and requirements of the host county and the DEPE; and

- Reviewing new applications for RMW incinerators in line with the DEPE's disposal strategy hierarchy laid out in Section B.4., particularly with respect to regionalization. In terms of RMW management, regionalization of disposal capacity refers to systems which are designed or retrofitted for the acceptance of RMW from two or more larger generators, such as hospitals, laboratories or pharmaceutical companies, or numerous smaller generators, such as hospitals accepting RMW from all private practitioners in their general service areas.

The following are the DEPE's general guidelines for advanced air pollution control technology as applied to hospital and other small-scale incinerators accepting RMW:

- (1) Particulate Emissions Guidelines - A high efficiency particulate control device designed to achieve greater than 99% control and demonstrate outlet concentrations of less than 0.015 grains/dscf at 7% oxygen particulate emissions;
- (2) Acid Gas Emissions Guideline - A high efficiency acid gas scrubber designed to achieve greater than 90% control of HCl and 80% of SO₂ and demonstrate outlet concentrations of less than 50 ppm_{dv} at 7% oxygen for sulfur dioxide;
- (3) Continuous Emissions Monitors and Recorders Guideline - Monitors and recorders for carbon monoxide, oxygen, and secondary combustion chamber temperature;
- (4) Opacity Monitor and Recorder Guideline - These may be required after operation if there are visible particulate emissions. Opacity is expected to be less than 10%, except for 3 minutes out of 30 minutes;
- (5) Stack Height Guideline - Stack height should be between 1.5 and 2.5 times the height of nearby structures to minimize aerodynamic downwash. Modeling is required if less than 1.5. Apply a screening procedure to determine if risk is clearly below this level. Additional air quality modeling may be required;
- (6) Increased Cancer Risk Guideline - Risk must be less than 1 in 10,000 and should be less than 1 in 1,000,000 for heavy metals and dioxin. DEPE will apply a screening procedure. Modeling may be required; and
- (7) Additional Guidelines - Additional guidelines exist for products of incomplete combustion, radioactive wastes, and various operational requirements. In addition, coordination with the Division of Solid Waste Management must take place to ensure that permits are consistent and that the proposed facility is included in the relevant district solid waste management plan.

8. Enforcement Policy

The objective of the medical waste enforcement program is to assist in ensuring that RMW

is collected, transported, and disposed of in an environmentally sound manner. The primary method of accomplishing this is to ensure that every generator, transporter, and disposal facility in New Jersey is properly registered with the DEPE and in compliance with all regulations of the agencies responsible for the management of RMW. The department's enforcement policy, supported by its education and inspection program and by state statutes authorizing various types of penalties, offers a system of punitive measures which can be taken against violators and which provide clear disincentives by making penalty assessments for regulatory noncompliance greater than the cost of compliance.

Pursuant to the Comprehensive Act, civil liabilities and criminal penalties are possible to ensure compliance with the Comprehensive Act and implementing regulations. The Comprehensive Act has assigned enforcement of the rules and regulations to the DEPE and the DOH. Civil liabilities were incorporated to provide remedial or corrective action for the medical waste regulations. Criminal penalties were established to punish violators and to offer a deterrent to the regulated community. Other provisions of the Comprehensive Act include a strict and joint liability clause and citizen rewards.

Even before the signing of the Comprehensive Act in March 1989, the DEPE had begun developing a cooperative interagency agreement among the various agencies which would be involved with responding to incidents of medical waste being improperly disposed of and incidents of medical wastes washing up on New Jersey's beaches. This agreement, prepared in May 1989, became known as the "Interagency Protocol for Incident Response to Medical Waste and Marine Floatables Incidents (Interagency Protocol)." The Interagency Protocol is updated each year, but closely mirrors the original 1989 procedure. Procedures developed by DOH to implement the Interagency Protocol at the local level are contained in two guidance documents issued under a cover memorandum on May 15, 1992 to Health Officers, et al., and referenced by "Subject: Medical Waste Wash-Ups." These documents can be found in Appendix A of the RMW State Plan.

The Interagency Protocol was developed by the DEPE's Division of Solid Waste Management and Office of Enforcement, the DOH, the Department of Law and Public Safety and the USEPA. The protocol, or standard operating procedures for notification, verification and response to an incident, assures expeditious dissemination of information and will maximize the ability of the agencies to respond to an incident.

9. Packaging and Tracking

The objective of the DEPE's RMW packaging and tracking requirements is to contain RMW in order to protect public health and safety from potentially infectious materials. This is accomplished first by requiring packaging to meet certain minimum standards and by documenting the transportation of RMW from generator to final disposal site. Tracking establishes a legally enforceable chain of custody. Since any generator of RMW shipping this

waste off-site must properly complete the state RMW tracking form, all generators are accountable for their waste. The use of a uniform four-part tracking form provides a consistent method of identifying the weight and destination of all shipments of RMW.

Implementation Strategy: The DEPE will continue to require full compliance with packaging and tracking requirements for generators and transporters. This is achieved by requiring generators shipping RMW off-site to use containers that are:

- Rigid;
- Leak-resistant;
- Impervious to moisture;
- Sufficiently strong to prevent tearing or bursting under normal conditions of use and handling; and
- Sealed to prevent leakage during transport.

Further, generators are required to:

- Package sharps and sharps with residual fluids in packaging that is puncture-resistant; and
- Package fluids (quantities greater than 20 cubic centimeters) in packaging that is break-resistant and tightly lidded or stoppered.

10. RMW Transport

The DEPE mandates specific transportation requirements for RMW with the objective of ensuring the safe transport of these wastes while on the roads of the state. The DEPE requires all persons transporting RMW to comply with the conditions of registration and RMW transport at N.J.A.C. 7:26-3A for RMW transporters. The DEPE will issue severe penalties for violations of these standards and regulations to maintain a high level of safety on the state's highways.

Implementation Strategy: The DEPE will continue to expect all registered transporters, or small quantity generators transporting their own wastes, to comply with the requirements for transporters of RMW at all times. The principal requirements applying to transporters are:

- Registration as both a RMW transporter and a solid waste transporter;
- A legal obligation to accept only properly packaged and labeled containers of RMW;

- A requirement to obtain a properly completed tracking form from the generator for each load of RMW, add required information to the tracking form, keep one copy for his records and pass the tracking form on to the next transporter, intermediate handler or destination facility;
- A requirement to maintain records of RMW transported for a minimum of three years and to submit an annual report to the DEPE; and
- Specific requirements regarding the physical condition of the vehicle, the securing of the vehicle to prevent access to the cargo-carrying body and the maintenance of the waste load in a condition free of mechanical stress or compaction during loading, unloading and transit.

11. Control of Small Quantities of Medical Waste

This section will address issues and the departments' policy positions surrounding generation of small quantities of RMW from three main sources: regulated small quantity generators, floatables, and household medical waste. The Comprehensive Act required the departments to make specific recommendations regarding the exemption of small quantity generators from the RMW regulatory program.

Regardless of how much waste is produced by a given type of generator, whether in the home or by professionals, the DEPE believes that regulations must provide controls on the disposal of those wastes, irrespective of the source, to prevent them from being improperly or unsafely disposed of. For example, syringes, whether being disposed of by a hospital or a dentist, patients administering their own insulin injections, or from drug addicts, can all pose the same potential health hazard to the health care worker, the general public or the solid waste disposal industry. The major objective of the DEPE is to ensure that all RMW and similar household medical wastes, especially syringes and needles, are managed and disposed of properly to assure the protection of the public's health, safety and the environment. For regulated small quantity generators this will be accomplished through maintaining the current regulatory program where no exemptions from regulation exist due to the amount of RMW generated. For household medical waste, education programs and increased opportunities for disposal through separate management systems will be pursued as further specified below.

A. Regulated Small Quantity Generators:

The departments' strategy for the control of small quantities of RMW is to continue to require the small quantity generator to comply with tracking requirements and the pretransport management requirements of labeling, sorting, packaging and marking for RMW. The DEPE has not found any evidence that the tracking form paperwork has been too burdensome for small quantity generators. In order to further reduce paperwork for generators, however, the department is planning to relax record-keeping requirements, such as requiring generators of more than 300 pounds of RMW per month to log monthly instead of daily, which is the present requirement. The tracking form provides a legal document establishing a chain of custody of the RMW and

is also used as the DOT required shipping manifest. In order to localize control of RMW further, the DEPE encourages hospitals with RMW treatment and destruction methods to regionalize with other hospitals for RMW disposal and to accept RMW from small quantity generators for disposal.

B. Floatables:

It is difficult to quantify the amounts and types of waste which have washed up on New Jersey's beaches during any particular time period. According to studies, the difficulty is due to the fact that the occurrence of such washups appears to be closely related to essentially random events such as storms and other weather events, disruptions at sewerage treatment plants, and loading and handling errors at solid waste disposal facilities.

Studies indicate that floatables originate from a variety of sources, and may remain in the water for extended periods of time. Since they can be transported by currents over considerable distances, it is very difficult to trace a specific source. Groups of very likely sources, however, have been identified for much of the trash appearing on beaches. Studies have identified eight marine transfer stations and the Fresh Kills Landfill as major sources of floatables. Further, three Pennsylvania transfer stations located along the Delaware River and one transfer station in Camden, have been sources of floatable debris. Another major source of floatables is raw sewerage discharges and combined sewer overflows.

The departments' short-term strategy is to minimize, or eliminate if possible, medical waste washups and their impacts on the public's health and safety and on the environment by maintaining and enforcing proper disposal practices for all medical waste generators. Further, the departments have worked with syringe manufacturers and are aware of independent manufacturer activities to include literature within packages of syringes which outline safe disposal procedures. In addition, the departments and the New Jersey Hospital Association have supported and authorized the acceptance of home generated syringes by registered generators to ensure proper disposal. The DEPE is also considering authorization for home generated syringes to be disposed of through periodic or permanent household hazardous waste collection days held by nearly every county in the state. Finally, the departments, in cooperation with the USEPA, the U.S. Coast Guard, the NYDEC, the U.S. Army Corps of Engineers, and other agencies, are making efforts to remove floating debris from certain waterways before the debris can be transported to the ocean.

Over the past several years, the number of medical waste incidents at New Jersey's beaches have been minimal. No major floatables incidents have occurred since the summer of 1988. This can be credited to a number of factors including: the floatables debris surveillance and collection programs noted above; the state's comprehensive RMW tracking and management program; heightened attention and generator/transporter/public education on dangers and penalties associated with illegal RMW disposal; the closure of substandard wastewater treatment facilities; upgrading of combined sewer systems; and generally favorable wind and weather patterns over the summer months. There can be no guarantee that floatables, including medical debris, will not

appear on New Jersey's shoreline in the future. Due to the above programs and natural factors, however, the experiences of 1987 and 1988 have not even remotely reoccurred. Further, it is accurate to state the New Jersey's beaches are clean, safe and among the best along the entire East Coast for summer vacationers.

C. Household Medical Waste:

Another source of small quantities of nonpoint sources of medical waste initially excluded from the RMW regulations were home self-care generators, that is, producers of household medical waste. The DEPE has discovered during implementation of the RMW program that even though this waste has been excluded, the DEPE and DOH were contacted for guidance by many individuals and organizations involved in home self-care on the disposal of medical waste. The primary concern has been adherence to N.J.S.A. 2A:170-25.17 which requires destruction of needles and syringes prior to disposal while attempting to comply with Centers For Disease Control (CDC) guidelines recommending that manipulation of needles and syringes be minimized to prevent needlesticks. In addition, despite the lack of specific regulations, many home self-care generators of medical waste express a desire to dispose of this waste in the safest, most responsible manner available to them.

In order to address the concerns of the home-health care community, the New Jersey Hospital Association has developed a program promoting safe syringe disposal. The association has developed a syringe collection program to develop a low-cost disposal service for injection-dependent individuals. For a nominal \$10.00 deposit fee home self-care generators are given a puncture resistant container for disposal of syringes and lancets used in the home setting. Once the containers are full they are returned to the hospital and given a new container. A private company picks up the used syringes for transport to a permitted disposal facility.

The departments have also worked with manufacturers of syringes, to support them in their efforts to educate syringe users of the proper methods of disposal for used home self-care syringes. The DEPE and DOH are also seriously considering giving support for syringes to be accepted by county Household Hazardous Waste (HHW) Collection day programs. HHW collection programs may provide another disposal location in each county for users to dispose of their syringes.

III. CURRENT STATUS OF THE REGULATED MEDICAL WASTE PROGRAM

Since the adoption of New Jersey's RMW regulations in 1989, significant progress has been made in the development and implementation of the RMW regulatory management program. Initially, the DEPE focused on the regulatory aspects of the program to gain control of RMW management in the state. As completion of this plan neared, the department focused on assembling baseline information on the number and types of generators, transporters and disposal facilities for RMW, and the composition and quantities of RMW generated, transported and disposed of in New Jersey. This baseline information for 1990 is the foundation of this plan, providing the basis for addressing the immediate and long-term needs of the state with respect to the disposal of RMW.

The purpose of this section of the Executive Summary is to provide a brief description of New Jersey's existing RMW system and programs. All of the data provided in this section are supported by the charts, tables, graphics and information set forth in Sections C.1 through 7 of the text of the RMW State Plan, and the reader is encouraged to refer to those sections for a more specific analysis and references.

1. Regulated Medical Waste Generation

In 1990, New Jersey generated approximately 20,025 tons of RMW. Of that total, 84.6% was generated by hospitals. Laboratories generated 10.4% and the remaining 5% was generated by a combination of private practitioners, kidney dialysis services, funeral services and small miscellaneous generators.

2. Disposal of Regulated Medical Waste

Of the 20,025 tons of RMW generated in 1990, 44% was disposed of at in-state facilities, and 56% was disposed of at out-of-state facilities. The following describes the in-state and out-of-state disposal practices.

In-State Disposal

As discussed above, 44% (or 8,811 tons of the total RMW generated) was disposed of at in-state facilities in 1990. Of the total RMW generated (20,025 tons), 25% was processed by New Jersey hospitals by incineration or alternative treatment and destruction methods. Further, 6% was self transported to central collection points for treatment and destruction and 4% was disposed via sewer systems. A commercial New Jersey facility (Trofe Incineration, Inc.) processed 9%, and 0.3% of the total RMW generated was processed by a second commercial

New Jersey facility (Rollins Environmental Services). In addition, 621 tons of medical waste disposed of in New Jersey at Trofe Incineration, Inc. was generated outside of New Jersey. (It should be noted that the Trofe facility ceased operations in 1991.)

Out-of-State Disposal

In 1990, approximately 56% of the total RMW stream (or 11,214 tons) was disposed of at out-of-state facilities. Of the total RMW generated (20,025 tons), 13% was exported to South Carolina, 12% was transported to Pennsylvania, 9% was transported to Virginia, and 7% was transported to Arkansas. The remaining 15% was transported in very small amounts to the following states: North Carolina, Ohio, Rhode Island, Connecticut, Florida, Indiana, Massachusetts, Maryland, North Dakota and New York, as well as Canada and transfer stations in Pennsylvania and Maryland.

3. Regional Partnerships

Since the enactment of the RMW regulations in 1989, four regional partnerships have been initiated involving hospital systems and research centers. In these regionalized partnerships, RMW is collected from one or more generators and is transported to a central facility for treatment and destruction. The facilities operating in this manner are listed below:

Raritan Bay Medical Center, Perth Amboy, Middlesex County receiving from Raritan Bay Medical Center, Old Bridge, Middlesex County;

Schering Corporation, Union, Union County receiving from Schering Corporation, Kenilworth, Union County;

Shore Memorial Hospital, Somers Point, Atlantic County receiving from Shore Memorial Hospital Regional Dialysis, Somers Point, Atlantic County; and

West Jersey Health Systems, Camden, Camden County receiving from:

West Jersey Health Systems, Voorhees, Camden County;

West Jersey Health Systems, Berlin, Camden County; and

West Jersey Health Systems, Marlton, Burlington County.

In addition, approximately half of New Jersey hospitals accept RMW from small generators such as private practitioners and health departments for on-site treatment and destruction or consolidation and shipment for off-site disposal. This practice provides for regional disposal of RMW for generators of small quantities and is actively encouraged by the department.

4. Costs of Transportation and Disposal

For generators of small quantities of RMW, the average cost for RMW pickup and disposal in New Jersey was \$1.28 per pound or \$33.24 per cubic foot. For generators of larger quantities of RMW, the average cost for RMW pickup and disposal in New Jersey was \$0.44 per pound or \$22.28 per cubic foot. These values are derived from data found in Section C.3. Section C.3., in addition to developing information about costs of transport and disposal, presents an economic analysis to determine the costs to and the impacts on the regulated community.

5. Alternative Disposal Technology

The Comprehensive Act required the departments to perform an evaluation of the environmental and public health impacts of all reasonably available RMW treatment and destruction technologies. The alternative disposal technologies the departments identified and reviewed included chemical treatment, microwaving, autoclaving, thermal inactivation, gamma radiation, pyrolyzing, and encapsulation. The departments reviewed these alternative disposal technologies with the intent to evaluate the efficacy and economic feasibility of the new technologies to supplement or replace incineration as a management method.

Of all of the emerging alternative disposal technologies, chemical treatment and microwaving appear to be feasible technologies that New Jersey facilities are choosing to treat and destroy their RMW on-site. As of September 1992, 12 facilities are permitted by the department to use the Medical Safetec unit (the Z 5,000 or Z 12,500) to treat and destroy their RMW by chemical disinfection and grinding. Also, as of September 1992, two New Jersey facilities are using the ABB Sanitec unit that grinds and microwaves to treat and destroy RMW. Additionally, five hospitals have solid waste plan inclusion or permit applications awaiting action for the ABB Sanitec System.

6. Capacity Analysis

The department's fundamental policy objective is to completely eliminate the exportation of waste to out-of-state facilities and to be totally self-sufficient in disposal capacity by December 31, 1997. The state's primary means of achieving that goal is the implementation of aggressive source reduction and recycling programs for the non-RMW stream and for elements of the RMW stream where appropriate, and the regionalization of programs. The December 31, 1997 self-sufficiency date has been selected due to the specific provisions of the Comprehensive Act, relatively small quantity of RMW generated, and amount of existing underutilized disposal capacity which already exists in the state. In addition, successful implementation of major facilities and programs takes generally this relative timeframe to complete from start to finish.

This RMW State Plan (see Section C.4) sets forth an analysis of the anticipated residual capacity that remains after accounting for source reduction initiatives and recycling in the year 1997, and sets forth a plan for developing additional facilities to manage that capacity in-state. By January 1, 1997 a total of 21,193 tons per year of RMW will require disposal. New Jersey will have a projected capacity shortfall of 14,258 tons in 1997. The lifting of the moratorium placed on commercial facilities by the Comprehensive Act should encourage commercial facility sitings. As stated earlier, ideally a single statewide facility could be developed which involves front-end or back-end processing to maximize recycling and a treatment/destruction component (preferably non-incineration) to handle the anticipated shortfall of approximately 33 tons per day in 1997. Finally, the department and the counties should continue to identify methods of maximizing the existing capacity of facilities to eliminate the shortfall.

IV. CONCLUSION

The summaries, descriptions and analysis explained in this Executive Summary emphasize the policy objectives and criteria in this RMW State Plan. Achieving a system for the proper management and disposal of RMW, in order to protect the public health and environment, is dependent on the successful implementation of the short and long-term strategies discussed in this RMW State Plan. New Jersey has already established a comprehensive system to provide for the proper and safe identification, tracking, packaging, storage, control, monitoring, handling, collection and disposal of RMW. The challenge ahead is for the counties, in full cooperation with the state government, to move forward and adopt long-term plans for RMW source reduction, recycling and regionalization toward our common goal of achieving disposal self-sufficiency. The release of this RMW State Plan triggers the formal county planning process and identifies the factual and policy framework necessary to structure long-term management programs.

Beyond this Executive Summary, Section C.4. provides county-by-county five-year capacity assessments and 30 year planning projections. Section C.5. presents the role of statutory enforcement and penalties provisions; enforcement strategy and interagency agreements, and past and present enforcement activity. Section C.6. provides a review of the training and education implemented by the department. Section C.3. presents an economic analysis to determine the costs to, and the impacts on, the regulated community. Section D. of the plan addresses the interrelationship of state and federal RMW programs and, more specifically, provides an overview of the federal demonstration program and of the department's assessment of alternate technology for the treatment and destruction of RMW. Section E. presents programmatic background including a historical overview and the legal/institutional framework of New Jersey's regulatory program. These latter sections of the RMW State Plan will not be addressed in greater detail within this Executive Summary. Please refer directly to the applicable portions of the plan for more information in these areas.

SOLID WASTE MANAGEMENT STATE PLAN UPDATE: 1993 - 2002

SECTION II: COMPREHENSIVE REGULATED MEDICAL WASTE MANAGEMENT PLAN

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SOLID WASTE MANAGEMENT STATE PLAN UPDATE: 1993 - 2002

SECTION II: COMPREHENSIVE REGULATED MEDICAL WASTE MANAGEMENT PLAN

A. INTRODUCTION

On March 6, 1989 the New Jersey Comprehensive Regulated Medical Waste Management Act (Comprehensive Act) was signed into law. This law, as well as earlier state and federal regulatory programs, was primarily in response to beach washup incidents along eastern coastal areas during the summers of 1987 and 1988. As a fundamental component of the Comprehensive Act, the New Jersey Departments of Environmental Protection and Energy (DEPE or department) and Health (departments) were to formulate a comprehensive regulated medical waste (RMW) management plan (RMW State Plan) addressing the immediate, interim and long-term needs of the state.

Generally, the Comprehensive Act specified plan contents in three areas. The first and most substantial from a workload perspective was the establishment of baseline information. The study of medical waste management represents a relatively new regulatory focus as an independent component of the broader solid waste field. Therefore, baseline information such as the number and type of RMW generators, waste composition and quantity by class, current collection and disposal practices, as well as an inventory of available treatment and disposal technologies, all require primary attention in plan formulation.

The second major area of analysis is forecasting. Based on compiled baseline information, the departments were mandated to project long-term trends under a number of planning timeframes. As examples, 30 year projections are required for RMW generation and composition, and county disposal capacity must be assessed over a 5 year term.

The final RMW State Plan area involves the consideration of policy issues and the formulation of recommendations to the Governor and Legislature. With an understanding of baseline data and future projections, the departments are mandated to address the application of the most appropriate statewide RMW disposal strategy; the degree to which RMW can be recycled; the appropriateness of accepting RMW for incineration at county resource recovery facilities; the need, if any, for a small quantity generator exemption from regulation; and rule changes necessary to fully implement the Comprehensive Act.

During 1990, the departments focused nearly all state planning efforts for this subject on the establishment of baseline information. Data were received from both health care facilities and private practitioners pursuant to surveys required by the regulations adopted on an emergency basis in August, 1988. Respondents reported on their actions regarding "special medical waste", as RMW was referred to at that time, during the periods October 1 through November 1, 1988, and November 15 through December 15, 1988. This data was validated, in effect, with data made available through "regulated medical waste" generator annual

reports in 1990. These reports reflected actual RMW generation, composition and other trends during the period June 1989 through June 1990 from approximately 8700 generators at that time. This is the most recent set of statewide data that has been tabulated, and will be referenced throughout this plan. In 1993, we know that there are over 16,000 generators of RMW in New Jersey. However, the 1990 data used throughout this RMW State Plan did include all hospitals and major laboratories in the state. These generators combined (about 300 in total) produced 95% of the total RMW in 1990. The remaining small quantity generators totaled about 8400, produced less than 5%. Since nearly all of the seven thousand new registrants since 1990 are small quantity generators, the total RMW produced currently should not be more than 5-10% above figures reported in 1990. Therefore the 1990 data used throughout this RMW State Plan should be applicable to current generator levels. Further, a more recent survey conducted by the Health Care Facilities Financing Authority in late 1992 showed consistency with the more recent information and the data presented throughout this plan.

These data reflect the identification and management of medically related waste pursuant to regulations presently in effect. Data analysis has been performed in the following areas: RMW generation by facility type; waste generation by county; waste composition by class (i.e. sharps, pathological waste, cultures and stocks, etc.); transporter inventory; and disposal capacity by county.

From this data analysis, a number of significant findings confirmed prior assumptions in the medical waste area. In terms of waste generation, it has long been assumed that general hospitals are the most significant generators of RMW. The state's data has shown this to be true as nearly 16,700 tons of a total quantity of 20,025 tons in 1990, or nearly 84%, is generated by the 101 general hospitals operating in New Jersey. In fact, all hospitals and laboratories combined produce approximately 95% of all RMW generated on an annual basis. Further, as noted above, all private practitioners (physicians, dentists, veterinarians, podiatrists and funeral homes) when combined produce less than 5% of the statewide total.

Similarly, data collected in terms of RMW composition shows the accuracy of the assumption that needles and syringes represent a significant quantity of material requiring management. For composition analysis, the DEPE utilized data from all generators. From these data, about 14% of all RMW falls within Class 4- Sharps the category of needles, syringes and other sharps. Further, approximately 45% falls within Class 3- the category of Human Blood and Blood Products, and approximately 16% in Class 1-Cultures and Stocks of Infectious Agents. Combined, these three categories make up about 75% of the total RMW generated. Somewhat surprising quantities of Class 2- Pathological Waste (11%) and waste from patients with highly communicable diseases (12%) were reported in the 1990 database. The significant amount of pathological waste is believed to be exaggerated by overclassified waste, containers and storage fluid, and mixing of other RMW waste with the pathological waste. Likewise, the departments do not consider that, in fact, 12 percent of the waste generated was from patients with highly communicable diseases as defined in the regulations. Cases of diseases qualifying wastes for Class 6 - Isolation Waste classification

are extremely rare. Class 6 - Isolation Waste is defined as certain highly communicable diseases as defined by the Centers for Disease Control and as specified in "Classification of Etiologic Agents on the Basis of Hazard." Chapter II of the State Sanitary Code entitled "Reportable Diseases" requires the reporting of certain diseases so that the New Jersey Department of Health (DOH) can take appropriate action to protect the public health. All the highly communicable diseases defined in Class 6 are reportable diseases. In 1990 the Infectious Disease Program within the DOH did not receive one report involving diseases listed in Class 6; yet the health care industry reported that 12 percent of the total waste generated in 1990 was from the care and treatment of patients with these rare diseases. Obviously, training and education is necessary to reduce the overclassification of this waste type. Not surprisingly, only 1% of the RMW composition was comprised of carcasses and contaminated materials associated with research animals exposed to pathogens. Class 7 - Unused Sharps constitutes 0.1% of the RMW stream.

Beyond the areas of generation and composition, the data reveal current treatment and disposal practices in general terms. In this regard, approximately 40% of generated RMW is rendered non-infectious or managed in-house, primarily through the use of on-site hospital incinerators, grinding/disinfection devices and microwave units. Approximately 60% of all RMW is transported off-site for disposal. Specific data is available to document trends in off-site disposal with much material reported transported to a handful of out-of-state incineration facilities, including the Incindere Incineration facility in Virginia and the Southland Incineration facility in South Carolina, among others. Beyond this practice, some material is known to be transported between hospitals for incineration, and to several non-incineration out-of-state facilities. Finally, about 5% of all RMW generated by health care facilities (hospitals, clinical laboratories, special hospitals, etc.) is disposed of via other handling methods, especially sanitary sewers in the case of liquids.

In terms of RMW transportation practices, a new type of collection industry evolved in the private sector. Current state RMW regulations specify a number of important provisions in terms of collection and transportation. These include requirements to keep RMW separate from other solid waste; to operate vehicles which can be locked when unattended; to be capable of placarding trucks on three sides with identifying RMW markings; and to ensure that RMW within a vehicle is not subject to mechanical stress. The end result of these provisions is that the use of standard solid waste compactor vehicles most commonly used to pick up our household trash, cannot be used for the collection of RMW. In place of these vehicles, industry is now using vans and step-vans to make rounds to private institutions to collect RMW separately. At this state of the RMW program, forty (40) individual companies are now registered as RMW transporters. These 40 companies operate approximately 250 vehicles for collection and transportation practices. A list of these companies is located in Section C.3.

In addition to the efforts in the establishment of baseline information previously identified and further discussed in section C.2., the departments have addressed a number of policy related issues of particular concern, including beach washups, current incineration practices

and program enforcement. Enforcement is discussed in Section C.5. Preliminary findings regarding beach washups and incineration are outlined in Sections B.7. and B.11. A summary of these latter issues is provided below.

As noted at the outset of this Introduction, the beach wash-up incidents of the summer of 1987 and 1988 and the associated economic impacts on New Jersey's tourism industry were major reasons for the high level of regulation imposed in the medical waste area. As a result, the issue of beach washups has received significant study over the past several years. Four studies have been completed which shed light on beach wash-up occurrences. These studies include the "New Jersey Floatables Study: Possible Sources, Transport, and Beach Survey Results" prepared by the Science Applications International Corporation, the "Investigation: Sources of Beach Washups in 1988" report by the New York State Department of Environmental Conservation (NYDEC), the "Delaware River Wash-Ups: Investigative Report" prepared by the New Jersey Department of Law and Public Safety, and a pilot project for the department's "Operation Clean Shores" which was conducted in February, 1989.

The results of these studies had a number of common components. First, each concluded that RMW represents a small percentage of the total amount of floatable waste collected. The "New Jersey Floatables Study", especially, provided much data on percentages of different types of floatables. In this study, fifteen beaches were sampled under three different weather conditions: average, post-storm, and post-spring high tide. Floatables were categorized as either plastics, glass, styrofoam, metal, paper, wood, kitchen waste, or clothing. The plastics category consisted of household containers, bags, six-pack rings, toys, tampon applicators, condoms, and syringes. Results from the survey show that the only medical-type waste that washed up on the fifteen beaches during the survey period were syringes and that the amount was very small compared to other washed up items. In fact, these data show that the medical waste component represented less than 1% of the number of floatables found.

A summarized table of the studies' results is shown in Table 1., below. During the surveys some of the individual beaches had items which were too numerous to count; the report data indicated this by noting that the samples were greater than 1000. For compilation of this summary table, beaches with items greater than 1000 were assumed to equal 1000, so that a comparison could be made.

A second major common area has focused on the causes of beach washups. The major sources of material identified include the mismanagement of municipal solid waste at land-based and marine transfer stations; raw sewage discharges from malfunctioning sewage collection and treatment systems; and through combined sewer overflows. Section B.11. of the RMW State Plan provides greater detail on each of these causal factors.

An additional area of significance, primarily identified within the Delaware River Report, is the apparent high percentage of "insulin-type" syringes. While only a small amount of RMW was found during the Delaware River study (all collected syringes combined from the

entire summer of 1989 filled approximately a one gallon container), 85% of the syringes were identifiable as "insulin type" (1cc).

TABLE 1
TOTAL FLOATABLES FOUND ON FIFTEEN BEACHES

(Numbers represent individual items sighted and identified)

CATEGORIES	NORMAL	HIGHEST TIDE	AFTER RAIN
Plastics	* 2,955	3,352	* 2,847
Condoms	0	4	0
Tampon Applicators	43	58	62
Syringes	2	4	4
Glass	* 2,421	* 3,143	* 3,100
Styrofoam	400	366	344
Metal	* 1,496	* 1,532	1,352
Beer Cans	* 1,188	* 1,289	260
Soda Cans	* 1,040	* 1,119	112
Paper	476	* 1,202	355
Wood	* 2,457	* 3,598	* 4,185
Burnt Pilings	17	57	126
Burnt Planks	28	43	* 1,004
Kitchen Waste	37	46	30
Clothing	43	60	52

* = Items on individual beaches were too numerous to count.

Further, approximately 57% of the syringes were coated with a "greasy/waxy material" which New Jersey Criminal Justice Investigators believe is evidence of their passage through sewer lines. This study and others illustrate the importance of and need for an aggressive education and outreach program targeted at the unregulated home health self care and, to the extent possible, intravenous drug user populations on the proper and safe disposal of medical wastes. The departments are in the process of developing such a program which will be

implemented during 1993. Additionally, since these "insulin-type" syringes are also used in legitimate medical applications whenever a low dose subcutaneous injection must be applied, enforcement efforts will be escalated to identify and deter anyone in the regulated community who inappropriately disposes of these types of solid floatable materials into the sanitary sewer system.

With respect to incineration, Section B.7. sets forth discussion of relevant issues of concern at this time. Briefly, it is clear that incineration at on-site hospital facilities is currently a significant factor in medical waste management in New Jersey. From the department's data, 23.4% of all RMW generated in New Jersey is disposed of on-site through existing hospital incinerators. This mode of disposal has a somewhat unclear future.

On one hand, the use of on-site hospital incinerators provides such benefits as both treatment and destruction of RMW in one process; volume reduction of material on the order of 90%; management at the point of generation, thus avoiding transportation and the potential for off-site mismanagement; reduction in liability concerns on the part of generators in terms of off-site management; and the effective use of management systems that are already in place. On the other hand, incineration is considered a disfavored management method by the department due to both economic and environmental concerns. Further, existing hospitals' incinerators are not, in all cases, equipped with advanced air pollution control devices and are often located in urban areas in close proximity to residential land uses. With this in mind, the DEPE's Air Quality Regulation section, through its air quality regulations imposing new lower limits on emissions through new air pollution permits, has effectively required the upgrading of existing hospital incinerators because of the following process. When older incinerators are unable to meet their permit emissions levels on the expiration of their DEPE air pollution control apparatus certificates, which is often determined through increased department monitoring, enforcement actions result that often lead to the upgrading of the incinerator, primarily through the air pollution control apparatus facility permitting process or in some cases the incinerator's shut-down. The requirements of air pollution control permits ensure the safe operation of incinerators to today's standards. Aspects of incinerator design such as stack height, pollutant controls on such constituents as particulates and acid gases as well as continuous monitoring devices are specified. Further, the permit limits the types of waste incinerated as well as the aggregate pollutant discharge load. Additionally, through the solid waste permitting process and the provisions of the Comprehensive Act, important operating standards applicable to all solid waste management facilities will be applied to hospitals. Issues such as on-site storage, materials processing, operations record-keeping, nuisance controls and ash monitoring and disposal will be addressed through enforceable solid waste permit conditions.

Through the combination of solid waste facility permit review and adding advanced air pollution controls, hospitals will be faced with difficult decisions regarding long-term management. In this regard, the department plans to adopt a statewide disposal strategy under which hospitals may choose the best management system to meet individual needs. However, a hierarchy of preferred management options has been identified and hospitals and

other generators must consider this hierarchy in developing future project planning and permitting submissions for the department's review. Available options are discussed in B.6. and D.3. below. Parameters which frame the use of these options are outlined within II.B.

In general, medical waste policy closely mirrors solid waste policy as reflected within Section I of the Solid Waste Management State Plan Update: 1993-2002 which addresses "Municipal and Industrial Solid Waste." This Section of the update was published in the New Jersey Register on February 16, 1993 and regional public hearings were held on March 16, 17 and 18. Similar to the goals and objectives outlined for municipal and industrial solid waste, opportunities for source reduction and recycling must be explored for the total medical waste stream and programs designed to maximize reductions in medical waste generation, as well as reuse and recycling must be developed. From a disposal perspective, the options of on-site non-regional incineration and out-of-state disposal are at or near the bottom of the management hierarchy. Therefore, incinerators will only be approved for further use if major upgrades to state-of-the-art standards are completed. Similarly, long-term out-of-state disposal is contrary to the department's goal of self-sufficiency and will not be approved. Finally, the department strongly supports regional planning and systems development.

The final policy discussed in the RMW State Plan is the enforcement strategy being applied in New Jersey, as well as a summary of monitoring and enforcement activities to date. Under the Comprehensive Act and the Federal Demonstration Program, significant statutory authority was provided to enforce the regulatory provisions. Through these laws, both civil and criminal penalty provisions were established which may be up to \$50,000 per day in fines and jail terms of up to 5 years for first time criminal offenders.

With this authority clearly established, the departments and the USEPA have worked cooperatively toward the formulation of interagency agreements which frame New Jersey's enforcement strategy. Generally, the regulated universe was divided among the three agencies for inspection purposes during the duration of the Federal Demonstration Program, which ceased as of June 22, 1991. In most cases, the DOH and USEPA concentrated their inspections/investigations on the larger RMW generators such as hospitals, clinical laboratories and state institutions, while the DEPE assumed the inspection role for the rest of the regulated community. The DEPE has generally concentrated on individual practitioners such as physicians and dentists. From time to time during the Demonstration Program, joint inspections between representatives of the three agencies were also conducted. With the termination of the Demonstration Program, the DEPE and the DOH have divided the state by counties and municipalities. Each agency is inspecting both large and small generators within their respective areas. The DEPE is the inspecting authority for transporters and destination facilities.

In addition, the inspection philosophy, at least in terms of initial site visits, is to inspect operations and practices and to train generators as to proper material handling and record-keeping in accordance with the department's regulations. While this training approach is

being carried out in pursuit of a clear understanding of applicable requirements by generators, transporters, and facility operators, the assessment of penalties is at all times possible and gross violators will be prosecuted to the fullest extent of the law.

As of August 1992, nearly 13,033 inspections were completed by the DEPE, DOH, and USEPA. In addition, approximately 60 reported incidents involving RMW mishandling or illegal disposal were responded to and investigated by these agencies over just the six month period from June 1989 to December 1989. Further, during the period from January 1, 1990 to August 1, 1992, these agencies investigated 619 reported incidents involving RMW. (See Table 23b on page C-187 for a summary of the reported incidents responded to.) While significant in number, the vast majority of these reported incidents were very minor in nature. When anticipated staff resources became available to the DEPE and DOH in 1991, a much more intensive inspection program began to be carried out. In addition to the cooperative working relationship developed between state and federal enforcement agencies, the USEPA, through the "Dire Emergency Supplemental Appropriations Act of 1989", made a program grant of \$612,000 available to New Jersey. The majority of these funds were applied to monitoring and enforcement initiatives.

As a result of this intensive inspection and investigation effort by the DEPE and DOH, during the period from January 22, 1990 to August 6, 1992, 124 Notices of Civil Administrative Penalty Assessments have been issued to medical waste generators and transporters for violations pursuant to the provisions of the Solid Waste Management Act (N.J.S.A. 13:1E-1 et seq.). The total penalties assessed equals \$1,037,950.00. Currently there are 700 cases under review by the Bureau of Compliance and Enforcement. The most frequent violations that have been assessed penalties are: failure to register as a generator of RMW [N.J.A.C. 7:26-3A.8(a)]; failure to use a tracking form when transporting or offering for transport RMW [N.J.A.C. 7:26-3A.19(a)] and failure to maintain a log of RMW generated [N.J.A.C. 7:26-3A.21(e)]. Unfortunately, despite the departments' emphasis of merging site inspection and generator education functions during the initial years of the RMW regulatory program, many generators failed to register. This led to a high percentage of the 700 cases now pending. Further, the number of violators over the past four years pertains to less than 5% of the regulated community, which is not uncommon for any regulatory program. The DEPE believes that in keeping with the intent of the medical waste program to track RMW from "cradle to grave," it is important that RMW generators and transporters comply with all the medical waste regulatory requirements.

The pages that follow constitute New Jersey's Comprehensive Plan for RMW. The sections of the plan are organized as follows. Section B sets forth the department's goals, policies and long-term implementation strategies for the management of RMW. Section C details the status of the current program, providing information on generators, transporters and facilities; amounts of RMW generated; state capacity analysis and planning projections; and monitoring and enforcement activities. Section D discusses the relationship between the state and federal programs, reviewing the federal demonstration program, federal funding of New Jersey for RMW and the assessment of new alternative technologies for the treatment and

destruction of RMW. Section E gives a historical overview of the New Jersey RMW program and discusses the institutional and legal framework. Finally, several relevant documents are included with this plan as appendices and attachments either for historical reference or to provide documentation of critical existing program initiatives. These are as follows:

Appendices

- A Interagency Protocol and Memorandums Implementing Responses to Medical Waste Wash-Ups
- B DEPE/DOH, Memorandum of Understanding (M.O.U.)
- C DEPE/USEPA, Memorandum of Agreement (M.O.A.)
- D Summary of New Technology Data (Table 37)

Attachments

- A RMW Facility Permitting Information Letter
- B Alternate Technology Information Questionnaire
- C RMW Alternate Technology Demonstration Project Review Letter
- D DOH Sample Microwave Operating Protocol

B. DEPE OBJECTIVES, CRITERIA, STANDARDS AND IMPLEMENTATION STRATEGIES

1. Interrelationship of Solid Waste and RMW Planning

Objectives and Criteria: RMW is considered by the DEPE to be a subset of solid waste with management practices and long-term objectives which will closely mirror those referenced within Section I: Municipal and Industrial Solid Waste of the Solid Waste Management State Plan Update: 1993-2002. While extraordinary RMW packaging, labeling, tracking, transport, treatment and disposal requirements exist in New Jersey law for both public health and aesthetic reasons, even the Comprehensive Act frames the merger of RMW within the scope of the broader context of solid waste management in the future. With the completion of this RMW State Plan, the initial planning responsibility for RMW will shift to county governments with specific requirements and timeframes for adopting long-term disposal arrangements; waste flow rules will be adopted by the department to control the movement of RMW; ratesetting jurisdiction will be exercised by the DEPE over rates and charges for the disposal of RMW at commercial facilities; and analysis of opportunities for regionalization of RMW facilities and systems will take place.

Given the above, the primary objectives of the DEPE in the area of RMW management are as follows consistent with the recommendations of the Emergency Solid Waste Assessment Task Force and the direction of the Comprehensive Act. These objectives are also consistent with the conclusions and recommendations of the New Jersey Advisory Council on Solid Waste Management (ACSWM) as contained within its final report on "Medical Waste Management in New Jersey." The ACSWM devoted calendar year 1990 to the study of medical waste management and recognized many of the objectives outlined immediately below:

- Achieve in-state self-sufficiency within the next five years;
- Maintain the special handling, tracking and transport requirements of existing law to ensure proper management of RMW;
- Establish statewide source reduction and recycling strategies for hospitals and other large institutions primarily for the non-RMW portion of the institutional waste stream;
- Further explore and develop source reduction and recycling opportunities for RMW;
- Rigorously apply a disposal capacity hierarchy in administering the county and state RMW planning process to foster regional facility development and more efficient utilization of existing RMW disposal capacity;

- Maximize the use of wastewater treatment systems for the management and treatment of liquid RMW, such as Class 3 - (Bulk Blood and Blood Products);
- Streamline the permitting process and develop efficacy standards for alternative systems to incineration, such as microwaves, chemical disinfection and grinding systems, etc.;
- Close down or upgrade existing substandard hospital and other small-scale RMW incinerators across the state;
- Provide counties with a clear, yet suitably flexible management framework to carry out the RMW planning process set forth within the Comprehensive Act;
- Pursue and serve as a facilitator for regional RMW planning and facility development;
- Contain costs of both health care and waste disposal for all generators to the extent possible in line with environmental and public health goals; and
- Continue to provide opportunities for education of the regulated community, including generators, transporters and disposal facility operators, as well as home health care patients self-administering insulin or other prescribed drug injections.

The criteria and standards to be followed to achieve these objectives are contained within the existing RMW regulations found at N.J.A.C. 7:26-3A and the Comprehensive Act with respect to special handling, tracking and transport of RMW. Current practices are also outlined in Sections B.2 and C.3 of this RMW State Plan. Strategies for advancing source reduction and recycling are contained in Section B.3 below. Short and long-term strategies with respect to treatment and disposal are outlined below for:

- Carrying out the county planning process set forth in the Comprehensive Act;
- Advancing regional planning and management. More specific criteria in the area of regionalization can also be found in Section B.5 below. As used throughout Section B. of this RMW State Plan, short-term refers to programs and strategies in place or under development for implementation within the next year. Long-term strategies may currently be under development, but are not likely to be implemented for one to several years due to their scope and complexity.

2. Self-Sufficiency and Interstate Waste Shipment

Objectives and Criteria: The DEPE's policy on establishing self-sufficiency for solid

waste disposal as outlined in the department's draft Municipal and Industrial Solid Waste Management Plan: 1993-2002 Update, also applies to the disposal and management of RMW. The timeframe for achieving RMW self-sufficiency has been targeted for December 31, 1997 or within the next five years. This five year timeframe is shorter than the targeted seven year self-sufficiency goal for solid waste, primarily due to the specific provisions of the Comprehensive Act, relatively small volume of RMW produced when compared to municipal solid waste (MSW) and existence of large amounts of underutilized disposal capacity all across the state. These issues are outlined further throughout this state plan.

While slightly different in timing, RMW and MSW self-sufficiency are founded on the same fundamental principles. Recent history has shown that New Jersey solid waste has been shut out of out-of-state landfills resulting in emergency state agency action to prevent wholesale calamity with garbage piling up in the streets. While significantly less RMW is generated, as compared to municipal solid waste, the state cannot afford to allow medical wastes to accumulate at its medical facilities due to a lack of disposal capacity. With approximately 56 percent of its RMW currently going out-of-state for disposal, New Jersey needs to develop additional capacity for managing its RMW.

Importantly, the DEPE is very aware of the stigma society attaches to medical wastes, viewing them as aesthetically repugnant wastes produced from contact with diseased people and as very infectious materials that pose a significant threat to human health, even though scientific evidence does not support this level of concern. Additionally, society has become increasingly concerned with general environmental and health issues and medical wastes have come to be viewed as aesthetic assaults to our cultural sensibility. Because of the fear and dislike that people have for medical wastes, the DEPE believes that it is logical to anticipate attempts in the future to limit the interstate disposal of this waste type.

At present, approximately 56 percent of New Jersey's RMW is disposed of out-of-state. The DEPE is very concerned that future impediments to the interstate shipment of medical wastes would put New Jersey in the position of not having sufficient in-state capacity for the disposal of the wastes from its hospitals and other medical institutions. The DEPE's goal is to develop sufficient in-state capacity to manage and dispose of all of New Jersey's medical wastes.

In terms of the ongoing debate surrounding interstate waste shipment, the DEPE takes the following policy positions:

- The USEPA must complete its final report to Congress as required under the Medical Waste Tracking Act of 1988 as quickly as possible and outline the scope of any future national RMW program. A minimal level of uniform planning requirements and consistent definitions should be developed by USEPA in order to provide more consistency between the management programs in each state;

- Minimum standards for the operation of RMW incinerators and alternate technologies should be developed to ensure appropriate public health and environmental protection;
- The USEPA must take a formal position regarding the landfilling of untreated RMW and develop minimum technical criteria should this practice be considered appropriate;
- The imposition of differential fees by RMW receiving states which earn that right by having EPA authorized programs is supported provided the differential fees are rationally based and uniformly applied;
- Immediate bans or unrestricted differential fees which would place New Jersey in a crisis situation and thwart the initiatives towards self-sufficiency outlined within this RMW State Plan are strongly opposed; and
- Existing contracts for disposal capacity entered by New Jersey generators and transporters should not be curtailed through legislative enactments.

Toward the goal of achieving self-sufficiency, the Comprehensive Act described a planning process for the management of RMW in New Jersey that is nearly identical to the process prescribed in the Solid Waste Management Act for solid waste. The following planning components for RMW are specifically outlined within the Comprehensive Act and are aimed at establishing in-state medical waste management capacity for all of New Jersey's RMW waste stream.

Statutory Planning Process

The DEPE and counties are obligated via statutory language to perform the following actions once this RMW State Plan has been formally proposed:

- (1) DEPE must transmit a written determination of need to the governing body of each county in this state in which the department has determined that there exists or impends an anticipated RMW capacity shortfall.
- (2) DEPE must issue appropriate administrative orders providing for the interdistrict or intradistrict flow of RMW. The administrative orders shall direct the flow of RMW generated within each county in this state to designated RMW disposal facilities and, subject to the prior approval of the owner or operator thereof, to designated noncommercial facilities for disposal.
- (3) Within 12 months of the receipt of a written determination of need and notification of a RMW disposal capacity shortfall, the governing body of the affected county shall provide for the RMW disposal requirements of the county as determined by

the department.

- (4) A county may provide for its RMW disposal requirements in accordance with any of the following arrangements:
 - i. The development of one or more new commercial RMW disposal facilities;
 - ii. The development of one or more new noncommercial RMW disposal facilities;
 - iii. The more efficient utilization of existing operational facilities; and
 - iv. The negotiation of an interdistrict agreement providing for the disposal of RMW generated within the county at an out-of-district facility.
- (5) In the event that a county has negotiated an interdistrict agreement the governing body of the county that is the designated recipient of out-of-district RMW shall transmit to the department a copy of the negotiated or proposed interdistrict agreement.
- (6) Each affected county shall prepare and adopt an amendment to the district solid waste management plan to incorporate the RMW disposal arrangement selected.
- (7) The department shall make a written determination as to whether each county required to provide for its RMW disposal requirements has selected and implemented an appropriate disposal arrangement. In the event that a county has failed to provide for its RMW disposal requirements, the commissioner shall certify the failure of that county.
- (8) In the event that the department determines that a county has failed to fulfill its RMW disposal responsibilities, the department shall hold a public hearing within 30 days of making the determination. At the public hearing, the relevant county shall have the burden to show that the county has taken timely and significant action toward providing for its RMW disposal requirements and that the determination of the department is unwarranted. Within 45 days of the conclusion of the hearing, the department shall make a final determination, with respect to county failure.
- (9) In the event that the department makes a final determination that a county has failed to fulfill its RMW disposal responsibilities, the department shall have the power to designate and develop in that county one or more appropriate RMW disposal facilities to be utilized by the county or several counties on a regional basis.

Short-Term Implementation Strategy: With the completion of this draft RMW State Plan, the planning scenario, as outlined above, for the disposal of RMW is initiated.

This planning process creates a legal framework for assuring adequate disposal capacity is planned for and implemented by the counties and/or the state. Additionally, the DEPE has developed a set of broad-ranging approaches addressing both waste generation and disposal, for enabling the state to achieve its primary RMW management goal of achieving disposal self-sufficiency within the next five years or by December 31, 1997. These approaches for medical waste, are nearly identical to those for solid waste and are as follows:

- a. **Source Reduction:** In terms of the non-RMW waste stream generated within hospitals and other large facilities, the overall objective for source reduction is to cap per capita generation of waste at 1990 levels, cap total waste generated at each institution within five years and then reduce total waste generated at each institution within ten years. This is consistent with general statewide solid waste policy. In terms of RMW, not enough is presently known to justify the establishment of specific statewide goals. However, Section B.3. which follows does identify areas which must receive future attention by large generators toward reducing the amount of RMW produced.
- b. **Recycling:** Hospitals and other large medical waste generators primarily produce municipal solid waste (MSW) in four basic categories: solid waste from offices (approximately 30%), cafeteria waste (approximately 20%), patient related solid waste (approximately 30%) and regulated medical waste (approximately 20%). Clearly, 80% or more of the hospital waste stream is MSW which is highly recyclable. As a result, the specific recycling objective is to achieve at least a 40% total hospital waste stream recycling rate by December 31, 1995 consistent with the programs administered within each host county.

In terms of RMW, it is once again extremely difficult to establish numerical recycling targets due to the relative infancy of the study of RMW and lack of any reliable data base which identifies detailed composition analysis of the various materials (e.g. paper, metal, glass, plastic) which constitute each of the seven defined categories of RMW. Section B.3. immediately following does identify some potential RMW recycling options and the department will continue to work with hospitals and the private sector to identify workable programs for RMW recycling.

- c. **Regionalization:** Regionalization offers particularly important opportunities for medical waste disposal because of the relatively limited capacity needed to handle the waste in a given region. The DEPE has been promoting regionalized disposal since the beginning of the medical waste program. Efficient cost-effective medical waste disposal will result from regionalization in most instances. In many cases already, major facilities such as hospitals are accepting wastes from smaller generators. Regionalization of larger facilities both within and among districts remains an immediate goal of the DEPE. A single statewide processing, treatment

and disposal facility could accommodate the projected shortfall of about 33 tons per day in 1997. Ideally, such a system would involve front-end or back-end processing to maximize RMW recycling, to be followed preferably by a non-burning system to treat and destroy non-recyclable residue.

Sections B.4. and 5. which follow outline the state's disposal strategy and regionalization goals. The statewide disposal strategy beginning on page B-31 identifies a hierarchy of preferred disposal options which will be rigorously applied by the DEPE toward advancing regionalization.

Long-Term Implementation Strategy: New Jersey will have to aggressively pursue the approaches described above in order to ensure the achievement and maintenance of its self-sufficiency objective. It is anticipated that self-sufficiency in medical waste disposal can be achieved within a five year period provided regional management can be implemented along with source reduction and recycling strategies, primarily due to the relatively small quantities of these wastes generated in the state. With generation levels at or near present levels, the DEPE firmly believes that the state can achieve and maintain medical waste disposal self-sufficiency within five years. Section C.4 of this plan provides a detailed statewide capacity analysis which outlines what needs to occur in order for New Jersey to address its projected capacity shortfall of approximately 11,965 tons in 1997.

3. Source Reduction and Recycling Opportunities

The preceding and following sections of this state plan deal predominately with programs and strategies to manage RMW. However, in terms of source reduction and recycling, the discussion in this section will primarily address the non-RMW components of the hospital and private company waste stream which are composed of more traditional institutional solid waste. Due to the relatively small quantities of RMW and aesthetic and public health concerns associated with these materials, a more limited focus will be paid to opportunities for source reduction and recycling. This is further the case since the departments have been unable to find any body of information which provides a detailed composition analysis of the material specific breakdown for the RMW stream (e.g. paper, metal, glass, plastic) which is critical to designing future source reduction and recycling strategies. As such information becomes available, the departments will work closely with major generators to design and implement RMW source reduction and recycling programs. However, it must be emphasized for both the general medical and RMW waste streams that proper patient care and concerns for infection control must take primacy in waste management which, in some cases, may limit both source reduction and recycling opportunities. Further, there are important regulatory, patient care, occupational safety and liability concerns associated with some of the action items noted below which must be considered prior to implementing

programs. For the purposes of clarity throughout this section, the terms "general medical waste" or "medical waste" will be used to refer to the non-RMW waste stream generated from the office, cafeteria and patient related departments of hospitals and private companies.

Objectives and Criteria: Source reduction is recognized as the first priority in the state's overall solid waste management hierarchy. Source reduction is defined as activities which eliminate or reduce the weight or volume of materials, decrease toxic and dangerous components contained in products, packaging and the waste stream, and increase product durability, reuse, refillability, and repair. Based on 1990 federal population census figures and medical waste generation data from the first "Annual Generator Report-RMW," there is approximately 5.2 pounds of RMW generated per person or 28.5 pounds per patient each year in New Jersey. The department's goal for source reduction of the non-RMW waste stream is to cap per capita generation of medical waste at 1990 levels, cap total waste generated at each institution within five years and then reduce total waste generated at each institution within ten years.

New Jersey's medical community generates approximately 20,000 tons of RMW per year and spends several million dollars to dispose of it. The high costs involved with the management of RMW, as well as environmental concerns with respect to the management of RMW, give rise to the importance and primary policy focus on source reduction and recycling. The New Jersey Hospital Association (NJHA) has estimated that hospitals generate approximately 13 pounds of waste per bed per day. Only about 3 pounds is classified by law as RMW. This fact alone indicates that significant opportunities for source reduction and recycling exist within the medical services industry waste generation system.

This point is further borne out if one examines the specific categories of waste materials generated in this setting. Aside from the RMW generated, the remaining waste stream is similar to wastes typically generated in any administrative office and cafeteria structure. As is typical, high grade papers including computer print-out, bond and other fine writing, corrugated and other lower grade paper, aluminum and tin cans, glass and plastic food and beverage containers, food scraps and yard trimmings, construction and demolition debris, and so on, are generated. The incidence of these materials provide source reduction and recycling opportunities not unlike those found in virtually every other sector in New Jersey. Since approximately 85% of all RMW is generated by hospitals, most of the action items noted below involve activities within the 101 hospitals in service within the state, but would also be applicable to laboratories and other large generators.

- a. **Source Reduction Strategies:** Source reduction can be accomplished in several different ways and involves strategies such as: waste audits; returning to multiple-use items and reuse of single-use items; packaging alterations; substitutions of nonchlorinated for chlorinated plastics; equipment and unused supplies donations;

and changes in office procedures. These strategies are further discussed below:

- (1) **Waste Audits:** As was previously indicated, at least 80% of all waste generated in the hospital setting is non-RMW. The most effective way to begin the implementation of any changes in waste management policy is first to determine the types and quantities of waste materials generated. There are several waste audit guides available for use in hospitals. The NJHA published one such guide in February, 1991. This guide, entitled Developing a Recycling Program: A Guide for Hospitals, includes, among other things, procedures for conducting a waste audit and identifying source reduction opportunities.

In addition, the department has published a guide for performing waste audits. Naturally, this guide does not include identification of source reduction opportunities specific to the hospital setting, but this is not a critical consideration since the basic elements of the waste audit are applicable to all solid wastes. The department strongly encourages the use of these guides as a first step in the identification and implementation of source reduction and recycling strategies, and will work with the NJHA throughout 1993 to ensure that all member facilities are afforded the opportunity to receive training in the use of these guides. Further, while of greater sensitivity due to public health and aesthetic concerns, the department also strongly encourages waste audits and composition studies of the RMW waste stream and will assist candidate hospitals or private companies willing to undertake such studies.

- (2) **Returning to multiple-use items and reuse of single-use items where practicable:** Many materials used in the medical community have evolved from being reused to more modern disposable (single-use) forms over the last few decades. A listing of some of these items is contained in Table 2 (5). The history of the health care field has been to improve quality and service while trying to maintain affordability by using cost-containment measures (1). Prior to World War II, reprocessing of medical devices was a common practice. During the ensuing years, the birth of disposables developed as suppliers and manufacturers provided the health care industry with surgical products that improved patient care at a reasonable cost. Manufacturers spent millions of research dollars to come up with profitable "over the counter" medical and surgical products. Many manufacturers labeled their products "For one use only." This labeling practice has increased to the point that certain items have been relabeled "For one use only" with no change in the product. Thus, legal, ethical, and economic implications have had an impact on the ability of the health care industry to respond to this issue (10). It is the intention of the department to establish a working group with the NJHA and the DOH, as part of a grant proposal which is currently in final planning stages, to examine the legal, medical and practical issues involved in the implementation of a program for the re-introduction of reusable non and semi-critical medical items. The

results of this two-year grant may allow the DOH to modify the procedures detailed at N.J.A.C. 8:43G-8.4(f), outlined below, to allow for a less regulated method of reintroduction of these items. In this regard, the DOH will play a primary role in addressing such issues as sterilization and infection control measures associated with some materials, particularly RMW.

Hospitals that have problems segregating medical waste from their various wards and departments can substitute, to some extent, certain reusable or reprocessable items. For example, cloth operating gowns, scrub suits, drapes, and diapers which can be sterilized and reused will minimize volume and disposal costs. While these items are not usually defined as "regulated" medical waste, they are usually disposed of as regulated waste because of poor segregation, or no segregation, at health care facilities. Therefore, greater use of reusable items is applicable to both the general medical waste and RMW streams. Hospitals can save considerable money in purchasing costs as well as disposal costs. In a study between two comparable New Jersey hospitals, the author DiGiacomo, concluded that reusable cloth clothing is a favorable option and saved one of the two hospitals involved \$119,000 annually (4). The savings did not include the cost which would have incurred had the waste been disposed of as RMW. When considering this aspect, the cumulative savings could be even more significant.

Diapers and drapes may be additional items which could possibly be switched from disposable to reusable. Again, these items do not usually meet the definition of RMW, but are often disposed of along with RMW and therefore, inflate the volume of waste. The use of cloth diapers instead of disposable diapers at a hospital can decrease the volume of medical waste and the costs involved with disposal. One New Jersey hospital experienced problems disposing of diapers as municipal solid waste and switched to disposing of them as RMW which was very expensive because in most cases medical waste is charged by the pound and diapers are heavy. After consideration, the hospital determined that \$3,500 a year could be saved if it switched from disposable diapers to cloth diapers (8).

Many hospitals, when questioned by the departments, agree that this may be an important area to examine when trying to reduce the volume of both general medical waste and RMW generated in health care. Non-critical and semi-critical items have the greatest potential for reuse because they can be substituted with products that are made of materials which can be laundered or sanitized without increasing risks. Disposable items offer certain advantages because they have a good reputation and are considered a norm in the healthcare field today. They offer safety, infection control and are very economical (1). One disadvantage with the disposable item is that it generates enormous volumes of waste which are in turn very costly to dispose of. The

advantage of using reprocessed items is the minimization of the generation of RMW and disposal costs. A reprocessed item can offer a hospital some control over supply purchases (6).

TABLE 2
MEDICAL ITEMS ORIGINALLY DURABLE

NON-CRITICAL	SEMI-CRITICAL	CRITICAL
Personal Protective Equipment Bed Pans Emesis Basins Bulb Syringes Soap Dishes Water Pitchers Diapers Drapes	Forceps Scissors for Suture Removal Staple Removers Chest-Tube Waterseal Bottles Airways Sputum Collection Sets Tracheostomy Tubes with Cuffs	Syringes Two and Three Way Stopcocks Transducers and Domes Solution Administration Sets Lumbar Puncture Trays Nasogastric tubing

* Some of these items would be considered RMW in specific situations

This control is important because it gives the hospital the ability to reduce the generation of general medical waste and RMW. Hospitals may be required to examine and evaluate this issue further in the future in order to cope with rising medical waste disposal costs.

The reuse of medical devices, such as those enumerated in Table 2, is an issue currently addressed in both state and federal regulations. These regulations were promulgated to protect the patient. Therefore, the responsibility to make this decision is ultimately placed on the health care provider. Careful consideration must be given regarding legal, ethical, economic, infection control and potential physiological effects of reuse. The departments will coordinate efforts over the next year with NJHA to establish a committee to address the qualification of reusable medical devices. Additionally, it is strongly recommended that each hospital develop a committee to evaluate the issue on a case by case basis. Further, the health care industry as a whole may be able to accomplish a significant reduction in medical waste by evaluating non-critical and semi-critical medical supplies and implementing materials changes on an industry-wide basis through revised purchasing practices.

The Food and Drug Administration (FDA) position on reuse of medical disposable devices is that the institution or practitioner who reuses a disposable medical device should be able to demonstrate: (1) that the device can be adequately cleaned and sterilized, (2) the physical characteristics or quality of the device will not be adversely affected, and (3) that the device remains safe and effective for its intended use.

Moreover, since disposable devices are not intended by the manufacturer or distributor for reuse, any institution or practitioner who resterilizes and/or reuses a disposable medical device must bear full responsibility for its safety and effectiveness (18).

The FDA considers disposable devices which are being reused, and which have not been demonstrated to be capable of complying with the requirements in the above paragraph, to be adulterated within the meaning of 21 U.S.C. 351(a)(2)(A) and in violation of 21 U.S.C. 331 (k).

The DOH has taken a similar position in recent revisions of the Hospital Manual of Standards adopted on July 1, 1990.

N.J.A.C. 8:43G-8.4(f) states that single-use items shall be reused or reprocessed only if the manufacturer recommends reuse or reprocessing, or if the hospital has scientific validation on the safety of reprocessing and reuse of the item. Procedures for reprocessing and reuse shall conform with these recommendations or validation studies (19). A validation study involves the following steps:

1. A description of the product giving the manufacturer's product name and number and the text on the product stating the restrictions on reuse (example: "For single-use only," "Not for reuse," "Disposable," etc.)
2. A description of the application for which the product is intended to be used.
3. Specific details regarding whether the product will be reused repetitively on a single patient or on different patients. If the product is to be reused on different patients, define what restrictions, if any, will apply to patients in specific disease categories.
4. A solicited document from the manufacturer stating recommendations for reprocessing and detailing how these exceptions affect the warranty of the product.
5. Written procedures for implementation within the department addressing the following elements:
 - a. Cleaning of the product after use;
 - b. Disinfection and/or sterilization protocol;
 - c. Packaging, labeling and storage (shelf life); and
 - d. Tracking mechanism to document number of reuse cycles.
6. Quality assurance studies to ensure patient safety:

- a. Data acquired by experimentation documenting efficiency of procedure stated above; and
- b. Data acquired by ongoing surveillance activities associated with each lot reprocessed or reused.

This data must address the infectious hazards, physical stability of the product and toxicologic aspects, including the prospect of endotoxin or chemical contamination.

7. Throughout the period of reuse, documentation shall be submitted to the Infection Control committee on a quarterly basis to document the continuing application of appropriate quality control procedures. Such documentation should include the evidence for review by the department head and should provide details of adjustments made in response to detection of problems (17).

The reuse of medical devices is one issue that society will not tolerate if the end result is increased health care costs or a compromise in the quality of patient care. Cost analysis must then be given consideration in making the final decision on reuse. The first step is to establish the cost of the product and the cost of labor, packaging, and sterilant. Next, consider volume: The number of devices used per year, how often (peaks/valleys in use), and short versus long-term volume forecasts; then determine the cost of additional liability insurance if necessary, audits to be performed, validation studies, and the costs of a quality assurance program. Also, materials cost must be considered: the useful life of the item, the need for additional processing equipment and depreciation, maintenance, and replacement costs (17).

- (3) **Packaging Alterations:** Product packaging, primarily composed of paper, accounts for approximately 1/3 of all solid waste generated. Although the same percentage may not hold true in the hospital non-RMW stream, there is no arguing the fact that packaging is a significant portion of the non-RMW universe.

Frequently, much of this product packaging is not needed for product integrity, and represents excess packaging. The department will work closely with the NJHA over the next year in identifying areas of excess packaging. However, if attempts to encourage medical products companies to voluntarily alter packaging practices to implement source reduction goals fail, the departments will consider lobbying for appropriate legislation to enact product packaging, or packaging constituent bans.

Medical product packaging contributes significantly to the waste stream. Some estimates indicate that packaging can contribute as much as twenty percent to the general medical waste stream, particularly from small generators. The departments will work with NJHA over the next year to develop ways of minimizing waste packaging. Use of reusable containers will be strongly supported over disposable containers. Additionally, when disposable waste packaging is used, packaging must be developed

that uses less materials, through improvement in packaging design, and uses more effective materials for structural integrity.

The preparation of waste materials, primarily RMW, for disposal can also add unnecessarily to the volume and weight of the disposal package. An extreme example of excessive waste packaging for RMW is encapsulation. In encapsulation systems, a large quantity of new liquid material is added to the waste to surround all pieces of the waste, thus entraining or encapsulating the waste within its outer package. These systems typically add 5 to 10 times the weight of the original waste in additional encapsulating material. The entire package with its original waste contents, and the additional heavy containment material must all be disposed of at the state's disposal facilities. Except for use in emergency situations to recover spills of liquid RMW, the department will not support the use of encapsulation systems, because they unnecessarily contribute significant quantities of waste to the waste stream. In fact, these systems do not actually destroy the waste, nor render it noninfectious according to state law. For example, syringes in many encapsulated packages can be extricated for illegal use.

- (4) **Substitution of Non-Chlorinated for Chlorinated Plastics:** Removing certain plastics from the medical waste stream has another important benefit besides reducing the volume of medical waste generated. Source reduction through substitution also helps to reduce acid gas and trace metal emissions generated during the incineration process of medical waste.

The large portion of plastics that are present in the medical waste stream are in the form of disposable items which are made from primarily polyvinyl chloride (PVC). When PVC's are incinerated at high temperatures the chlorine present is converted to hydrochloric acid (Hcl). Hcl is an acid gas pollutant which must be controlled. Control strategies for Hcl include feed control to avoid the acceptance of certain waste types and installation of air pollution control equipment (15). Removing plastics from the waste stream will not only reduce the amount of waste to be incinerated, but will reduce acid gas emissions from incinerators. At the same time, there is also a need to examine alternative materials, such as the non-chlorinated plastic polyethylene, which do not have the same problems of the incineration of polyvinyl chloride (14).

Removing chlorinated plastics from the waste stream destined for incineration also serves to reduce emissions of trace metals. The presence of chlorine is one of the four variables (chlorine concentration, temperature, metal species concentrations and oxygen concentration) which affect the vaporization of metals (7). Metals are a major concern in incineration because they are capable of penetrating deep into the human lungs (7). Removing chlorinated plastics from the waste stream can indirectly reduce toxic metal emissions.

The department will include the investigation into alternative materials such as polyethylene as part of the grant with the NJHA discussed in B.3.a.(2) above.

- (5) **Changes in Office Procedures:** The generation of medical waste can be significantly reduced through changes in purchasing practices and other office procedures. One of these methods involves the purchase of recharged laser printer toner cartridges, which is becoming common practice in the public and private sectors. The purchase and use of copiers with two-sided copying capability will also greatly reduce the generation of high grade office waste paper. The endorsement of such practices as the substitution of "styrofoam" drinking cups with (ceramic) durable cups is another source reduction strategy. These and other strategies are endorsed by the DEPE and the NJHA, and are included in the waste audit manuals described in B.3.a.(1) above.
- (6) **Product Design Optimization:** The departments will support and where possible aid the development and design of new or modified medical products that use smaller quantities of raw materials for their manufacture and final product composition. Through new integrated design technologies available to manufacturers for developing and designing products, manufacturers can optimize the use of the most effective materials to maximize product performance while minimizing product material composition. In many cases historically, products were manufactured with little or no consideration as to the design specifications actually necessary to meet present performance requirements. As an example of this principle, Abbott Labs, Diagnostics Division, has collaborated with Nypro, Inc. to redesign a medical product by reducing its wall thickness. By applying computer assisted integrated design technology, Abbott was able to remove 500,000 pounds of material each year in the product and ultimately from the solid waste stream. (12)

Further, where feasible, the departments strongly support raw material substitution so that both more performance effective and recyclable raw materials are used over those with lower performance ratings and those which are less readily recyclable in order to minimize contributions to the medical waste stream. Minimization of the raw materials needed to produce and comprise products, means that less medical waste, and in some cases RMW, is ultimately produced when these products are discarded following use. The DEPE will work with NJHA, product manufacturers and other organizations to determine opportunities for product design optimization within the next year. The department can provide monies for product design research for waste reduction through the Recycling Act, N.J.S.A. 13:1E-96, in the form of loans, loan guarantees and grants. Consumers within the medical community will need to work with manufacturers in the future to develop products that use the minimum of materials necessary to provide optimal performance of the product for its intended use and also to maximize the recyclability of product components.

- (7) **Minimizing Hazardous Materials in the Waste Stream:** An important component of source reduction is reducing the toxicity and dangerous nature of the waste stream. This can be accomplished in many ways such as removing toxic, pathogenic, and physically dangerous items. Where substitution of nontoxic constituents does not take place, recycling and proper management will be critical through the establishment of

permanent household hazardous and small quantity generator waste collection sites within each county or on a regionalized basis. Toward this end, the department is preparing a "Guide to Developing Permanent Household Hazardous Waste Collection Programs," which is scheduled to be released in July 1993. The departments will evaluate over the next year the possibility of utilizing Household Hazardous Waste collection programs as a means of helping to get home self-care syringes out of the solid waste stream. It is also possible that local health departments can play an important advisory role to homeowners and other small quantity generators of hazardous substances as to proper identification and management practices for materials of concern.

- (8) **Equipment and Unused Supplies Reuse:** Another way to minimize the quantity of RMW disposed of, while having a positive social benefit, is to donate used and unused equipment and supplies to organizations in the United States or other countries for reuse by indigent persons or medical facilities without sufficient funds to purchase new supplies. As an example, one mission in Texas, the Medical Benevolence Foundation Presbyterian Medical Mission Fund, which is a non-profit foundation, provides expertise, supplies, labor and funds to medical communities in developing countries (9). The foundation accepts medical equipment and supplies, donated from hospitals, which are generated when they clean out supplies, do inventory, etc. Many of these items are normally discarded as solid waste, and occasionally as RMW. Recently the DEPE has been approached by several companies starting reusable medical equipment and supplies programs. The DEPE and the NJHA will continue to investigate and identify other organizations or other outlets for the donation of medical devices within the next year.

b. Recycling Opportunities:

Goals and Policy: Since over three fourths of all hospital generated waste is non-RMW, as identified by the NJHA, and since this waste is similar to waste generated in non-hospital settings, it is appropriate that the state endorse a recycling policy that is consistent with those goals established in the larger non-hazardous solid waste stream. More specifically, since about 80% of the waste stream is municipal (institutional) solid waste, the objective for hospitals and other large medical waste generators is to achieve at least a 40% total hospital waste stream recycling rate by December 31, 1995 consistent with the programs administered in each host county. Strategies to achieve this goal are discussed below. It should also be noted that this is a broad policy objective derived primarily from experience and study of the general solid waste stream. Detailed study of recycling opportunities in hospitals is planned by the NJHA through a pending USEPA/DEPE grant. The results of this study may result in modification of the 40% total hospital waste stream recycling goal consistent with the study findings.

- i. **Source Separation:** One of the most productive waste recycling techniques for medical waste is proper segregation and classification. Hospitals usually experience several problems when segregating general medical waste, that is,

patient related waste not classified as RMW, and RMW. They find it generally difficult to segregate large volumes of material and to properly train hospital maintenance staff. They feel it is too time consuming and are sometimes over cautious when segregating. Some hospitals have on-site incinerators which burn all of their waste and do not feel they need to segregate.

Hospitals are frequently very cautious when segregating waste. In some cases this is due to the difficulty in disposing of "medical type" waste in the municipal solid waste stream or they are concerned with employees accidentally disposing of RMW with municipal solid waste and, consequently, being fined through an enforcement action. It is estimated that hospitals overclassify medical waste by a factor of three (11). At times, hospitals are not concerned with segregation because one of the benefits of on-site treatment is the reduction of waste handling practices. This saves time, reduces employee exposure, and saves dollars spent on labor and materials needed to segregate waste.

Despite the above discussion, current law (N.J.S.A. 13:1E-99.11 et seq.) requires the source separation of designated materials in the institutional sector, of which hospitals are a part. The NJHA, in the report entitled Developing A Recycling Program: A Guide for Hospitals, stated that "Hospitals should go beyond the minimum requirements of the law by establishing a comprehensive recycling program." The DEPE appreciates and endorses this policy, as it is critical in the achievement of any recycling goal. The department, in conjunction with the DOH and NJHA, will work to develop a program within the next year to overcome the real and imagined difficulties experienced in source separating recyclable materials in hospitals, by providing technical assistance and training where practicable to designated hospital personnel in establishing source separation programs for office, cafeteria and other non-RMW. Table 3 below lists items the department believes can be effectively source separated within a hospital.

- ii. **Promote Recycling of RMW After Treatment:** Hospitals and other larger RMW generators may have opportunities to recycle components of the RMW stream. Many RMW waste stream components can be safely recycled once the waste is treated to significantly reduce or eliminate its potential for disease transmission. The ability to recycle RMW components can actually be made practicable and be facilitated by the processing methods used by certain existing RMW treatment and destruction technologies. For example, some RMW management technologies now in use involve RMW treatment followed by shredding of the waste. These technologies such as microwave and mechanical grinding/disinfection systems are analyzed in detail in Section D of this plan. Plastics, as one example of a recyclable waste stream component, can be recovered and separated to the degree necessary from the shredded waste material, and then recycled for use in other products (13). Other evolving recycling methods use certain technologies that have been developed, which handle only plastics. These units melt plastic

syringes into plastic waste plugs which then have the potential to be recycled (16). In this past decade, it is estimated that the plastic content of hospital waste has increased from 10% to over 30% (2). Further, the plastic content in RMW can be twice as much as the content in municipal solid waste (15). Since plastics in municipal solid waste are currently recycled, plastic recycling can also be an important consideration for RMW. In the future, this type of recycling processing will be able to separate the various metal components from the treated RMW and recovered plastic, making the metals available for recycling as well. While elaborate processing equipment for RMW may be economically prohibitive on an individual facility basis, regional systems may provide economies of scale and feasible opportunities for recycling treated RMW. (As noted in Section B.4., the department strongly supports front-end or back-end processing systems as part of regional facility development to maximize opportunities for recycling materials from and incoming RMW stream.)

TABLE 3

HOSPITAL ITEMS FOR SOURCE SEPARATION

OFFICE	CAFETERIA	PATIENT RELATED WASTE
All grades of paper	Food Waste Aluminum Cans Glass Tin Plastics Magazines Newspapers Corrugated Cardboard Reusable Utensils	Newspaper Magazines

- iii. **Procurement Initiatives:** Procurement of recycled goods to motivate the development of private markets is necessary to support and expand a recycling strategy. The state has continued its aggressive policy of procurement of products containing post consumer and other recycled materials content, especially in the area of paper and paper products. Using the procurement requirements of P.L.1987,C.102 as a catalyst, the state has expanded recycled paper purchases so that currently, the state purchases nearly 60% of all paper and paper products containing 50% secondary waste paper material. The 10% price preference for recycled paper also supports present procurement policies to purchase recycled

paper with the highest post-consumer waste content. New Jersey state income tax forms, state maps, annual reports, and budget message and appropriations handbooks are printed on recycled paper. A number of departments publish brochures on recycled paper as well.

To further expand procurement, the department has developed a Guide To Public Procurement of Recycled Products to recycling coordinators and procurement officers in state agencies, counties, municipalities, school districts, volunteer fire departments, and county and state colleges. This document was published by the department in October 1992. The department will make this guide available to the NJHA as a tool for focusing their efforts on procurement of recycled goods. Table 3a identifies those recycled items currently purchased by the state which at a minimum should be investigated by hospital procurement officers.

In order to begin the process of integrating recycled goods procurement into overall medical facility administration, the department recommends the following course of action:

- (a) Appointment of a recycled product procurement coordinator in each hospital;
 - (b) Review of all procurement specifications to eliminate those that discriminate against the use of products with recycled content;
 - (c) Revisions to existing recycled paper and paper product minimums so as to achieve a minimum 65% recycled paper and paper product purchase rate by 1995;
 - (d) Revisions to the minimum post-consumer content standards for paper and paper products to achieve a minimum 15% and 25% minimum post-consumer content standard, respectively, by 1995;
 - (e) Maximizing the use of re-refined motor oil, retreaded or remolded tires and recapture of chlorofluorocarbon refrigerant during air conditioner servicing;
 - (f) Revisions to printing and other vendor contracts to require use of recycled paper on all brochures, reports and other documents; and
 - (g) Maximizing the purchase of products made from recycled metal, glass and plastic.
- iv. **Mandate Statewide Recycling of Certain Materials:** Where specific materials are recycled across the state but are not mandated by all counties, consideration will be given to a statewide mandate for materials where a sufficient market and economically viable collection system exists. The department will work with the NJHA to assess the results of waste audits performed in hospitals, and actions by hospital administrators to significantly increase the number of

materials separated for recycling purposes. These materials could include, but need not be limited to: PETE and HDPE plastic containers, steel cans, corrugated cardboard and office paper. This course of action will only be taken in the broader context of solid waste management if county recycling programs do not result in the attainment of the minimum 50% MSW and 60% total waste stream statewide recycling goals.

TABLE 3a

RECYCLED PRODUCTS UNDER STATE CONTRACT

	COMMODITY	RECYCLED CONTENT
1.	Boxes, Record Storage with Lids	75%
2.	Buckets, Plastic Recycling	Min. 10% Post-Consumer
3.	Calendar Work Schedules	Cover: 65%
		Text: 50%
4.	Envelopes, Interoffice	50%
5.	Laser Printer Toner Cartridges	Re-manufactured/Recharged
6.	Pads	50%
7.	Forms, Stock Tabulating	50%
8.	Lumber, Plastic	100%
9.	Oil, Motor	Re-Refined
10.	Paper Napkins	100%
11.	Paper, Toilet Tissue	100%

SECTION B.3. - REFERENCES

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4. Statewide Disposal Strategy

Objectives and Criteria: From 1990 data, approximately 20,000 tons of RMW was generated. In the context of solid waste management this is a very small quantity amounting to a fraction of a percent of the 14.8 million tons of total solid waste generated throughout New Jersey in 1990. The entire statewide annual generation of RMW in terms of required daily management is approximately 55 tons per day. Despite the relative small volume of RMW, this waste stream has been managed in an extraordinary fashion over the past five years due to concerns for public health and aesthetics, which became so apparent with the beach wash-ups of 1987 and 1988 and other highly publicized land-based incidents. Further, 1990 data reveal that 56% of all RMW generated continued to be transported out-of-state for disposal, primarily at incineration facilities. Such management is contrary to the department's self-sufficiency goals addressed in detail within Section B.2.

In addition, significant confusion has arisen, particularly in the northeastern counties which currently are predominately solid waste exporters, with the medical waste "look alike" problem. On countless occasions, New Jersey transporters have been denied access to dumping at out-of-state facilities and forced to return loads of municipal solid waste to transfer stations and hospitals because something in the load "looked" medical. Common articles from hospitals and doctor's offices, such as gloves, caps, gowns, tongue depressors and even waiting room magazines bearing a doctor's name on the label, have been cause for loads to be refused. This type of occurrence has negatively impacted transporters, transfer station operators and generators throughout northern New Jersey and resulted in over management of municipal solid waste as RMW and significantly driven up disposal costs. This dilemma can best be rectified through achievement of disposal self-sufficiency where management control can be exercised.

Problems also exist with respect to the 44% of the RMW waste stream being managed within New Jersey. Approximately 48% of the RMW disposed of in-state in 1990 was burned at 55 hospital incinerators across New Jersey. In addition, another 20% of the RMW disposed of in-state was incinerated at the Trofe, Inc. incinerator in Mt. Laurel, N.J., which has closed November 1991. In some cases, hospital incinerator facilities are substandard by today's air emission requirements and do not employ advanced air pollution control systems. As further outlined in Section B.7 below, the department has been and will continue to cause these facilities to upgrade or close.

In response to the above noted problems and concerns, it is critical for New Jersey to move forward expeditiously with a rational and definitive statewide disposal strategy as outlined below. The primary objectives of the department in establishing a statewide

disposal strategy are to:

- Achieve in-state self-sufficiency within the next five years;
- Advocate regional management and disposal of RMW across the state through development of one or more new processing/treatment/disposal systems to serve multi-county regions or through shared use of existing state-of-the-art treatment and disposal systems at hospitals or other facilities;
- Provide counties with a clear, yet suitably flexible management framework within which to carry out the RMW planning process set forth within the Comprehensive Act;
- Maximize the use of sewer systems for the management and treatment of liquid RMW, such as Class 3 bulk blood and blood products;
- Streamline the permitting process and develop efficacy standards for alternative systems to incineration such as microwaves, chemical disinfection and grinding systems, etc. (This policy objective and associated implementation plans will be addressed in greater detail as part of Section B.6 below.);
- Close down or upgrade existing substandard hospital and other small-scale RMW incinerators across the state. (This policy objective will be addressed in detail as part of Section B.7 below.)

The departments criteria and implementation strategies to achieve these objectives are outlined in detail below.

Short-Term Implementation Plan: As outlined earlier in Sections B.2.& 3., the department's overriding objectives are to maximize source reduction and recycling of medical wastes which are not considered RMW, source reduce and recycle limited components of the RMW stream where feasible and appropriate, and achieve self-sufficiency in in-state management and disposal within the next five years. Source reduction and recycling plans were addressed earlier in Section B.3. The following are the specific plans and timeframes associated with achieving in-state disposal self-sufficiency which seek to conform to the statutory county/state planning process, while strongly advocating regional planning between multiple counties toward development or better utilization of RMW disposal capacity. (Beyond the following planning discussion, Section C.4. of this state plan also provides a detailed capacity analysis which frames statewide and county-by-county capacity requirements by December 31, 1997.)

- a. **The Statutory Process:** The Comprehensive Act required the department to make a projection of the anticipated RMW disposal capacity shortfall in each county over

the next five years as part of the RMW State Plan. Further, upon submission of the RMW State Plan to the Governor and Legislature, the department was mandated to transmit a written certification of need to each freeholder board of a county where a RMW disposal capacity shortfall is anticipated.

The Comprehensive Act goes on to specify that within one year following receipt of the department's certification of need, the county must provide for its RMW disposal requirements in any of the following ways:

- Development of one or more new commercial (for-profit) RMW disposal facilities;
- Development of one or more non-commercial RMW disposal facilities, such as an on-site hospital microwave or incinerator operated for a cost-based fee not in excess of the costs actually incurred for RMW treatment and disposal;
- Making more efficient use of existing in-county facilities, such as through reducing use of on-site hospital facilities for processing general hospital waste and increasing the treatment and destruction of RMW on a countywide basis;
- Negotiating an "interdistrict agreement" between two or more counties to provide for the out-of-district treatment and destruction of RMW.

Following consideration of the options identified above, each county is required to adopt a plan amendment for submission to the department to outline the selected disposal plan for RMW. After completion of the one-year county planning process, the Act requires the department to make a written determination as to whether each county has selected and implemented an appropriate disposal arrangement for RMW. In the event that a county has not selected and implemented a disposal strategy, the department is mandated, following a public process, to certify the failure of the county and is empowered to designate and develop needed disposal capacity on behalf of the county.

The department has already begun the implementation of the statutory process outlined above. On May 19, 1989, letters were written to each county to outline the county/state planning obligations of the Comprehensive Act. Further, on October 15, 1991, each county was forwarded a data set which identified each generator of RMW in the county, the quantity of each class of RMW generated for the 1990 registration year, a listing of all registered destination facilities within the county, and a breakdown of the RMW processed by each for the 1990 registration year. The formal timeframes established in the Comprehensive Act will be triggered by the proposal of a Notice of Availability of this RMW State Plan in the New Jersey Register, submission of the draft plan to the Governor and Legislature and distribution of the draft plan, along with a certification of need (where

appropriate), to each county by certified mail. These activities are scheduled to take place during April 1993. In this regard, each county five year capacity assessment is contained within Section C.4. of this RMW State Plan and will be forwarded to each county as part of the certification of need process.

- b. **Regionalization:** Since the passage of the Comprehensive Act and participation in the Federal Demonstration Program, solid waste policy has changed dramatically as a result of the efforts of Governor Florio's Emergency Solid Waste Assessment Task Force. The major policy change reflected in terms of disposal capacity planning pertained to bringing counties together for shared use of new systems for all or a significant portion of the waste stream generated by two or more counties. This same fundamental logic, of building the fewest number of additional facilities or making better use of existing infrastructure for both economic and environmental reasons, is directly applicable to the management of RMW as the DEPE's recommended approach.

As noted within the Governor's Emergency Solid Waste Assessment Task Force Final Report and stressed throughout the Municipal and Industrial Solid Waste Management State Plan Update: 1993 - 2002 proposed in February 1993, regionalization is a fundamental policy objective of the department. As noted within the task force final report, "counties working together can achieve . . . more economical and environmentally sound disposal options than each county working alone." Regionalization is aimed at bringing together counties, hospitals, laboratories and small generators in pursuit of shared use of disposal capacity. In terms of RMW management regionalization of disposal capacity refers to systems which are designed or retrofitted for the acceptance of RMW from two or more major generators, such as hospitals, laboratories or pharmaceutical companies, or numerous smaller generators, such as hospitals accepting RMW from all private practitioners in their general service area. Further, as noted throughout this RMW State Plan, the quantities of RMW generated statewide are relatively very small and would be complimentary to regional management both from an environmental control and economic perspective. The department strongly supports and advocates regional development of new capacity or the shared use of existing capacity. Examples include the following:

- Development of a multi-county regional or statewide RMW processing and disposal facility to serve a broad area of the state. Such a facility, which would involve front-end or back-end processing to advance recycling followed preferably by a non-incineration treatment and destruction facility, would be strongly supported by the department.
- Expanded operations at existing hospital facilities with approved microwave, chemical disinfection and grinding or new/upgraded incineration facilities to

accept RMW from private practitioners (generally very small quantity generators) or other hospitals/laboratories on a community-wide, countywide or more regional basis. A small quantity transporter exemption already exists at N.J.A.C. 7:26-3A.27(d) to facilitate the movement of RMW by private practitioners to hospital facilities and such actions would not be considered "commercial" if the hospital only charges a "cost-based fee not in excess of the costs actually incurred for RMW treatment and disposal."

- Conversion of the Ft. Dix Heat Recovery Incinerator to increase the disposal of RMW from Burlington County and on a broader regional basis at the discretion of the county freeholder board. The revised status of the Ft. Dix Military Training Facility and downscaled operations has stimulated interest in broader facility use which would be consistent with the February 22, 1989 amendment to the Burlington County Solid Waste Plan which was certified on August 24, 1989. The department strongly supports use of this facility on a regional basis for RMW and would further support expansion of operations to add processing equipment to advance front-end or back-end RMW separation and recycling.
- Expansion of existing agreements between Warren/Somerset and Hunterdon Counties, Essex and Bergen Counties, Mercer and Atlantic Counties and Union and Bergen Counties to specifically provide for RMW disposal at existing and planned solid waste facilities.

With respect to the first initiative noted above, the New Jersey Health Care Facilities Financing Authority (HCFFA) convened a Regulated Medical Waste Task Force in December, 1991, to develop, on an accelerated basis, a comprehensive, coordinated statewide approach to RMW treatment and disposal. The task force consists of representatives of the office of the Governor, the office of the Attorney General, the office of the Environmental Prosecutor, the DEPE, DOH, HCFFA, the New Jersey Hospital Association and officials from several specific hospitals.

The HCFFA is the quasi-public agency which must review and approve the financing for new or replacement equipment at hospitals throughout the state. Due to the high cost of new disposal equipment and HCFFA's responsibility to help keep health care costs down, the agency has worked aggressively through the RMW Task Force to evaluate regional opportunities for disposal. Over the last year the Task Force has, among other things, gone on numerous site visits to evaluate existing treatment and destruction systems, hosted vendor presentations for emerging new technologies, improved the state's RMW data base through surveys and evaluated the economics of financing various types of facilities. The DEPE and DOH strongly support the ongoing role of the Task Force and will coordinate the review of new hospital RMW disposal capacity with this group in line with the strategy contained in this RMW State Plan, as well as the hierarchy of preferred

management outlined in Section B.4.g. on page B-39 below. In addition, the departments will continue to support the efforts of the Task Force to evaluate and potentially facilitate the development of new regional RMW processing and disposal capacity.

- c. **Use of Wastewater Treatment Systems:** In 1990, approximately three and one-half percent (3 1/2%) of the total RMW generated or 700 tons of liquid waste was disposed of via sanitary sewer. This was primarily Class 3 blood and blood products and other body fluids generated by hospitals and funeral homes. This quantity represents about 500 gallons of sewage flow per day being introduced to the statewide wastewater flow which is measured in hundreds of millions of gallons per day. Further, disposing of blood and other body fluids through sewer systems has been a standard operating procedure for decades.

From a management perspective, the departments strongly support such a practice for public health reasons and consider that continued use of sewers for liquid RMW disposal to represent best management practice. The domestic treatment works operating in the state are multi-million dollar investments effective in high-technology equipment designed to treat wastewater and appropriately discharge effluent under controlled and permitted conditions. It is most appropriate to continue to actively utilize this vast infrastructure for all liquid RMW disposal and to avoid the management of liquids through solid waste systems.

- d. **Streamlined Permitting:** The departments acknowledge the role state government must play in making disposal self-sufficiency a reality. Since the Comprehensive Act was passed the departments have worked together closely to expedite both the solid waste plan inclusion and facility permitting of new non-commercial disposal capacity at hospitals and private sector companies for microwaves, chemical disinfection and grinding units and incinerators with advanced air pollution control systems. Further, over-burdensome regulatory requirements from multiple DEPE and DOH programs have not been imposed, and in most cases a single installation and control apparatus permit has been issued for these non-commercial operations. In some cases relatively minor discharge permits have also been necessary. Finally, the DOH has initiated the development of efficacy standards for alternative technologies to incineration and has integrated appropriate requirements stemming from their analysis into the single installation and control apparatus permit noted above. This has been completed and applied with respect to microwave systems and the DOH is actively pursuing the establishment of efficacy standards for chemical disinfection and grinding units.

During the one-year county planning process noted earlier the departments will continue to work cooperatively with generators to streamline, where appropriate, the development of new capacity in line with the disposal strategy hierarchy below.

The departments will carefully evaluate any proposed plan amendments and permit submissions to ensure consistency with the strategy outlined above, as well as the hierarchy of management preferences found in B.4.g. below.

- e. **Hospital Incinerators:** In the broader context of solid waste management, incineration is considered along with landfilling to represent the least favored long-term management strategies in New Jersey, with the exception of out-of-state disposal. Incineration requires significant capital investment and raises environmental concerns, primarily in terms of air emissions. As a result, a major shift in policy direction was forged by the solid waste task force and supported by Governor Florio to maximize source reduction and recycling, and minimize the need for new and costly disposal capacity, particularly incinerators, through aggressive pursuit of regional solid waste planning and implementation. It is New Jersey's policy to reduce current and planned dependence upon incineration to the maximum extent possible. Section B.7. below articulates in detail the DEPE's position on incineration in general. However, as a summary in the context of the statewide disposal strategy, the DEPE maintains the following primary objectives and implementation strategies:
- Future permit applications will be heavily scrutinized and only systems employing advanced air pollution control devices will be permitted. County plan amendments and permit applications for new small scale and commercial incinerators will only be approved or accepted for review where the county and/or generator(s) have demonstrated compliance with the source reduction and recycling goals of the state and where such new capacity is proposed for regional use and/or is otherwise consistent with the host county plan, as well as the hierarchy of management preference outlined in B.4.g. below. (These same tests in terms of source reduction, recycling and regionalization will be applicable to any proposal for new facility development of any kind.)
 - More stringent air pollution control requirements pertaining to particulate controls, acid gas controls, stack height and monitoring will continue to be imposed on existing hospitals and any new facilities and other small-scale incinerators that cannot meet their existing permit emissions limits. (For a discussion of this issue see Section B.7).
 - Rigorous enforcement will continue to be applied in the inspection of hospital and other small-scale incinerators and substandard units will be assessed penalties and forced to close in the absence of generator commitment and county/state plan consistency toward major facility upgrading.
- f. **System Redefinition:** The RMW regulations developed following adoption of the Comprehensive Act, which are found at N.J.A.C. 7:26-3A, require destination

facilities, such as microwave units, chemical disinfection and grinding systems and incinerators, to "treat and destroy" RMW. The treatment aspect of the definition pertains to the public health concerns expressed in the Comprehensive Act and generally is separately defined as reducing or eliminating the potential for causing disease. The term "destruction" responds to the important aesthetic concerns addressed by the Act and is defined to require RMW to be rendered unrecognizable.

Beyond requirements for both treatment and destruction, the RMW regulations state that only treated RMW may be accepted at licensed solid waste transfer stations and landfills. Further, the treated material still must be tracked, packaged, labeled and transported in accordance with all RMW requirements. Despite the authorization for transfer stations and landfills to accept treated RMW, only one private transfer station owner has sought a permit modification within the three years the regulations have been in effect to accept RMW and has never actually handled this material.

During the one year county planning process, the department will consider one additional management option of "system redefinition." Under such an approach, the department will consider requests from county governments for amendments to the existing solid waste regulations to provide for the integration of RMW within the solid waste disposal systems of each county. For example, counties may want to use their existing landfills for the disposal of untreated RMW. The department could consider this option provided the existing tracking packaging, labeling and transportation requirements for RMW were maintained and extraordinary handling and disposal requirements were put into place for landfilling this type of material. Changes to existing rules would be needed to allow for properly packaged, labeled, tracked and transported RMW to be disposed of at existing transfer stations, landfills and energy recovery incinerators in untreated form, provided such facilities amend their permits to include acceptance of this waste type.

In terms of landfilling untreated RMW, changes to the existing "Sanitary Landfill Operational and Maintenance Requirements" found at N.J.A.C. 7:26-2A.8 would be needed. The model for these changes could be existing asbestos landfilling standards found at N.J.A.C. 7:26-2A.8(1) which require landfilling in separate marked and recorded areas and immediate depositing and covering of asbestos upon receipt. To fully implement a redefinition strategy to manage RMW within the solid waste disposal system, other regulatory changes would be required to: create a new waste type category at N.J.A.C. 7:26-2.13(g); modify the "Additional Engineering Design Submission Requirements and Design Requirements for Thermal Destruction Facilities and Transfer Stations" found at N.J.A.C. 7:26-2B.4 and 2B.5 to provide for the proper handling and processing of RMW; revise N.J.A.C. 14:11-7 to require disposal facilities to file for an initial tariff to enable the recovery of all costs associated with the special handling and disposal of RMW; and amend the "Interdistrict and Intradistrict Solid Waste Flow Rules" to direct the

movement of RMW.

The redefinition concept, as noted, would require extensive regulatory changes and additional technical research on the impact, if any, on the environment or health, which would likely take one to two years to fully complete. As a result, the department frames this concept within the Comprehensive Plan as a potential option for statewide application provided sufficient support is expressed by the counties for merging RMW within existing solid waste disposal systems during the formal one-year planning process. Further, system redefinition would only be pursued after necessary public health and employee protection issues had been addressed and needed safeguards put in place. Finally, fewer regulatory changes would be needed to integrate the disposal of untreated RMW at existing county incinerators, as compared to acceptance at transfer stations or landfills. However, significant design changes, such as separate feed lines may be necessary. The department will consider requests for authorization to handle untreated RMW at existing and planned large-scale county incinerators on a county-by-county basis. Primarily, county plan amendments and modifications to facility permits would be needed to obtain such authorization.

- g. Disposal Strategy Hierarchy:** The statewide disposal strategy outlined above seeks to conform to the specific provisions mandated within the Comprehensive Act, expand the options available to counties in the planning process to ensure greater management flexibility, and to achieve the statewide public policy goal of self-sufficiency within the next five years. The preceding narrative contained in this section can be summarized within the disposal strategy hierarchy provided below. The hierarchy represents a listing in descending order of the options the DEPE views as the best management practices to safely dispose of RMW in environmentally sound and economical ways and to achieve self-sufficiency as quickly as possible. County plan amendments developed pursuant to this RMW State Plan and the Comprehensive Act will be reviewed with this hierarchy as a backdrop. However, counties will be afforded the opportunity within the one-year planning process to pursue the RMW disposal strategy which best suits individual circumstances. The DEPE will approve rational county plans which address the various elements of the hierarchy and will only intervene directly in cases where a county has failed to meet its obligations under the Comprehensive Act. The department's disposal strategy hierarchy is as follows:

1. County management strategies which include regional planning for the use of existing or planned RMW processing/treatment/disposal capacity on a multi-county basis through interdistrict agreements;
2. Strategies which demonstrate the capacity and timeframes for achieving self-sufficiency through more efficient use of existing in-county RMW disposal capacity at state-of-the-art hospital and other facilities such as microwaves,

chemical disinfection and grinding systems, upgraded incinerators and sanitary sewer systems;

3. Plans for the development of new commercial or non-commercial disposal capacity at hospitals or other facilities for use on a singular countywide basis;
 4. Plans for the development of new commercial or non-commercial disposal capacity at hospitals or other facilities for use by a single large generator;
 5. Plans which call for the merger of RMW disposal within the existing solid waste infrastructure of the county through revision of existing regulations to allow for the acceptance of untreated RMW; and
 6. Out-of-state disposal which will only be acceptable as a short-term option pending development of in-state capacity and which will not be authorized for long-term use other than as part of a broad county contingency plan.
- h. Commercial Facility Moratorium:** The Comprehensive Act drew a statutory distinction between commercial and noncommercial facilities. The term "noncommercial" was defined to include facilities which accept "regulated medical waste from other generators for on-site disposal for a cost-based fee not in excess of the costs actually incurred by the facility for the treatment of regulated medical waste." The Comprehensive Act further outlined certain planning and licensing exemptions for new noncommercial facilities to allow their development during the time period when the department prepared the RMW State Plan. Conversely, the Act placed a moratorium on the development of new commercial facilities during the state planning process. The Act specifically provided that "no proposed new commercial RMW disposal facility shall be included within a district solid waste management plan prior to the submission to the Governor and the Legislature of the comprehensive State regulated medical waste management plan." In addition, the Act prohibited the DEPE from considering "any application for, or approve any registration statement or engineering design application" for a new commercial RMW facility prior to the submission of the RMW State Plan to the Governor and Legislature.

During the timeframe that the RMW State Plan has been developed, no new commercial facilities of any kind have been considered for county plan inclusion or engineering design approval. However, during this same timeframe approximately 23 new or replacement RMW treatment and disposal facilities were developed at hospitals and pharmaceutical companies, primarily utilizing microwave and chemical disinfectant and grinding technologies on a noncommercial basis. In each case, an officer of the institution was required to sign an affidavit which attested to the noncommercial status of the planned operation prior to permit issuance. As a result, despite the commercial facility moratorium, significant new

treatment and disposal capacity has been developed in New Jersey while the RMW State Plan was being completed.

The Comprehensive Act was silent on the procedures by which the departments would adopt the RMW State Plan. However, submission to the Governor and Legislature is clearly required, at which time the commercial moratorium on new facility development would expire. The departments will transmit a copy of the RMW State Plan to the Governor and Legislature concurrent with the proposal of a "Notice of Availability" of the draft plan in the New Jersey Register. At that point the departments will resume consideration of county plan and technical engineering submissions for new commercial facilities consistent with the disposal strategy hierarchy outlined in g. above.

5. Regionalization of Programs and Facilities

Objectives and Criteria: The goals for regionalizing medical waste management include building the fewest additional disposal facilities while making the most complete use of the state's existing disposal capacity. Further, regionalization of disposal is desirable because it will make the maximum use of in-state facilities.

The New Jersey Solid Waste Management Act required each of the 21 counties and the Hackensack Meadowlands Development Commission to develop a plan for the management of the solid waste generated within the district over a 10-year planning horizon. Historically, the county planning process resulted in the siting of an incinerator in nearly every county. This outcome had been subject to mounting criticism from both the public and the private sectors in the last five years due to persistent questions involving potentially harmful emissions and toxic ash from incinerators, as well as concerns about the economic viability of incinerators over the long-term.

The appointment of Governor Florio's Emergency Solid Waste Assessment Task Force and its subsequent investigations in 1990 indicated the need for regionalization in solid waste management as well as an aggressive source reduction and 60% recycling program. The department's short-term goal is to shift away from past practices where 21 counties were relatively isolated in their respective planning activities and to use the planning, permitting and financing approval process to facilitate regional considerations for RMW management as well as other aspects of solid waste planning. Through increased regionalization of existing and planned RMW disposal capacity, the state can achieve its primary public policy goal of self-sufficiency on an accelerated basis. Further, regionalization has both environmental and economic advantages, particularly for the related small scope of RMW generation. Regionalization and self-sufficiency will also minimize the distances that RMW must travel over state roads to out-of-state facilities, therefore minimizing the potential for adverse incidents with the wastes during

transport. In fact, largely due to the fact that there is much less RMW produced in the state than solid waste, (RMW is about 0.2 percent of the solid waste stream, or 20,000 tons per year), regional approaches to medical waste management offer opportunities to make much more efficient use of existing disposal facilities. Medical wastes have a certain degree of real and perceived potential infectiousness, and localized in-state disposal will reduce the likelihood of human exposure to the wastes during transportation incidents. Opportunities for greater capacity utilization should be possible by regionalizing disposal at existing medical facility incinerators that are being upgraded to meet current emissions standards. Other types of on-site disposal systems using alternative technologies to incineration also present opportunities for regional disposal, especially for small generators. The department will encourage small quantity generators to self-transport to hospitals and similar facilities to decrease transport out-of-state.

The statewide disposal capacity analysis beginning on page 152 clearly demonstrates potential and currently available opportunities for regionalization. As this analysis points out, based on projected 1997 RMW generation and available disposal capacity, New Jersey will have a capacity shortfall of approximately 11,965 tons per year or 33 tons per day. A single, relatively small processing/treatment/disposal system appropriately located could easily accommodate this entire shortfall. Beyond this obvious conclusion, existing hospital incinerators, on a statewide average, are burning 72% municipal waste (such as on-site generated office, cafeteria and patient related waste) and only 28% RMW. Clearly, opportunities to displace municipal waste in favor of accepting RMW on a more regionalized basis are great. The same potential exists for alternate technology facilities such as microwaves and chemical disinfection and grinding systems which are, on a statewide average, currently run at a 33% rate of total design capacity.

Short-Term Implementation Strategy: The strategy for implementing regionalization goals is to use the planning and permitting processes for RMWs, as described in the Comprehensive Act and the disposal capacity analysis in section C.4., to drive the regionalization process. Using the generation and capacity information presented in this report, counties will be able to begin to collaborate on developing regional medical waste management options. Counties are expected to examine both large and small generators of medical wastes for their regional disposal potential. The specific process counties should follow to develop regionalization opportunities is outlined below.

Approximately half of New Jersey's hospitals accept RMW from generators of small quantities of RMW. Some of these hospitals treat and destroy the RMW on-site by incineration or by alternative technologies. Other hospitals collect the RMW, consolidate it with their own RMW, and have it transported by a RMW transporter for off-site disposal. The department will encourage generators of smaller quantities to self-transport to hospitals to decrease transport out-of-state. The Comprehensive Act provides an exemption for RMW small quantity generators to self transport their

RMW's to a central collection point such as a hospital. A small quantity generator in this context is defined as an entity generating less than 3 cubic feet of RMW per month. The RMW rules found at N.J.A.C. 7:26-3A incorporate this exemption and set forth the conditions for its use. These rules may be changed within the limits of statutory authority to facilitate and encourage the collection and disposal of RMW in-state. The department's objective is to promote regulatory changes to facilitate regionalization among facilities, regardless of size.

a. **Procedures For Counties To Follow In Regionalization:** There are four basic steps which the department has identified for counties to follow in performing their regionalization analysis. In addition to these steps, the DEPE will be available, upon request of participating counties, to serve in the capacity of catalyst or facilitator to bring counties together, clarify state policies and requirements, and guide the negotiation process. The four basic steps are:

1. A careful analysis by each county of RMW management systems and existing disposal plans including generation trends at hospitals and other RMW facilities, current/future recycling rates at RMW facilities, existing and planned capacity, and cooperation between RMW facilities within the county to dispose of RMW;
2. Identification of current capacity deficiencies in the county for RMW disposal from the data provided in this state plan;
3. Identification of two or more counties as potential regional partners that can satisfy county needs; and
4. Contact and meet with candidate partners toward negotiating a regional arrangement and contact large facilities toward negotiating an arrangement to accept RMW from generators of small quantities of RMW.

The department previously supplied data about RMW generation rates to the counties on October 15, 1991. The department will supply information concerning the five year RMW capacity needs for the counties through a separate certified mailing to the counties during April 1993. Both the data supplied to the counties on October 15, 1991 and the five year RMW capacity needs found in section C.4. are based on data derived from the 1990 Annual Generator Report submitted to the DEPE each year by all RMW generators. The respective counties will develop and adopt plan amendments, as described in more detail in the following subsection, to provide adequate RMW disposal capacity in each solid waste district. The department will assist the counties in developing and implementing their regionalization plans.

- b. **Plan Amendment Requirements:** In accord with the Comprehensive Act, the department is required, on submission of the RMW State Plan to the Governor and Legislature, to transmit a written certification of need to each county where a RMW disposal capacity shortfall is anticipated. Disposal capacity shortfalls are calculated from available data from the 1990 AGR and from the 1991 destination facility report indicating RMW generation rates and in-state treatment/destruction rates. Each county is required to adopt a plan amendment outlining a RMW disposal plan for submission within one year to the department for review and approval. Under the statutory authority of the Solid Waste Management Act, the department must review and revise a county plan amendment within 150 days. Otherwise the county plan amendment becomes effective as submitted. The Comprehensive Act specifies that if a county has not selected and implemented a suitable disposal strategy, the department, under authority granted in the Comprehensive Act, must certify within one month the failure of the county and develop needed disposal capacity on behalf of the county.

Each county must submit a plan amendment for RMW disposal that includes regionalization. These submissions must reflect consideration of the following areas:

1. The current status of existing in-county or in-state regional RMW processing and disposal capacity;
2. A listing of any current interdistrict agreements with other counties and the status of planned regional strategies, as well as any agreements between the county and any large facilities to accept RMW from generators of small quantities of RMW. This should also include discussion of specific negotiations held to date regarding facility regionalization;
3. Long-term capacity analysis that considers:
 - (a) County RMW generation trends using generation data supplied from the DEPE analysis of 1990 AGR;
 - (b) Recycling rates;
 - (c) Remaining disposal capacity;
 - (d) Planned capacity for in-county or regional use and associated implementation schedules;
4. Current and future dependence on out-of-state disposal capacity and associated timeframes;
5. Identification of current plan deficiencies and needs which can be satisfied through agreements with other facilities and with other counties;

6. Development of new or expanded facilities within the county to receive RMW from other generating facilities as part of a regional plan for RMW, such as:
 - (a) New commercial (for-profit) RMW disposal facilities;
 - (b) New noncommercial RMW disposal facilities, such as an on-site hospital alternate technology system or an incinerator operated for a cost-based fee not in excess of the costs actually incurred for RMW treatment and disposal;
 - (c) The use of existing incinerators; and
 - (d) Making more efficient use of existing in-county facilities, such as through reducing use of on-site hospital facilities for processing general hospital waste and increasing the treatment and destruction of RMW on a regional basis at those facilities; and
7. Economic analysis and financing considerations.

As noted in the statewide disposal strategy under section B.4., the department will rigorously apply the identified hierarchy of preferred disposal options in the review of county plan submissions required under the Comprehensive Act, as well as for any county plan amendment which proposes new RMW disposal capacity.

- c. **Hospital Regionalization Practices:** The department will continue to encourage and assist hospital systems and research centers to regionalize the treatment and destruction of their RMW at central facilities. At the present time there are already some hospital systems and research centers within New Jersey which consolidate RMW from related generators. These involve using employees of the hospital system or research center as non-commercial RMW transporters. RMW is collected from one or more generators and transported to a central facility for treatment and destruction. Generators of RMW currently operating in this manner in New Jersey are:

Central Receiving Facility

- (1) Raritan Bay Medical Center
530 New Brunswick Avenue
Perth Amboy, NJ 08861
Middlesex County

- (2) Schering Corporation
1011 Morris Avenue

Secondary Generation Facility

Raritan Bay Medical Center
1 Hospital Plaza
Old Bridge, NJ 08857
Middlesex County

Schering Corporation
200 Galloping Hill Road

Union, NJ 07083
Union County

Kenilworth, NJ 07033
Union County

- (3) Shore Memorial Hospital
New York Avenue
Somers Point, NJ 08244
Atlantic County

Shore Memorial Hospital
Regional Dialysis
415-417 Shore Road
Somers Point, NJ 08244
Atlantic County

- (4) West Jersey Health Systems
1000 Atlantic Avenue
Camden, NJ 08104
Camden County

West Jersey Health Systems
101 Carnie Boulevard
Voorhees, NJ 08043
Camden County

West Jersey Health Systems
White Horse Pike & Townsend
Berlin, NJ 08009
Camden County

West Jersey Health System
Route 73 & Brick Road
Marlton, NJ 08053
Burlington County

It should be noted that for West Jersey Health Systems, the regionalization operations involve generators in two counties.

Long-Term Implementation Strategy: Through the application of the short-term strategy outlined above, a number of long-term goals toward regionalization should become achievable. These goals are summarized as follows:

a. Statewide Regionalization: Encourage and expedite the development of a regional treatment and disposal system to serve statewide needs which ideally involves front-end or back-end separation equipment to maximize recycling and employs non-burn technology.

b. Incineration: Incineration is among the least favored methods of long-term treatment and/or destruction for RMW as for other solid wastes. The control devices required are costly and there is a public perception that even with these control devices, incineration is a major source of air pollution. The department has a long-term strategy to make maximum use of existing incineration capacity on a regional basis and when necessary and where appropriate, to phase out incinerators as alternate technologies

become available over the next few years. The department is requiring the upgrading of incinerators to current air pollution control standards as permits come up for renewal.

c. Alternate Technologies: The department intends to encourage the development and use of alternate technologies to treat and destroy RMW. These include chemical treatment units, microwaves, autoclaves and various other devices, all of which include grinders/shredders to render the RMW unrecognizable. Facilities having these devices will be encouraged to make them available for use on a regional basis. Through removal of regulatory restrictions, the department will encourage regional disposal between all large and small generators. It is departmental policy, as has been stated earlier, to handle RMW within the state and discourage a dependence on out-of-state disposal.

d. Recycling: The department will encourage and assist the counties in developing and implementing recycling strategies for medical wastes in general and RMWs in particular. Due to the nature of many types of RMW, this may prove to be a limited option for reducing the amount of RMW subject to treatment and disposal. The department will also give highest priority to regional disposal systems which include front-end or back-end processing to advance recycling goals.

e. Education: The departments will work with the counties for the purpose of educating RMW generators, especially large scale generators such as hospitals, concerning source reduction and recycling. By using items that can be sterilized and reused, the volume of RMW generated can be reduced. Further, RMW generators can train personnel to avoid overclassification of solid waste as RMW and in this way reduce the amount of RMW generated.

f. Procurement: Regionalization embraces cooperation between counties, hospitals, and all RMW generators to efficiently coordinate their waste management programs. The concept goes well beyond strictly disposal capacity planning. In this regard, hospitals and other generators should consider such activities as joint purchasing programs to advance source reduction and recycling goals as previously discussed in Section B.3. Through essentially "recycling what you can and purchasing what you recycle," hospitals and other institutions can save money, and help "close the loop" though serving as a market for products made from recycled materials or which otherwise advance environmental themes.

6. Use of New Technologies

Objectives and Criteria: Historically, incineration and steam sterilization, usually referred to as autoclaving, were the only two widely used methods of treating medical

waste in New Jersey and throughout the country. Generators have preferred on-site incineration as a means of disposal of medical waste since incineration decreased liability concerns and, once incinerated, exempted the resulting ash from regulation as RMW.

The increasing trend towards stricter regulatory requirements regarding permissible air emissions from incinerators has necessitated upgrades and retrofitting existent incinerators with expensive control equipment. As economic and environmental disadvantages have increased, on-site incineration has diminished in stature to a point where it now is considered among the least favorable of disposal strategies for long-term solid waste management. The Comprehensive Act and the emergency medical waste rule consider steam sterilization as only a treatment method that does not normally render medical waste non-recognizable. This meant that autoclave units needed additional equipment that rendered the waste non-recognizable so as to exempt the processed waste from regulation as RMW. Combined with incineration's general decline in favor and feasibility, and the promulgation of the Comprehensive Act and the emergency medical waste rule equating steam sterilization to only a treatment method, new and innovative means of disposal have attracted more attention.

The DEPE's objective is to facilitate the use of alternate technologies, particularly on a regional use basis, whenever possible. By implementing regulatory controls on new technologies whenever necessary, the primary objective of safe disposal of medical waste can be accomplished. Where new technologies are used on-site, they provide economical on-site disposal alternatives to incineration for generators and effect the basic objective of protecting public health and safety. The departments' policy toward use of new technologies must first be to ensure their efficacy in treating the wastes in order to protect the public health, safety and the environment, as required by law. While the departments strongly encourage the development and use of alternative technologies, they are not, in all cases, totally proven in terms of efficacy, safety, durability, and economy. As a result, proper caution must be taken to ensure that the necessary public health and environmental controls and safeguards are in place. The protocols and requirements outlined within this section are intended to ensure the appropriate development and use of technologies.

Many new technologies have been available for the past five years and have slowly but steadily gained acceptance. A major portion of this RMW State Plan is an evaluation of new technologies (see Section D.3). In this analysis, the departments have identified the key advantages and disadvantages of each system by reviewing published literature of vendors, government agencies and other institutions that have conducted the technological evaluations. Research is being conducted by USEPA on the major technologies, which will provide direct knowledge of their technological efficacy. Efficacy in this instance, is generally defined as the system's microbiological destruction effectiveness. USEPA research data, along with the technological information presented in this report, will provide guidance for the departments' development of the necessary

operational guidelines for new medical waste disposal technologies.

Short-Term Implementation Strategy: In the near-term, that is, prior to the issuance of the USEPA's efficacy data in their third Report To Congress, the departments believe it is appropriate to allow the use of new technological systems based on the information presented in this report and a case-by-case permit review of the use of the system at the facility to determine the effectiveness of treating and destroying RMW.

Required Approvals For New Technology: The department does not determine the particular alternate technology which a RMW facility or county should use. A county, hospital or other RMW facility selects the alternate technology they will use based on their investigations. The department is a performance based and not a technology based permitting agency and thus will review any technology presented by a county in the form of a plan amendment. However, as noted in Section B.4., the DEPE has developed a hierarchy of preferred disposal options and will review proposals for new facilities against this backdrop. The department has already registered and permitted six microwave/grinder units and twelve chemical treatment/grinder/shredder units.

The departments have county planning, registration, and permitting requirements that a facility must satisfy before commencing operations as part of the process to assure proper and safe operation of a RMW system using an alternate technology and to assure the treatment efficacy of alternate technologies to protect public health. These procedures involve inclusion within the county solid waste plan of the county within which the facility is located; receiving DEPE approval of the county's proposed plan inclusion; registration as a RMW destination facility; permit approval for required air pollution control devices; and permit approval for waste water discharges if there are any; and in addition, DOH development of the site specific operating protocol to approve the use of the technology for use at that specific location to ensure the efficacy of the treatment method for the wastes at that facility. (See Attachment A for the "Permitting Information Letter". This letter details the DEPE, DOH and other agencies' procedures and requirements with which prospective RMW destination facilities must comply before being allowed to treat and destroy RMW.)

- a. **New Technology Evaluation:** For purposes of evaluation and assessment the DEPE and DOH collected background information on alternate technologies for medical waste disposal and will apply this knowledge in the review of specific applications to make a determination for use at each site location. The following information is required from all vendors and was collected for review by the DEPE to identify the technologies available, for New Jersey generators, that have the potential for being the most effective and efficient alternatives that are cost effective, while providing safe RMW management. (See Section D.3. for a detailed review of alternate technologies. See Attachment B for the New Technology Questionnaire used by the department to obtain the following information.)

- (1) **Conditions of Operation - Requirements:** The basic conditions required at the generators facility, i.e., space, plumbing, sewer connection, electrical connection, venting, staff training, staff certification requirements, parametric monitoring and controls, chemicals to be stocked, permits/approvals, etc. to operate the equipment.
- (2) **Constraints on use:** The capability of and the explanation for the equipment's ability to process or accept all seven classes of RMW.
- (3) **Typical Operation - Waste Handling:** Information on parameters such as the charge capacity, reduction in volume, weight and infectious nature and, composition and suggested method of disposal of the equipments solid, liquid and air/gaseous discharges.
- (4) **Time required to install in New Jersey and Availability:** Information as to whether the equipment is readily obtainable for installation in a New Jersey generator's facility, plus the identification of any distributors.
- (5) **List of Facilities with the equipment installed in New Jersey and Other States:** Identification of any facilities that currently have operational equipment installed which could provide a track record of operations.
- (6) **Safety Precautions:** Information on safety devices built into the equipment and safety procedures to be followed in the event of aberrant operating circumstances. Also details on training to enhance safe equipment operation. Information on specific safety procedures necessary to comply with federal, Occupational Safety and Health Administration (OSHA) requirements.
- (7) **Parametric Monitoring and Controls:** Information on the use of parametric monitoring and control devices developed and built into the equipment, the controls protection from being overridden by operators and the tamper-resistance of monitoring and any data collection reporting or other information systems, to assure that a medical waste disposal technology can not be tampered with by operating staff at a facility.
- (8) **Efficacy Analysis of the technology:** DEPE and DOH are concerned about the efficacy of medical waste disposal technologies in treating RMW (i.e. significantly reducing the levels of pathogens to safe levels or rendering RMW pathogen free). A vendor of a medical waste disposal technology must submit information to DEPE on the ability of the technology to effectively treat RMW. The information on efficacy of treatment will be forwarded to DOH for review and analysis. DOH will be the lead agency in investigating the efficacy of any alternate technology

system (i.e. rendering RMW non-infectious or less infectious) and will keep DEPE informed about the investigatory process. An alternate technology review committee within DOH is establishing efficacy standards to assure that new/alternate technologies for treating and destroying RMW satisfy all requirements to protect both facility employee and public health.

A vendor is encouraged to submit supportive reports and/or assessments of the medical waste disposal technology produced by a professional research or engineering firm, university, etc. not associated with the vendor company. The data required, drawn from repeated application of the process, should include, at a minimum, the following:

- Actual quantity of medical waste processed; assessment of how closely this waste resembles waste which would be generated in New Jersey, i.e., whether it includes the same and all types of wastes as defined in New Jersey regulations; and capacity of the system, i.e., quantity of medical waste processed by the facility per unit time;
- Costs to generator per unit weight of medical waste processed; estimated costs to the generator to prepare, if necessary, medical waste for processing. This would include, but not be limited to, costs (including labor) that the generator might bear to receive any training from the vendor or other sources, and to segregate, consolidate, package, store, handle and manifest medical wastes according to vendor requirements/standards; and
- Characterization of the end product, emissions and by-products and, results of tests on reduction in infectious nature of the medical waste after treatment.

A vendor must certify that the equipment marketed in New Jersey is the same as the equipment submitted for new technology evaluation. The vendor must notify the department in writing concerning any design or operational changes prior to selling new or modified devices.

- (9) **Cost-effectiveness and energy efficiency of the technology:** To determine the potential overall value of a technology, the DEPE, while assessing medical waste disposal technologies, requires from vendors the submission of numerical data adequately characterizing the operational efficiency of the equipment from at least one actual, working facility and if that data is not available, then numerical data adequately characterizing the performance of a prototype. Also, DEPE requires submission of actual data on cost of installation and operation in a facility that generates

medical waste and, if that is not available, projected cost of installation and operation in a typical facility which generates medical waste.

DEPE also requires data on energy costs for operating an alternate technology system. The data on energy costs must be presented in a format relating energy costs to the amount of RMW processed, that is, the energy-efficiency of the RMW alternate technology management system.

This information, combined with the data required in (6) above produced by an independent investigator and drawn from repeated application of the process, will enable DEPE to evaluate the relative cost-effectiveness of an alternate technology.

- b. **Operational Protocol:** The department, in conjunction with DOH, has developed an operational protocol for some new technologies for which they have been requested to grant operational status. Ultimately these protocols will be formally adopted in the DEPE's RMW regulations. At this time, these protocols allow for the operation of the disposal systems under a set of terms and conditions that specify what types of waste may be processed, limitations on the presence of certain organisms, efficacy testing both at start-up and during continuous operation, record-keeping, contingency plans, storage requirements and operator training. The DOH, prior to issuance of authorization to operate, requires the following information for screening new technology equipments' efficacy in treating medical waste:

- (1) Detailed assessment of the manufacturer's technical specifications and operations and maintenance manual;
- (2) Detailed review of manufacturer supplied efficacy testing and QA/QC findings performed by independent laboratories;
- (3) A site visit to a facility where the equipment is in operation;
- (4) Physical plant site evaluations of all facilities intending to install the equipment;
- (5) Consultation with federal agencies such as USEPA, on alternate technology assessments;
- (6) Consultation with infection control officials in other states which have issued approvals for the equipment;
- (7) Consultation with DOH's Division of Public Health and Environmental Laboratories; and

(8) Consultation with the DOH Review Committee for Alternate Technology.

The DOH then issues a site operation protocol on a case-by-case basis to ensure safe and effective treatment of the RMW.

The site operation protocol is tailored to the type of equipment being permitted for the treatment/destruction of RMW and to any special conditions of the facility. The protocol specifies the terms and conditions of operation of the equipment, among these:

- (1) Allowable waste in feedstock;
- (2) Efficacy testing covering conditions of feedstock, required test organisms and required time intervals;
- (3) Record-keeping requirements;
- (4) Contingency plans for proper handling and disposal of RMW during planned and unplanned shutdowns;
- (5) RMW storage; and
- (6) Operator training.

Once these reviews by the departments have been completed, the DEPE will require prior to operation:

- (1) Inclusion in the solid waste management plan of the county within which it is located.
- (2) Registration with the DEPE, Division of Solid Waste Management to operate as a RMW facility.
- (3) A site operation protocol by the DOH.
- (4) Any other permits and approvals that may be required for any emissions, such as air, water, radiation and hazardous materials. Among these are:
 - (a) Air Pollution Control Permit to Construct, Install or Alter Control Apparatus or Equipment and Certificate to Operate Control Apparatus or Equipment;
 - (b) Industrial Treatment Works Approval;
 - (c) Treatment Works Approval for Sanitary Sewer Extension;
 - (d) Sewer Ban Exemption;

(e) New Jersey Pollutant Discharge Elimination System (NJPDES):

- i. Significant Indirect User Permit; or
- ii. Discharge to Surface Water; or
- iii. Discharge to Groundwater; and

(f) Radiation Protection Programs Review.

Mobile Processing Units: Beyond the discussion above, the DEPE fully supports the use of mobile unit systems for the processing of RMW. The operation of this type of system in New Jersey would necessitate the mobile unit and the facility utilizing the unit to obtain all permits and authorizations required by the department before operation. Permits and authorizations for media discharges such as air and sewer discharges are generally site-specific to the facility processing solid or medical wastes. A mobile unit, to treat and destroy RMW contained on a truck which can be moved from facility to facility, presents certain advantages in spite of the need for permitting the unit and each facility. More efficient use can be made of the capacity of mobile units. Several facilities may utilize one mobile unit rather than having under-utilized treatment/destruction units located at a number of facilities generating relatively low levels of RMW. The use of mobile units also eliminates the risks to the environment and human health posed by transporting RMW to central treatment/destruction facilities. The outlay of capital funds is reduced as only the number of mobile units needed for a district or region is purchased rather than one unit per facility. Further, the efficiency of the treatment/destruction system is enhanced by the availability of a backup unit when a primary unit needs repairs. As can be seen from the preceding discussion the use of mobile RMW processing units present a number of advantages. These mobile units could operate on either a non-commercial (at cost) basis or commercial basis with the lifting of the commercial facility moratorium with the publication of this RMW State Plan.

Demonstration Pilot Projects: The DEPE fully supports demonstration or pilot projects. A RMW generator, whether a hospital, laboratory or other facility, may set up a demonstration project for three or four months in cooperation with an alternate technology manufacturer or vendor. The RMW generator must have department approval before commencing the temporary demonstration project. The department approval process includes a letter of support from the host county freeholder board or plan implementation agency, authorization from the Division of Solid Waste Management, a temporary operating air pollution control permit, authorization from the DOH and authorization from the Wastewater Facilities Regulation Element as well as all other agencies' authorizations based on specific media discharges. The department has developed a letter to send to generators that details the requirements listed above and explains the procedure for demonstration project approval. (The letter is contained in Attachment C.) On completion of the demonstration project, the alternate technology system may not be operated at the facility until full county plan inclusion and all regular

authorizations and permits are obtained from the county and department for a RMW destination facility.

Long-Term Implementation Strategy: The DEPE's long-term implementation strategy for the use of new technologies for medical waste disposal, based on the research findings of the short-term plan above and those of USEPA's, is as follows:

- (1) To formulate and adopt performance standards regarding treatment efficacy and destruction completeness for each type of new technology for medical waste management equipment.
- (2) To continue to research and review new technologies based on current scientific expertise to promote the use of technologies as part of a regional disposal plan which maximizes efficiency and safety from a public health standpoint.
- (3) To accomplish self-sufficiency in terms of disposal by increasing the residual materials recycled or reused and to decrease the amount currently being disposed of. This would be done in conjunction with the DEPE's continuing research programs to develop new technologies and additional uses for residual materials.

7. Incineration Policy

Objectives and Criteria: Incineration is considered a disfavored solid waste management strategy in New Jersey. Incineration requires significant capital investment and raises environmental concerns, primarily in terms of air emissions. As a result, a major shift in policy direction was forged by the solid waste task force and supported by Governor Florio to reduce dependence upon incineration, in favor of a strategy which maximizes source reduction and recycling, and develops new disposal capacity through regional planning and implementation. It is New Jersey's objective to reduce current and planned dependence upon incineration to the maximum extent possible by:

- Continuing to monitor and enforce against hospital and other small-scale incinerator operations to ensure compliance with the incinerator's pollution limits specified in the air pollution control permit. Older systems currently used in some hospitals and private corporations for RMW and other medical waste disposal will be subject to enforcement actions if out of compliance, and as a result can be required to be upgraded or shut-down if permit conditions cannot be continually met or the

incinerator emissions exceed the limits specified in an applicable air rule.

- Carefully scrutinizing any new or pending applications for RMW incinerators to ensure that maximum efforts are being put forth by the applicant to implement source reduction and recycling programs consistent with the plans and requirements of the host county and the DEPE;
- Reviewing new applications for RMW incinerators in line with the DEPE's disposal strategy hierarchy laid out in Section B.4. earlier, particularly with respect to regionalization. In terms of RMW management, regionalization of disposal capacity refers to systems which are designed or retrofitted for the acceptance of RMW from two or more larger generators, such as hospitals, laboratories or pharmaceutical companies, or numerous smaller generators, such as hospitals accepting RMW from all private practitioners in their general service areas.

At present, incineration is an important method of disposal for RMW in New Jersey. Of the treatment and disposal technologies in general use, incineration alone is capable of both treating and destroying all types of RMW. Data from the 1990 generator annual report (see discussions in earlier sections) indicates that over 23% of the regulated material generated by hospitals is incinerated on-site. These data indicate over 650,000 pounds of RMW, about 23.4% of the total, is incinerated each month in New Jersey. However, the future of this option for some hospitals is uncertain as further discussed below.

Short-Term Implementation Strategy: New Requirements, and Implications for On-Site Incinerators: In early 1993, about one-quarter of the hospitals in New Jersey operate on-site incinerators for the disposal of the solid waste generated at the facility. Such materials as RMW, general patient related waste, as well as office and cafeteria wastes are all disposed of via the on-site incinerator.

In some cases existing incinerator units have been in operation for many years and lack modern air pollution control devices. In addition, these facilities are often situated within urban areas directly adjacent to apartment houses or other residential uses. The combination of urban location, low stack height, and insufficient air pollution control devices make some existing operations antiquated by today's standards. To address these deficiencies, the Comprehensive Act imposes new levels of regulatory control over hospital incinerators and the DEPE's Air Quality Regulation (AQR) section has initiated an initiative over the past several years of more frequent monitoring, resulting in enforcement actions, which often forces facility upgrading.

The Comprehensive Act prohibits the permitting of any new commercial medical waste incinerators or other commercial facilities until the completion of the RMW State Plan. Non-commercial facilities, however, are permissible. Non-commercial facilities are those which process waste for a charge which does not exceed the cost of handling and

disposal, that is, not for profit.

The Comprehensive Act also "grandfathered" into the relevant district solid waste management plan every existing incinerator or disposal facility in operation as of March 6, 1989 that was accepting RMW for disposal. The regulations (N.J.A.C. 7:26-3A) promulgated pursuant to the Comprehensive Act grant temporary authorization to incinerators which were accepting RMW on or before March 6, 1989 provided the requirements of N.J.A.C. 7:26-3A are met. These requirements include the facility's owner or operator having an existing certificate to operate control apparatus or equipment (certificate) issued from the DEPE's AQR pursuant to N.J.A.C. 7:27, the air pollution control code. In addition, the authorization continues for only as long as the facility's current certificate remains valid. These certificates are normally issued at five year intervals by the DEPE. The Comprehensive Act goes beyond this level of permitting to additionally require each hospital incinerator to apply for and receive a solid waste facility permit. The significance of this requirement lies in the new level of review which will be performed. Under solid waste facility permitting such factors as on-site storage, security, material processing, authorized waste types, ash testing and disposal, and other relevant aspects of "site plan" review will be performed and permit conditions issued to direct facility operations. In this regard, the DEPE will utilize existing regulatory authority under N.J.A.C. 7:26-2 and 2B to perform review and issue permits where appropriate. Further, the DEPE will take appropriate enforcement action for noncompliance on results of monitoring indicating exceedence of permit conditions coinciding with the expiration of existing AQR air permit certificates. Incinerator facilities that cannot come into compliance with their existing permit conditions will be notified of the new regulatory requirements and those facilities will be placed on an appropriate schedule toward permit application, development, submission, and review before the permits are renewed.

Under the compliance maintenance process outlined above, enforcement actions are taken against existing incinerators that cannot comply with the limits specified in their air pollution control permits and/or the limits in an applicable air rule. The enforcement actions usually ultimately result in installation of advanced air pollution control equipment and in some cases higher stacks. Additionally, for all proposed new and modified units, AQR requires that the most advanced air pollution control technology is installed prior to operation. Advanced air pollution control technology for incinerators includes: efficient particulate control and acid gas control with an alkaline spray dryer and baghouse; continuous monitoring and recording of operation and emission parameters; and sufficient stack height to avoid aerodynamic down-wash.

Following are some details on DEPE's general guidelines for advanced air pollution control technology. Additional details and requirements exist; information on these can be obtained from the AQR.

- (1) Particulate Emissions Guideline - A high efficiency particulate control device

designed to achieve greater than 99% control and demonstrate outlet concentrations of less than 0.015 grains/dscf at 7% oxygen particulate emissions.

- (2) Acid Gas Emissions Guideline - A high efficiency acid gas scrubber designed to achieve greater than 90% control of Hcl and 80% of SO₂ and demonstrate outlet concentrations of less than 50 ppm_{dv} at 7% oxygen for sulfur dioxide.
- (3) Continuous Emissions Monitors and Recorders Guideline - Monitors and recorders for carbon monoxide, oxygen, and secondary combustion chamber temperature.
- (4) Opacity Monitor and Recorder Guideline - These may be required after operation if there are visible particulate emissions. Opacity is expected to be less than 10%, except for 3 minutes out of 30 minutes.
- (5) Stack Height Guideline - Stack height should be between 1.5 and 2.5 times the height of nearby structures to minimize aerodynamic down-wash. Modeling is required if less than 1.5. Apply a screening procedure to determine if risk is clearly below this level. Additional air quality modeling may be required.
- (6) Increased Cancer Risk Guideline - Risk must be less than 1 in 10,000 and should be less than 1 in 1,000,000 for heavy metals and dioxin. DEPE will apply a screening procedure. Modeling may be required.
- (7) Additional Guidelines - Additional guidelines exist for products of incomplete combustion, radioactive wastes, and various operational requirements. In addition, coordination with the Division of Solid Waste Management must take place to ensure that permits are consistent and that the proposed facility is included in the relevant district solid waste management plan.

Financial implications of plans to upgrade or expand existing on-site incinerators are large. A telephone survey of 34 on-site incinerators performed by the DEPE in February, 1990 indicated that about two-thirds planned to upgrade or replace their incineration units soon. The average estimated cost of these changes exceeded \$750,000.

On the other hand, if a hospital elects to forego incineration, it will face the costs of off-site disposal of the waste it formerly incinerated in the absence of developing alternate on-site capacity or entering a regional disposal arrangement. Disposal costs for RMW in large quantities are on the order of \$0.30 per pound or more, which can translate into hundreds of thousands of dollars per year in expenses for a hospital. Some portion of this cost would be above the hospital's cost of disposal of the waste if it were managed as a solid waste, not RMW.

Solid Waste Incinerators: The use of large county solid waste incinerators, is another potential option for disposal. Projects at Fort Dix, and Camden, Essex, Warren and Gloucester Counties are operational and a facility in Union County is well under construction. All of these facilities are designed to operate at combustion temperatures of 1600 to 1800 degrees Fahrenheit and either are, or will be, equipped with advanced air pollution controls including auxiliary burners for maintaining proper temperatures, fabric filters (baghouses) or electrostatic precipitators for particulate control, and wet or semi-dry scrubbers for acid gas controls. In addition, many of these projects would also include nitrogen oxide control technologies. Inasmuch as RMW is similar, if not identical in its physical make-up to municipal solid waste, there is no doubt that this material could be effectively disposed of at solid waste incinerators. Further, the Essex, Warren and future Union County Facilities are or will be regional in nature, accepting solid waste from two or more counties.

More than half of the RMW generated in New Jersey is incinerated either at hospitals or in commercial incinerators. Diverting this waste stream to solid waste incinerators would serve the dual purpose of destroying RMW and supplying additional energy for local usage. However, the present physical structure of solid waste incinerators in New Jersey creates a barrier to incinerating RMW at these facilities. All of the above referenced facilities have singular feed lines. Vendors have expressed concern over mixing RMW and MSW within their systems. It is probable that separate feed lines would be needed to be retrofitted into these facilities to accommodate acceptance of RMW.

The large solid waste incinerators are constructed with a collection pit into which incoming municipal solid waste is unloaded or "tipped." Then a clam shell scoop operated from an overhead crane raises a load and deposits it into a feedbin or onto a conveyer belt which feeds the waste into the first chamber of the incinerator. Obviously, any boxes and bags contained in a municipal solid waste stream will be ruptured by this process before going into the incinerator. Hospital incinerators and commercial incinerators handling RMW use feed systems whereby cardboard cartons or "red bags" do not rupture until they are inside the first chamber of the incinerator.

For aesthetic considerations and due to concerns about dispersing airborne pathogens, it may not be practical to have RMW going to solid waste incinerators as they are currently operated. These facilities are very resistant to handling loads containing blood soaked materials, blood bags and tubing with blood, animal carcasses, body parts, bulk blood, syringes, laboratory wastes, pathological wastes, and other RMW not amenable to public display. There is also a concern of health risks associated with needle sticks and employee exposure to splashes resulting from bulk blood and body fluid containers rupturing with the use of heavy equipment, although, these concerns would not be great where direct vehicle discharge into a large collection pit takes place. With the implementation of the Blood Borne Pathogen Rule by OSHA, owners and operators would assume greater responsibilities and liabilities in protecting their employees from

these potential exposures. These issues reinforce the need for separate feed lines in order to reduce employee exposure and address the aesthetic issues raised by sanitation workers. It is difficult to verify the degree of hazard or lack of hazard in any particular load of RMW and the perception of risk is greater for RMW than for municipal solid waste.

Despite these limitations, the department would consider allowing RMW to be disposed of at solid waste incinerators in the future. Within the disposal strategy outlined in Section B.4., the departments have framed a "system redefinition" concept. This basically would entail redefining certain aspects of existing regulations to allow untreated RMW to be integrated within the solid waste disposal systems of each county under highly controlled conditions. However as was clearly indicated previously, this option will only be pursued upon request on a county-by-county basis from those counties with operational or planned large-scale solid waste incinerators.

Despite the perception problems and an apparent reluctance on the part of facility vendors to accept medical waste, the potential offered by these large, state-of-the-art facilities for disposing of large quantities of RMW is attractive enough to warrant serious investigation and efforts to solve potential problems. This issue receives additional attention in the technology assessment in Section D.3 of this plan.

Long-Term Implementation Strategy: Disposal of RMW by resource recovery incineration will receive extensive review. Initial summary reports from generators and other information gathering efforts indicate that a large portion of the medical waste generated in New Jersey is disposed of by incineration. Potential possibilities, and potential difficulties, are considerable. A variety of aspects of this issue will be explored.

8. Enforcement Policy

Objectives and Criteria: The objective of the medical waste enforcement program is to assist in ensuring that RMW is collected, transported, and disposed of in an environmentally sound manner. The primary method of accomplishing this is to ensure that every generator, transporter, and disposal facility in New Jersey is properly registered with the DEPE and in compliance with all regulations of the agencies responsible for the management of RMW. The department's enforcement policy, supported by its education and inspection program and by state statutes authorizing various types of penalties, offers a system of punitive measures which can be taken against violators and which provide clear disincentives by making penalty assessments for regulatory noncompliance greater than the cost of compliance.

Pursuant to the Comprehensive Act, civil liabilities and criminal penalties are possible

to ensure compliance with the Comprehensive Act and implementing regulations. The Comprehensive Act has assigned enforcement of the rules and regulations to the DEPE and the DOH. Civil liabilities were incorporated to provide remedial or corrective action for the medical waste regulations. Criminal penalties were established to punish violators and to offer a deterrent to the regulated community. Other provisions of the Comprehensive Act include a strict and joint liability clause and citizen rewards.

Enforcement may include inspections, investigations, receiving and initiating complaints concerning violations and holding hearings or initiating legal proceedings seeking legal and equitable relief. The DEPE works through the offices of the Attorney General for civil and criminal enforcement. The regulations, as with all solid waste law, also provide for local enforcement by local boards of health or county health departments.

While it is not the department's intention to rely on punitive measures to obtain regulatory compliance, these measures must be taken in circumstances of flagrant violation of the rules governing the management of RMWs. Through compliance inspections, the department intends to educate and assure regulatory compliance by employing a program of frequent inspections by DEPE or DOH inspectors. This practice establishes an agency presence at a generator, transporter, or disposal facility with sufficient frequency to ensure the operator's awareness of the regulations as well as their compliance.

The Comprehensive Act and the federal USEPA's Demonstration Program, defined the USEPA, DEPE and DOH and local health departments as the multiple agencies responsible for carrying out the enforcement provisions of the medical waste law. This law also prescribed the authority these organizations have to enforce the state and federal laws provisions, but did not outline an enforcement strategy for the organizations to carry out. A medical waste enforcement strategy was developed during the first year of the medical waste program based on the laws' requirements, the agencies' broader floatables action plan and general long-standing agency enforcement goals. Both formal written agreements between the agencies and informal understandings have been established to frame the implementation of the strategy.

Even before the signing of the Comprehensive Act in March 1989, the DEPE had begun developing a cooperative interagency agreement among the various agencies which would be involved with responding to incidents of medical waste being improperly disposed of and incidents of medical wastes washing up on New Jersey's beaches. This agreement, prepared in May 1989, became known as the "Interagency Protocol for Incident Response to Medical Waste and Marine Floatables Incidents (Interagency Protocol)." The Interagency Protocol is updated each year, but closely mirrors the original 1989 procedure. The procedures necessary to implement the Interagency Protocol are contained in the memorandums "Policies and Procedures Governing Multiagency Response and Coordination to Medical Waste Wash-Up Incidents" and "Safeguards to be Employed in the Collection, Removal and Disposal of Medical Waste

Involved in Beach Wash-Ups", both revised May 15, 1992. These memorandums are contained in Appendix A.

The Interagency Protocol was developed by the DEPE, Division of Solid Waste Management, Office of Enforcement and the DOH as well as the various other agencies participating in the Interagency Protocol listed below. The Interagency Protocol outlines the standard operating procedures for notification, verification and response to an incident, to assure expeditious dissemination of information that will maximize the ability of the agencies to respond to an incident. Agencies involved in the Interagency Protocol are: DEPE, DOH, Department of Law and Public Safety, Office of the Environmental Prosecutor and USEPA. A more detailed description of the Interagency Protocol is found in Section C.6.B.

Coordinated enforcement and compliance inspection efforts are important to both effective implementation and maintenance of the medical waste program's standards. Compliance inspections and enforcement activities are conducted at the state level by the DEPE and the DOH. A Memorandum of Understanding was developed by the two agencies (See Appendix B). The agreement establishes a formal basis for cooperative inspection and enforcement activities between the two agencies. The Memorandum of Understanding describes the interagency enforcement division of labor in effect in 1992. At the end of 1992, the DEPE and DOH divided the state by county and municipality. Each agency inspects all of the RMW registrants in their agency's respective areas. The DEPE is the inspecting authority for all transporters and disposal facilities.

The DEPE had also formed a formal agreement with the USEPA to promote the most effective use of the agencies' resources during the Demonstration Program. At the time of the Demonstration Program, USEPA and DOH concentrated inspections on the DOH regulated health care facilities such as hospitals, nursing homes, blood banks, state institutions, and clinical laboratories. The DEPE concentrated its enforcement efforts on individual medical practitioners such as doctors, dentists and veterinarians, as well as the miscellaneous generators such as funeral homes and weight loss centers. The Memorandum of Agreement or M.O.A., was agreed to by representatives of the two agencies in November of 1989. This M.O.A. describes how the two agencies coordinated inspection, enforcement and response action activities. In brief, this agreement calls for the exchange between the agencies of information concerning where inspections were conducted, formal enforcement actions, and the agencies' incident response policies and protocols. The M.O.A. may be found in Appendix C of this document for historical reference.

Implementation Strategy: The department's policy is to maintain a high visibility presence in the regulated community. The frequency of inspections of generators needed to accomplish this is to inspect each generator at least once every two years. The departments believe that the vast majority of RMW generators will achieve regulatory compliance in the areas of registration, tracking, packaging, record keeping,

etc. by the end of 1993. All transporters and major disposal facilities accepting RMW are presently in compliance. Transporters of RMW are inspected four times each year. Major disposal facilities will be inspected not less than annually.

9. Packaging and Tracking

Objectives and Criteria: The objective of RMW packaging is to properly contain RMW in order to protect public health and safety from potentially infectious materials. The objective of tracking RMW is to protect public health and safety from potentially infectious materials. This is first accomplished as stated above by requiring packaging to meet certain minimum standards and by documenting the transportation of RMW from generator to final disposal site. Tracking establishes a legally enforceable chain of custody. Since any generator or RMW shipping this waste off-site must properly complete the state RMW tracking form all generators are accountable for their waste. The use of a uniform tracking form provides a consistent method of identifying the weight and destination of all shipments of RMW.

Prior to the concern among the general population about medical waste disposal that developed in 1988, there were no specific laws or regulations controlling the packaging and transporting of medical waste in New Jersey. In response to beach wash-up incidents during the summers of 1987 and 1988, the State of New Jersey adopted regulations on October 7, 1988 defining "Special Medical Waste," a subset of medical waste that is of particular concern in protecting human health and the environment. These regulations also set the first standards for various areas of RMW management including packaging and the monitoring of RMW transport from generator to final disposal.

The RMW regulations were then upgraded on June 23, 1989 imposing more effective and comprehensive requirements in the area of packaging and tracking of RMW and by providing consistency with the federal program. In the areas of packaging and tracking, it has been the intent of the October 7, 1988 regulations and later the August 25, 1989 regulations to set standards for safe, secure packaging and to document the transportation of RMW from generator to final disposal.

Implementation Strategy: Continue to require full compliance with packaging and tracking requirements for generators and transporters. This is achieved by requiring generators shipping RMW off-site to use containers that are:

- Rigid;
- Leak-resistant;

- Impervious to moisture;
- Have a strength sufficient to prevent tearing or bursting under normal conditions of use and handling; and
- Sealed to prevent leakage during transport.

Further, generators are required to:

- Package sharps and sharps with residual fluids in packaging that is puncture-resistant; and
- Package fluids (quantities greater than 20 cubic centimeters) in packaging that is break-resistant and tightly lidded or stoppered.

Further, the department will continue to require generators not receiving a copy of the tracking form certifying receipt of a particular batch of RMW by the destination facility, to initiate action to determine the cause to assure all RMW is properly managed at permitted facilities. This procedure is naturally meant to ascertain that RMW is being properly disposed of. Upon completion of a transportation cycle, the generator will have two copies of the tracking form, one with his signature only and one with his signature and the disposal facility signature. The transporter and the disposal facility will each have a copy of the tracking form. The departments carefully inspect generators and transporters to ensure that wastes are packaged and tracked, as these functions are defined in the regulations at N.J.A.C. 7:26-3A. With the medical waste program in place for nearly three years, data indicates that registered generators and transporters are complying with packaging and tracking requirements.

Since the current New Jersey regulations place no time limit on off-site disposal of RMW, through the tracking system, that has been stored in accordance with the regulations at N.J.A.C. 7:26-3A, small quantity generators of RMW are allowed to accumulate and store their RMW for indefinite periods. The department is herein proposing to implement a time limit for the storage of RMW. A regulatory amendment is also under development that will incorporate this new storage period limit in the RMW rules. The DEPE believes that disposing of RMW at least once a year will not impose an onerous burden on small quantity generators while protecting human health and the environment.

In order to facilitate small generator packaging and tracking issues, the department is considering revisions in RMW transport requirements to define the responsibilities of collection facilities. An example of a collection facility is a generator that accepts small quantities of wastes from neighboring facilities for consolidation and shipment to an off-site disposal facility. The authorization of this practice is intended to facilitate transport and regionalization of RMW management and ultimately to reduce costs of disposal.

For further discussion of this concept see Section B.10 below.

Recently, the Federal Hazardous Materials Transportation Uniform Safety Act, 49 U.S.C. 1801 et seq. ("HMTUSA") and subsequent new federal regulations administered by USDOT, were enacted and became effective on October 1, 1992. HMTUSA was designed to make the United States requirements for transporters of materials, including hazardous and infectious materials, uniform and more consistent with international shipping requirements. The law specifies standards for packaging all materials, including RMW and other hazardous materials. The department, with the assistance of the Division of Law, is presently evaluating the impact of these regulations on RMW packaging and tracking in New Jersey to determine whether the federal preemption provisions of HMTUSA will effect New Jersey's present standards.

10. RMW Transport

Objectives and Criteria: The DEPE is mandating specific transportation requirements for RMW with the objective of ensuring the safe transport of these wastes while on the roads of the state. The DEPE requires all persons transporting RMW to comply with the conditions of registration and RMW transport per N.J.A.C. 7:26-3A for RMW transporters. The DEPE will issue severe penalties for violations of these standards and regulations to maintain a high level of safety on the state's highways.

Prior to the implementation of medical waste regulations in 1988, medical waste had not generally been handled separately from other solid waste streams when being transported off-site for disposal. It was frequently mixed with other solid wastes from hospitals and research laboratories with certain wastes being double bagged in accordance with DOH guidelines. Many doctors mixed medical and solid waste together as there was no provision for separate handling or disposal. Much of the medical waste stream was compacted with solid waste in the large compactor trucks used for municipal solid waste.

In a relatively few documented cases, these practices exposed hospital personnel, trash collectors, transporters and landfill workers to injuries by needles or other sharps. They also exposed these people and members of the general public to infectious waste. While very limited in the number of actual cases, the possibility of increased risk of infection and injury resulted from these practices. There are also considerations of aesthetics which were not considered under the system existing before 1988. There were a limited number of instances reported in various local newspapers throughout New Jersey of public exposure to varying unpleasant medical waste encounters.

In the interest of improving the flow of RMW from small generators to RMW transporters, the DEPE allows doctors and other parties generating less than three cubic

feet of RMW to self-transport only their own RMW with a tracking form to another generator (doctor, dentist, etc.) for inclusion with their RMW. The second generator gives the RMW to a RMW transporter with the tracking form for transport to a disposal facility. The small generators must comply with certain transporting requirements to qualify for this exemption. They must also maintain required records.

Implementation Strategy: The DEPE expects all registered transporters, or small quantity generators transporting their own wastes, to comply with the requirements for transporters of RMWs at all times. With adoption of the medical waste rules on October 7, 1988 followed by the further adoption of RMW rules on August 25, 1989, DEPE obtained the tools to control the transportation of RMW and prevent public exposure incidents. The principal requirements of the RMW rules (N.J.A.C. 7:26-3A et seq.) of August 25, 1989 applying to transport of RMW are:

- Registration as both a RMW transporter and a solid waste transporter;
- A legal obligation to accept only properly packaged and labeled containers of RMW;
- A requirement to obtain a properly completed tracking form from the generator for each load of RMW, sign/date the tracking form acknowledging receipt, return Copy 4 to the generator, keep Copy 3 for his records and pass the tracking form onto the next transporter, intermediate handler or destination facility;
- A requirement to maintain records of RMW transported for a minimum of three years and to submit an annual report to the DEPE;
- Specific requirements regarding the physical condition of the vehicle, the securing of the vehicle to prevent access to the cargo-carrying body and the maintenance of the waste load in a condition free of mechanical stress or compaction during loading, unloading and transit;
- Labeling of the truck to indicate the transporting of a cargo of RMW;
- Appropriate training for RMW transporters; and
- Generators of less than 3 cubic feet (50lbs) of RMW per month may ship sharps, classes 4 and 7 to permitted destination facilities via the U.S. Postal Service's registered mail service.

To facilitate and improve costs of the transport of RMW, the DEPE is prepared to allow the establishment of RMW collection facilities, both non-commercial and commercial. The non-commercial RMW collection facilities will improve and control the process whereby small generators self-transport RMW to other generators for eventual disposal.

The RMW commercial collection facilities will provide for the consolidation of loads of RMW under controlled conditions. An allowance of up to five days storage of RMW in transit from generator to destination facility will be proposed to substitute for the existing requirement of a 24 hour limit. The department will develop further guidelines for the conditional operation of collection facilities. Collection facilities are expected to improve the efficiency of the transport of RMW to commercial destination facilities, and be more cost effective than the present system that often results in shipments of only partial truckloads.

The DEPE is also examining the historical requirements for small shipments to be made only via registered mail. The DEPE is prepared to allow shipments by the U.S. Postal Service if generators can obtain mailing receipts from the U.S. Postal Service by using certified mail, for example, which is less expensive. The U.S. Postal Service recently modified its regulations to allow medical waste sharps to be shipped first class or priority mail.

11. Control of Small Quantities of Medical Wastes

This section will address issues and the departments' policy positions surrounding generation of small quantities of RMW from three main sources: regulated small quantity generators, floatables, and household medical wastes.

Regardless of how much waste is produced by a given type of generator, whether in the home or by professionals, the DEPE believes that regulations must provide regulatory controls on the disposal of those wastes, irrespective of the source, to prevent them from being improperly and unsafely disposed of. For example, syringes, whether being disposed of by a hospital or a dentist, individuals administering their own insulin injections or by illicit intravenous (IV) drug users, can all pose the same potential health hazard to the health care worker, the general public or the solid waste disposal industry. The DEPE believes the regulatory requirements for RMW produced by the medical community are sufficient to protect the public health from the potential hazards posed by these wastes. However, many millions of syringes, among other types of medical wastes are produced in the households of New Jersey, as well as from illegal drug users. These household, or home self-care, wastes are not regulated under the RMW program authorized by the Comprehensive Act. Like small quantity generator RMW, home self-care medical wastes present a particularly difficult situation to control because of the very wide distribution of the generators throughout the state. Without question, the vast majority of home self-care generators dispose of needles and syringes in a responsible manner. However, there is some evidence that these home self-care wastes, as well as syringes from drug addicts, have historically contributed to the medical wastes that appear as floatables in the ocean and on the state's beaches.

With the aforementioned small, nonpoint sources of medical wastes in mind, the major objective of the DEPE is to ensure that all RMW and similar household medical wastes especially syringes and needles are managed and disposed of properly to assure the protection of the public's health, safety and the environment. For regulated small quantity generators this will be accomplished through maintaining the current regulatory program where no exemptions from regulation exist due to the amount of RMW generated. For household medical waste, education programs and increased opportunities for disposal through separate management systems will be pursued as further specified below.

In Section (a) below, a review of small quantity generator exemption options is presented as required by the Comprehensive Act. In this review, the positive and negative aspects and impacts of small quantity generator exemptions are discussed. Section (b) discusses beach wash-up material (floatables) that are a small source of medical waste, but nevertheless, highly impact the RMW management issue. The third Section (c), discusses another source of medical waste which is not regulated by the RMW regulations, but also impacts the RMW program. Household medical waste, or home self-care waste as it is also referred to, is commonly disposed of as municipal solid waste so there exists a potential for it to be mismanaged when disposed of or there is a perception that this home self-care waste is mismanaged RMW that has been disposed of in the municipal solid waste stream.

a. Evaluation of RMW Small Quantity Generator Exemption Options:

(1) Tracking exemption

Discussion: Any person in New Jersey that produces RMW is currently subject to the RMW regulations. The RMW regulations require all generators of RMW to comply with the pretransport requirements to segregate, package, label, mark, store, decontaminate; and also track and dispose of RMW in a specific manner. An examination of the measures necessary to achieve DEPE's objective concerning the control of small quantities of medical wastes requires examining a small quantity generator regulatory exemption from the tracking requirements of the RMW program. One of the main differences between the New Jersey RMW program and the federal demonstration program was the federal exemption for generators of less than 50 pounds per month from tracking requirements, if certain conditions and other requirements were met. It is important to note though that the federal program still required small quantity generators (less than 50 pounds per month) to maintain logs recording shipments of less than 50 pounds. The federal program also did not exempt small quantity generators from proper packaging, labeling, marking and transport of their waste. Before the program was implemented and lacking first-hand experience, the USEPA felt that some form of exemption from the full tracking requirements was appropriate for small generators because the paperwork burden regarding tracking would overwhelm generators, transporters, and

disposers. However, under the USEPA exemption, the amount and type of waste exempted from tracking was minimal. Since generators were required to maintain similar records of their shipments, very little, if any paperwork or effort was saved. The Comprehensive Act did not provide for a small quantity generator exemption from tracking requirements in New Jersey's medical waste program pending the departments review of this issue and policy positions to be reflected in this RMW State Plan.

As required by New Jersey law, the DEPE has required small quantity generators to use the RMW tracking form in the same manner as generators of 50 pounds or more per month of RMW. These generators often transport RMW themselves or have RMW transported off-site, at most, a few times per year. For those small quantity generators close to the limit of 50 pounds per month, the required use of the tracking form provides an additional impetus for the legal disposal of RMW. The DEPE is not aware of any evidence that the tracking form, in its present format, has created a serious problem for either small quantity generators, transporters or disposal facilities, either in terms of difficulty in completing the forms or in creating large amounts of paperwork. The one page tracking form is readily filled out by generators both small and large. The small quantity generator disposes of fewer shipments of RMW each year and has fewer tracking forms to keep for the required three year period. At the same time, there is a chain of custody record established by the tracking forms that is maintained by the generator and the intermediate handler/destination facility. This documentation provides a valuable resource to verify that RMW from small quantity generators is being disposed of legally.

Additionally, as discussed in more detail in Section B.9, recently adopted federal Department of Transportation (DOT) regulations require a manifest for all shipments of infectious wastes. The medical waste tracking form appears to meet DOT requirements for a shipping manifest, thereby providing consistency in shipping documentation by precluding the need for a different shipping manifest.

Implementation Strategy: The department's strategy for the control of small quantities of medical wastes is to continue to require the small quantity generator to comply with the pretransport and the tracking requirements. The DEPE has not found any evidence that the tracking form paperwork has been too burdensome to small quantity generators. The tracking form provides a legal document establishing chain of custody of the RMW and is also used as the DOT required shipping manifest. In order to localize control of RMW further, As discussed in Section B.8, the DEPE encourages hospitals with RMW treatment and destruction methods to regionalize with other hospitals for RMW disposal and to accept RMW from small quantity generators for disposal. Regionalization of disposal is a more efficient method for the safe management of RMW which can be less costly.

(2) Explanation of a Broad Regulatory Small Quantity Generator Exemption

Discussion: Another objective of DEPE regarding the control of small quantities of medical wastes was to examine the possibility of exempting generators from either some or all of the general management requirements for RMW, not just the tracking requirements as discussed previously.

During adoption of the medical waste rules the federal program considered outright exemption of small quantity generators and subsequently, the waste could be disposed of in the normal solid waste stream. This option was rejected since USEPA felt some problems have been caused by relatively small quantities of medical waste being improperly managed.

The DEPE reviewed the available data from the RMW program in New Jersey, and foresees the possibility that problems could arise from instituting a small quantity generator exemption in New Jersey. In New Jersey in 1990, there were approximately 8600 generators of RMW in category one (less than 50 pounds per year) and approximately 1900 generators in category two (50 to 200 pounds per year). Assuming a very conservative disposal rate of even 10 pounds per year for category one generators and 50 pounds per year of RMW for category two generators, there would be a possibility of at least 200,000 pounds (or 100 tons) of RMW being disposed of annually without tracking if these generators were exempt. These medical wastes from small quantity generators such as physicians typically consist of sharps, including syringes, which may pose the greatest potential health risk to the public if improperly disposed of. There are approximately 100 small syringes per pound of used syringes when disposed of. Thus, even these conservative projections of the amount of RMW from small quantity generators could mean the potential for millions of syringes being untracked and removed from uniform management each year. Prior to the advent of the RMW regulations, sharps were often disposed of in the ID 10 municipal solid waste stream. Today, it is recognized that used syringes should not be mixed with ID 10 waste unless first destroyed. Items such as syringes, could fall into the hands of illegal users of the devices or injure solid waste workers or the public who come into contact with the wastes.

Further, the category one and two generators in 1992 represent approximately 14,000 out of a universe of approximately 16,000 RMW generators in New Jersey. If there is no requirement for a small quantity generator to produce a tracking form to verify proper disposal of RMW at an intermediate handler or destination facility, the opportunity is established for harm to solid waste management personnel during disposal of the waste. This potential RMW dumping would pose the type of potential health hazard to sanitation workers and the general public the DEPE and other regulatory agencies wish to control. On December 6, 1991, the Occupational

Safety and Health Administration (OSHA) of the United States Department of Labor adopted regulations entitled "Occupational Exposure to Bloodborne Pathogens," which define regulated medical waste and establishes a management system for healthcare facilities and their workers. These guidelines cover all health care providers and no one is exempted. The OSHA rule basically requires that the wastes now regulated as RMW be packaged similarly to what is presently regulated according to RMW rule requirements. Thus even without RMW regulations, small generators would be required to package certain medical waste in separate containers.

Since the RMW program has been put into effect in August 1989, the DEPE has been successful in preventing significant RMW dumping incidents. The DEPE does not wish to eliminate important regulatory control that could compromise the effectiveness of the entire program. One aspect which must be considered when evaluating small quantity exemptions is that while the amount and type of waste exempted appears to be minimal, when exempted it could become an uncontrollable amount of waste since it is produced by a large number of sources distributed widely throughout the state. It is conceivable that the small quantity generator exemption may increase the possibility of illegal dumping. For all of these reasons the DEPE does not believe that a small quantity generator exemption is warranted or desirable for New Jersey's small quantity generators of RMW.

Implementation Strategy: The department's strategy for small generator waste control is to continue to fully regulate the small quantity generator. As discussed, the DEPE has not found any evidence that the program and paperwork has been too burdensome to small quantity generators. The DEPE will continue to monitor reports and look at data bases of the RMW program and will work to be aware if any changes occur that might warrant another examination of a small quantity generator exemption. DEPE will continue to educate all generators about the RMW program by publishing fact sheets and updates which review the program in general, explain any new issues or review complex regulations to help generators. As discussed in the previous section, DEPE will encourage regionalization between hospitals and small quantity generators so that they have several options available to them to minimize the costs involved with their RMW disposal.

b. Floatables

Discussion: To better understand the issue of the control of small quantities of medical wastes several facets of the beach wash-up and medical waste issue merit examination. One facet is the percentage of wash-up material, i.e. floatables, which actually falls into the category of RMW. Another facet is the relative degree of repugnance engendered in the public's perception by floatables which fall into the categories regulated as medical waste and those, such as pieces of wood, which do not. A third facet of the issue is how effective the Comprehensive Act and its

implementing regulations will be in preventing floatable medical waste items from entering waterways.

All facets of the floatable/medical waste issue identified above are under study by the DEPE, and definitive evaluations cannot yet be made. However, four recent studies have been completed which shed considerable light on the first facet of the issue, the question of the percentage of floatable material which is medical waste. The conclusions of all four studies are unequivocal: medical waste is a very small subset of floatable waste. The major sources are mismanagement of municipal solid waste, raw sewage discharges, and combined sewer overflows.

The first report, "New Jersey Floatables Study: Possible Sources, Transport, and Beach Survey Results" was prepared by the Science Applications International Corporation in November 1987 for the NJDEP under the sponsorship of the USEPA Region I. This study examined the potential sources of floatables washed up on New Jersey beaches. The second report, "Investigation: Sources of Beach Wash-ups in 1988" was prepared by The New York State Department of Environmental Conservation (NYDEC). This report identified the most likely sources of 1988 beach wash-ups in New York and New Jersey. The third report, "Delaware River Wash-Ups: Investigative Report" described a study by the New Jersey Department of Law and Public Safety. This study investigated wash-up incidents in order to identify sources of waste from May 9 to August 16 of 1989 along the lower shores of the Delaware River. The fourth report was a pilot project for the DEPE's "Operation Clean Shores" conducted in February, 1989.

(1) Volume of Regulated Medical Waste Wash-ups

It is difficult to actually quantify the amounts of various types of waste which have washed on New Jersey's beaches during any particular time period. This difficulty is due, according to the studies, to the fact that the occurrence of such wash-ups appears to be closely related to essentially random events such as storms and other weather events, disruptions at sewage treatment plants, and loading and handling errors at solid waste disposal facilities.

However, two of the four studies did provide data on the percentages of various types of waste in the wash-ups. The "New Jersey Floatables Study: Possible Sources, Transport, and Beach Survey Results" in particular, provided detailed data resulting from surveys of fifteen New Jersey beaches. A tabular compilation of the data from the fifteen beaches is presented in the Executive Summary to this state plan. These data indicate that the types of items most likely to cause outrage and disgust when seen on beaches, including condoms, tampon applicators, and syringes and other medically related waste, comprise less than 1% of the total floatables stranded on beaches. Another study, the Operation Clean Shores pilot project, resulted in 490 tons of wood and trash being removed from two beaches in

Woodbridge along the Arthur Kill and two shorelines in Bayonne along Newark Bay. Approximately 91 percent of the debris by volume was wood from piers, pilings, bulkheads, and derelict vessels; 6.5 percent was plastics and paper; 1.5 percent was tires; and 1 percent was recyclable glass and aluminum. Medical waste was also found in small quantities at less than 1 percent.

(2) Public Perception of Floatables

It is likely that most beachgoers are inured to the sight of some trash on beaches. Wood and similar debris has always been present on New Jersey's coast, and many vacationers remember when chunks of tar and related material, much of which probably originated from tankers sunk during World War II, were invariably present on the beaches.

But substances such as wood and tar do not frighten, outrage, or disgust people as does a syringe, a blood bag, or a vial of blood. These latter sorts of items do, albeit very rarely, appear on New Jersey beaches. When they do appear, people refrain from shore activities.

The evidence strongly suggests that the chances of contracting a blood borne disease from exposure to this repugnant material is extremely remote. In fact, some experts have classified the risk of infection from the human immunodeficiency virus through this type of exposure as "almost zero." As is discussed in Section E.1.h, four factors must be present for transmission of disease to occur. There must be the presence of a pathogen of sufficient virulence, a sufficient reservoir of the pathogen to cause disease, a suitable portal of entry into the host, and a susceptible host. It is almost impossible that these four factors would be present simultaneously when a beach visitor encounters a washed up item. Despite persistent efforts to communicate this information on lack of risk to the public, expressions of fear, outrage, and disgust invariably accompany sightings of medically related waste on the beaches. A single syringe may be seen by hundreds of people; the sight will likely violate many of these people's perception of the beach as a clean, pure, "natural" place for a long time into the future, perhaps for their lifetimes.

(3) Source of Floatables

The studies indicate that floatables originate from a variety of sources, and may remain in the water for extended periods of time. Since they can be transported by currents over considerable distances, it is very difficult to trace a specific source. However, groups of very likely sources have been identified for much of the trash appearing on beaches. The NYDEC report and the New Jersey study identified eight marine transfer stations and the Fresh Kills Landfill as major sources of floatables. The Delaware River report identified three Pennsylvania transfer stations located

along the Delaware river and one transfer station in Camden, New Jersey as sources of floatable debris.

Another major source of floatables is raw sewage discharges and combined sewer overflows. Many of these instances are directly related to weather conditions. There are three main types of sewers: sanitary sewers which carry municipal and industrial waste, storm sewers which carry rain and surface water run-off, and combined sewers which carry both types of waste. During normal rainfall, floatables are removed at the sewage treatment plant. During heavy rainfalls, the amount of water that can be carried by the sewers is exceeded and excess water is discharged directly into waterways without floatables being removed. Even when there is no rain, millions of gallons of raw sewage can be discharged daily. These overflows are due to malfunctioning regulators or gates which in theory should open during heavy rains. The Delaware River report estimates that 23.5 million gallons per day of raw sewage is discharged into the Delaware River. Combined sewer overflows during periods of rain or melting snows also present a problem. The NYDEC report and the New Jersey study identify New York's combined sewers as a major source of floatables. The Delaware River report determined that combined sewers in Philadelphia and Camden are also major sources of floatables which are regularly discharged into the Delaware River.

The reports state that other sources of floatables include refloatables, normal beach use, recreational boating, commercial shipping, and illegal dumping. Refloatables are stranded floatables that become re-suspended during high tides created by heavy rains and lunar cycles. If these floatables are not removed from the beaches the first time they are stranded, wind and water currents eventually free them to become new sources of pollution. All four reports acknowledged refloatables as a minor source of floatables. Minor sources of floatables identified by the NYDEC report and the New Jersey study were normal beach use and recreational boating. Another minor source of floatables identified by the reports was commercial ships. Illegal dumping is the last source identified by the three reports.

An additional area of great significance, as primarily identified within the Delaware River Report, is the apparent high percentage of insulin type syringes. While only a small amount of RMW was found during the Delaware River study (all collected syringes combined from the entire summer of 1989 filled approximately a one gallon container), 85% of the syringes were identifiable as insulin type (1cc). Further, approximately 57% of the syringes were coated with a "greasy/waxy material" which New Jersey Criminal Justice Investigators believe is evidence of their passage through sewer lines. This study and others illustrate the importance of and need for an aggressive education and outreach program targeted at the unregulated home health self care and, to the extent possible, intravenous drug user populations on the proper and safe disposal of medical wastes. The department has developed such a program which will be implemented in the very near future.

Additionally, since these "insulin-type" syringes are also used in legitimate medical applications whenever a low dose subcutaneous injection must be applied, enforcement efforts will be escalated to identify and deter anyone in the regulated community who inappropriately disposes of these types of solid floatable materials into the sanitary sewer systems.

Implementation Strategy: DEPE's short-term strategy is to minimize or eliminate if possible medical waste wash-ups and their impacts on the public's health and safety and on the environment by maintaining and enforcing proper disposal practices for all medical waste generators.

Further, the departments have worked with syringe manufactures and are aware of independent manufacturer activities to include literature within packages of syringes which outline safe disposal procedures. In addition, the department and NJHA have supported and authorized the acceptance of home generated syringes by registered generators to ensure proper disposal. The DEPE is also considering authorization for home generated syringes to be disposed of through periodic or permanent household hazardous waste collection days held by nearly every county in the state. Finally, the departments, in cooperation with the USEPA, the U.S. Coast Guard, the NYDEC, the U.S. Army Corps of Engineers, and other agencies, are making efforts to remove floating debris from certain waterways before the debris can be transported to the ocean.

One program in this area of endeavor is "Operation Clean Shores," where potentially floatable shore debris is being collected along 45 miles of New Jersey coastline through the use of prison inmate labor and municipal heavy equipment. This was formerly a summer program but is now conducted on a year-round basis.

Annual summer programs concerning floatables and water quality are:

1. The Coastal Surveillance Program where low-altitude helicopter flights will be run six days per week from mid-May through September to identify floatables and algal blooms;
2. Implementation of a "Floatables Action Plan" where the Army Corps of Engineers will perform routine and non-routine clean-ups of floatables spotted during helicopter surveillance; and
3. The Cooperative Coastal Monitoring Program where state, county and local officials will provide routine bacterial water quality testing in over 300 coastal areas.

The departments are developing recommendations as to additional regulatory or education related steps necessary to control illegal disposal of syringes including the

flushing of insulin syringes as further discussed below. Further, the DEPE is also implementing state programs under the provisions of Section 402 (p.) of the Federal Clean Water Act to upgrade combined sewer systems.

Over the past several years, the number of medical waste incidents at New Jersey's beaches have been minimal. Further, no major floatables incidents have occurred since the summer of 1988. This can be credited to a number of factors including: the floatables debris surveillance and collection programs noted above; the state's comprehensive RMW tracking and management program; heightened attention and generator/transporter/public education on the dangers and penalties associated with illegal RMW disposal; the closure of substandard wastewater treatment facilities; upgrading of combined sewer systems; and generally favorable wind and weather patterns over the summer months. There can be no guarantee that floatables, including medical debris, will not appear on New Jersey's shoreline in the future. However, due to the above programs and natural factors, the experiences of 1987 and 1988 have not even remotely reoccurred. Further, it is accurate to state that New Jersey's beaches are clean, safe and among the best along the entire east coast for summer vacationers.

c. Household Medical Waste

Objectives and Criteria: Another source of small quantities of nonpoint sources of medical wastes that was excluded from the RMW regulations initially, were home self-care generators, that is, producers of household medical waste. The DEPE has discovered during implementation of the RMW program that even though this waste has been excluded, the DEPE and New Jersey Department of Health were contacted for guidance by many individuals and organizations involved in home self-care on the disposal of medical waste. The primary concern has been adherence to N.J.S.A. 2A:170-25.17 which requires destruction of needles and syringes prior to disposal while attempting to comply with Centers For Disease Control (CDC) guidelines recommending that manipulation of needles and syringes be minimized to prevent needlesticks. In addition, despite the lack of specific regulations, many home self-care generators of medical waste express a desire to dispose of this waste in the safest, most responsible manner available to them.

In order to address the concerns of the home-health care community, the New Jersey Hospital Association has developed a program promoting a safe syringe disposal. The Association has developed a syringe collection program with the assistance of Medical Waste Systems, d/b/a Bio Systems (Bio Systems), a medical waste management company, to develop a low cost disposal service for injection-dependent individuals. For a nominal \$10.00 deposit fee home self-care generators are given a puncture resistant container for disposal of syringes and lancets used in the home setting. Once the containers are full they are returned to the hospital and given a new container. Bio Systems picks up the used syringes for transport to

their waste processing plant in Warminster, PA.

Implementation Strategy: Realizing that some guidance is necessary for the management of home self-care waste in the general community, the DEPE's short-term strategy is to help manage this waste. As a first step, the Department of Health in conjunction with DEPE developed guidelines in response to the New Jersey Hospital Association's program for generators, transporters and destination facilities that are participating or intend to develop a system for collection and disposal of syringes generated through home self-care. These guidelines are designed to ensure the safe handling and disposal of this all too ubiquitous waste material. The guidelines authorize registered RMW generators to accept syringes generated from home self-care individuals where it is specifically required that:

- Generators be registered by the disposal facility;
- Containers for syringes be puncture-resistant and labeled as "Home Self-Care Medical Waste;"
- Final shipment of the waste must be by registered RMW transporter; and among other requirements
- Records must be maintained on all waste transactions.

The departments have also worked with manufacturers of syringes, to support them in their efforts to educate syringe users of the proper methods of disposal for used home self-care syringes. The DEPE and DOH are also seriously considering giving support for syringes to be accepted by county Household Hazardous Waste (HHW) Collection day programs. HHW collection programs may provide another disposal location in each county for users to dispose of their syringes on a periodic or regular basis.

C. STATUS OF CURRENT PROGRAM

Introduction: As mentioned throughout this RMW State Plan, as with any relative new field of study, data becomes a critical variable in establishing baseline conditions and in planning for future needs. This was strongly the case in developing New Jersey's RMW Program and this RMW State Plan since the body of knowledge about generation, composition, transportation, treatment and disposal was virtually non-existent when initial medical waste regulatory programs were put in place in 1988.

Compared to the initial regulatory phase for RMW in 1988/1989, a great deal has been learned which frames the future direction that the counties and state will need to take to properly manage RMW in the years ahead. Within Section C, the following basic information will be provided:

- An overview of data management system development;
- RMW generation analysis of health care facilities and private practitioners;
- Composition analysis of the amounts of RMW generated in each of New Jersey's seven categories;
- Generation by each of the 21 counties;
- An overview of current collection practices and associated requirements for segregation, packaging, labeling and tracking;
- Summary of transporter requirements;
- Analysis of in-state and out-of-state disposal practices and facilities used, as well as on-site and off-site treatment and disposal methods;
- Cost summaries of transportation and disposal;
- County-by-county capacity analysis and five-year projections;
- Statewide capacity analysis toward achievement of self-sufficiency; and
- An overview of New Jersey's RMW enforcement program.

Throughout this chapter, the most recent complete database was utilized from 1990 annual generator and transporter reports. More recent data for 1991 is being tabulated at this time (March 1993) and data from 1992 is required to be submitted by June 1993. The size of the regulated universe of over 16,000 generators makes it difficult to provide more timely

information. However, preliminary analysis of 1991 figures, as well as recent survey information from hospitals compiled by the Health Care Facilities Financing Authority appears to correlate reasonably well with the 1990 information provided in this state plan.

As a final introductory note, the reader will find considerable detail and some redundancy within Section C. To a large extent, the department has attempted to address all the specific elements of the Comprehensive Act which laid out, in considerable detail, the required contents of the RMW State Plan. A more concise treatment of the most relevant aspects of the status of the current RMW program can be found in the Executive Summary and interwoven throughout Section B which represents the DEPE's "objectives, criteria, standards and implementation strategies."

1. Overview of Data Management System Development

- a. Regulated Universe: Who is Generating Medical Waste in New Jersey?** From the inception of New Jersey's RMW program, the DEPE recognized the difficulty that would be involved in determining what organizations were actually generating such waste in the state. In this section, the DEPE describes the process of determining the regulated universe and gives its current size and composition. This is the first step in determining the types, amounts and counties of origin for RMW generated in New Jersey, which first began with the "Special Medical Waste" regulations in 1988.

When the DEPE adopted the "special medical waste" regulations in 1988, it sent public information documents to over 40,000 potential generators of special medical waste informing them of the new medical waste rule. The lists of these potential generating medical facilities including funeral homes, school districts and licensed medical and dental practitioners were obtained from numerous sources. Among these sources were professional regulating and licensing agencies including the Department of Health, the Department of Law and Public and Safety, the Department of Labor and the Department of Education. While these agencies could not provide the names of specific "special medical waste" generators, they were responsible for registering organizations and companies the DEPE believed would be most likely to generate such waste. Where the specific licensing was not sufficient to identify potential special medical waste generators, "Standard Industrial Classification" (SIC) categories were used to determine likely classes of generators.

The medical waste generating organizations can be segregated into two general categories. The first contains licensed health care facilities; such as hospitals, blood banks, and clinical laboratories. The second is a category encompassing all other types of generators, which are primarily private practitioners. The first category, "Category 1", contains organizations that are required to obtain licenses to operate medical care facilities from the DOH. Specifically included within this category of organization are general hospitals, clinical laboratories, blood banks, renal

dialysis centers, special hospitals, long-term care facilities, ambulatory care facilities, home health agencies, homes for the aged, family planning clinics and out-patient drug treatment centers, among others. (For simplicity this category will be referred to as "health care facilities" even though clinical laboratories and blood banks are not statutorily defined as such.) The remainder of the known types of organizations fall into a second general category, "Category 2", which includes the private practitioners of dentistry, medicine, veterinary, osteopathy and podiatry as well as funeral homes, pharmacies and schools. Historically, health care facilities were regulated by the DOH and accurate information on the numbers and types of generators existed. However, the private practitioner universe was never specifically regulated by the DOH or DEPE and little data existed in 1988 as to the number of potential generators.

The August 1988 regulations did not require generators to register with the DEPE. Under those regulations at N.J.A.C. 7:26-3A, the DEPE required all generators of "special medical waste" to submit a one-time 30 day report of their generating activity. This report was intended by the DEPE to identify generators and provide the DEPE with information on the types and quantities of medical wastes generated. Over a period of time, nearly 8,000 of these reports were received from Category 1 and 2 organizations representing both actual producers of "special medical waste" and from nonproducers. Listed below are Tables 3b and c which summarize the numbers of generating facilities known to the DEPE in 1988 from the filings of the 30 day summary reports.

TABLE 3b

1988 - GENERATORS REPORTING - CATEGORY 1: HEALTH CARE FACILITIES

SIC NO.	HEALTH CARE FACILITIES	# ESTIMATED	# REPORTED	PERCENT REPORTING
8052	Ambulatory Care Facilities	74	73	99
8099	Blood Banks	127	126	99
8071	Cat Scan	1	1	100
8071	Clinical Laboratories	540	521	96
8093	Family Planning Clinics	43	43	100
8082	Freestanding Medical Day Care	20	20	100
8062	General Hospitals	101	101	100
8059	Government Homes for the Aged	2	2	100
8082	Home Health Agencies	59	59	100

8059	Homes for the Aged	58	57	98
8059	Long-term Care Facilities	278	271	97
8082	Medical Care	36	35	97
8093	Out-Patient Drug Treatment	44	41	93
8093	Private Developmental Centers	5	2	40
8063	Private Psychiatric Hospitals	6	6	100
8092	Renal Dialysis Centers	9	9	100
8093	Residential Alcohol Treatment	24	24	100
8093	Residential Drug Treatment	12	12	100
8082	Residential Health Care	172	154	90
8069	Special Hospitals	21	21	100
	TOTALS	1,632	1,578	93.7

TABLE 3c

1988 - GENERATORS REPORTING CATEGORY 2

(NA - Not Analyzed)

SIC NO.	PRACTITIONERS & MISC. GENERATORS	ESTIMATED # REGISTERED	# REPORTED	PERCENT REPORTING
7261	Funeral Homes	713	456	64
0741-2	Veterinarians	1,469	361	25
8011-31	Physicians (MD & DO)	26,143	2,126	8
8021	Dentists	6,119	2,729	45
8043	Podiatrists	919	308	33
8041	Chiropractors	2,200	NA	NA
8049	Acupuncturists	28	NA	NA
8211	School Districts	1,536	NA	NA
8733	Special Labs	782	NA	NA
8221	Medical School	42	NA	NA

8049	Midwives	96	NA	NA
5912	Pharmacies	1,767	NA	NA
	TOTALS	41,814	5,980	NA

In Table 3c, above, certain categories of private practitioners were not analyzed because it was determined that they either generated little or no medical waste or because data was unavailable at the time of the survey. These are marked "NA" in the table.

When the existing RMW rule was adopted in June 1989, the DEPE needed to determine what organizations were generating RMW in order to develop a comprehensive program to effectively regulate the RMW generating community. While the DEPE recognized that it was not necessary to know precisely how many generators would register in order to develop the medical waste program's ultimate budget and workplan, a relatively accurate estimate of the registrant base was necessary in order to frame the size of the program, thus providing sufficient staff to accomplish the requirements specified by the Comprehensive Act. By accurately projecting the size of the regulated community, the DEPE could thus avoid overly inflating the size of the medical waste program based on unrealistically high projections of the registrant population or conversely, undersizing the program. Obtaining a reasonably accurate projection of the number of actual RMW generating organizations, proved to be difficult for two reasons in the very short time-frame available.

First, the DEPE had to identify all of the potential types of sources of medical wastes among the medical community. In 1988, the RMW generators were believed to be the obvious sources within the primary care medical community such as doctors, hospitals, clinical laboratories and a lengthy list of other types of private practitioners. As described above, these sources fall into the categories of health care facilities and all other sources. Other suspected producers of RMWs include such organizations as pharmaceutical companies, as well as any organization with a medical treatment office or clinic, on-site, which could include factories, professional sports teams, schools, farms, racetracks and large office buildings.

However, the lists that were obtained from the sources listed above in 1988, did not accurately reflect operating organizations for various reasons. The lists contained large numbers of practitioners who were either no longer in business, or were registered in New Jersey but operated their business in another state. Further, obtaining lists of some of the latter types of facilities listed above required more time than the DEPE had available. The DEPE realized that, in the limited amount of time at hand, efforts to contact and register generators would have to be focused on the major generators of medical wastes. Response to the 30-day summary

report, required by the 1988 rule, of all listed health care facilities, practitioners and miscellaneous generators, was approximately fifteen percent, or nearly 8,000 reports out of the 44,000 distributed. The response was high, at over ninety percent, by the larger DOH licensed facilities such as hospitals, but was relatively low from the potential generators. The DEPE suspects this low rate of return from the smaller generators may have been caused by a number of factors. Some members of the medical community may have overlooked the 30-day report requirement, while some perhaps, were unclear whether the waste they were actually generating would be classified as special medical waste since this was the first time they were required to manage their waste stream in a specific manner. Certainly a large, indeterminable number of organizations on the mailing list were not generating RMW for various reasons and were not required to respond. Nonetheless, it was clear that nearly 8,000 medical facility sites were in business and at least 7,000 practitioners were generating medical wastes. Most of these could reasonably be expected to be in business at the time of the onset of the RMW rule in June 1989. Since approximately 7,000 reports were filed as generating some amount of medical waste, this number became the lower limit for the number of registrants the DEPE believed actually existed.

The second difficulty in projecting the future number of registering RMW generators was presented by the numerous factors involved with determining whether an actual operational practice or business would be a generator of RMW. Only businesses or organizations which actually generate RMW are required to register as generators with the DEPE. Some types of licensed medical practices such as psychiatrists and dental orthodontists do not normally generate RMW in the course of patient care. Also, an unknown number of medical practitioners employed by medical facilities and working in them would not be required to separately register. Further, many group practices consist of more than one health care professional. These professionals, as members of a group practice formed for the purpose of conducting a medical business, whether doctors, nurses or other types of practitioners, would not each be required to register as generators with the DEPE. Rather, the 1989 regulations required the business entity through which the individuals are employed to register. In some cases certain health care facilities are merely operating divisions within larger organizations such as hospitals and may not be required to register separately.

The other medical practices produce medically related materials such as tongue depressors or table papers, but do not produce any waste defined by law as RMW. Further complicating the matter of determining the number of true generating organizations, was the requirement that each separate site that produces RMW, which is operated by a single legal entity, must register. Many practices operate more than one office where waste is produced and would be required to register each waste generating office.

Thus, because of the complex factors discussed above, making an "a priori" determination of whether a medical practitioner actually generates RMW at a specific site was a highly problematical endeavor. Only actually surveying all such sites could produce a clear picture of the actual number of RMW generators. Since a comprehensive written survey was prohibitive, limited telephone surveys were conducted to attempt to ascertain how many of the organizations were actually generating RMW.

The telephone surveys indicated that approximately one-third of the originally identified 44,000 apparent medical organizations would be likely to register as RMW generators. This would place the number of program registrants at about 15,000. This number of 15,000 was also confirmed unofficially by several representatives of trade associations representing medical practitioners, as the number of practicing businesses likely to produce RMW. The DEPE, therefore, had narrowed the range of the number of registrants, bounded at a lower limit of registrants at about 7,000, from the submission of the one time summary report in 1988. The upper limit, though less certain, appeared to be established at approximately 15,000 based on the telephone survey information and the estimates provided by professional associations. In fact, as of April 1993, the DEPE has registered over 16,000 RMW generators.

It seemed reasonable to assume that a comprehensive regulatory program, such as that required by the Comprehensive Act would capture more small organizations than the 7,000 that reported in 1988 under the somewhat confusing circumstances of the entirely new program, which went largely un-enforced. On the other hand, as an upper limit, the unverified number of 15,000 registrants appeared to be potentially too inflated as many factors were expected to operate after the adoption of the new rule which would tend to reduce the number of actual registrants. For example, some doctors or other facilities such as schools, would be likely to cease the practices producing very small amounts of RMW that would cause them to be required to register as generators.

Given the likelihood that a significant number of actual generators had not filed summary reports in 1988, the DEPE projected that about forty percent more Category 2 filers would register than had filed positive generation reports in 1988. Not wanting to base the final program budget on an overly inflated generator universe which did not exist, the DEPE conservatively projected that 6,777 private practitioners and miscellaneous generators would register, by applying the forty percent factor to the number of summary reports with positive generation amounts. The DEPE made an additional projection of 1446 registrants for farms, pharmaceutical companies, other businesses, paramedical units and other potential generators that were expected to register.

For preparation of the medical waste program budget in 1989, the DEPE used the following projections of the size of the registration population based on the information available to it at the time. These values are listed below in Table 4.

TABLE 4

PROJECTED REGULATED MEDICAL WASTE GENERATORS-JUNE 1989

TYPE	ORIGINAL ESTIMATE	FINAL PROJECTION
Hospitals	129	130
Blood Banks	142	142
Clinical Laboratories	545	545
Other Health Care Facilities	846	798
Private Practitioners & Misc. Generators	40,236	6,777
Other Organizations	1,578	1,446
TOTALS	43,476	9,838

Since 1989, detailed generator registration data obtained from the registration forms for generators for registration years 1990, 1991, and 1992 is available making the true extent of the generating community apparent. Data reflecting present registration status is shown below in Table 5. From this information, the current number of registered RMW generators is approximately 16,000. More detailed data on generators is presented in Section C.2. DEPE and DOH compliance inspectors are still finding that many organizations are not registered. As many as 5 percent more generators may ultimately register. At this juncture, the unregistered generators are typically small private practices.

TABLE 5

STATUS OF REGULATED MEDICAL WASTE GENERATORS-1993

SIC NO.	FACILITY	REGISTERED
0741-42	Veterinarians	503

7261	Funeral Homes	541
8011-31	Physicians (M.D.,D.O.)	7,555
8021	Dentists	4,147
8041	Chiropractors	2
8043	Podiatrists	676
8049	Midwives	172
8051	Ambulatory Care Facilities	282
8059	Government Home for the Aged	84
8062	General Hospitals	113
8063	Private Psychiatric Hospitals	16
8069	Residential Alcohol Treatment	26
8071	Clinical Laboratories	256
8082	Home Health Care Agencies	148
8092	Renal Dialysis Centers	14
8093	Out-Patient Drug Treatment	140
8099	Health & Allied Services	102
8211	Schools	1,200
8221	Colleges, Universities and Professional Schools	50
8731/34	Special Laboratories	88
9431	Health Departments	63
9711	National Security (Armed Forces)	4
	TOTAL	16,182

- b. **Data Characterization:** In this section, the RMW data collection procedures are described. Factual data is of prime importance to solid waste and RMW planning. Serving as the foundation for source reduction, recycling and disposal capacity planning. Data on generation of RMW has been obtained from both RMW generators and RMW transporters. Data concerning RMW transportation is also used to determine disposal practices.

The first "Annual Generator Report-Regulated Medical Waste" (AGR) was mailed in the month of August, 1990 to all RMW generators that had registered as of July 20, 1990. The AGR is required as part of the RMW management program (See N.J.A.C. 7:26-3A.21(h).) This 1990 AGR covered the period of June 22, 1989 to June 21, 1990. The purpose of the AGR's are to collect data concerning the amounts and classes of RMW generated in New Jersey as well as other information about treatment methods, disposal methods, transporters utilized, frequency of RMW pick-ups and related data.

The data collected in the first AGR and to be collected in subsequent AGRs covers the whole spectrum of generators of RMW. This includes large generators such as general hospitals, clinical laboratories, blood banks and renal dialysis centers and extends through medium size generators down to small generators such as doctors, dentists and veterinarians.

In order to develop information about the disposal of RMW, DEPE used data from the semi-annual transporter reports. These reports were submitted by approximately 29-30 transporters registered with the DEPE as RMW transporters at that time. The two reports used for the purposes of this investigation cover the periods of June 23, 1989 to December 19, 1989 and December 20, 1989 to June 17, 1990. These periods coincide with the time span of the AGR allowing for a comparison of generation and disposal data. The transporter reports are required as part of the RMW management program (See N.J.A.C. 7:26-3A.35(f).)

It is difficult to compare existing data about medical waste disposal with the newer RMW data in this report. This is due in part to the different definitions of medical waste used in the different generation reports. Also, with the new regulations in place, some generators may be more concerned with liability than they were before the current regulations were implemented in June, 1989. Thus, they may be more prone to classify wastes as RMW if there is any question they might be considered RMW. This could result in higher rates of generation. On the other hand, possible increased costs of RMW disposal could lead some generators to meticulously avoid over-classification to minimize RMW generation in an effort to attempt to cut disposal costs.

- c. **Data Collection Methodology:** In this section, there is a brief description of the methodology for developing a generator database as well as descriptions of the information requested from RMW generators and transporters. These are essential steps in determining the nature, amount and origin of RMW.

The registration process for RMW generators was initiated in 1988 through contacts with the DOH, other state departments and the various New Jersey medical associations as described earlier in Section C.1.a. DOH supplied DEPE with lists of health care facilities, which included most of the large RMW generators in New

Jersey. Through the New Jersey medical associations, DEPE informed doctors, dentists and podiatrists of the new state requirements for properly disposing of RMW. DEPE also contacted other professional associations to notify other potential generators of RMW, such as funeral directors.

As a result of these activities, the DEPE has registered all large RMW generators and virtually all small RMW generators. The Enforcement Elements of DEPE and DOH continue to periodically find small RMW generators that have not registered. The DEPE believes that even in early 1993 around five percent of generators of small quantities of RMW may still not be registered.

As stated previously, RMW data was obtained from two sources, the AGR giving generation data and the semi-annual transporter reports giving disposal data. These reports cover the period of June 22, 1989 to June 21, 1990. The AGR was mailed to all RMW generators registered as of July 20, 1990. The transporter report was mailed on a semi-annual basis to the approximately 29 or 30 RMW transporters registered at the time of the mailing.

(1) **Generation of RMW:** In responding to the first AGR, it was found that the number of generators in each category was as follows:

GENERATOR CATEGORY	WEIGHT (RMW)	NO. OF GENERATORS
1	Less than 50 lbs/yr	6,339
2	50 - 200 lbs/yr	1,493
3	200 - 300 lbs/yr	384
4	300 - 1000 lbs/yr	266
5	more than 1000 lbs/yr	294
TOTAL		8,776

There were 8776 generators who responded to the first AGR. Of the approximately 1800 generators that were registered and did not respond, it was determined from their registration information that they were almost exclusively Category 1 generators. In the process of validating the AGRs, it was necessary to remove a number of the reports from the database due to various reasons. These involved doctors' offices closing, not generating RMW despite initial generator registration and duplicate reports, as well as various invalid reports. The final database contained 8189 generators.

1990 AGR respondents were asked to determine into which of seven classes the generated waste fell. The classes are as follows:

- Class 1 - Cultures and stocks of infectious agents and biologicals
- Class 2 - Pathological waste
- Class 3 - Human blood and blood products
- Class 4 - Needles, syringes, and sharps
- Class 5 - Animal wastes & animal carcasses, etc. from research animals exposed to pathogens
- Class 6 - Isolation wastes
- Class 7 - Unused hypodermic needles, syringes, scalpel blades and suture needles

Note: These seven classes and classification criteria are described in detail in the RMW regulations (N.J.A.C. 7:26-3A.6).

Respondents were also asked to determine into which of three disposal categories the wastes fell for final treatment and disposal. The three categories were:

- Category A - Treated - rendered non-infectious in house before being transported off-site
- Category B - Untreated
- Category C - Other handling (Disposal via sewer or any other method)

Respondents were asked to indicate the quantity of waste generated, by class, and by category. They were also asked to describe the method used to render the waste non-infectious if it fell into category A, and the method of ultimate disposal for categories A, B, and C. For category A and B wastes, they were also asked to indicate the facility where the waste was ultimately disposed of.

(2) Disposal by Registered Transporter: In addition to determining the amount of RMW generated, it is important for the DEPE to determine the amount of RMW taken to disposal sites and thus assure the proper management of the RMW. This process is carried out through the semi-annual transporter reports. The semi-annual transporter reports were initiated by USEPA. These reports have been changed to annual reports in New Jersey as of July 1, 1991.

The disposal data presented in Section C.3. of this document was collected from two semi-annual transporter reports covering June 23, 1989 to December 19, 1989 and December 20, 1989 to June 17, 1990. This matches the time span of the AGR which is June 22, 1989 to June 21, 1990. The data derived from the AGR is presented in Section C.2.

The semi-annual transporter reports were mailed to approximately 30 RMW transporters registered at the time of the two mailings. The RMW transporter report requested first a list of generators (names and addresses) from which RMW was picked up and the quantities of RMW in pounds specified as treated or untreated. The report next gives the quantities (in pounds) of treated and untreated RMW delivered to a second transporter or transfer facility. The final portion of the transporter report gives the names and addresses of intermediate handlers and destination facilities that the transporter used. The quantities of treated and untreated RMW delivered to these facilities is also required.

The data obtained from the semi-annual transporter reports enables DEPE to determine the amounts of RMW being disposed of from New Jersey and the final disposal sites whether they are in New Jersey or out-of-state.

- d. **Data Handling Methodology:** The information received from the AGRs and from the transporter reports was reviewed and converted to an electronic media, computerized data format for ease in analysis. The procedures used for this process are summarized below.

(1) **Generation of RMW, Data from AGR:** The AGR forms were printed in a machine readable format. As the forms were returned by mail they were sorted into batches on a daily or every other day basis and arranged in numerical order by generator ID Number. Staff reviewed the forms for any gross or obvious errors in filling in the answer circles. Where necessary, telephone follow-ups to generators were made to verify the data.

The forms were sent to an outside contractor for machine reading and compiling the raw data from the answer sheet source documents. The data was received from the contractor onto computer data discs and transferred on to standard personal computer floppy discs. Staff then reviewed the data on the floppy discs looking for any obvious omissions in transferring the data from the answer sheets to the electronic format. This procedure involved comparing all large generator and every twentieth small generator AGR source document against the computerized data for accuracy. In instances where errors were observed, all paper copies were compared to electronic data for that disc or section of disc. The contractor rescanned some batches of paper copies and the new electronic data was reviewed to confirm accuracy of scanning.

The database was checked for duplicate entries. In some cases, RMW generators had submitted duplicate reports. After these discrepancies were eliminated the database was then useable to compile information about amounts and types of RMW generated, facilities generating RMW, quantities of RMW generated by county and other related information contained in Section C.2.

(2) Disposal by Registered Transporter, Data from Transporter Reports: The completed semi-annual transporter reports were returned by mail. These reports were reviewed by staff for errors and omissions. Follow-up telephone calls and letters were used to resolve these issues. The reports were arranged in alphabetic order by transporter name and the raw data was entered into a computer database. The data from the transporter reports was then available to generate the information about disposal of RMW contained in Section C.3.f.

2. Baseline RMW Generation and Composition Analysis

Having established the regulated universe, obtained relevant information on RMW from that universe and processed the information into a useable database, the department can develop data characterizing various aspects of the regulated universe. Within this section, the database obtained from the AGR is used to show the amounts of RMW generated and the entities in the regulated community generating specific quantities. For example, the quantities of wastes generated in each of the seven classes of RMW defined at N.J.A.C. 7:26-3A.6(a) can be determined. It is also possible to do a breakdown of one category of generators such as doctors (see Figure 3) and see that approximately 2200 doctors out of the total doctors reporting generate approximately 50 pounds per year of RMW.

Thus, various quantitative aspects of the regulated community generating RMW can be determined from the available database. Importantly, the department can determine the generation of RMW on a county-by-county basis and a hospital-by-hospital basis. This is a valuable tool for planning for self-sufficiency concerning New Jersey RMW disposal.

- a. Health Care Facility Generation:** In this Section (C.2.a.) and the Sections immediately following (C.2.b and c), data is listed regarding the generation of RMW in New Jersey. This data for "health care facilities" and for "private practitioners and miscellaneous generators" informs us concerning the amounts of RMW generated by each group and the number of generators in each group. This gives a clearer picture of the breadth of the regulated community generating RMW. Figures 1 through 5 (subsection b) indicate the distribution of generators by quantity of RMW generated for the five numerically largest groups: funeral homes, veterinarians, doctors, dentists and podiatrists. These figures (1 through 5) clarify the "usual" generation of RMW by private practitioners.

Data from the 1990 AGRs was compiled to show the total waste generation of health care facilities and is presented in Table 6 below:

TABLE 6

1990-TOTAL WASTE GENERATION FROM HEALTH CARE FACILITIES

	NUMBER REPORTED	MEAN GENERATED LBS/YR	TOTAL GENERATED TONS/YR
General Hospitals	101	331,488.31	16,740.16
Medical Laboratories	126	14,696.67	925.89
Kidney Dialysis	11	37,941.00	208.68
Specialty Hospitals	24	8,216.63	98.60
Psychiatric Hospitals	14	13,431.21	94.02
Skilled Nursing Care Facilities	198	565.75	56.01
Health and Allied Services	25	4,006.60	50.08
Home Health Care Services	68	294.90	10.03
Nursing & Personal Care Facilities	46	424.63	9.77
Health Practitioners Offices & Clinics	53	238.68	6.33
Intermediate Nursing Care Facilities	13	301.54	1.96
Special Outpatient Facilities	58	49.88	1.45
TOTALS	737	411,655.80	18,202.98

Data in Table 6 above indicate that general hospitals and medical laboratories are major generators of RMW. Commercial testing laboratories (see Table 7 below) are also major generators of RMW. Doctors and dentists, as shown in Table 7, do not generally produce large amounts of RMW even though they constitute the two largest groups numerically. There are a small number of doctors with exceptionally large practices that generate more than 1000 lbs/yr of RMW.

- b. **Private Practitioners and Miscellaneous Generators:** Data from the 1990 AGRs was compiled to show the total waste generation of private practitioners and miscellaneous generators and is presented in the table below.

TABLE 7

TOTAL WASTE GENERATION - 1990
PRIVATE PRACTITIONERS AND MISCELLANEOUS GENERATORS

	NUMBER REPORTED	MEAN GENERATED (LBS/YR)	TOTAL GENERATED (TONS/YR)
Commercial Testing Labs	58	38,025.86	1,102.75
Doctors of Medicine	3,340	207.74	346.92
Funeral Services	378	668.36	126.32
Research & Devel Labs	20	6,024.00	60.24
Colleges, Univ. & Prof. Schools	21	5,501.19	57.76
Dentists	2,574	36.22	46.61
Health Departments	40	1,749.18	34.98
Veterinary Services	350	167.52	29.32
Pharmacies	13	1,173.00	7.62
National Security	4	2,333.50	4.67
Podiatrists	326	17.94	2.92
Correctional Facilities	17	190.59	1.62
Elementary Schools	301	2.38	0.36
Miscellaneous	10	38.00	0.19
TOTALS	7,452	56,135.48	1,822.28

TABLE 8

MONTHLY WASTE GENERATION - PRIVATE PRACTITIONERS
AND MISCELLANEOUS GENERATORS

	NUMBER REPORTED	MEAN GENERATED LBS/MONTH/ SITE	TOTAL GENERATED LBS/MONTH
Funeral Homes	378	55.70	21,052.83
Veterinarians	350	13.96	4,886.00

Physicians (MD,DO)	3,340	17.31	57,820.08
Dentists	2,574	3.02	7,772.25
Podiatrists	326	1.49	487.33
TOTAL	7,968	---	---

The number of generators in each of the five categories was compiled from the 1990 AGRs. Waste generation quantities, based on the number of generators who reported are shown in Table 8 above. The data compiled in Table 8 demonstrates that private practitioners and miscellaneous generators as a group generate considerable quantities of RMW, though individually each generates relatively small quantities on a monthly basis.

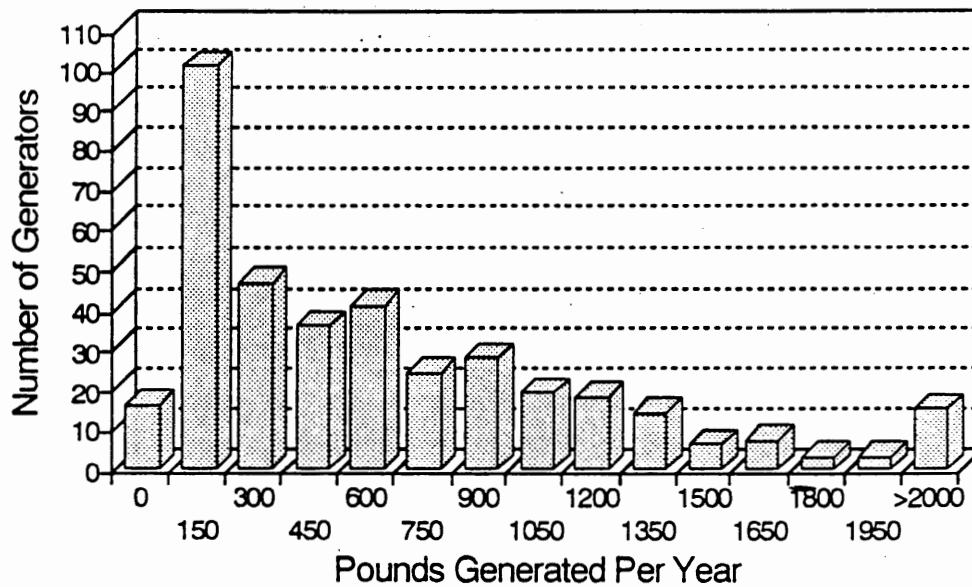
Distributions of waste generation for five categories of private practitioners and miscellaneous generators are shown in Figures 1 through 5, below. These figures are provided to demonstrate the distributions of private practitioners generating various quantities of RMW. These figures indicate that most private practitioners and miscellaneous generators generate relatively small quantities of RMW on an individual basis each year.

The data distribution in the following figures is obviously skewed to the lower end of the scale. Such a skewed pattern is typical of data that is bounded at one end, but not at the other. In the case of generation of RMW, no one can generate less than zero, so the distribution is bounded at the lower end. However, it is not bounded at the upper end except by the practical size of a facility or practice. Such a skewed distribution is frequently apparent in environmental and demographic data. For instance, if one made a distribution graph of numbers of frogs in a pond within certain age ranges, one would see many more individuals at the low end of the range, tapering down to a few aged individuals at the high end of the range. The person who observed the pond, and noticed that there were lots of small tadpoles, not so many larger tadpoles, a few mature adults, and a very few large, old adults would be observing the same skewed distribution phenomenon. In the case of generators of RMW, the distribution graphs all show the same pattern: there are many relatively small generators, fewer middle-sized generators, and very few large generators for each type of generator depicted.

Figure 1 below depicts waste generation of funeral homes. Although funeral homes generate relatively large quantities of RMW, almost all of this waste is liquid which is disposed of via sanitary sewer. If these fluids are discounted, funeral homes generate relatively small quantities of RMW.

FIGURE 1

RMW GENERATION: FUNERAL HOMES



In Figure 2, below depicting waste generation of offices of veterinarians, four extreme values of 1613, 5368, 5940 and 6940 pounds per year are not shown. These were not included in the graph because doing so would have compromised detail in the range where most generators are concentrated.

FIGURE 2

RMW GENERATION: VETERINARIANS

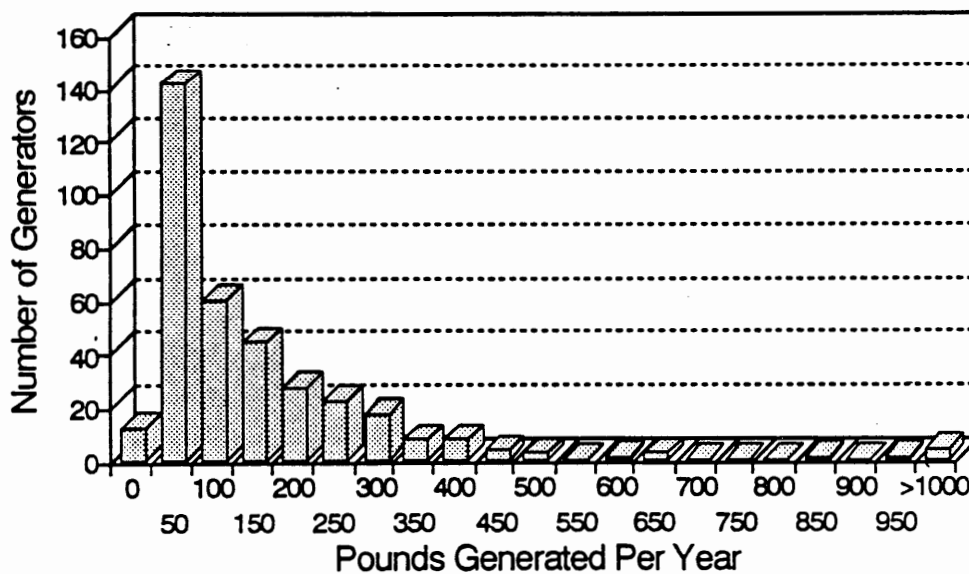


FIGURE 3

RMW GENERATION: DOCTORS

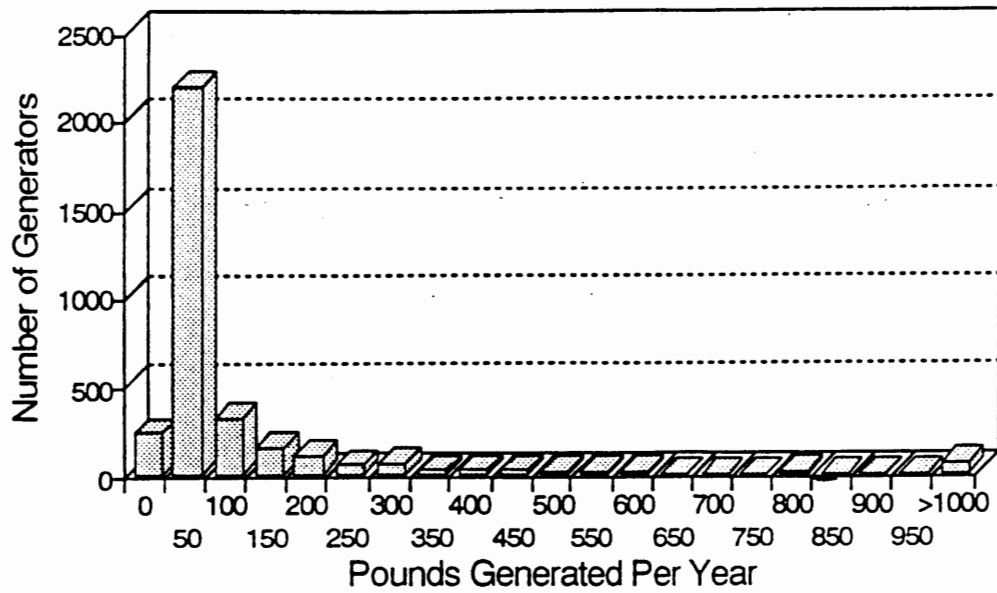


FIGURE 4

RMW GENERATION: DENTISTS

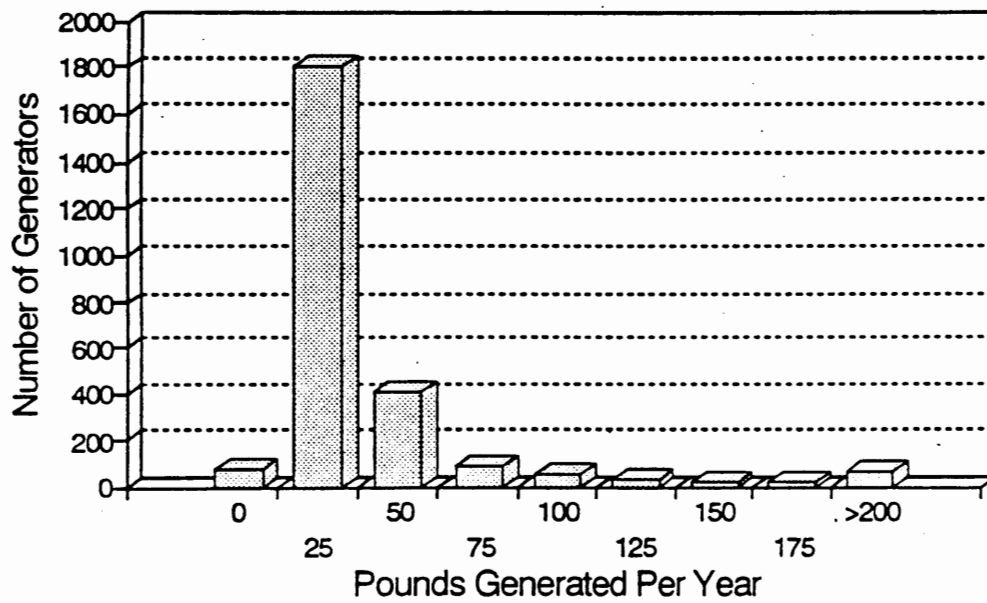


FIGURE 5

RMW GENERATION: PODIATRISTS

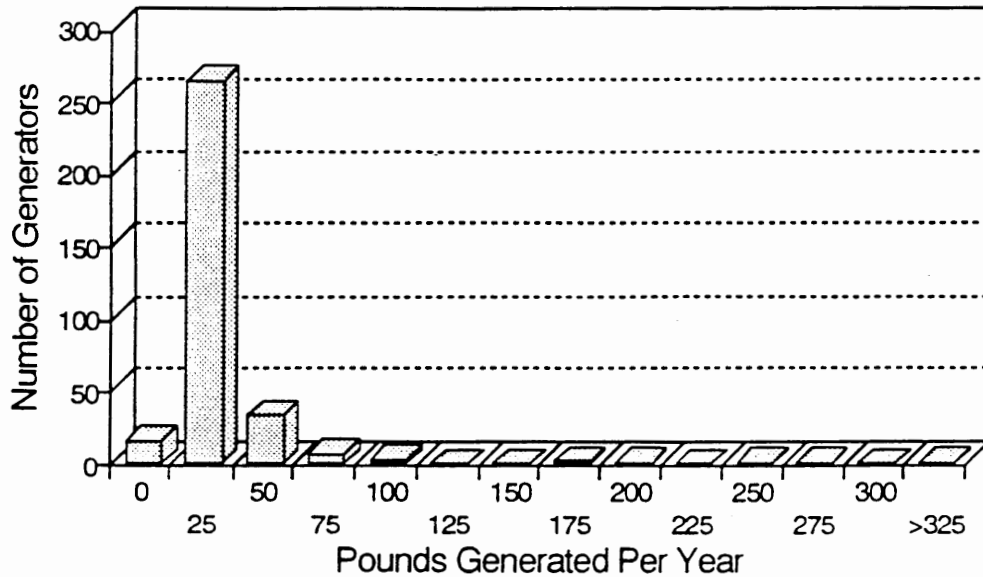
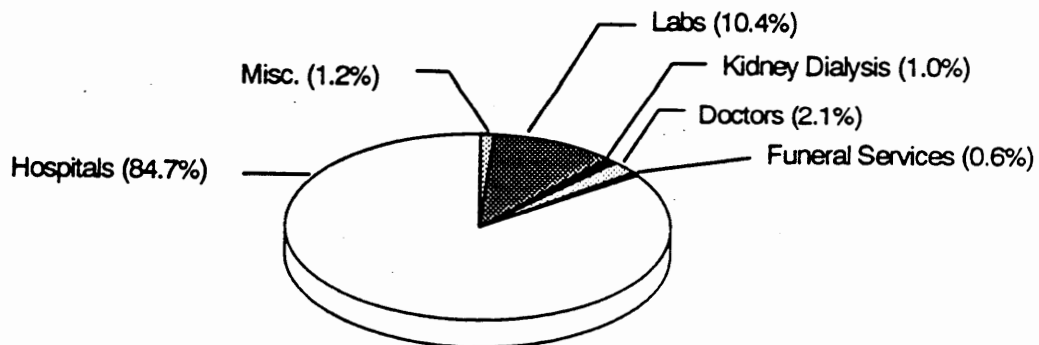


FIGURE 6

RMW GENERATORS



Hospitals and laboratories account for approximately 95% of the RMW generated in New Jersey, as is shown in Figure 6 above. Further, by adding the categories of funeral services, kidney dialysis centers, and physicians, nearly 99% of all material generated is accounted for. Note that this accounting of the sources of the waste says nothing about how such waste is disposed of or otherwise managed. As

discussed in Section C.1. and C.3. some waste is rendered non-infectious in house, some waste is disposed of off-site, and a relatively small percentage of waste is dealt with in other ways, primarily by being disposed of via sanitary sewer.

- c. **Combined Waste Generation - All Sources:** Generation totals from all generators were sorted by quantity from the 1990 annual generator reports and are presented in tons per year in Table 9 below:

TABLE 9

RMW WASTE GENERATION SUMMARY - ALL GENERATORS

	NO. REPORTED	MEAN LBS/YR	TOTAL TONS/YR
General Hospitals	101	331,488.31	16,740.16
Commercial Testing Labs	58	38,025.86	1,102.75
Medical Labs	126	14,696.67	925.89
Doctors of Medicine-Off. & Clinics	3,340	207.55	346.92
Kidney Dialysis Centers	11	37,941.00	208.68
Funeral Serv. & Crematories	378	668.34	126.32
Special Hospitals	24	8,216.63	98.60
Psychiatric Hospitals	14	13,421.31	94.02
Research & Dev. Labs	20	120,480.00	60.24
Colleges, Univ. & Prof. Schools	21	5,501.19	57.76
Skilled Nursing Care Facil.	198	565.75	56.01
Health & Allied Serv.	25	4,006.60	50.08
Dentists Offices & Clinics	2,574	36.23	46.61
Health Departments	40	1,749.18	34.98
Veterinary Services	350	167.52	29.32
Home Health Care Services	68	249.90	10.03
Nursing & Personal Care Facil.	46	424.63	9.77
Pharmacies	13	1,173.00	7.62
Health Practitioners Off. & Clinics	53	238.68	6.33
National Security	4	2,333.50	4.67
Podiatrist Offices & Clinics	326	17.94	2.92

Intermediate Nursing Care Facil.	13	301.54	1.96
Correctional Facilities	17	190.59	1.62
Special Outpatient Facilities	58	49.88	1.45
Elementary & Secondary Schools	301	2.38	0.36
Miscellaneous	10	37.10	0.19
TOTAL	8,189		20,025.26

- d. **Composition Analysis:** In this subsection, the breakdown into classes of RMW generated is quantified for 1990. The AGR required the reporting of RMW by classes 1 through 7 (see definitions at N.J.A.C. 7:26-3A.6(a)). This enables the department to determine the nature of the wastestream and any variation in the method of disposal for different classes of RMW.

Waste from all sources was sorted and analyzed by waste class. It is clear that Class 3 wastes (human blood and blood products) is the largest category. Class 1 wastes (cultures and stocks of infectious agents and biologicals) also contribute a large portion, as does Class 4 (needles, syringes and sharps). Class 2 (pathological) wastes and Class 6 (isolation) wastes also contributed significant amounts. It must be noted that Class 6 quantities may not be an accurate account of the isolation waste generated. While analyzing the 1990 annual reports it was discovered that many large generators separated and reported non-regulated medical waste also known as overclassified waste, as Class 6. Provisions have been made in the logging and annual reporting forms to correct this problem. Together, Classes 1, 2, 3, 4 and 6 contribute 98.8% of the total waste generated. Classes 5 (animal waste) and 7 (unused sharps), provide very small contributions to the total material generated. The proportion of RMW of each class is shown in Figure 7.

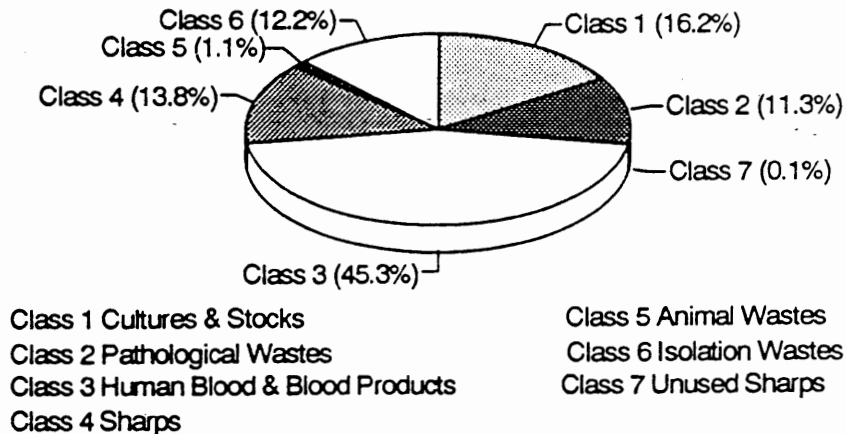
- e. **Additional Data:** Other aspects of the health care facility data are interesting. For instance, hospitals report generation, and incineration (for those that incinerate) of what appears to be a large quantity of Class 3 wastes, blood and blood products. This class also includes items saturated with blood, such as drapes, disposable pads, etc. which could result from surgical procedures. Apparently, hospitals choose to classify much of this material as Class 3 waste.

It is also noteworthy how little waste is generated as a result of residential health care agency activities. It is probable that this low quantity reflects a type of patient care that normally does not result in generation of RMW.

Based on the 1990 federal census figures and the first AGR (1990) there are approximately 5.2 lbs of RMW per person, or 28.5 lbs per patient, generated each year in New Jersey.

FIGURE 7

RMW COMPOSITION ANALYSIS



- f. **Generation Analysis by County:** One of the most critical components of this RMW State Plan is the county-by-county analysis of generation and the availability of disposal capacity. From this analysis a general indication of how each solid waste district (county) fares in terms of being self-sufficient in terms of RMW disposal capacity and opportunities for the regionalization of disposal facilities can be assessed. To carry out such an analysis, it is necessary to have data about both RMW generation on a county-by-county basis and treatment and destruction capacity. It is helpful, for planning purposes, to know the amount of RMW generated in any county as compared to county population and to hospital beds per county.

From the 1990 generator annual reports, data concerning the weight generated by county was consolidated. Total weights generated by county were compared to 1990 population totals also by county. The results are shown in Figure 8. The data concerning county populations and weights of RMW generated were also compared to hospital beds per county. See Figure 8a and Table 10.

It is clear that the ratio of population to RMW generated varies considerably from county to county. This variance may reflect a higher proportion of health care facilities in certain counties. Demographic differences, such as income available for medical care, could also be partly responsible. Conceivably, differences in reporting could also be a factor.

FIGURE 8

RMW GENERATED BY COUNTY AND POPULATION

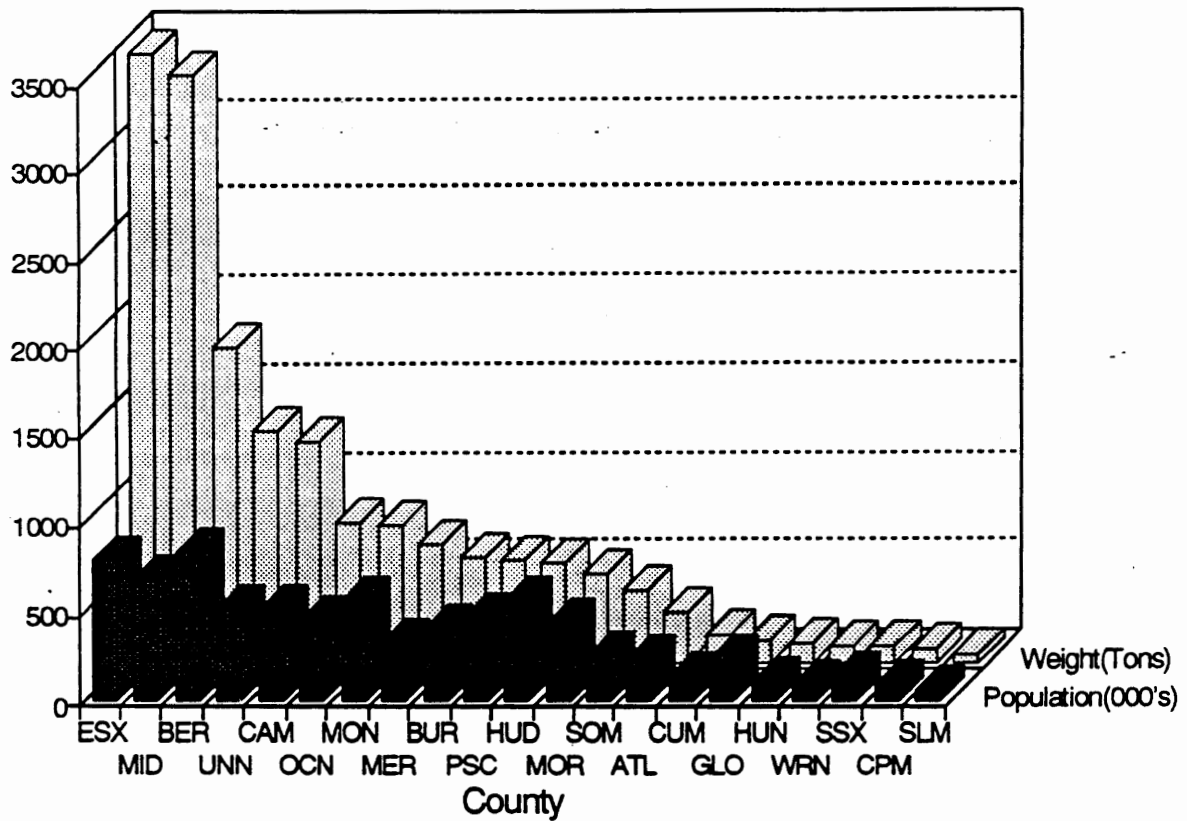


TABLE 10

RMW GENERATED BY HOSPITALS PER COUNTY PER YEAR

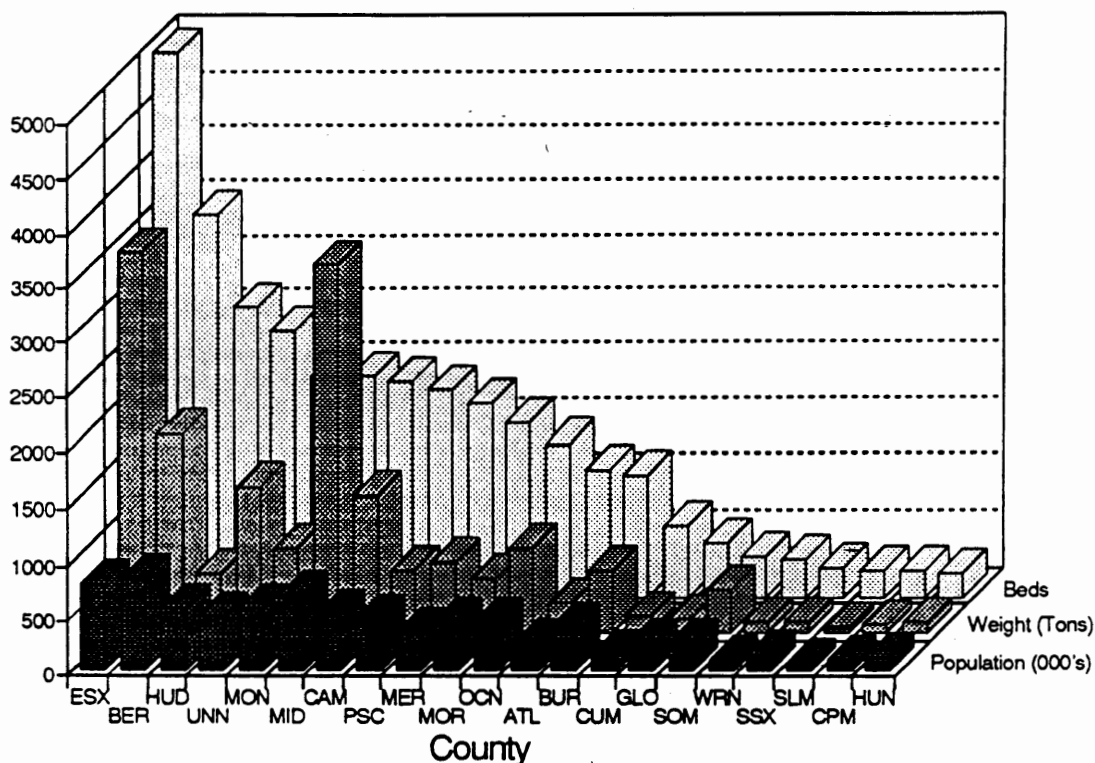
County	All Generators Tons Generated	1990 Census Population (Thousands)	Estimated Number of Beds/ County	Hospital Tons Generated	Waste Generated Pounds/Bed/ Year
Salem	48.35	65	243	44.75	368.27
Cape May	76.57	95	239	70.71	591.67
Sussex	90.44	131	271	85.14	628.31

Warren	98.91	92	320	93.41	583.83
Hunterdon	459.75	108	202	104.32	1,032.92
Gloucester	133.97	230	485	113.11	466.43
Cumberland	160.85	138	631	146.93	465.72
Atlantic	311.72	224	1,125	271.79	483.18
Somerset	585.84	240	374	394.37	2,108.94
Morris	553.48	421	1,547	487.54	630.30
Hudson	603.04	553	2,605	542.23	416.30
Passaic	586.34	453	1,831	563.08	615.05
Burlington	690.66	395	1,078	577.44	1,071.32
Mercer	975.57	326	1,706	649.81	761.79
Monmouth	805.77	553	1,966	762.84	776.03
Ocean	832.96	433	1,360	774.53	1,139.01
Camden	1,319.43	503	1,907	1,235.52	1,295.77
Union	1,627.93	494	2,385	1,301.33	1,091.27
Bergen	2,591.07	825	3,457	1,772.74	1,025.59
Middlesex	3,605.60	672	1,950	3,311.65	3,396.57
Essex	3,866.99	778	4,922	3,436.93	1,396.56
21	20,025.23	7,729	30,604	16,740.16	1,093.99

The data in Table 10 above provides information on the amount of RMW (in pounds) generated annually per bed on a county-by-county basis. This information is based on hospital generated RMW. Table 10 shows a wide variation in RMW lbs/bed/year from one county to another. The values vary from a low of 368 lbs/bed/year generated in Salem County to a high of 3396 lbs/bed/year in Middlesex County. These variations may indicate over-classification, differences in medical conditions being treated and their attendant wastes or other factors yet to be determined. Table 10 also provides data on total RMW generated per county and 1990 county census population in thousands for purposes of comparison. Figure 8a illustrates graphically the information about hospital RMW lbs/bed/year on a county basis.

FIGURE 8a

RMW GENERATED BY COUNTY - POPULATION & BEDS



(Source: 1990 Annual Generator Report-Regulated Medical Waste)

- g. **Future Reporting:** The DEPE is collecting data that should continue to provide a detailed and even more accurate picture of the generation and management of RMW in New Jersey. Pursuant to the regulations that became effective in June of 1989, generators, transporters, and intermediate handler/destination facilities are required to provide annual reports concerning their RMW activities. As future AGR data is compiled from generators, trends in generation will become apparent. Further, the registration process itself, which is still adding up to approximately one thousand new generators each year, will provide considerable information enabling the DEPE to profile the regulated community even further regarding the generation and management of RMW.

3. Current Collection, Transportation and Disposal Trends

A wide range of specific topics related to collection, transportation and disposal of RMW are covered in this section. The procedures for packaging, tracking and transporting RMW will be described in detail in this section. Also included are origin of transporter data, various aspects of disposal practices, costs of transportation and disposal, and an analysis of on-site treatment and destruction capacity in New Jersey. Sections C.3. a,b,c and d will give a clear picture of the management of RMW from packaging by the generator through the transportation phase to delivery to the disposal facility. Sections C.3.e. and C.3.f. provide information on amounts of RMW transported, methods of transportation, disposal methods, locations of disposal facilities (in-state and out-of-state), and comparisons of AGR data and transporter data. In Section C.3.g., the costs of transportation and disposal are investigated. Under Section C.3.h., there will be found a county-by-county analysis of on-site treatment and destruction capacities for incinerators and alternate technologies.

- a. New Industries:** The present medical waste regulations have created opportunities for new businesses to develop that are applicable to collection, transportation, and disposal. Firms specializing in packaging and collection and transportation of RMW have developed in response to the demands of the regulated community. Certain aspects of these businesses are clear, such as the use of step vans and similar trucks instead of packer trucks by transporters. Other aspects, such as the development of businesses employing a new technology to treat or destroy RMW, are being conceptually developed, and are expected to begin operation soon after publication of this RMW State Plan and the lifting of the moratorium on the establishment of new RMW disposal facilities. Additionally, there are already many chemical and microwave treatment units in use at hospitals throughout the state. Much of the data which follow, in Sections C.3.e. and C.3.f., based on the 1990 transporter data and the 1990 AGR, provide outlines of some of these new types of businesses and the scopes of their operation at this time. Additional information is provided regarding the existence of medical waste treatment systems in New Jersey's medical waste facilities today.
- b. Tracking System:** The foundation of the state's medical waste program is the tracking system. New Jersey requires that all RMW that is generated, stored, transferred, treated, destroyed or disposed of in-state and out-of-state be handled and managed properly from the point of generation to the point of disposal. The best assurance for proper management is to establish a chain of custody to establish documentation of the handling of the wastes prior to ultimate disposal. This chain of custody system also importantly requires each person to recognize they are taking responsibility for the proper handling of the waste while it is in their possession thus ensuring the consistent awareness of the presence of RMW toward its safe and proper handling and disposal. The tracking system consists of a New Jersey Medical Waste Tracking Form, with four carbon copies, which contains

information concerning the RMW being transported. Each person that handles the waste, the generator, transporter and destination facility is responsible for completing certain portions of the form. Figure 9 below is an explanation and an example of a completed medical waste tracking form.

The tracking form is initiated by the generator when RMW is readied for shipment off-site for treatment or disposal. The generator completes the generator portion of the form (Boxes 1-15). Boxes 1-8 include information as to who generated it, who will transport it and where it should be disposed of. The generator documents on the tracking form how much medical waste is being shipped off site by indicating how many containers and their total weight (boxes 12 & 13). The generator should note any special handling instructions at box 14. The generator then signs/dates the form at box 15 to certify that this information is correct. The transporter at box 16 then signs/dates the form to certify the receipt of the RMW described in boxes 11-13. The generator receives Copy 4 of this four copy form at this time. These tracking forms must be kept as records of disposal practices for at least three years per the RMW rule.

The next step is the transporter's responsibility to complete. The tracking form copies 1, 2 and 3 are kept by the transporter and accompany the waste to the destination facility. If the waste is given to a second transporter or an intermediate handler, boxes 17 through 21 must be completed. Once the transporter arrives at the destination facility, the destination facility assumes responsibility for the tracking form and the medical waste by signing/dating the destination facility certification, box 22, and noting any discrepancies at box 23. The transporter receives Copy 3 of the four page tracking form at this time. The transporter must keep this copy of these tracking forms for a period of three years as records of the RMW transported by the company.

The next step in the RMW tracking system is the destination facility's responsibility for compliance. The destination facility keeps Copy 2 of the four page tracking form for his facility records for a period not less than three years. The destination facility completes the medical waste tracking chain by mailing Copy 1 of the completed four page tracking form back to the generator. When the generator receives this correct and completed copy, he is assured that his medical waste was properly managed during transport and has reached its designated disposal site.

Whenever this RMW tracking system chain of custody is not completed properly, such as variations in the number or weight of the shipment, variation of the waste by categories, broken, torn or leaking packaging, or missing or incomplete tracking forms, the system assures identification of the potential mismanagement of the RMW. Exception and discrepancy reports are required so that state officials are notified of mismanagement. Investigations as to why the medical waste was mismanaged can then follow. The system can be adapted for any RMW that is



State of New Jersey
Department of Environmental Protection and Energy
Division of Solid Waste Management
CN 414 Trenton, NJ 08625



Please print or type.

In case of an emergency discharge, immediately call Environmental Protection and Energy at (609) 292-7172 (24 hours a day)

TRACKING FORM - REGULATED MEDICAL WASTE (RMW)

INSTRUCTIONS FOR COMPLETING RMW TRACKING FORM

- Copy 1 - GENERATOR COPY: Mailed by Destination Facility to Generator
Copy 2 - DESTINATION FACILITY COPY: Retained by Destination Facility
Copy 3 - TRANSPORTER COPY: Retained by Transporter
Copy 4 - GENERATOR COPY: Retained by Generator

As required under N.J.A.C. 7:26-3A:

- This multicopy (4-page) shipping document must accompany each shipment of regulated medical waste generated in NJ and/or all shipments in transit to NJ.
- Items numbered 1-14 must be completed before the generator can sign the certification. Item 22 must be completed by the destination facility.

For assistance in completing this form, you may contact the NJDEPE Bureau of Medical Waste and Residuals Planning at (609) 530-8599.

INSTRUCTIONS

16. Transporter 1 (Certification of Receipt of RMW as described in items 11, 12, & 13)

JOE SMITH
Printed/Typed Name

Joe Smith
Signature

9/14/93
Date

17. Transporter 2 or Intermediate Handler
(name and address)

18. Telephone Number
()

19. State Transporter
Permit or ID No.

20. Transporter 2 or Intermediate Handler (Certification of Receipt of RMW as described in items 11, 12, & 13)

Printed/Typed Name

Signature

Date

21. New Tracking Form Number (for consolidated or remanifested RMW)

22. Destination Facility (Certification of Receipt of RMW as described in items 11, 12, & 13)

☒ Received in accordance with items 11, 12, & 13

BILL BURN
Printed/Typed Name

Bill Burn
Signature

9/15/93
Date

(If other than destination facility, indicate address, phone, and permit or ID no. in box 14.)

23. Discrepancy Box (Any discrepancies should be noted by item number and initials)

TRANSPORTER

DESTINATION

GENERATOR

1. Generator's Name and Mailing Address

JOHN B. DOE
1 MAIN STREET
ANYTOWN, NJ (ZIP)

2. Tracking Form Number

528412

4. State Permit or ID No.

0123456

3. Telephone Number (201) 123-4567

5. Transporter's Name and Mailing Address

MR. SMITH'S TRANSPORT CO.
1 SOUTH STREET
ANYTOWN, NJ (ZIP)

6. Telephone Number

(201) 981-6543

7. State Transporter Permit or ID No.

NJS000012345

8. Destination Facility Name and Address

DISPOSAL FACILITY, INC.
1 NORTH STREET
ANYTOWN, NJ (ZIP)

9. Telephone Number

(609) 123-4567

10. State Permit or ID No.

0341A1SD01

11. New Jersey Waste Description

a. RMW (Untreated)

12. Total No.
Containers

2

13. Total Weight
or Volume

10 lbs.

b. RMW (Treated)

c. State RMW

14. Additional & Central Collection Point Information

NONE

15. Generator's Certification:

Under penalty of criminal and civil prosecution for the making or submission of false statements, representations, or omissions, I declare, on behalf of the generator **JOHN B. DOE** that the contents of this consignment are fully and accurately described above and are classified, packaged, marked, and labeled in accordance with all applicable State and Federal laws and regulations, and that I have been authorized, in writing, to make such declarations by the person in charge of the generator's operation.

JOHN B. DOE
Printed/Typed Name

John B. Doe
Signature

9/14/93
Date

Copy 1 GENERATOR COPY (White): Mailed by Destination Facility to Generator
Copy 2 DESTINATION FACILITY COPY (Yellow): Retained by Destination Facility

Copy 3-TRANSPORTER COPY (Pink): Retained by Transporter
Copy 4-GENERATOR COPY (Goldenrod): Retained by Generator

FIGURE 9

transported by vehicle, shipped through the mail, transported by rail or transported to a foreign country.

In summary, all RMW that is generated, stored, transferred, treated, destroyed or disposed of in New Jersey must be handled and managed properly. The medical waste tracking system accomplishes this requirement by requiring generators to establish a chain of custody for their waste until it is ultimately disposed of. When this chain of custody fails to be completed properly, state officials are notified so investigations can be performed to ensure that medical wastes are properly managed in the State of New Jersey.

- c. **Pre-Transport Requirements:** The medical waste regulations attempt to ensure the proper management of RMW by establishing pre-transport, transportation and collection requirements; tracking system requirements are in effect throughout the process. Generators are required to meet six pre-transport requirements before their waste can be collected by RMW transporters. RMW transporters are also required to meet several transport and collection requirements before they can legally transport RMW.

Pre-transport requirements include segregation, packaging, storage, decontamination of certain reusable containers, labeling and marking. The generator must also initiate a tracking form for each batch of RMW separately disposed of. Each requirement will be briefly addressed below.

Segregation: All RMW must be segregated from non-regulated waste and then further segregated when practicable into three separate categories. The first category consists of sharps and sharps containing residual fluids. The second category includes fluids where quantities are greater than 20 cubic centimeters. The third category combines all other RMW.

Packaging: All RMW must also be packaged safely. Generators may use one or more containers to meet packaging requirements. These requirements include containers that are rigid, leak resistant, impervious to moisture, resistant to tearing or bursting, and sealed to prevent leakage. Special care must be taken when packaging sharps and fluids. In addition to the previously mentioned general requirements, sharps containers must be puncture-resistant and fluids containers must be placed in break resistant, tightly lidded or stoppered containers.

Storage: Prior to transport, RMW must be stored in accordance with the regulations. All waste must be stored in a manner and location that maintains the integrity of the packaging and provides protection from water, rain, and wind. The waste must be maintained in a nonputrescent state and refrigerated when necessary. Outdoor storage areas must be locked to prevent unauthorized access. On-site storage areas must be limited to authorized employees. RMW must be stored in a

manner that affords protection from animals and does not provide a breeding place or food source for insects and rodents.

Decontamination of Reusable Containers: RMW regulations also set requirements for the decontamination of reusable containers. All non-rigid packaging and inner liners can not be re-used. Any container used for storage or transport, which is designated for re-use, must be decontaminated if the container shows signs of visible contamination. Any container not capable of being rendered free of any visible signs of contamination must be managed as RMW.

Labeling: Labeling requirements specify that packages must be labeled by the generator with a water-resistant label which states "MEDICAL WASTE" or "INFECTIOUS WASTE" or displays the universal biohazard symbol. Red bags which have been used as inner packages do not have to be labeled with these terms or symbols, but must meet marking requirements. Packages containing treated RMW, that was rendered non-infectious, do not need to be labeled with the term "MEDICAL WASTE" or with the universal biohazard symbol. Figure 10 depicts the labeling requirements for inner and outer containers of RMW.

Marking: The next pre-transport requirement states that all packages are subject to marking requirements on their outermost surfaces. All packages ready for transport must have a water-resistant tag which provides the generator's name, address, and DEPE issued RMW identification number and the transporter's name, address and DEPE issued RMW identification number. The identification tag also must include the date of the shipment and identification that the contents of the container are medical waste. In addition, if the package contains inner containers, each inner container must include a water-resistant tag that has the generator's name and address. Even RMW which has been treated to substantially reduce or eliminate its potential for causing disease, must still be marked according to these requirements. Figures 10 and 10a, below, depict marking requirements for containers and packages of untreated and treated RMWs as well as the labeling requirements referenced above.

Further, regulations state that a New Jersey Medical Waste Tracking Form must be completed and ready to accompany the RMW. The medical waste tracking form records and provides certification for the chain of custody of the medical waste from the generation site to the final destination facility. All six of the pre-transport requirements must be met as well as initiation of the tracking form before a RMW transporter is allowed to collect and transport RMW to a destination facility which accepts RMW.

- d. **Transporter Requirements:** After all pre-transport requirements are met, RMW may be collected by registered RMW transporters. Transporters are subject to specific licensing requirements before they are allowed by DEPE to collect RMW.

The first licensing requirement for a transporter is to register with the DEPE as a regulated medical waste transporter. The second is to register as a solid waste transporter and meet all solid waste regulation (N.J.A.C. 7:26-3) requirements. Third, a transporter must obtain an 'A-901' approval as required by the regulations at N.J.A.C. 7:26-16 et seq. Fourth, transporters must obtain a Certificate of Public Convenience and Necessity from the DEPE, Division of Solid Waste Management, Bureau of Registration. This certificate had been available from the Board of Public Utilities until their recent merger into the DEPE, as required by N.J.S.A. 48:13A-6. Additionally during the federal demonstration program that ended in June of 1991, transporters were required to notify the USEPA in writing of the company's intent to transport RMW and receive from the USEPA an identification number. Transporters must complete these licensing requirements before they can collect and transport RMW. In addition to licensing requirements, RMW transporters must maintain vehicles according to specific requirements. First, all transporters must meet all vehicle requirements of the solid waste regulations (N.J.A.C. 7:26-3). Secondly, the vehicle must have a fully enclosed, leak-resistant cargo-carrying body and must be kept in good sanitary condition. Next, the RMW must not be subject to mechanical stress or compaction during loading, unloading and during transit. The cargo-carrying body shall be secured if left unattended. Lastly, vehicles are subject to identification requirements. The cargo-carrying body must, on two sides and on the back, have in letters a minimum of three inches in height, the company name, DEPE RMW identification number, and a sign, or the words affixed, "MEDICAL WASTE" or "REGULATED MEDICAL WASTE".

Transporters must follow other requirements during collection and transportation. They must not accept any RMW unless the outer surface of the container is labeled and marked. A completed New Jersey Medical Waste Tracking Form must accompany the waste. RMW may not be transported with any other type of solid waste unless the transporter treats both wastes as RMW. If more than one transporter handles the waste. This second or subsequent transporter must attach a water-resistant identification tag with the transporters name, DEPE RMW identification number, and date of receipt. Transporters are authorized by the RMW regulations to consolidate on a single tracking form, medical waste shipments of less than 220 pounds if they choose. They are required to maintain a transporter consolidation log indicating all shipments consolidated. Under the medical waste regulations, transporters are also required to submit a transporter report to the DEPE describing the source and disposition of all waste the company transported.

To summarize the RMW handling requirements for generators and transporters, the regulations attempt to ensure the proper management of RMW in New Jersey by establishing pre-transport requirements for generators and transportation requirements for transporters. Generators must segregate, package, mark and label the waste before it can be collected for disposal. Generators must also complete a tracking form which will accompany the waste until it reaches its disposal site.

Transporters of RMW must meet licensing and registration requirements in addition to vehicle requirements. Transporters may not accept the waste for transport unless it is properly segregated, packaged, marked and labeled. Transporters are also required to report to the DEPE generator sources, weights and disposal facility locations of the RMW. In addition, transporters can not accept a shipment if it is to be treated, transported, stored, transferred, destroyed, disposed of, or otherwise managed in New Jersey unless it is accompanied by a tracking form. Transporters are allowed to consolidate the tracking forms if the shipment is less than 220 pounds, though the DEPE is strongly considering a regulatory amendment to allow consolidation of larger quantities of RMW as described in Section B.10.

As of February 1, 1993, forty RMW transporters have completed the necessary requirements for registration with the DEPE. Seven transporters, identified by an asterisk ("*"), have a limited registration which enables them to transport only self-generated waste. Table 11 is a list of registered transporters. Before RMW generators give their RMW to a transporter or a disposal company, the generator should always confirm the current registration and permitting status of the RMW transporter or disposal company by contacting the DEPE at (609)530-8599.

TABLE 11
REGULATED MEDICAL WASTE TRANSPORTER LIST
(FEBRUARY 1, 1993)

	DEPE NUMBER	TRANSPORTER	CITY	STATE
1.	13638	Bridgeview Inc.	Morgantown	PA
2.	7885	BFI South Jersey	Cranbury	NJ
3.	16499	Chambers Waste Systems of NJ	Parsippany	NJ
4.	12029	Cifaloglio Inc	Landisville	NJ
5.	16301	Coast Medical Services Inc	Fair Haven	NJ
6.	0546	Consolidated Waste Services	Toms River	NJ
7.	16347	Controlled Medical Disposal Inc	Clark	NJ
8.	4323	Daniello Carting Co	White Plains	NY
9.	17593	Dicar Asbestos Ltd	Bronx	NY
10.	01125	DiMarco Disposal Srvs Inc	Elizabeth	NJ
11.	8326	Domenick Pucillo Disp	Hillside	NJ
12.	16348	East Coast Med Waste	Morrisville	PA

13.	16760	Environmental Control Co	New Hyde Pk	NY
14.	4377	Interboro Disposal	Hoboken	NJ
15.	2138	Interstate Waste Removal	Trenton	NJ
16.	12704	K.S. Processing	Marcus Hook	PA
17.	16321	Matlack	Wilmington	DE
18.	10707	Medical & Hazardous Waste Mgt	Bronx	NY
19.	11692	Medical Waste Sys.DBA Bio Sys	Warminster	PA
20.	11776	Medigen of New York	West Babylon	NY
21.	14994	MIT Waste Div Inc	Hammonton	NJ
22.	11679	Montrose Manning	Upper Darby	PA
23.	03312	Morris County Sanitation Serv Inc	E Hanover	NJ
24.	15499	Nappi Trucking	Matawan	NJ
25.	7006	National Waste Disposal	Trenton	NJ
26.	15986	Orchard Hill Memorial Pk	Warren	NJ
27.	17153	* Parkside Dialysis Ctr	Newark	NJ
28.	16568	* Raritan Bay Med. Ctr.	Perth Amboy	NJ
29.	9497	Regional Carting	Morganville	NJ
30.	16324	Rollins Env. Services	Bridgeport	NJ
31.	16092	S-J Transportation Co	Woodstown	NJ
32.	16218	* Schering Corp	Union	NJ
33.	2068	* Shore Memorial Hosp	Somers Pt	NJ
34.	16430	Solid Waste Technologies	Warren	NJ
35.	17523	* So Jersey Hospital Sys	Bridgetown	NJ
36.	17914	St Barnabas Medical Center	Livingston	NJ
37.	1479	T. J. Egan & Co	Bloomfield	NJ
38.	16824	The NDL Organization	Peekskill	NY
39.	14893	* West Jersey Health Sys	Camden	NJ
40.	2758	White Brothers Trucking	Elizabeth	NJ

* Limited Registration. Only Allowed to Transport Self-Generated Waste.

FIGURE 10

UNTREATED REGULATED MEDICAL WASTE PACKAGE

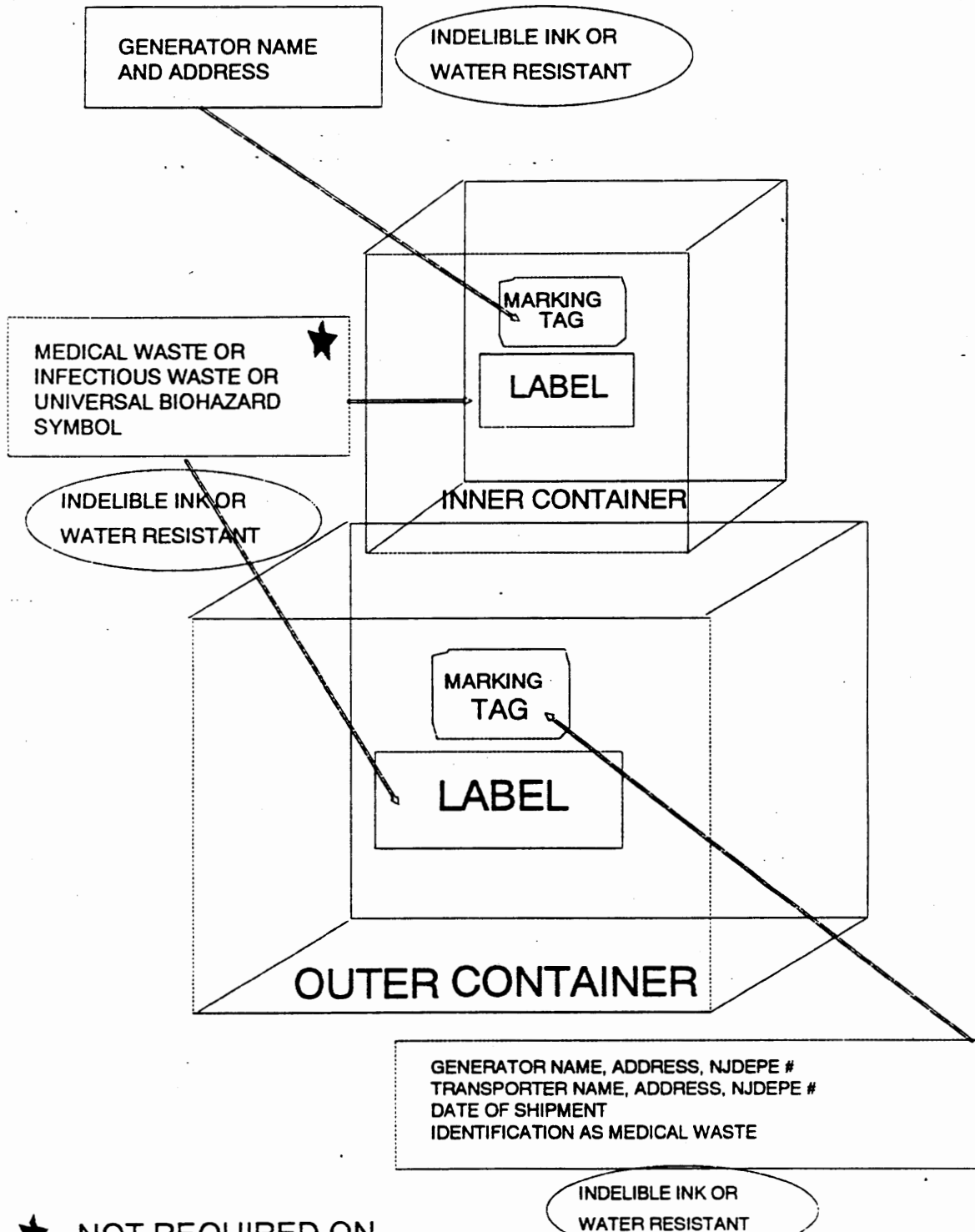
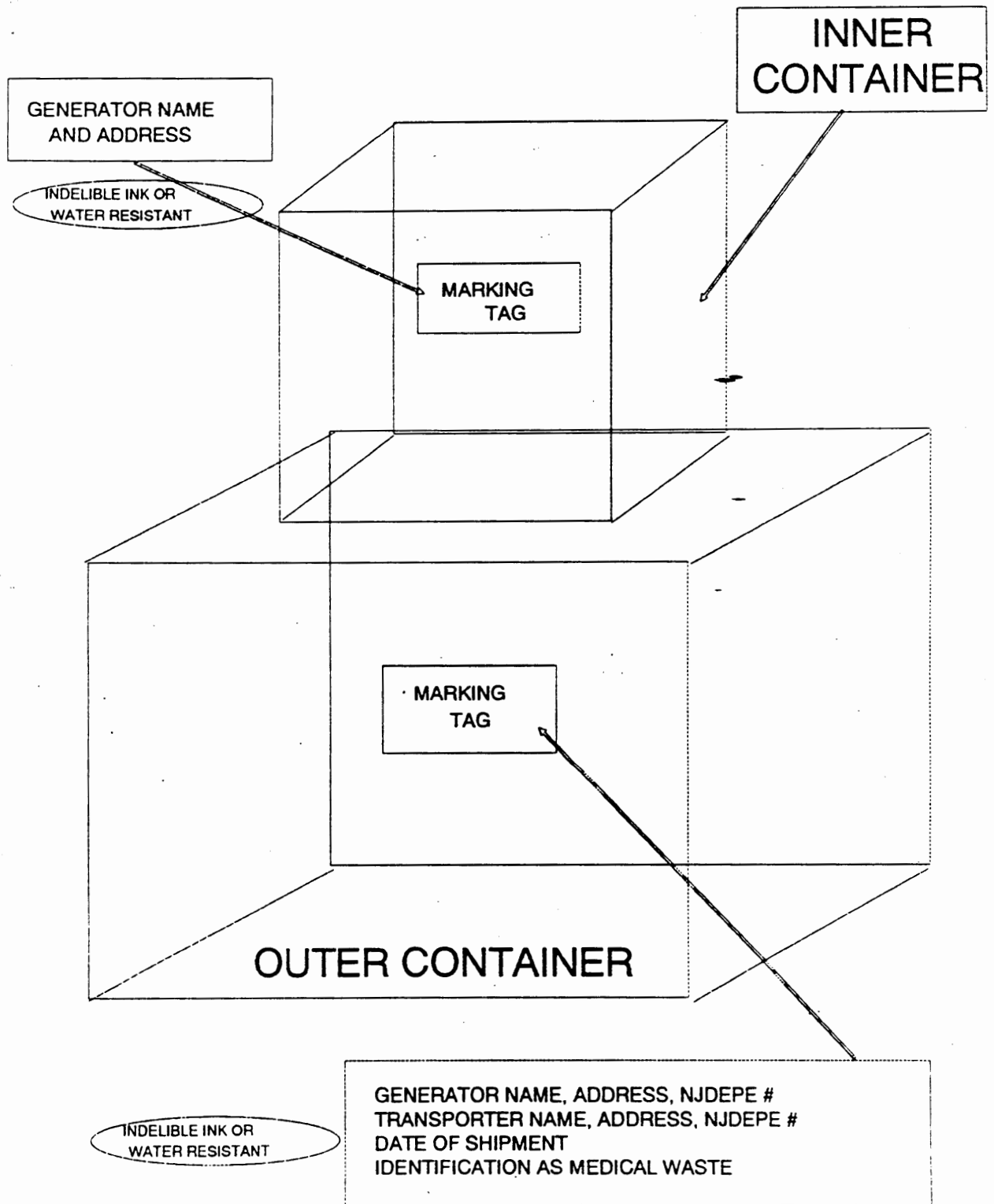


FIGURE 10a

TREATED REGULATED MEDICAL WASTE PACKAGE



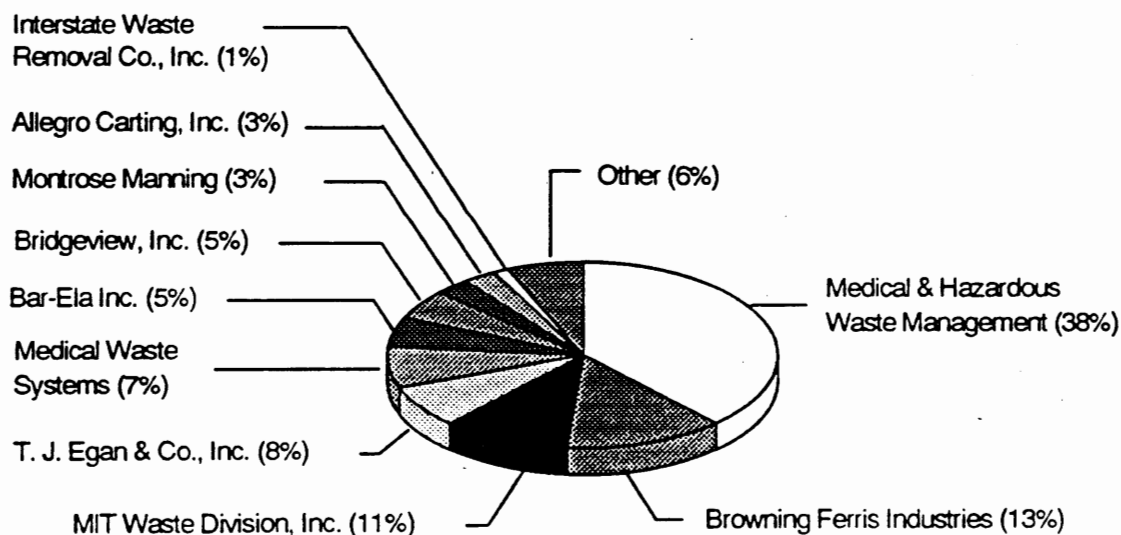
- e. **Transporter Data from 1990 Reports:** Data from two semi-annual transporter reports for registered transporters were used to identify principle RMW transporters. USEPA required four RMW transporter reports. These covered the following intervals:

1. June 23, 1989 to December 19, 1989
2. December 20, 1989 to June 17, 1990
3. June 18, 1990 to December 14, 1990 and
4. December 15, 1990 to June 12, 1991

The first two transporter reports that cover the interval of June 23, 1989 to June 17, 1990 correspond to the first AGR for generators that covers the interval of June 22, 1989 to June 21, 1990. The transporter data from the first and second RMW transporter reports is used in the following tables and figures. Transporter information, such as weights transported and name of transporter, was compiled. The ten transporters which accepted the largest amount of medical waste are depicted in the following graph. See Figure 11. Numerous smaller transporters hauling medical waste at the time of the survey were combined and are shown as "Other" on the graph.

FIGURE 11

LARGEST RMW TRANSPORTERS - 1990 TRANSPORTER REPORT DATA
(June 23, 1989 to June 17, 1990)

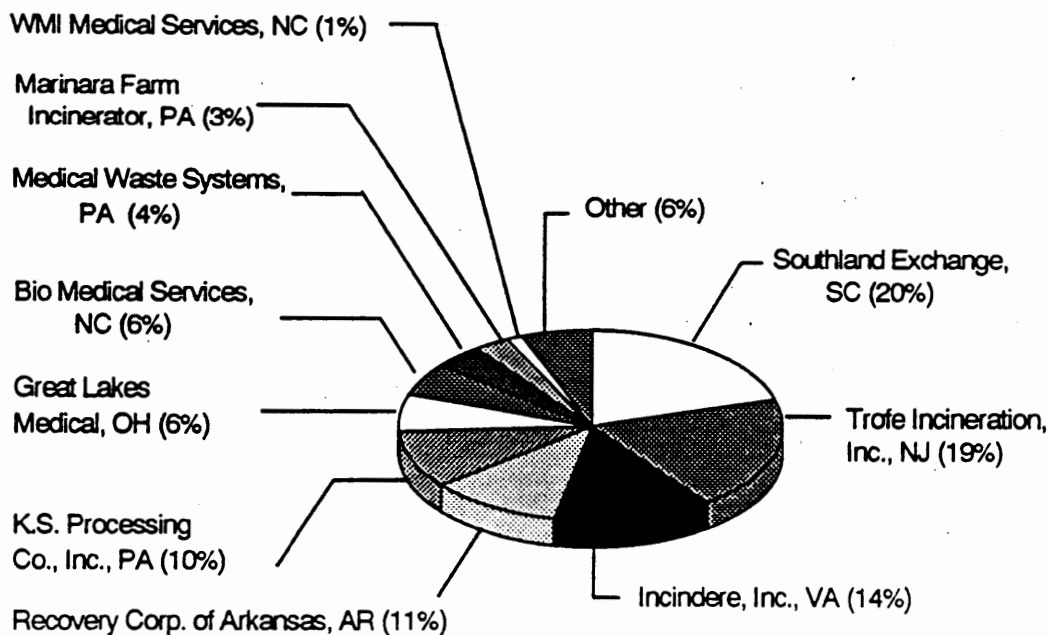


f. **Disposal Practices:** In section C.3.f. various aspects of disposal practices concerning RMW are reviewed. Transporting and self-transporting practices are reviewed as well as the use of the United States Postal Service for sending used sharps to disposal facilities. There is a brief description of RMW transported into New Jersey for disposal. Information is provided on in-state disposal and out-of-state transportation and disposal. With the exception of Trofe Incineration, now closed down, in-state disposal is predominately on-site, non-commercial. The section concludes with a comparison of AGR data and transporter data. This subsection (C.3.f.(4)) indicates that the quantity of RMW transported off-site as reported by generators correlates reasonably well with data from transporters concerning the quantities of RMW transported off-site.

(1) **In-State and Out-Of-State Facilities:** Data from two semi-annual transporter reports, June 23, 1989 to December 19, 1989 and December 20, 1990 to June 17, 1990, was used to identify major RMW disposal patterns and facilities. Disposal facility information was compiled from these reports. The disposal facilities that were reported as accepting the largest total quantities of RMW from transporters during the survey period are shown in Figure 12 below. Percentages shown in Figure 12 refer to the percentage of waste that the facility received of the total quantity that was transported. The ten largest facilities shown all incinerate the RMW they receive.

FIGURE 12

LARGEST RMW DISPOSAL FACILITIES - 1990 TRANSPORTER REPORT DATA
(June 23, 1989 - June 17, 1990)



Information used to generate Figure 12, above, was analyzed to determine final destination facility location, in-state and out-of-state. Also incorporated was information from the 1990 AGRs regarding how much waste was managed in-state. Of the commercial facilities, all but two, Trofe Incineration, Inc. and Rollins Environmental Services, are out-of-state. Except for Trofe Incineration, Inc., and Rollins Environmental Services that accept RMW, all in-state RMW facilities are non-commercial. Results of this analysis indicate that approximately 44% of the waste generated in New Jersey was disposed of in New Jersey. See Figure 13. Of that, 48% was incinerated on-site and 21% was transported to Trofe Incineration and Rollins Environmental Services. An additional 8% was managed on-site by generators by methods other than incineration including autoclaving, melting, and disinfection and grinding. Disposal by sewer system accounts for another 9% and the rest is disposed of by other methods. From the information contained in the 1990 AGR, it is not clear what quantity of the remaining 14% was stored on-site awaiting disposal and what quantities had already been disposed of by one of the above methods.

Figure 13 also shows that between June 23, 1989 and June 17, 1990 56% of the waste generated was disposed of out-of-state. Of that total, 80% was transported to incineration facilities, 5% was transported to treatment and destruction facilities, and 15% was transported to a treatment facility or a destruction facility or did not report what type of facility they transported to.

As shown in Figure 12, considerable quantities of RMW are being disposed of at facilities in South Carolina, Virginia, Pennsylvania and Arkansas. Lesser quantities of RMW are going to other out-of-state facilities as well. Trofe Incineration which was disposing of approximately 17% of New Jersey's RMW in 1990 ceased operations in November 1991. It is clear from more recent transporter data that the RMWs Trofe Incineration was handling have been diverted to out-of-state disposal facilities which substantially increases New Jersey's RMW export figure.

As part of the department's policy for solid waste disposal self-sufficiency, the department plans to encourage increasing in-state disposal facilities, both commercial and non-commercial. The use of alternative technologies such as chemical treatment, microwave treatment and autoclaving are being developed. Generally, a larger in-state disposal capacity for RMW will make New Jersey less vulnerable to arbitrary closings of out-of-state facilities and the attendant unfavorable national opinion of New Jersey being a waste exporter. The exclusive use of in-state facilities in the future will also reduce the costs of RMW disposal since long distance transport costs are a significant factor. The department expects to fully implement the policy of RMW self-sufficient management by 1997.

Also of interest is the portion of RMW which is disposed of via sanitary sewer. Essentially, the only waste disposed of this way during the survey period was Class

3 waste, which at the time of the survey included bulk bloods. Of the health care facilities, general hospitals generated about 72% of the Class 3 waste disposed of via sewer.

FIGURE 13

RMW MANAGEMENT PROFILE

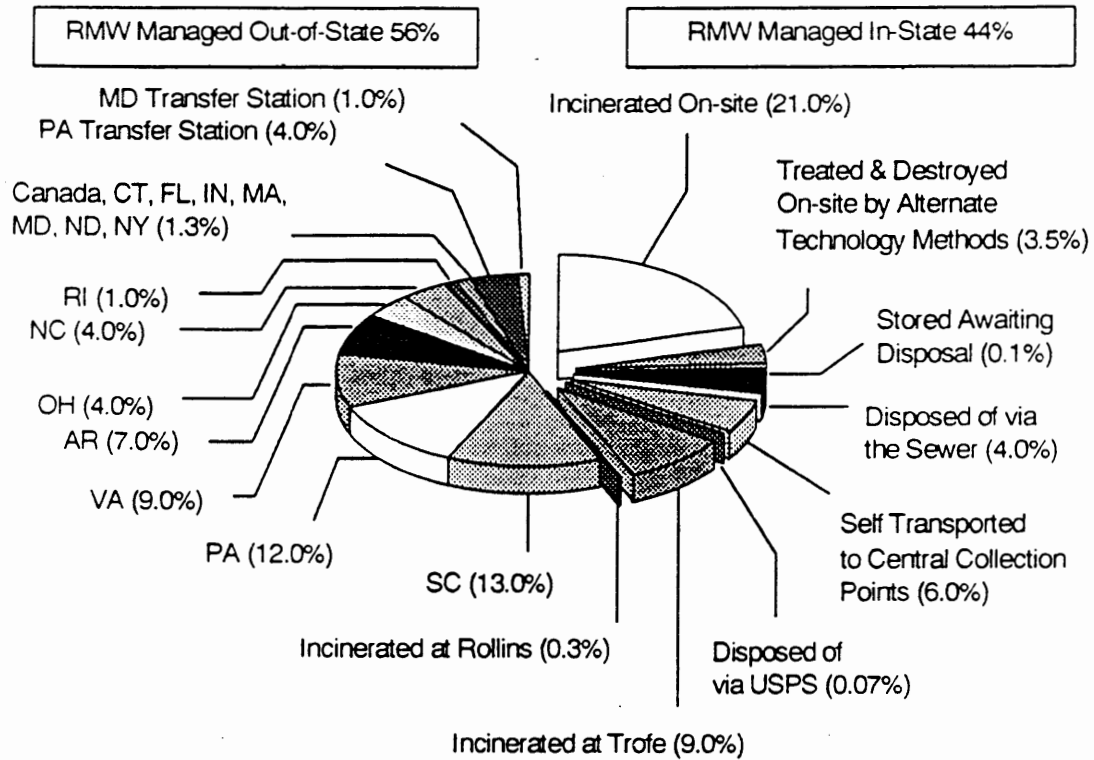
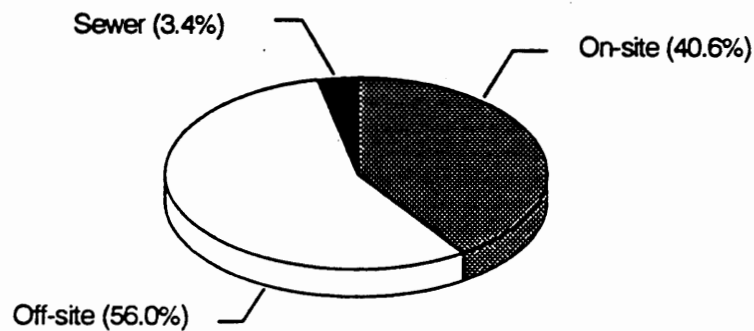


FIGURE 14

RMW TREATMENT SITES - 1990 AGR DATA



Commercial testing laboratories contributed another 9.5% of Class 3 waste disposed of in this manner. Another significant source of Class 3 waste disposed of via sewer is funeral homes. Virtually all waste generated by funeral homes falls into Class 3. Approximately 72 tons per year of the RMW from funeral homes consists of blood-soaked cloth and miscellaneous Class 3 wastes. The estimated contribution of funeral homes to sewer disposal is approximately 54 tons per year. This quantity was added to that of all generators to produce Figure 14. Overall, about 3% of the RMW generated in New Jersey during the survey period was Class 3 waste included in Category C, disposed of via sanitary sewer, as Figure 14 illustrates.

The portions of the RMW waste stream managed within the two other waste treatment categories, on-site treatment and off-site treatment, are also shown in Figure 14. In the 1990 survey, generators were asked to identify the classes of waste they generated; they were also asked to indicate under which "Category", A, B, or C, how the waste was managed. Essentially, Category A represented waste treated and destroyed on-site; Category B represented waste treated and destroyed off-site; and Category C represented waste handled in other ways. Survey results indicated that virtually all waste listed under Category C was disposed of via sewer. During the examination of the survey data, waste that appeared to be listed under more than one category was assigned to one category only to avoid double counting. See Part C.1.c. for a discussion on categories and classes of RMW.

It is important to emphasize that the RMW reported disposed of via sanitary sewer, primarily blood and blood products, is a minuscule component of the waste stream that enters New Jersey's sewage treatment plants daily. The approximate 700 tons per year of liquid waste described herein translates to about 500 extra gallons of sewage flow per day added to the total wastewater flow of the state; a flow that is measured in hundreds of millions of gallons per day.

It appears likely that the portion of RMW disposed of via sanitary sewer has increased since the initial stages of the RMW program in 1988. Several of the large health care facilities have installed units that shred and disinfect waste by addition of liquid disinfecting agents. These units dispose of the liquid portion of the treated waste stream, largely water and sodium hypochlorite (bleach) solution with a small amount of dissolved or suspended biosolids, to the sanitary sewer. While meaningful data on the quantity of liquid waste produced in this way was not available at the time of this report, it is likely that, despite these estimated increases, the quantities involved will have no noticeable impact on New Jersey's sewage treatment systems.

(2) Transporting & Self Transporting Practices: New Jersey regulations permit three modes of transportation for off-site management of RMW. First, all generators of RMW are required to have all types and classes of RMW transported by licensed RMW transporters if another person is transporting a generator's RMW. Second,

generators of less than three cubic feet of RMW per month may transport their own RMW of classes 4 and 7 (sharps and unused sharps) through the United States Postal Service. Lastly, small quantity generators (generators of less than three cubic feet or approximately 50 lb. of RMW per month) are permitted to self-transport their own RMW and are exempt from transporter registration requirements. Self-transport of all types and classes of RMW to another generator for storage or disposal is permitted by this class of generator.

Data was collected from transporters for the two semi-annual reporting periods, June 23, 1989 to December 19, 1989 and December 20, 1989 to June 17, 1990 and from generators for the period from June 22, 1989 to June 21, 1990. For analytical purposes, data was combined and unified where necessary and possible from both the generator and transporter reports. Information on mail-sharps companies was gathered by preliminary examination of AGRs for the period June 22, 1990 to June 21, 1991.

Data from the first AGR indicates that transport of RMW was achieved predominantly through the services of registered transporters, followed by self transport and lastly shipping through the United States Postal Service (Table 12 & Figure 17 in tons). Figures 15 and 16 show the relative percentages of RMW generators using registered transporters, the United States Postal Service or self-transporting. The remainder of the generators either stored their RMW for eventual disposal, disposed of their RMW through treatment and destruction on-site or the sanitary sewer system.

TABLE 12

1990 RMW TRANSPORTATION PROFILE

MANAGEMENT TRANSPORTATION METHOD	METHOD OF TRANSPORTATION	NUMBER OF GENERATORS	RMW TRANSPORTED (TONS)
Transported Off-Site	Registered Transporters	4,550	15,042
Transported Off-Site	United States Postal Service	666	13
Transported Off-Site	Self Transport	201	1,311
Other Methods	None	2,772	3,659
TOTALS		8,189	20,025

FIGURE 15

RMW GENERATOR TRANSPORTATION METHODS
1990 AGR DATA - ALL GENERATORS COMBINED

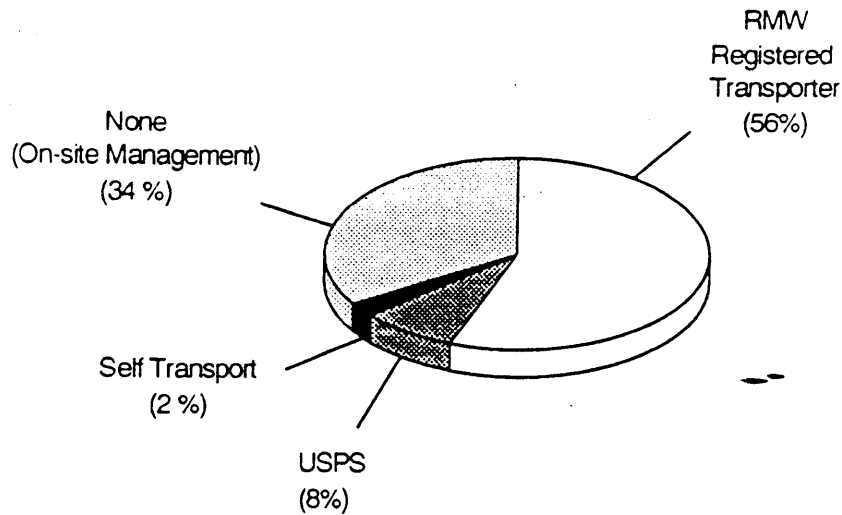
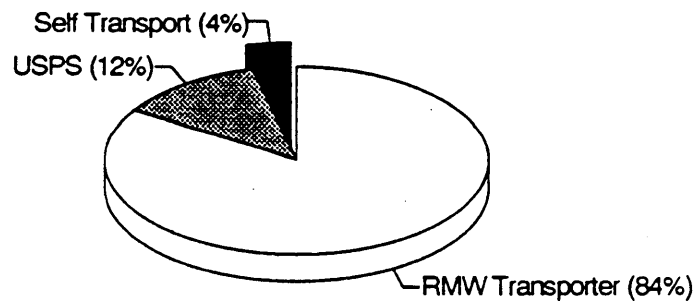


FIGURE 16

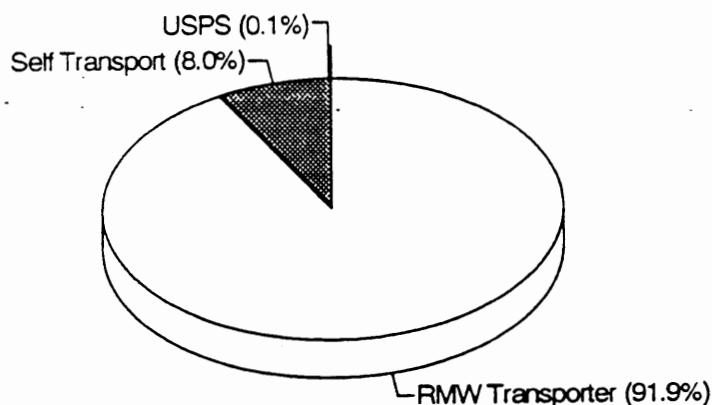
RMW TRANSPORTATION METHODS EXCLUDING ON-SITE MANAGEMENT
(1990 AGR Data - 5,417 Generators)



A large portion of RMW transported from the point of generation for off-site management and disposal was through registered transporters, while a small amount was self transported. The amount of RMW shipped via the United States Postal Service was approximately 1/10 of one per cent of all RMW generated in the state in 1990. (Figure 17)

FIGURE 17

RMW TRANSPORTED OFF-SITE
(1990 AGR Data - 16,366 Tons)



It was evident that many physicians and dentists and a few other generators responding to the AGR were confused with the term "unused sharps." Reports from these generators indicated unusually large quantities of Class 7 waste. Follow-up contacts with some generators revealed that many had included in the report under Class 7 waste quantities of their stored stock of new, unused sharps. The validity of reports on disposal of Class 7 (unused sharps) via United States Postal Service is suspect and thus this data has been excluded.

Thirty-three commercial transporters reported picking up 12,033 tons of RMW from generators. Typically, the largest group of generators that had pickups was that of physicians (Table 14 & Figure 18). Information presented in Table 14 and Figure 18 are averages of the number of generators from the first two semi-annual transporter reports. Averages were used to avoid counting generators twice who had RMW collected in both the reporting periods. However, hospitals contributed to the bulk of the RMW shipped off-site (Table 13 & Figures 19 - 21).

Figure 17, based on the first AGR, indicates that approximately 15,000 tons of RMW was transported off-site by RMW transporters (91.9% of 16,366 tons). The transporter reports as noted above indicate 12,033 tons were picked up from generators during the same time interval.

In addition to the 12,033 tons of RMW from N.J. generators as reported by transporters, 621 tons were transported from New York and Pennsylvania into New Jersey to this state's medical waste disposal facilities. Thus, the in-state and out-of-

state RMW shipments combined from the transporter reports show 12,654 tons of RMW transported by RMW transporters registered in New Jersey. Most of this RMW went to destination facilities except for 1,400 tons. Approximately half of this 1,400 tons, 700 tons, went to in-state transfer stations and 700 tons to out-of-state transfer stations. It is not known where the final disposal site was for RMW transported to out-of-state transfer stations. Approximately 600 of the 700 tons reported as transported to an in-state transfer station was formerly RMW that had been treated and destroyed by a grinding/chemical treatment method and was thereafter classified as municipal solid waste.

The transporter report form used during this time period was developed by USEPA and did not require further tracking by the initial transporter for RMW delivered to transfer stations or second transporters. While the use of generator tracking forms accompanying the RMW ensures the generator of proper disposition of the waste stream, the USEPA did not provide for data collection from this situation.

It is known at present, that a small amount of RMW can be reported twice through the AGR system. This situation arises when small generators (predominantly physicians) self-transported RMW to a larger generator (another physician or a hospital) for disposition. The larger generator will dispose of the RMW according to the requirements of the RMW regulations. However, both the small generator and larger generator might report the same waste in their AGR. DEPE is working with the generators to clarify reporting requirements and ensure that each generator reports only the RMW it actually generates as a result of its own operations. It is expected that this reporting error will decrease in future AGRs. As stated above, DEPE is working to determine other possible sources of the discrepancy between the transporter report and the first AGR.

Self-transport of RMW is often performed to transfer RMW to a central collection point that in many instances is another small quantity generator that is sometimes the generator's own main business site. At the central collection point, the RMW is consolidated for disposal by on-site treatment and destruction or eventual transport off-site using a registered RMW transporter.

This provision is favorable to small quantity generators since it means consolidation of costs, be it for treatment and destruction at the central collection point or pickup and disposal. Normally, facilities such as hospitals act as central collection points for small quantity generators affiliated with the hospitals. All central collection points are required to operate on a non-commercial basis or be permitted as commercial transfer stations. Since the allowance for the central collection point to accept RMW from other generators is based on its non-profitability because of the moratorium on commercial facilities, and disposal costs are bound to be largely minimized due to RMW consolidation, this would appear to be a useful method of collection and transport for small quantity generators. Data from the annual

generator reports indicates that 201 generators utilized self-transportation of RMW in New Jersey (Table 12).

Since the current New Jersey regulations place no time limit on off-site disposal of RMW, through the tracking system, that has been stored in accordance with the regulations at N.J.A.C. 7:26-3A, small quantity generators of RMW are allowed to accumulate and store their RMW for indefinite periods. The department is herein proposing to implement a time limit for the storage of RMW. A regulatory amendment is also under development that will incorporate this new storage period limit into the RMW rules. The DEPE believes that disposing of RMW at least once a year will not impose an onerous burden on small quantity generators while protecting human health and the environment.

TABLE 13

RMW TRANSPORTED OFF-SITE - ONE YEAR SUMMATION
(June 1989 - June 1990)

GENERATOR TYPE	UNTREATED RMW (Tons)	TREATED RMW(tons)	TOTAL RMW(Tons)
Hospitals	8,575	98	8,672
Laboratories	1,432	50	1,481
Clinics	832	102	934
Physicians	259	2	261
Dentists	31	0	31
Veterinarians	39	0	39
Long-term or Residential Health Care Fac	223	38	261
Blood Banks	67	0	67
Other	280	7	286
Totals	11,737	296	12,033

(Source: Transporter reports I & II)

TABLE 14

GENERATORS OF RMW TRANSPORTED OFF-SITE VIA REGISTERED TRANSPORTERS
(Six Month Average for June 1989 - June 1990)

GENERATOR TYPE	NUMBERS OF GENERATORS
Laboratories	302
Clinic	339
Physician	2,838
Dentist	548
Veterinarian	289
Long-term or Residential Health Care	216
Blood Banks	11
Other	551
Totals	5,093

(Source: Transporter Reports I & II)

FIGURE 18

GENERATOR OFF-SITE RMW TRANSPORTATION PROFILE:
(1990 Transporter Report Data - 5,228 Generators)

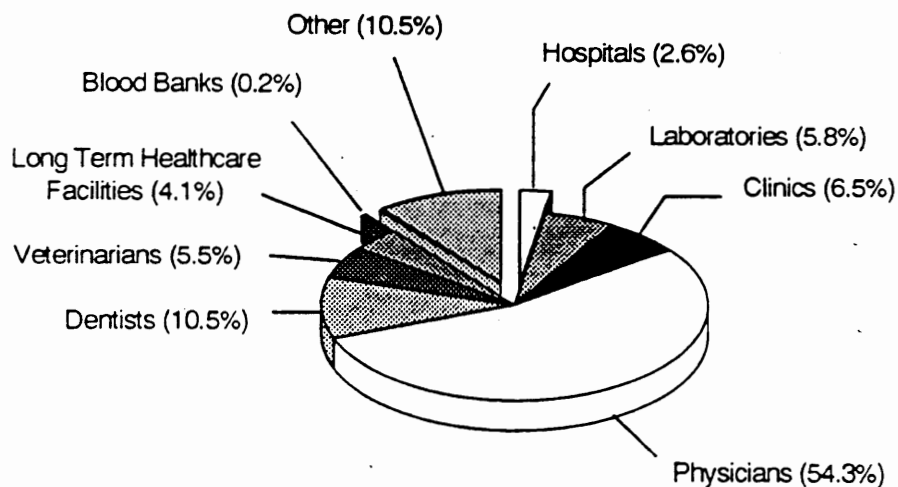


FIGURE 19

RMW TRANSPORTATION PROFILE: UNTREATED RMW SHIPPED OFF-SITE
(1990 Transporter Report Date - 11,737 Tons)

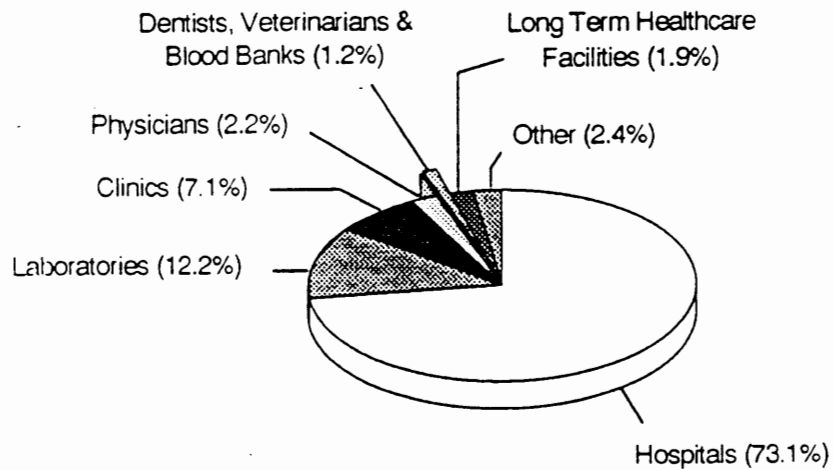


FIGURE 20

RMW TRANSPORTATION PROFILE: TREATED RMW SHIPPED OFF-SITE
(1990 Transporter Report Data - 296 Tons)

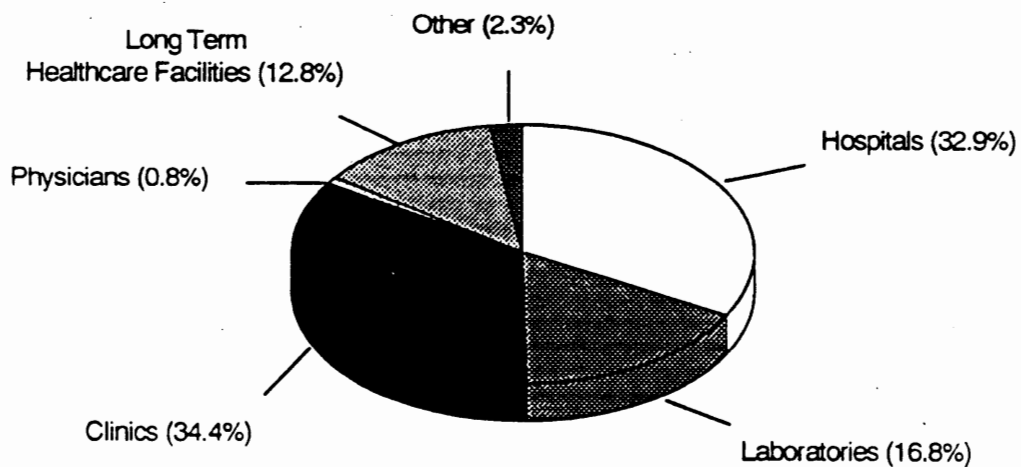
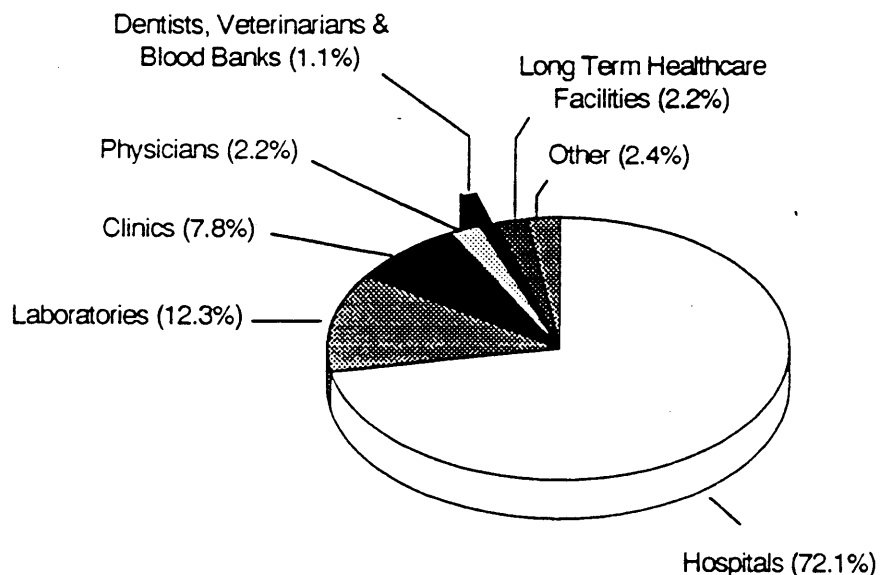


FIGURE 21

RMW TRANSPORTATION PROFILES: TOTAL RMW SHIPPED OFF-SITE
(1990 Transporter Report Data - 12,033 Tons)



Small quantity generators sometimes store their wastes for long periods and often, if their waste consists largely of Classes 4 & 7 RMW, choose to transport that RMW by the United States Postal Service. Present regulations allow mail shipment of RMW, only for Classes 4 and 7, and only via United States Postal Service registered mail. In 1990, 666 generators shipped approximately 13 tons of sharps through the mail (Table 12). The AGRs for 1991 indicate there were 2 known mail-sharps disposal companies in New Jersey and 13 out of state, accepting such sharps as needles and syringes for disposal (Table 15). As of February 1993, EZ Specialties, Inc., of New Jersey, is no longer permitted to accept Class 4 and Class 7 wastes in their New Jersey facilities from either New Jersey or out-of-state RMW generators. This company may provide mailing containers for generators to send RMW directly to out-of-state or future permitted in-state RMW disposal facilities. Medtex Int., Inc. and Medwaste Int., Inc., both of Michigan, also are prohibited from accepting Class 4 and Class 7 wastes, according to the Michigan Attorney General's Office. These companies are under indictment by the State of Michigan as of February 1993 and have come to an agreement with postal authorities whereby they will no longer operate a mail receiving facility for sharps. The out-of-state facilities listed in Table 15 are neither being recommended nor have been investigated by the department to assure their operation is in accordance with all requirements. Generators should satisfy themselves of a facility's compliance with regulatory requirements before sending RMW there for disposal.

TABLE 15

FACILITIES ACCEPTING SHARPS VIA UNITED STATES POSTAL SERVICE

(Source: Annual Generator Report 1991)

NAME	ADDRESS	CITY & STATE	ZIP
Stericycle	1700 N Airport Rd	W Memphis AR	72301
Gala Systems	1300 15th St	Denver CO	80202
Isolyser Co., Inc.	4350 Inter Blvd	Norcross GA	30093
Sytech Medical Co.	9851 Gross Point Rd	Skokie IL	60076
Integrated Med Waste Mgmt.	5610 W 82nd St	Indianapolis IN	46278
Medical SafeTec	5610 W 82nd St	Indianapolis IN	46278
Precision Energy Sys.	54 N County Rd- 400E	Valpraiso IN	46382
Medtex Int. Inc.	4403 Empire Way	Lansing MI	48917
Medwaste Systems Intl., Inc.	4403 Empire Way	Lansing MI	48917
EZ Specialties Inc.	77-83 Second Ave	Paterson NJ	07514
Orchard Hill Spec Waste	75 Stirling Rd	Warren NJ	07059
Bridgeview	Box 364 RR 1	Morgantown PA	19543
Pro Sharps (EMSI)	111 W Mockingbird La	Dallas TX	75247
WMI Medical Serv. of Texas	410 Industrial Blvd	Tersell TX	75610
Sharps Disposal Inc.	145 W 4500 South	Murray UT	84107

* Receiving facilities not permitted to accept Class 4 and Class 7 RMW from New Jersey RMW generators.

(3) Out-Of-State Generators RMW: In addition to the RMW generated in New Jersey, there is RMW generated out-of-state and transported to New Jersey facilities for treatment and destruction. The following table (Table 16) contains information obtained from the first, second and third intermediate handler and destination facility reports showing the amounts of RMW managed, all was incinerated, for 1989, 90 and 91 at New Jersey commercial facilities. The acceptance of out-of-state RMW at these facilities had no significant impact on New Jersey's facilities' capability of managing RMW. Small amounts of New Jersey's RMW are also collected by companies coordinating RMW shipments via U.S. Postal Service (Section C.3.f.(2) above). These small quantities of RMW are shipped out-of-state as of April 1993, but should pose no problem for disposal at future New Jersey facilities because of the small quantities involved.

In the future, according to the Comprehensive Act, each county must develop capacity for RMW generated in the county (See Section B.2.). Therefore any RMW disposal facility accepting RMW from out-of-state sources must first be able to assure the county or region of New Jersey the facility will be able to manage the waste directed to it from New Jersey sources before accepting out-of-state waste.

TABLE 16

RMW DISPOSED OF AT NEW JERSEY COMMERCIAL FACILITIES (1989-91)

YEAR	FACILITY	CITY	COUNTY	IN-STATE RMW (tons)	OUT-OF-STATE RMW (tons)
1989	Rollins	Bridgeport	Gloucester	6	3
	Trofe	Mt. Laurel	Burlington	797	641
	Total			803	644
1990	Rollins	Bridgeport	Gloucester	72	36
	Trofe	Mt. Laurel	Burlington	1,428	1,845
	Total			1,500	1,881
1991	Rollins	Bridgeport	Gloucester	-16	14
	Trofe	Mt. Laurel	Burlington	438	674
	Total			454	687
Total				2,757	3,212

(Source: Intermediate Handler & Destination Facility Annual DEPE Reports I, II & III)

(4) Comparison of AGR Data and Transporter Data: The purpose of data collection of RMW management information is to determine what practices are occurring and then to use this information to plan for better management of the RMW disposal practices in the future. The methodology for collecting the 1990 AGR data and the 1990 transporter data has been explained previously (see C.1.b.,c. and d.; also C.3.e). In Table 17 shown below, data is presented from the first and second transporter six month reports which comprise the 1990 transporter report data, and from the 1990 AGR.

The data from the 1990 AGR used in the following discussion is limited to that for RMW generators that generated 300 pounds per year or more of RMW. This was

done for purposes of ease in handling the data and included 807 generators out of a population of 8189. Analyzing the data from the entire group of 8189 generators would be time consuming and cumbersome. The amount of RMW being analyzed in this manner is over 99%, 19,891 tons out of a total quantity of 20,025 tons, of all RMW generated in 1990. Thus, eliminating approximately 7300 smaller generators from this analysis results in the elimination of only 266 tons of RMW from the analysis which does not constitute a significant amount of data in this universe.

Another data base on the disposal of RMW was developed by the New Jersey Health Care Facilities Financing Authority (HCFFA). This data base is derived from information submitted to HCFFA by a group of 89 New Jersey hospitals and summarizes RMW generation rates for 1989, 1990 and 1991 for the survey group. The HCFFA data base shows RMW generation rates somewhat higher than those contained in the 1990 AGR but in general, shows overall consistency with the 1990 AGR data.

The department acknowledges that there are limitations to the data from the 1990 AGR and the 1990 transporter report. The 1990 AGR represents the first comprehensive effort to obtain data from the entire community of RMW generators. There were some weaknesses in the design of the form which have been corrected in subsequent annual reports. There also was some confusion on the part of RMW generators as to how to assemble and report data. This confusion was not entirely due to the design of the form but to understanding new procedures. This has resulted in anomalies such as 269 generators supposedly incinerating on-site when only approximately 90 incinerators were permitted at that time. It is believed that many of these generators were self-transporting to hospitals which maintained incinerators.

One source of apparent error in the AGR can be attributed to allowing the choice of only one disposal method for each class of RMW. It was determined that the report format should be limited to four pages for simplicity. It was not possible to have a four page format and allow more than one disposal choice per class of RMW. Generators using more than one disposal method per class of RMW were advised to mark the major or most frequently utilized disposal method.

In regard to the 1990 transporter report, there are a few sources of possible error. Some RMW, approximately 750 tons, was tracked to out-of-state transfer facilities and second transporters. This quantity of 750 tons probably went to destination facilities but this is not readily verifiable. This amount has not been included in graphs within this report showing disposal of RMW from New Jersey in various states. Further, the quantity of 666 tons RMW disposed of at an in-state transfer facility is believed to have been treated and destroyed prior to transport and thus had become ID 10 solid waste, not RMW.

The amount of RMW from the 1990 transporter report which will be considered is 11,462 tons going to intermediate handlers/destination facilities plus the 667 tons to Pennsylvania transfer facilities and the 89 tons to Maryland transfer facilities. This equals 12,218 tons of RMW that are accounted for in the 1990 transporter report.

At this point, the data in Table 17 from the 1990 AGR is examined to determine whether generators reported an equivalent amount of RMW going to intermediate handlers/destination facilities as is indicated in the 1990 transporter report.

On examination of the data in Table 17 from the 1990 AGR, the amount of RMW generated by the larger generators (300 pounds/year or more) is 19,891 tons. The quantity of 681 tons listed under Category C is assumed to be blood and blood products which were probably disposed of via sewer systems. This quantity would not be going into the RMW transportation system. Of the various types of medical waste quantified in Table 17, certain types would still be classified as RMW and would be going into the RMW transportation system. These categories from Table 17 will now be listed and tabled for comparison with the 1990 transporter data. Under Category A, RMW that was autoclaved (671 tons), melted (3 tons) or listed as other (398 tons) will be assumed to still be RMW, that is not both treated and destroyed. These numbers from Category A equal 1,072 tons RMW to be transported to out-of state facilities. This quantity is added to the total of Category B RMW (11,106 tons) to give a total of 12,178 tons of RMW. It is assumed that the 11,106 tons of Category B RMW also had been disposed of through transportation to out-of-state facilities. The value of 12,178 tons of RMW is close to the amount of 12,218 tons of RMW calculated above from the 1990 transporter report.

TABLE 17

COMPARISON OF TRANSPORTER AND AGR DATA - (TONS)

TREATMENT METHOD	CATEGORY A TREATED	CATEGORY B UNTREATED	CATEGORY C OTHER HANDLING	TOTAL RMW	TRANSPORTER REPORTS 1&2 DATA
Autoclave	671	622	17	1,311	-
Melting	3	8	0	11	-
Chemical Disinfection/ Grinding	694	396	1	1,091	-

Incineration	4,163	1,274	154	5,590	-
Other	398	47	1	446	-
More than one method	3	0	0	3	-
None indicated	2,170	8,759	508	11,438	-
TOTAL	8,104	11,106	681	19,891	12,218

* Data from 807 generators generating 300 lbs. or more per year that represents 99% of the RMW waste stream.

g. Economic Analysis of Costs of Transport and Disposal:

(1) Collection and Disposal Data: Cost data on collection and disposal was collected from RMW transporters in the earlier part of 1991. It is extremely important to note that while the Comprehensive Act required transporters of RMW to obtain a Certificate of Public Convenience and Necessity from the former Board of Public Utilities (now merged within the DEPE), it exempted transporters from government ratesetting. In the absence of such ratesetting jurisdiction, which does exist for all other types of solid waste transporters, the transporter of RMW is in a free market economy of competition. As a result, cost data is not readily available to the DEPE and can generally only be obtained through independent surveys. In terms of disposal charges to be levied by in-state commercial facilities, the Comprehensive Act did subject such facilities to government ratesetting. However, since the Comprehensive Act placed a moratorium on any new commercial facility development until the RMW State Plan was completed, no ratesetting cases have been heard by the BPU or DEPE. As a result, the disposal cost section below primarily addresses out-of-state disposal costs. Transporter costs are discussed immediately below, with an analysis of disposal costs to follow.

Transporters indicated that it is not uncommon for them to base transportation and disposal charges on location of site of collection, distance traveled, number of collections per year, weight and/or volume of load of RMW and related factors. Seventeen commercial transporters provided the following information in response to the voluntary survey. Most transporters include items such as containers, liners, packaging tape and labels in the charge. Most reported providing tracking forms, either blank or partly completed as a service to the generators. There may be a charge included for weighing the RMW at the time of collection and for completing the tracking form. RMW transporters charge by weight (per pound) or by volume (per container) or a combination of both (container, with a maximum weight limit).

Transporters were reluctant to specify the quantity of RMW that qualified a generator as a small or large generator for rate setting purposes. One transporter defined relatively large quantities of RMW as 700 lb/week or higher. This would obviously apply to hospitals and other very large (category 5) generators. The category 1 through 4 generators range from generators of less than 50 pounds per year of RMW (category 1) up to generators of 300 to 1000 pounds per year of RMW (category 4). Category 5 generators are defined as those that generate more than 1000 pounds of RMW per year. In the section on economic analysis contained in this report, the values in Table 18 will be used for category 1 through 4 generators and those in Table 19 for category 5 generators.

Transporters also were reluctant to discuss the cost on a "mileage" basis or "pound mileage" basis for transporting RMW to out-of-state disposal facilities. It is difficult therefore to determine the amount of the actual haulage costs. While there is some variation in the fees paid to disposal facilities, the average charge that a transporter pays to a disposal facility is \$0.20 per pound for accepting RMW. This expense should be kept in mind in reference to the following transportation charges as it is included in them.

Table 18 shows the average charges RMW transporters reported for collection and disposal for generators of less than 700 lbs/week of RMW. As can be seen from the table, 1.28 dollars per pound (\$/lb.) and \$33.24 per cubic foot (\$/cu.ft.) are the average charges for collection and disposal. It should be noted that the average charge in terms of \$/cu.ft. is skewed upward due to the inclusion of the higher charge. When the charge for sharps disposal is excluded, the average charge is \$14.49/cu.ft. Charges had to be presented in \$/lb. and \$/cu. ft. because some of the RMW transporters only charged by one or the other or by a combination of both. The department also compiled collection and disposal costs for generators of relatively larger quantities of RMW. Table 19 reflects the sliding scale transporters charge for collection and disposal from generators of more than 700 lbs/week of RMW. The average charge for collection and disposal for larger generators are 0.44 \$/lb. and 22.28 \$/cu.ft. As explained above, the average charge in terms of \$/cu.ft. is skewed upward. Excluding the higher charge for sharps disposal gives an average charge of \$2.50/cu.ft. for large generators (more than 700 lbs/week). When Table 18 and Table 19 are compared, it is clear that RMW transporters charge generators of relatively lesser quantities of RMW almost three times as much in terms of \$/lb. as they charge generators of relatively larger quantities of RMW. RMW transporters assessing charges in terms of \$/cu.ft. charge approximately six times as much to small generators as to large generators, when the costs of sharps disposal is excluded. While the survey did not ask transporters to justify the differences in charges, it can be assumed that a transporter would incur higher costs servicing relatively smaller generators because there is more expense involved with handling and transport to pick up from a large number of smaller generators.

TABLE 18

ESTIMATED CHARGES FOR COLLECTION AND DISPOSAL

(less than 700 lbs/week)

(Charges generally include cost of packaging material and labels)

PICKUP	MIN \$/lb	MAX \$/lb	AVG \$/lb	MIN \$/cf	MAX \$/cf	AVG \$/cf
Flat Rate **	---	---	---	108.96	301.92	145.75
Flat Rate	1.40	1.40	1.40	---	---	---
Flat Rate	1.10	1.22	1.18	---	---	---
Weekly	---	---	---	5.89	26.12	10.04
Bi=Weekly	---	---	---	6.44	19.85	11.35
Monthly	---	---	---	7.56	37.31	13.52
Bi-Monthly	1.22	1.33	1.26	8.67	44.78	15.70
Quarterly	---	---	---	9.22	48.51	17.00
On Call	---	---	---	10.33	55.97	19.31
Average	1.24	1.32	1.28	22.44	77.78	33.24

** Sharps Only

(Source: Communications from 10 Commercial RMW transporters)

TABLE 19

ESTIMATED CHARGES FOR COLLECTION AND DISPOSAL

(More than 700 lbs/week)

PICKUP	MIN \$/lb	MAX \$/lb	AVG \$/lb	MIN \$/cf	MAX \$/cf	AVG \$/cf
Flat Rate	0.35	1.25	0.80	---	---	---
Flat Rate	0.35	0.45	0.40	2.22	2.78	2.50
Flat Rate	0.35	0.45	0.41	---	---	---
Flat Rate	0.02	0.85	0.34	---	---	---
Flat Rate	0.37	0.37	0.37	---	---	---

Flat Rate	0.36	0.52	0.44	----	----	----
Flat Rate	0.30	0.40	0.35	----	----	----
Monthly **	----	----	----	42.06	42.06	42.06
Average:	0.31	0.58	0.44	22.14	22.42	22.28

** Sharps only

(Source: Communications from 9 registered RMW transporters)

Charges for large quantities of RMW (greater than 700 lb/week) averaged the lowest at \$ 0.44 per pound and \$ 22.28 per cu ft (Table 19)

TABLE 19a

GENERAL CHARGES FOR COLLECTION AND DISPOSAL OF RMW

(Charges generally include cost of packaging material and labels)

PICKUP	MIN \$/lb	MAX \$/lb	AVG \$/lb	MIN \$/cf	MAX \$/cf	AVG \$/cf
Flat Rate	1.67	1.67	1.67	----	----	----
Flat Rate	0.30	2.00	0.90	----	----	----
Flat Rate	0.60	1.25	0.89	----	----	----
Flat Rate	0.60	0.75	0.67	----	----	----
Flat Rate	0.83	0.83	0.83	----	----	----
Flat Rate	1.40	1.40	1.40	----	----	----
Monthly	0.45	1.60	0.76	----	----	----
On Call	1.43	1.43	1.43	----	----	----
On Call	2.83	2.83	2.83	----	----	----
Average	\$1.12	\$1.53	\$1.26	----	----	----

(Source: Communications from 9 registered RMW transporters)

FIGURE 22

RMW TRANSPORTER COLLECTION AND DISPOSAL CHARGES
BY SIZE OF GENERATOR

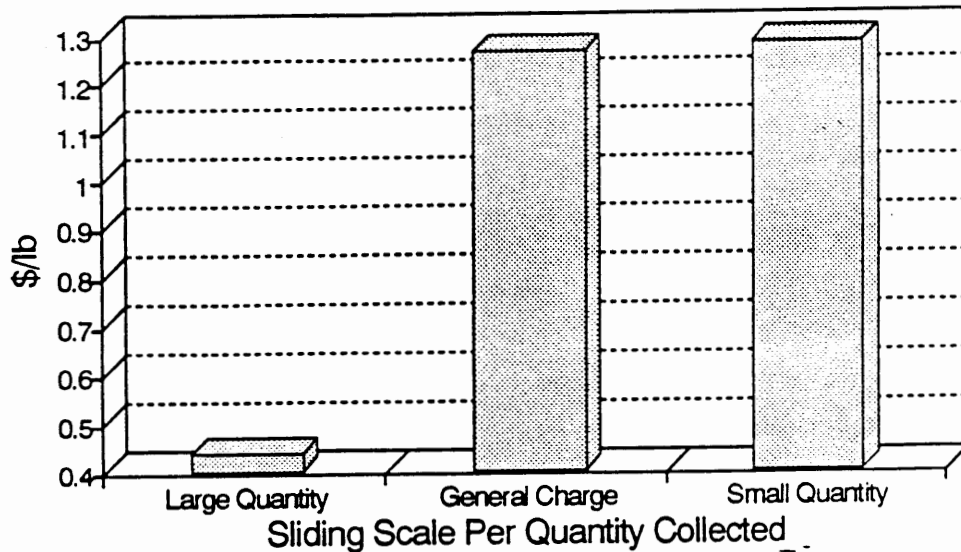


Table 19a shows the reported general charges for collection and disposal of RMW in \$/lb. Some transporters in addition to charging generators based on their quantity produced (large or small), utilized a general service charge as well. Transporters were not clear as to who they charged these rates to. The average of this charge is 1.26 \$/lb. This average is almost the same as the amount charged to relatively small generators of RMW at 1.28 \$/lb. The average costs shown in Tables 18, 19 and 19a can also be compared to the estimated costs for the alternate technologies contained in Section D.3.b-Table 26. The operating costs vary from \$0.20 to \$0.44 per pound of RMW. Capital costs for equipment have to be calculated and disposal costs determined for the municipal solid waste generated from RMW to obtain a complete picture of disposal costs.

The cost for on-site incineration of RMW at hospitals can vary from \$0.07 to \$0.50 per pound of RMW depending on the equipment used. This does not include transportation costs of the ash residue to an off-site landfill. As older equipment has to be upgraded in response to current regulations, the lower figure of \$0.07 per pound is expected to increase.

Refer to Section C.g.(2) and Table 19c therein for additional discussion of the economics of RMW management. Table 19c shows total transportation costs and

total disposal costs for RMW generated in 1990 in each of the five generator categories.

Figure 22, above, depicts RMW transporter charges to generators of RMW for collection and disposal when charging by \$/lb. The average charges in \$/lb. from Tables 18, 19 and 19a were used for this figure. The data in this figure are based on quantity collected. See Figure 24 for data based on frequency of collection. As can be seen from the graph, relatively small generators pay more for collection and disposal than relatively large generators. Some transporters indicated that in addition to a specific charge to relatively small and large generators, they additionally had a general charge. Transporters were not clear who was subject to these general charges.

Figure 23 shows RMW transporter charges to generators of RMW for collection and disposal when charging by \$/cu.ft. Data from Tables 18, 19 and 19a were used for this figure. The data in this figure are based on quantity collected. See Figure 25 for data based on frequency of collection. Similar to Figure 22, relatively small generators are charged more for collection and disposal than relatively large generators. Transporters did not indicate that they charged a general charge in \$/cu.ft.

FIGURE 23

RMW TRANSPORTER COLLECTION AND DISPOSAL CHARGES
BY SIZE OF GENERATOR

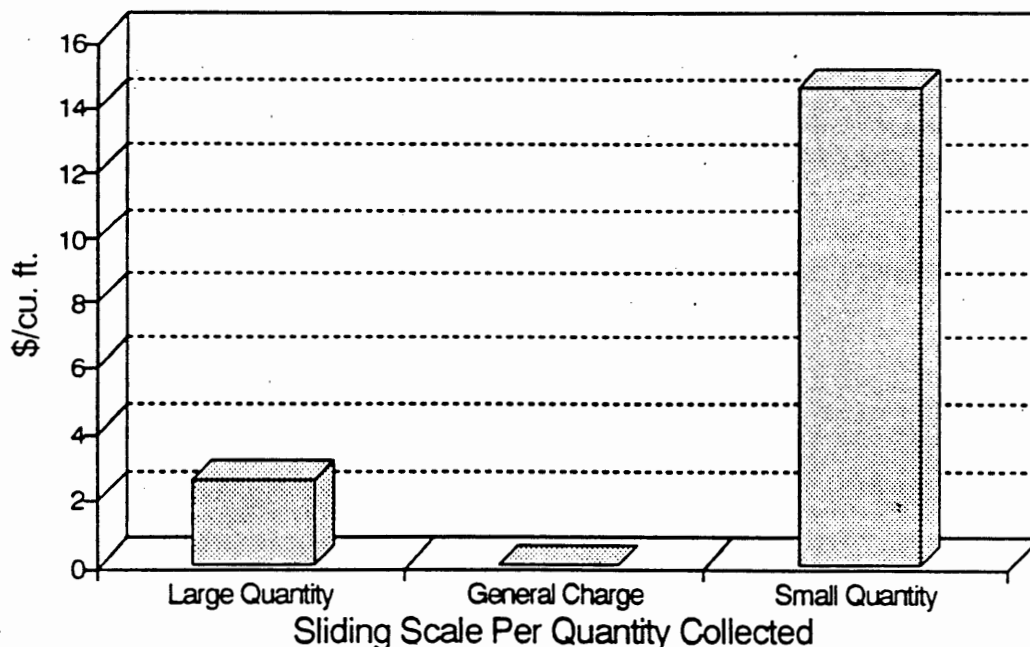


FIGURE 24

RMW TRANSPORTER COLLECTION AND DISPOSAL CHARGES
BY COLLECTION FREQUENCY

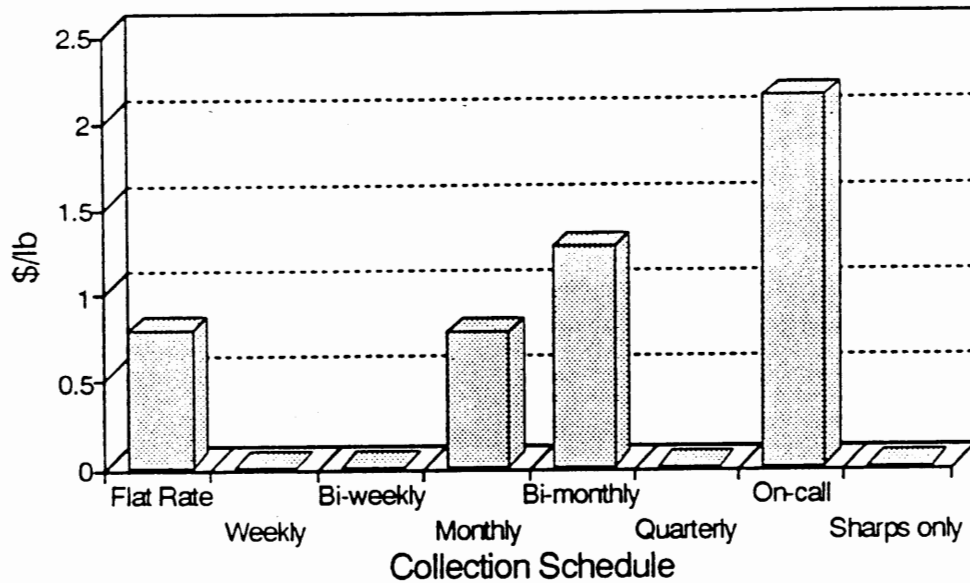


FIGURE 25

RMW TRANSPORTER COLLECTION AND DISPOSAL CHARGES
BY COLLECTION FREQUENCY

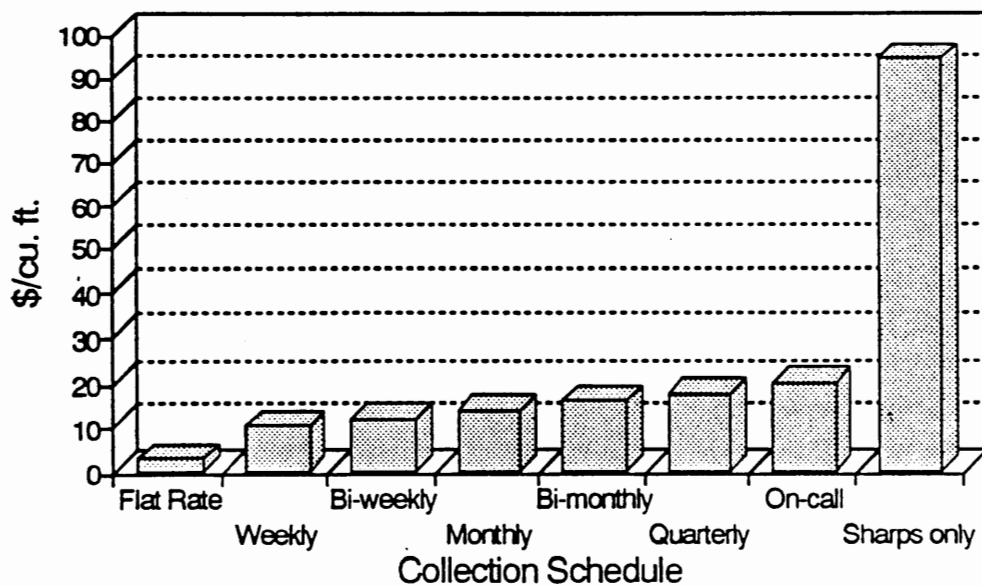


Figure 24 shows the RMW transporters' charges to generators based on the frequency of collection for collection and disposal of RMW when charging by \$/lb. Data from Tables 18, 19 and 19a were averaged and the values obtained are presented in Figure 24. From the figure, it can be seen that on-call collection is the most expensive. Bi-monthly collections were second most expensive followed by a flat rate and monthly collection. There were no weekly, bi-weekly or quarterly collections reported. On a \$/lb basis, transporters did not report charging a special rate for sharps collection and disposal which is in contrast to the next figure, Figure 25, that shows costs on a \$/cu.ft. basis.

Figure 25 shows the RMW transporter charges to generators based on the frequency of collection for collection and disposal of RMW when charging by \$/cu.ft. Data from Tables 18, 19 and 19a were averaged and the values obtained are presented in Figure 25. From the figure it can be seen that generally collection and disposal costs for RMW decreased with the increased frequency of collections. Of the collection schedule, on-call collections were more expensive than regularly scheduled collections. Also, the graph shows that the cost of collection and disposal for sharps is very expensive at 93.91 \$/cu.ft.

Due to misinterpretation on the part of respondents, information provided through the AGR on the cost of disposal through self transport to a central collection point and through the United States Postal Service, was found to be unusable for inclusion in the present work.

At present, costs to self transport RMW could be inferred to be minimal since this activity is carried out predominately by physicians transporting RMW to another physician's office or to a hospital which the physician is associated with. Some hospitals do incur expenses for limited transport of RMW from a satellite facility to the main hospital.

(2) Economic Analysis of Regulations: An economic analysis is required by the Comprehensive Act in order to determine the costs to and the impacts on the regulated community due to the RMW management program. Information developed elsewhere within the RMW State Plan will be used for this economic analysis. Data about transporter charges can be found in Section C.3.g.(1) "Collection and Disposal Data". Facility charges are listed in Table 19c below and discussed in the following narrative. There is also an extensive discussion in Section B.4.b. "Regionalization". Using information from the sections referenced above, recommendations will be developed concerning the need for changes, if any, to the statute and regulations necessary to improve the program's economic impact while not impacting on its effectiveness. Economic costs are determined concerning RMW management for the five categories of generators. These costs cover administrative, transportation and disposal expenses. This information is explained in the following section and shown in the accompanying tables. The required

recommendations will be based on this data.

The DEPE has developed a list of the factors that contribute to the cost of treating, destroying and disposing of RMW in New Jersey. These have been determined to be:

1. Administrative costs for generators;
2. Transportation costs; and
3. Treatment, destruction and disposal costs.

In Table 19b, the administrative costs incurred by generators in categories 1 through 5 are estimated based on assumed time to perform specific administrative tasks and using a salary of \$15 per hour. In Table 19c, transportation and disposal costs are determined for the five categories of generators by using data from several sources. The quantities of RMW generated in the five categories was obtained from the first AGR. The transportation charges to the generators were obtained from a 1991 survey of RMW transporters in New Jersey and from information supplied by the N.J. Hospital Association. Further, information obtained from the Transporter's Ad Hoc Working Committee, which represents several registered transporters in New Jersey, makes it possible to estimate with a reasonable degree of accuracy the costs that transporters pay to facilities receiving RMW.

The DEPE has estimated the total costs to RMW generators in 1990 to treat, destroy and dispose of RMW. This determination is based on data from the 1990 AGR showing the quantities of RMW disposed of in categories one through five and then calculating total costs spent using costs (\$ per lb.) supplied by a 1991 survey of transporters, by the New Jersey Hospital Association and DEPE projections. The DEPE has also computed the average cost per patient at a hospital and the average weekly cost to a doctor incurred by the disposal of RMW under the current regulatory requirements.

TABLE 19b

PROJECTED ADMINISTRATIVE TIME & COSTS
GENERATOR (MONTHLY BASIS)

GENERATOR CATEGORY	#1	#2	#3	#4	#5
Preparing Tracking Forms (minutes)	3	8	10	15	200
Maintaining Daily/Monthly Logs (minutes)	10	10	30	60	120

Collecting, Packaging & Labeling Waste (minutes)	10	15	20	100	500
Sub-Total (minutes/month)	23	33	60	175	820
Sub-Total (minutes/year)	276	396	720	2,100	9,840
Preparing Annual Generator Report (minutes/year)	30	30	30	90	300
Total (minutes/year)	306	426	750	2,190	10,140
Total (hours/per year)	5.1	7.1	12.5	36.5	169
Annual Cost (based on \$15/hr)	\$76.50	\$106.50	\$187.50	\$547.50	\$2535.00

Based on the quantity of RMW generated at New Jersey hospitals in 1990 and the number of hospital patients in New Jersey in 1990 it has been determined that approximately 28.5 lbs of RMW is generated per patient on an annual basis. The cost of disposal is \$7.13 per patient and factoring in a hospital's administrative costs, this expense rises to \$7.35/patient (Based on \$2535.00/hospital and 1,173,615 patients/101 hospitals; \$0.22/patient from information obtained for 1990 for New Jersey hospital patients according to the New Jersey Hospital Association).

Prior to the adoption of the RMW rules in August 1989, the New Jersey hospitals were regulated by DOH under rules generally requiring the incineration of pathological wastes. The adoption of the RMW rules changed the classification of medical wastes and may have increased the quantities of medical wastes subject to special handling. However, many hospitals in that time frame were incinerating the pathological wastes they generated and in some instances were incinerating pathological wastes from other hospitals. In addition, some hospitals maintained incinerators sufficiently large to incinerate other medical wastes and solid wastes from hospital operations.

Hospitals were incurring costs for the treatment and disposal of medical wastes before the adoption of the RMW rules. It must be emphasized that while the cost today of \$7.35 per patient includes an increase over previous indeterminate RMW disposal costs, it is not a totally new or added cost. It is very difficult to determine exactly what those prior disposal costs were. In many cases, such as hospitals operating incinerators, the present costs would be very similar to prior costs because the same disposal devices are being operated. In any case, the prior costs must also be considered when examining the present estimated cost of \$7.35 per patient for a hospital to dispose of the RMW generated.

TABLE 19c
RMW GENERATORS DISPOSAL COSTS

CATEGORY	(a) # GENERATORS	TOTAL TONS(b) RMW GENERATED	AVERAGE LBS GENERATED	AVERAGE (c) DISPOSAL COSTS	TOTAL (c) DISPOSAL COSTS	DESTINATION (d) FACILITY CHARGES	TRANSPORTATION CHARGES
#1 - <50 lbs	5,889	113	38	\$49	\$289,868	\$45,292	\$244,576
#2 - 50-200 lbs	1,398	148	211	\$270	\$378,112	\$59,080	\$319,032
#3 - 200-300 lbs	370	178	961	\$1,230	\$455,142	\$71,116	\$384,026
#4 - 300-1000 lbs	254	107	840	\$1,075	\$273,152	\$34,144	\$239,008
#5 - >1000 lbs	278	19,480	140,142	\$35,036	\$ 9,739,900	\$6,233,536	\$3,506,364
TOTAL	8,189	20,025	N.A.	N.A.	\$11,136,174	\$6,443,168	\$4,693,006

(a) Registration Category 9/90

(b) 1990 Annual Generator Report - RMW

(c) 1991 Survey of transporter charges - summarized in RMW State Plan Update,
RMW-- \$1.28/lb. Categories 1 - 4;
N.J. Hosp. Assoc. data-- \$0.25/lb. Category 5

(d) N.J. Transporters Ad Hoc Working Committee estimate of RMW destination facility charges - \$0.20/lb. Categories 1-3 and \$0.16/lb. Categories 4 and 5

Category 1 is numerically the largest group of generators, having 5889 generators in the first AGR. These entities each generate less than 50 pounds a year. Their average RMW generated per year is 38.45 pounds based on the 1990 AGR (see Table 19c). The average annual disposal cost is \$49.22 per generator and the average administrative expenses are \$76.50 per year. This amounts to \$125.72 a year or \$2.42 a week in increased costs for a Category 1 generator.

The average annual disposal costs and administrative expenses are higher in categories 2, 3 and 4. This is reflective of higher RMW generation rates and probably a higher patient load. On this basis, the per patient cost is expected to be equivalent to that for Category 1. The disposal costs for the largest category of generators, Category 5, have decreased over the past few years. There was previously a charge of \$0.36/lb. for hospitals to dispose of RMW through registered RMW transporters. In the latter part of 1992 and early 1993 charges have decreased further to \$0.25/lb. Disposal costs are expected to decrease even further as additional in-state capacity is developed reducing shipping costs, and with the maturation of the medical waste disposal industry which is becoming increasingly competitive.

The above analysis of data from several sources, including the 1990 AGR and the 1989-90 RMW transporter reports, indicates that the RMW regulations have resulted in some increase to per-patient costs at a doctor's office or in a hospital. However, the cost increases as described above have been relatively small. These costs must be compared to the increased protection of human health and the environment afforded by improved regulation of the disposal of RMW. Possibly, greater use of the alternate technologies for treatment/destruction of RMW in area hospitals and county destination facilities could decrease transportation costs (in-state and out-of-state) and thus lower the costs.

h. County-by-County Analysis of On-Site Treatment & Destruction Capacity

Historically, the practice of on-site disposal formed a vital aspect of the overall medical disposal strategy for New Jersey. As depicted in Figure 13 in Section C.3.f.(1) above, approximately 65 % of the RMW being disposed of in-state by treatment and destruction is through on-site facilities. Section C.3.f.(1) also outlines New Jersey's RMW disposal practices. In the planning process to achieve self-sufficiency in RMW management in New Jersey, it is necessary to know the present disposal capacity of in-state facilities. In this section (C.3.h), New Jersey's current on-site disposal capacity is examined. The data presented here is then used to formulate tables in Section C.4 projecting existing generation and disposal rates. This will help to identify in-state disposal capacity needed to achieve total self-sufficiency by December 31, 1997. DEPE has already supplied the counties with this data on RMW generation and disposal capacity to aid them in planning for and developing additional RMW disposal capacity.

Data about on-site RMW disposal capacities was collected during early 1992 utilizing the Intermediate Handler and Destination Facility Report. The data represents available capacities for the calendar year 1991. However, alternate technology units for the treatment and destruction of RMW are rapidly replacing incinerators or complementing incineration facilities' on-site disposal capacity. For this reason, capacities of incinerators that closed down in 1992 have been excluded from Table 21 and capacities of alternate technology units permitted in 1992 have also been included in Table 21a. The term "permitted capacity" indicates the amount of RMW in lbs/hr that a facility is allowed to process by DEPE. In the air pollution control permit this is listed as an "operation limitation" and in the solid waste permit for an incinerator as a "waste processing rate". The actual throughput is usually less than the permitted capacity.

A county-by-county breakdown of permitted incineration and alternate technology capacities is portrayed in Tables 20, 21, 21a and 21a-(1) and Figures 26 and 26a. At first glance, the permitted capacities of on-site incinerators and alternate technology devices for treatment and destruction of RMW may appear to reflect the maximum quantity of waste that could be managed on-site. However, to supplement RMW with more combustible material and to reduce off-site municipal solid waste disposal costs, facilities normally incinerate almost all of the solid waste they generate along with their medical waste. Alternate technology units, on the other hand, are mostly designed specifically for medical waste disposal, and generally have relatively less throughput capacity compared to incinerators. The departments have observed that these factors prompt generators to limit the solid waste processed through these units, and process mostly RMW.

By the end of 1992 there were 23 on-site incinerators and 21 alternate technology units permitted for the disposal of RMW. Permitted capacities ranged from 50 tons/yr to 1667 tons/yr for incinerators and 24 tons/yr to 2000 tons/yr for new technology units. However, utilization ranged up to 1716 tons/yr for incinerators and 0.28 tons/yr to 453 tons/yr for new technology units (Tables 20 and 21a). Based on manufacturers' claims, the RMW incinerators can be expected to have life expectancies of approximately 15 years and alternate technology units also approximately 15 years. These life expectancy estimates are dependant on proper maintenance and amount of use of the equipment.

Working with the permitted capacities and actual throughput presented below, projections of disposal capacities for the entire state are worked out in Section C.4.a. Projections for state and county RMW disposal capacities in 1995 are presented in Table 21b (see Section C.4.a). Present and future capacity for the disposal of RMW is discussed in Section C.4.a. A difference between counties is apparent in permitted on-site treatment & destruction capacity. Permitted capacity is a quantity which is difficult to define exactly at this time. There are a considerable amount of changes taking place at RMW facilities in New Jersey due

to the RMW regulations and changes in the air pollution control regulations. During the period of this study, certain permitted on-site incinerators have ceased operations, either because of permit expiration or for other reasons. In some cases, expansions or up-grades are in progress. Some non-commercial facilities have acquired alternate technology devices such as grinder/microwave units to treat and destroy RMW. Other facilities are in the process of being permitted and acquiring alternate technology devices.

Relative on-site throughput capacities, by county are depicted in Figure 26 for incinerators and in Figure 26a for alternate technology treatment and destruction facilities. It is evident that some counties have considerably more nominal capacity than others. On the other hand, as many as six counties, Cape May, Hudson, Ocean, Passaic, Sussex and Warren have no RMW on-site disposal capacity. Also, it is evident that none of the counties utilize their units' permitted capacity to the full extent.

FIGURE 26

RMW INCINERATION CAPACITY BY COUNTY

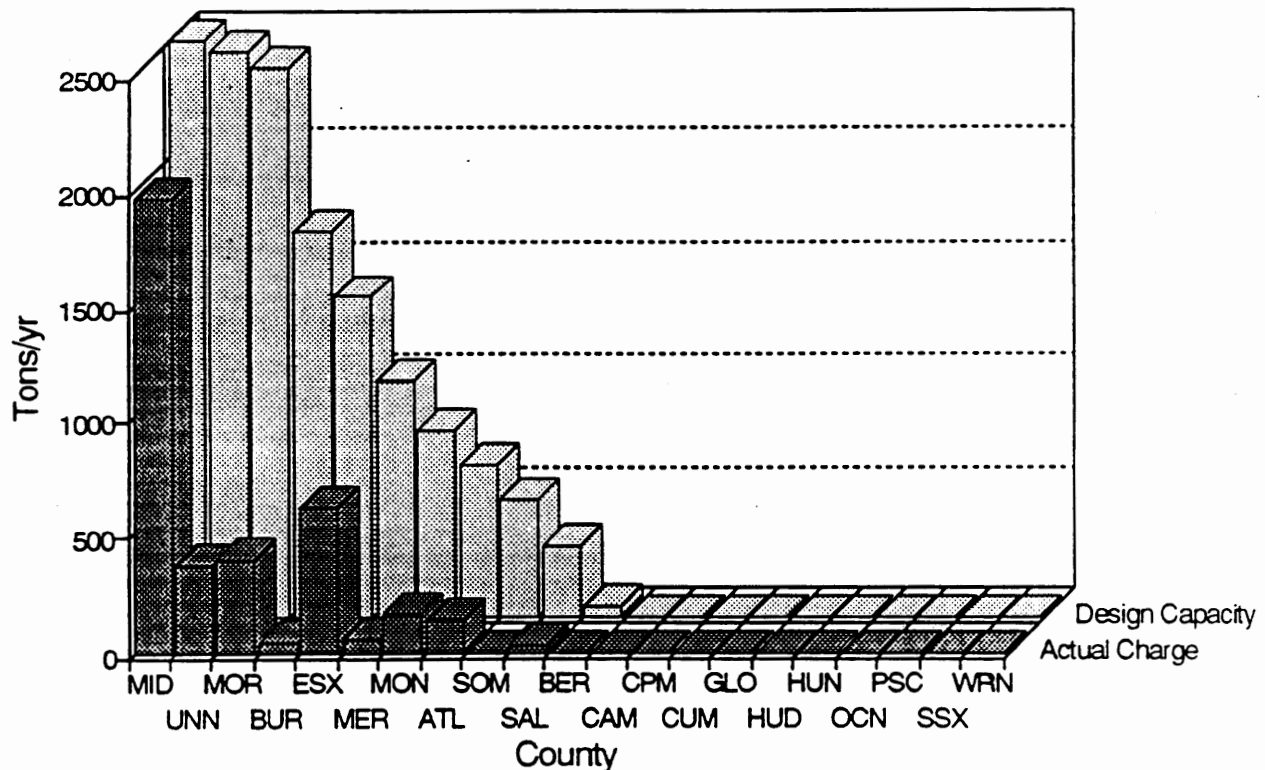
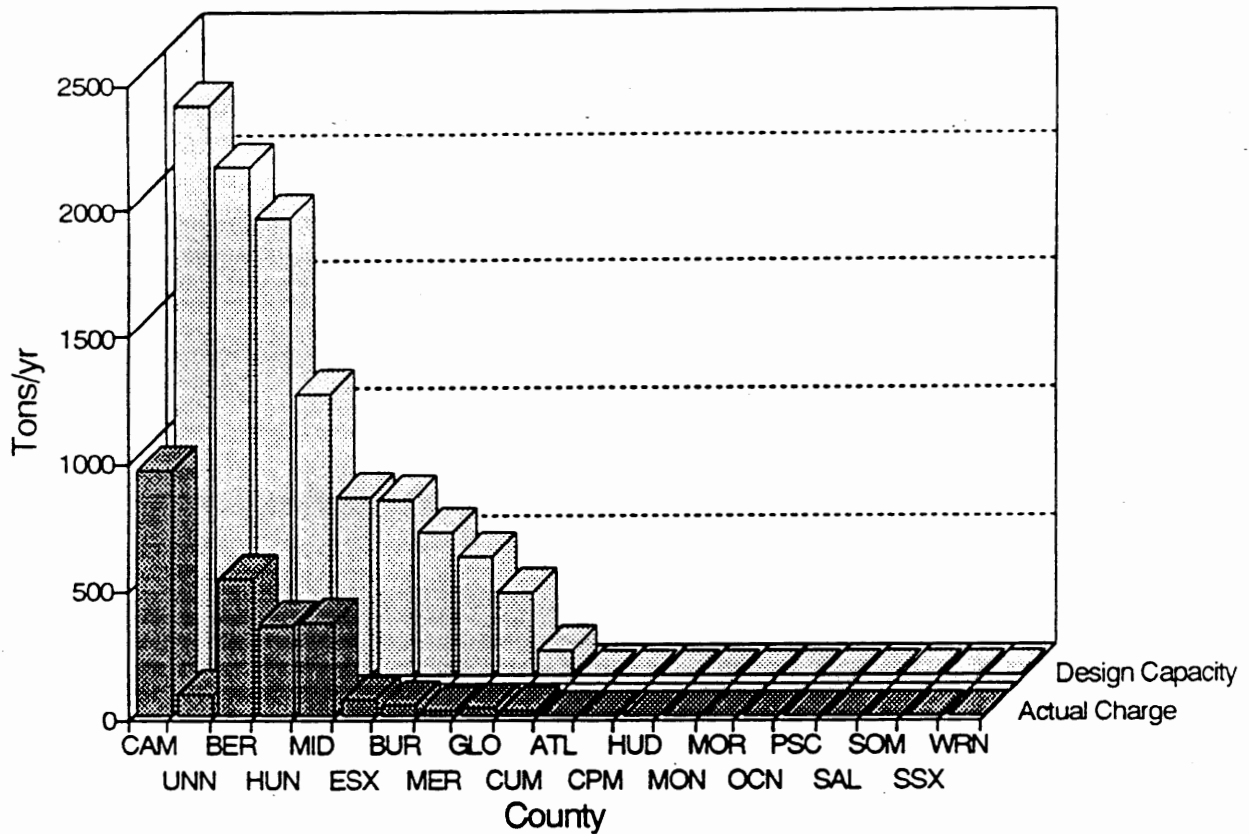


FIGURE 26a

RMW ALTERNATE TREATMENT & DESTRUCTION TECHNOLOGY
CAPACITY BY COUNTY



As discussed in other parts of this section, DEPE had previously pursued a policy of requiring each county to manage its solid waste stream. This, combined with the resistance received from public and private sectors to policy objectives of siting regional disposal facilities, led to the evolution of policy geared towards building the fewest additional disposal facilities while making the most complete use of the state's disposal capacity. Under these goals, it is the objective of DEPE to encourage the development of regional processing and disposal facilities. Further, the department also supports large quantity generators with on-site disposal facilities accepting RMW from small quantity generators. Additional quantities of RMW received from other sources of generation would supplement the disposal facilities waste charge and compensate for the disposal shortfall that is projected in most counties.

TABLE 20

1992 ON-SITE INCINERATION CAPACITY INFORMATION

COUNTY	FACILITY NAME	CITY	PERMITTED CAPACITY lbs/hr	PERMITTED CAPACITY Tons/yr *	ACTUAL RMW CHARGE Tons/yr ***
Atlantic	Shore Memorial Hospital	Somers Point	(b) 650	(b) 650	** 135.58
Bergen	Englewood Hospital	Englewood	50	50	4.11
	Pascack Valley Hospital (a)	Westwood	(b) 0	(b) 0	0.00
Burlington	Resource Recovery Facility	Fort Dix	1667	1667	43.78
Camden	None	-	-	-	-
Cape May	None	-	-	-	-
Cumberland	None	-	-	-	-
Essex	Clara Maass Medical Center	Belleville	800	800	100.80
	Columbus Hospital	Newark	435	435	155.90
	Saint Michael's Medical Center	Newark	(b) 150	(b) 150	363.53
Gloucester	None	-	-	-	-
Hudson	None				
Hunterdon	None	-	-	-	-
Mercer	American Cyanamid Co	Princeton	(b) 250	(b) 250	8.91
	Helene Fuld Medical Center	Trenton	780	780	46.36
Middlesex	Raritan Bay Medical Center	Perth Amboy	1100	1100	213.79
	Robert Wood Johnson Univ Hospital	New Brunswick	1100	1100	1716.26
	Wyeth-Ayerst Research	Monmouth Junction	300	300	30.60
Monmouth	Monmouth Medical Center	Long Branch	750	750	146.19
	Patterson Army Community Hospital	Fort Monmouth	(b) 57	(b) 57	13.98

TABLE 20 cont'd.

COUNTY	FACILITY NAME	CITY	PERMITTED CAPACITY lbs/hr	PERMITTED CAPACITY Tons/yr *	ACTUAL RMW CHARGE Tons/yr ***
Morris	Chilton Memorial Hospital	Pompton Plains	600	600	40.11
	Dover General Hospital & Medical Ctr	Dover	1000	1000	263.72
	Morristown Memorial Hospital	Morristown	(b) 780	(b) 780	91.69
Ocean	None	-	-	-	-
Passaic	None	-	-	-	-
Salem	Memorial Hosp of Salem County	Salem	(b) 300	(b) 300	30.83
Somerset	Branchburg Farm	Somerville	500	500	0.21
Sussex	None	-	-	-	-
Union	Elizabeth General Medical Center West	Elizabeth	700	700	88.77
	Merck & Co Inc	Rahway	375	375	103.76
	Overlook Hospital	Summit	775	775	46.21
	Rahway Hospital	Rahway	(b) 500	(b) 500	105.43
	Schering Corporation	Union	(b) 100	(b) 100	23.69
Warren	None	-	-	-	-
TOTAL	23			13719	3774.19

* Assuming incinerators operate 8 hours per day, 5 days per week, 50 weeks per year.

** Data from On-site Incineration Report - for the Period June 22 to December 22, 1990.

*** Source: Intermediate Handler and Destination Facility Report - for the period January 1 to December 31, 1991.

(a) Start up in 1993.

(b) Unit's Design Charge Capacity

Note: Facility capacity information presented herein represents data available as of December 1992.

TABLE 21

1992 COUNTY INCINERATION CAPACITY THROUGHPUT SUMMARY

COUNTY	PERMITTED CAPACITY lbs/hr	PERMITTED CAPACITY Tons/yr *	ACTUAL RMW CHARGE Tons/yr
Atlantic	650.00	650.00	135.58
Bergen	50.00	50.00	4.11
Burlington	1667.00	1667.00	43.78
Camden	-	-	-
Cape May	-	-	-
Cumberland	-	-	-
Essex	1385.00	1385.00	620.23
Gloucester	-	-	-
Hudson	-	-	-
Hunterdon	-	-	-
Mercer	1030.00	1030.00	55.26
Middlesex	2500.00	2500.00	1960.65
Monmouth	807.00	807.00	160.17
Morris	2380.00	2380.00	395.52
Ocean	-	-	-
Passaic	-	-	-
Salem	300.00	300.00	30.83
Somerset	500.00	500.00	0.21
Sussex	-	-	-
Union	2450.00	2450.00	367.86
Warren	-	-	-
TOTAL		13719.00	3774.19

* Assuming incinerators operate 8 hours per day, 5 days per week, 50 weeks per year.

(Source: Intermediate Handler and Destination Facility Report - for the period January 1, to December 31, 1991)

Note: Facility county capacity information presented herein represents data available as of December 1992.

TABLE 21a

1992 ON-SITE ALTERNATE TREATMENT AND DESTRUCTION TECHNOLOGY
CHARGE CAPACITY INFORMATION

METHOD OF TREATMENT & DESTRUCTION	COUNTY	FACILITY NAME	CITY	PERMITTED CAPACITY LB/HR	PERMITTED CAPACITY TONS/YR *	ACTUAL RMW CHARGE TONS/YR ***
Autoclaving and Grinding	Essex	Schering Corp	Bloomfield	(a) 85.00	(a) 85.00	39.81
	Gloucester	EM Diagnostic Systems	Gibbstown	(b) 24.00	(b) 24.00	1.63
	Hunterdon	Immunobiology Research Institute	Annandale	(a) 400.00	(a) 400.00	0.28
	Middlesex	Smith Kline Beecham Pharmaceuticals	Piscataway	NA	NA	2.06
	Total for autoclaving and grinding/particlizing			509.00	** 509.00	43.78
Chemical Disinfection and Grinding	Bergen	The Valley Hospital	Ridgewood	(b) 1000.00	(b) 1000.00	314.51
		Hackensack Medical Center	Hackensack	800.00	800.00	214.02
	Camden	Kennedy Memorial Hosp Univ Med Ctr	Cherry Hill	200.00	200.00	6.38
	Cumberland	South Jersey Hospital System	Bridgeton	(b) 100.00	(b) 100.00	15.30
	Essex	Gib Laboratories	New Providence	400.00	400.00	2.23
		Saint Michael's Medical Center	Newark	(b) 200.00	(b) 200.00	15.15
	Gloucester	Underwood Memorial Hospital	Woodbury	(b) 100.00	(b) 100.00	8.30

TABLE 21a (cont'd.)

METHOD OF TREATMENT & DESTRUCTION	COUNTY	FACILITY NAME	CITY	PERMITTED CAPACITY LB/HR	PERMITTED CAPACITY TONS/YR *	ACTUAL RMW CHARGE TONS/YR ***
Chemical Disinfection and Grinding	Gloucester	Kennedy Memorial Hosp Washington Div	Turnersville	200.00	200.00	9.18
	Hunterdon	Roche Biomed Labs	Raritan	(b) 700.00	(b) 700.00	341.09
	Mercer	Cytogen Corp	Plainsboro	360.00	360.00	2.74
		Public Health & Envir Laboratories	Trenton	(b) 100.00	(b) 100.00	12.03
	Union	Muhlenberg Regional Medical Center	Plainfield	(b) 2000.00	(b) 2000.00	78.31
	Total for chemical disinfection and grinding				6160.00	6160.00
Microwaving and Shredding	Burlington	Memorial Hospital of Burlington County	Mt Holly	(b) 550.00	(b) 550.00	38.83
	Camden	Cooper Hospital/Univ Med Cent	Camden	700.00	700.00	453.53
		Our Lady of Lourdes Med Cent	Camden	(b) 800.00	(b) 800.00	414.99
		West Jersey Hospital System	Camden	550.00	550.00	75.76
	Middlesex	JFK Medical Center	Edison	700.00	700.00	350.03
	Total for microwaving and Shredding				3300.00	3300.00
Total for New Treatment and Destruction Technology Units				9969.00	9969.00	2396.17

* Assuming units operate 8 hours per day, 5 days per week, 50 weeks per year

** Includes NAs

*** (Source: Intermediate Handler and Destination Facility Report-for the period January 1 to December 31, 1991 and BMWRMSP's facility files)

NA Information Not Available

(a) Destruction Unit's Maximum Charge Capacity

(b) Unit's Design Charge Capacity

Note: Facility capacity information presented herein represents data available as of December 1992.

TABLE 21a-1

**1992 COUNTY ALTERNATE TREATMENT AND DESTRUCTION TECHNOLOGY
CAPACITY SUMMARY**

County	Permitted Capacity lb/hr	Permitted Capacity Tons/yr *	Actual RMW Charge Tons/yr
Atlantic	-	-	-
Bergen	1800.00	1800.00	528.53
Burlington	550.00	550.00	38.83
Camden	2250.00	2250.00	950.66
Cape May	-	-	-
Cumberland	100.00	100.00	15.30
Essex	685.00	685.00	57.19
Gloucester	324.00	324.00	19.11
Hudson	-	-	-
Hunterdon	1100.00	1100.00	341.37
Mercer	460.00	460.00	14.77
Middlesex	700.00	700.00	** 352.10
Monmouth	-	-	-
Morris	-	-	-
Ocean	-	-	-
Passaic	-	-	-
Salem	-	-	-
Somerset	-	-	-
Sussex	-	-	-
Union	2000.00	2000.00	78.31
Warren	-	-	-
	9969.00	9969.00	2396.17

* Assuming units operate 8 hours per day, 5 days per week, 50 weeks per year

** Includes NA

NA Information Not Available

(Source: Intermediate Handler and Destination Facility Report - for the period January 1 to December 31, 1991 and BMWRMSP's facility files)

Note: Facility county capacity information presented herein represents data available as of December 1992.

4. Statewide Disposal Capacity Analysis

a. Capacity Analysis:

The following is an analysis of the RMW disposal needs for the State of New Jersey in order to achieve self-sufficiency. The section is divided into three components. First is a RMW disposal analysis which, through a step-by-step progression, identifies the amount of RMW which will require out-of-state management by December 31, 1997 in the absence of implementation of additional in-state disposal facilities. The second component demonstrates, through a reasonable set of assumptions, what must be accomplished to achieve in-state self-sufficiency in RMW disposal capacity within the next five years. This analysis delineates the challenge which lays ahead to bring the needed additional capacity on-line. The third section identifies capacity needs on a county-by-county basis in 1997 assuming recent trends and new planned disposal capacity. This latter element was specifically required under the provisions of the Comprehensive Act as basic information from which counties could develop RMW management plans as outlined earlier in Section B.4.

(1) RMW Statewide Disposal Analysis: As outlined throughout Section B., the department's primary management goals are to: work with hospitals and other large generators to achieve a 40% total hospital waste stream recycling rate by December 31, 1995; attempt to further identify source reduction and recycling opportunities for RMW; develop new commercial RMW processing/disposal capacity on a regional use basis and make more efficient use of existing in-state capacity; and to achieve self-sufficiency in disposal capacity by December 31, 1997. It is important to be mindful once again of these primary goals in the presentation of a statewide capacity analysis in terms of the assumptions made. Due to the significance of the interstate waste shipment issue and compelling need to pursue self-sufficiency, a conservative set of assumptions has been used so as not to potentially over estimate existing and currently planned in-state capacity.

This capacity analysis is projected for 1997 based on currently available data concerning generation rates, incineration, new technology and sewer disposal. Data from the 1990 federal census is used as well as population projection values supplied by the N.J. Department of Labor, Division of Planning & Research Office of Economic Analysis. The capacity analysis projected to 1997 has been carried out for the State of New Jersey and for each of the 21 counties in New Jersey.

Step A:

Table 21b projects baseline generation in 1997 at 21,193 tons. For this calculation, the "no per capita change scenario" outlined in Table 22c was used which assumes that evolving source reduction and recycling strategies applied within hospitals will

cap per patient RMW generation at current levels. In order to remain conservative, source reduction is not assumed to reduce the total generation of RMW. Rather, in assuming that per patient generation is capped, increases in generated RMW becomes solely a function of population increase and the additional number of patients providing RMW. Also, as outlined in Section B.3., actual figures on the potential impact of aggressive recycling programs for RMW have not been developed anywhere in the country to afford opportunities for numerical goal-setting. As a result, while remaining totally committed to achieving a 40% total hospital waste stream recycling rate by the end of 1995, the department has assumed a zero percent RMW recycling rate for the purposes of presenting a conservative capacity analysis. Therefore, baseline generation used to begin the analysis is 21,193 tons.

Step B:

The principle in-state method for RMW disposal at this time is on-site incineration. As of December 1992, as reflected in Table 20, 23 on-site incinerators which accept RMW are permitted and operating in New Jersey. Collectively these facilities processed 3,774 tons in 1991. Further, it must be pointed out that just over 25% of the total waste processed by these facilities was made up of RMW. Approximately 74% of the material burned was actually municipal solid waste. (The significance of this fact will be addressed further in this analysis under the "Policy Discussion" section.)

The recent trend in RMW management has been to close or significantly upgrade existing incinerators to meet the DEPE's detailed environmental standards for operations. For the purpose of this analysis, and based on the generally upgraded design and operational status of the individual incinerators, the department estimates that the 23 existing facilities will remain open and be capable of processing 3,774 tons per year when assuming current RMW loading rates. This figure does not consider higher percentages of RMW disposal at these incinerators, nor does it assume any increased RMW processing due to population affects and greater numbers of patients producing RMW. When the 3,774 tons of existing incinerator capacity is deducted from the 21,193 generation figure, 17,419 tons requiring additional management remain. It should also be mentioned that since this is an RMW capacity analysis and plan, it would not be appropriate to add an ash figure back into the generation equation. While the 23 incinerators assumed to be operational in 1997 will produce approximately 30% ash by weight processed, this material would be considered municipal solid waste and not RMW and does not require further attention here.

Step C:

Various new technologies for treating and destroying RMW are gaining acceptance and popularity with larger generators as on-site incineration is being phased out at

some hospitals. As reflected in Table 21a, as of December 31, 1992 there were four autoclaving and grinding, twelve chemical disinfection and grinding and five microwave and shredding facilities operating within New Jersey at hospitals and private laboratories/companies. Taken together, these 21 non-incineration systems processed approximately 2396 tons of RMW in 1991. This figure represents a collective 24% utilization rate based upon a total design charging capacity of 9969 tons as noted in Table 21a. For the purposes of this analysis it was assumed that all of these facilities will remain in operation as of 1997 and will process at current levels. In subtracting existing alternate technology capacity from the 17,419 tons referenced at the end of Step B, 15,023 tons of RMW will remain requiring management.

Step D:

It is next important to deduct liquid RMW (primarily blood and other body fluids) which is currently disposed of via sanitary sewer. Based upon 1990 AGR statistics as noted on Figure 14 on page 117, 3.4% of all RMW generated was disposed of via sanitary sewer. It once again should be stressed that this represents a very small amount of waste entering wastewater treatment facilities which accept millions of gallons of liquids per day. Applying the 3.4% figure to the baseline generation number of 21,193 tons equals 765 tons of RMW projected to be disposed of 1997 via sanitary sewer. When deducting this figure from the 15,023 number reflected at the bottom of Step C, 14,258 tons of RMW will still require management in 1997.

Steps A - D Equation Summary

21,193	(Estimated 1997 RMW Generation)
- 3,774	(On-site Incineration Capacity)
- 2,396	(Alternate Technology Capacity)
- <u>765</u>	(Sanitary Sewer Disposal)
14,258	(Total Estimated Statewide Capacity Shortfall)

(2) Capacity Analysis Summary: From the analysis above, a total of 21,193 tons per year of RMW will require disposal as of December 31, 1997 based upon the assumptions indicated. As the analysis indicates there will be a capacity shortfall of approximately 14,000 tons of RMW that cannot be treated and destroyed in-state. Without development of additional disposal capacity, New Jersey would need to export this tonnage to out-of-state disposal facilities. New Jersey would be exporting approximately 68% of its total RMW stream in 1997. Given the state's strong commitment to achieving self-sufficiency in disposal capacity, the following discussion identifies the specific project development activities which would need to take place over the next five years to make self-sufficiency a reality. This presentation is broken down into two sections. The first identifies projected new

capacity from projects currently in advanced planning phases or in the department's permit review process. The second identifies potential future projects or activities which would be needed to make self-sufficiency a reality.

(3) Projected New Capacity: A number of projects are currently under planning or technical review for permitting before the department as further identified below. The inclusion of these specific projects in this analysis will in no way influence the technical review and associated permit decisions which will be based on the merits of the projects. The projects noted have been used since they are actively being pursued by the prospective host county and/or applicant and could potentially add statewide RMW capacity.

(a) Mercer County Incinerator: This project is currently under technical review by the DEPE and is proposed for 1,450 tons per day of primarily municipal solid waste or approximately 476,325 tons per year of processing capacity assuming a 90% on-line availability. This facility is planned to accept solid waste on a regional basis from both Mercer and Atlantic Counties. It has been included within this analysis since the county plans to incorporate a separate feed line dedicated to the processing of RMW from both counties. Based upon the current status of the project in terms of permit application review, and assuming that it can be permitted and developed on a two-year construction schedule, it is possible that operations could commence in 1995. For the purposes of this analysis, the Mercer incinerator could accept the RMW generated in both counties which would not otherwise be treated and destroyed by existing incinerator and alternate technology facilities already considered under Steps B, C and D earlier. When these existing facilities are considered, the Mercer incinerator could handle the remaining RMW of approximately 964 tons from Mercer County and 201 tons from Atlantic County for a grand total of 1165 tons per year in 1997.

(b) New Incinerators: As of December 31, 1992 there were two additional incinerator permit applications before the department for review for the Riverview Hospital in Red Bank, Monmouth County and the Pascack Valley Hospital in Bergen County. Using 1990 AGR data, these two facilities generated a total of 306 tons of RMW. If permitted and constructed, it will once again be conservatively assumed that these facilities would be operational in 1997 and accepting 306 tons per year of RMW.

(c) Alternate Technology Facilities: As of December 31, 1992, three additional alternate technology projects were under technical review by the department for microwave and shredding facilities at Dover General Hospital in Morris County and Holy Name Hospital in Teaneck, Bergen County, as well as an autoclaving and grinding system at the East Orange Veterans Administration Hospital, Essex County. Collectively, these three hospitals

generated 822 tons of RMW based upon the 1990 AGR. If permitted and constructed, it will be once again conservatively assumed that these facilities would be operational in 1997 and accepting 822 tons per year of RMW.

Taken together, if the six projects referenced above are in fact permitted and constructed, they would represent an additional capacity of approximately 2293 tons per year for RMW. In further deducting this potential capacity from the total 1997 statewide shortfall referenced in the equation summary on page 154, there would still be a statewide capacity deficit of about 11,965 tons per year. This would mean that in the absence of more efficient use of existing capacity or development of yet additional regional or on-site processing/disposal capacity, New Jersey would still be exporting 57% of its RMW for out-of-state disposal at the end of 1997.

(4) Potential Future Projects or Activities: The following is a listing of potential future projects or activities, some mixture of which, would be necessary to address New Jersey's projected status as a 57 % exporter in 1997 from the above analysis.

(a) Statewide Processing/Disposal Facility: Earlier in this RMW State Plan within Section B.4., the department identified a hierarchy of disposal strategy options toward the future. Clearly the development of a multi-county regional or statewide RMW processing and disposal facility would be considered the preferred option. Ideally, such a facility would involve front-end or back-end processing to advance recycling, and be followed by a non-incineration treatment and destruction facility. From the analysis provided above, a single appropriately located facility could be developed to accommodate the projected shortfall of 11,965 tons per year. Such a facility would amount to a 33 ton per day system which, when compared to project proposals for municipal solid waste, would represent a relatively small operation. Further, the New Jersey Health Care Facilities Financing Authority has performed computer modelling for regional facility development and demonstrated significant economies of scale that would be associated with a regional or statewide system.

(b) More Efficient Use of Existing Capacity: As alluded to earlier within this capacity analysis and specifically identified in Table 20 and 21a, the 44 existing incinerators and alternate disposal facilities have significant additional potential capacity to process RMW. In terms of incinerators, only 28% of the available capacity at the 23 remaining facilities was used to process RMW in 1991. Approximately 72% or 9,945 tons of permitted capacity was used to incinerate municipal solid waste (MSW). In terms of alternate technology disposal capacity, while these systems don't generally process MSW, they routinely are not operated at or near full capacity. As an example, for 1991 the 21 existing facilities processed 2396 tons, but have a permitted capacity of 9,969 tons. This translates into a 24% utilization rate or 7,573 tons of unused

TABLE 21b

5 YEAR RMW PROJECTION GENERATION - DISPOSAL CAPACITY SUMMARY

COUNTY	PROJECTED GENERATION (1997)	PROJECTED INCINERATION (On-site-1997)	PROJECTED ALTERNATE TECHNOLOGY CAPACITY	PROPOSED INCINERATION CONSTRUCTION	PROJECTED SEWER DISPOSAL 1997	PROJECTED CAPACITY SHORTFALL (Tons/yr)
ATLANTIC	348.8	-135.6	0.0	0.0	-0.4	212.8
BERGEN	2637.8	-4.1	-528.5	0.0	-15.5	2089.6
BURLINGTON	754.9	-43.8	-38.8	0.0	-5.7	666.6
CAMDEN	1409.5	0.0	-950.7	0.0	-10.8	448.1
CAPE MAY	86.7	0.0	0.0	0.0	-0.7	86.0
CUMBERLAND	169.8	0.0	-15.3	0.0	-8.5	146.0
ESSEX	3860.9	-620.2	-57.2	0.0	-158.1	3025.4
GLOUCESTER	143.9	0.0	-19.1	0.0	-1.3	123.5
HUDSON COUNTY	608.6	-41.40	0.0	0.0	-67.9	540.6
HUNTERDON	516.1	0.0	-341.4	0.0	-0.2	174.6
MERCER	1069.9	-55.3	-14.8	0.0	-3.4	996.5
MIDDLESEX	3918.1	-1960.7	-352.1	0.0	-303.2	1302.1
MONMOUTH	880.9	-160.2	0.0	0.0	-3.5	717.2
MORRIS	578.8	-395.5	0.0	0.0	-4.1	179.1
OCEAN	937.2	0.0	0.0	0.0	-158.8	778.3
PASSAIC	617.0	0.0	0.0	0.0	-2.6	614.3
SALEM	49.4	-30.8	0.0	0.0	-0.9	17.6
SOMERSET	648.7	-0.2	0.0	0.0	-8.9	639.6
SUSSEX	100.2	0.0	0.0	0.0	-1.8	98.4
UNION	1630.5	-367.9	-78.3	0.0	-6.3	1178.1
WARREN	102.8	0.0	0.0	0.0	-2.5	100.3
STATE OF NEW JERSEY	21070.5	-3815.7	-2396.2	0.0	-765.1	14134.7

capacity. Taken together, in the hypothetical, as much as 16,000 tons of additional capacity is already operational in New Jersey.

While such a presentation is convenient for the exercise at hand, it must be realized that each of these 44 facilities, almost without exception, was developed for on-site generated disposal only by hospitals and private companies. None of these facilities are commercial utilities regulated by the DEPE under approved tariffs. As a result, expanded use for more efficient disposal of RMW would be at the discretion of each individual facility. Inasmuch as each of these projects was designed for on-site use, hospitals and companies are not primarily in the waste disposal business, and both are very concerned with host community relations, it is doubtful that many would even consider serving as a regional facility. Further, since each is relatively small when considered separately, it would appear doubtful that front-end or back-end processing equipment would be feasible contrary to the preferred management mode of the department. However, despite these considerable limitations, it is clear that significant additional disposal capacity is in place should any of the 44 facilities opt for an expanded role in RMW management.

(c) Management of RMW as Solid Waste: Section B.4. identifies a potential to merge RMW management within the broader in-state solid waste disposal infrastructure through "system redefinition." Under such an approach, changes to existing rules would be needed to allow properly packaged, labeled, tracked and transported RMW to be disposed of at solid waste landfills and energy recovery incinerators in untreated form, provided such facilities amend their permits to include acceptance of this waste type. This approach would result in a fundamental redefinition of the existing RMW management scheme put in place through the Comprehensive Act and existing regulations in once again authorizing RMW to be managed along with other solid wastes. While representing a major regulatory shift, the department would consider this option in the future provided sufficient support is expressed by the counties for this approach during the formal one-year RMW planning process outlined in the Comprehensive Act. Finally, fewer regulatory changes would be needed to integrate the disposal of untreated RMW at existing county incinerators, as compared to acceptance at transfer stations or landfills. However, significant design changes, such as separate feed lines may be necessary. The department will consider requests for authorization to handle untreated RMW at existing and planned large-scale county incinerators on a county-by-county basis. Primarily, county plan amendments and modifications to facility permits would be needed to obtain such authorization.

(5) Achievement of Self-Sufficiency by December 31, 1997: The above discussion clearly indicates the significant need for additional processing/disposal capacity to be brought on line within the next five years to

achieve the department's self-sufficiency goal. As noted, even after considering that nearly all existing facilities will remain in operation as of 1997 and that all projects currently in the planning and permitting pipeline will actually be implemented, New Jersey will still be a 57% exporter for out-of-state disposal. As outlined in detail within Section B.4., the DEPE through the RMW State Plan is proposing to adopt a statewide disposal strategy to address this capacity shortfall. The department will work with each county during the statutory one-year planning process in order to structure the best possible approach to RMW management. Further, the department will rigorously apply the preferred disposal strategy hierarchy outline on page 39 as part of the county/state planning process to ensure that appropriate consideration of regional planning and project development takes place.

(6) County-by-County 5 year Capacity Assessment: The Comprehensive Act, in addition to requiring the preparation of the above statewide capacity analysis, required the department to provide a five year capacity assessment for each county. This is necessary since the act also requires counties to develop long-term plans as part of the formal one-year planning process which will be triggered by the publication of this draft state plan in the New Jersey Register. The following county assessments, as well as the other county specific information within Section C., will assist counties in developing required plans. (An overview of the statutory planning process is provided in Section B.4. on page 32.) It should also be noted that letters were written to each county in May 1989 to outline the county/state planning obligations of the Comprehensive Act and each county was also forwarded a data set in October 1991 to enable preliminary planning analysis. Each data set identified generators of RMW in the county, the quantity of each class of RMW generated for the 1990 AGR, a listing of all registered destination facilities within the county, and a breakdown of the RMW processed at each facility during the 1990 registration year.

Within Table 21c below, 1997 projections for each county have been provided. In all cases a summary of 1997 generation; projected in-county incinerator capacity using the assumption of continued operation of existing facilities as noted in Step B on page C153; projected in-county alternate technology capacity using the assumption of continued operations of existing facilities as noted in Step C on page C153; and projected sanitary sewer disposal capacity as framed in Step D on page C154, have been noted below for each county. At the end of each county equation, a summary of any projected capacity shortfall has been provided. It must also be pointed out that the "projected new capacity" and "potential future projects or activities" outlined on pages C156 and C158 were excluded from the following presentation since the noted projects have yet to receive permits for construction and operation from the DEPE.

TABLE 21c

STATE AND COUNTY CAPACITIES - 1997 PROJECTIONS

(Tons RMW Per Year)

STATE OF NEW JERSEY

21,070.0	(Projected Generation - 1997)
-3,774.0	(Projected Incineration On-site - 1997)
-2,396.0	(*Projected Alternate Technology Capacity - 1997)
<u>-765.0</u>	(Projected Sewer Disposal - 1997)
14,135.0	CAPACITY SHORTFALL (Tons/yr)

ATLANTIC COUNTY

348.8	(Projected Generation - 1997)
-135.6	(Projected Incineration On-site - 1997)
0.0	(*Projected Alternate Technology Capacity - 1997)
<u>-0.4</u>	(Projected Sewer Disposal - 1997)
212.8	CAPACITY SHORTFALL (Tons/yr)

BERGEN COUNTY

2,637.8	(Projected Generation - 1997)
-4.1	(Projected Incineration On-site - 1997)
-528.5	(*Projected Alternate Technology Capacity - 1997)
<u>-15.5</u>	(Projected Sewer Disposal - 1997)
2,089.6	CAPACITY SHORTFALL (Tons/yr)

BURLINGTON COUNTY

754.9	(Projected Generation - 1997)
-43.8	(Projected Incineration On-site - 1997)
-38.8	(*Projected Alternate Technology Capacity - 1997)
<u>-5.7</u>	(Projected Sewer Disposal - 1997)
666.6	CAPACITY SHORTFALL (Tons/yr)

CAMDEN COUNTY

1,409.5	(Projected Generation - 1997)
0.0	(Projected Incineration On-site - 1997)
950.7	(*Projected Alternate Technology Capacity - 1997)
<u>-10.8</u>	(Projected Sewer Disposal - 1997)
448.1	CAPACITY SHORTFALL (Tons/yr)

CAPE MAY COUNTY

86.7	(Projected Generation - 1997)
0.0	(Projected Incineration On-site - 1997)
0.0	(*Projected Alternate Technology Capacity - 1997)
<u>-0.7</u>	(Projected Sewer Disposal - 1997)
86.0	CAPACITY SHORTFALL (Tons/yr)

CUMBERLAND COUNTY

169.8	(Projected Generation - 1997)
0.0	(Projected Incineration On-site - 1997)
-15.3	(*Projected Alternate Technology Capacity - 1997)
<u>-8.5</u>	(Projected Sewer Disposal - 1997)
146.0	CAPACITY SHORTFALL (Tons/yr)

ESSEX COUNTY

3,860.9	(Projected Generation - 1997)
-620.2	(Projected Incineration On-site - 1997)
-57.2	(*Projected Alternate Technology Capacity - 1997)
<u>-158.1</u>	(Projected Sewer Disposal - 1997)
3,025.4	CAPACITY SHORTFALL (Tons/yr)

GLOUCESTER COUNTY

143.9	(Projected Generation - 1997)
0.0	(Projected Incineration On-site - 1997)
19.1	(*Projected Alternate Technology Capacity - 1997)
<u>-1.3</u>	(Projected Sewer Disposal - 1997)
123.5	CAPACITY SHORTFALL (Tons/yr)

HUDSON COUNTY

608.6	(Projected Generation - 1997)
-0.0	(Projected Incineration On-site - 1997)
0.0	(*Projected Alternate Technology Capacity - 1997)
<u>-67.9</u>	(Projected Sewer Disposal - 1997)
540.6	CAPACITY SHORTFALL (Tons/yr)

HUNTERDON COUNTY

516.1	(Projected Generation - 1997)
0.0	(Projected Incineration On-site - 1997)
-341.4	(*Projected Alternate Technology Capacity - 1997)
<u>-0.2</u>	(Projected Sewer Disposal - 1997)
174.6	CAPACITY SHORTFALL (Tons/yr)

MERCER COUNTY

1,069.9	(Projected Generation - 1997)
-55.3	(Projected Incineration On-site - 1997)
-14.8	(*Projected Alternate Technology Capacity - 1997)
<u>-3.4</u>	(Projected Sewer Disposal - 1997)
996.5	CAPACITY SHORTFALL (Tons/yr)

MIDDLESEX COUNTY

3,918.1	(Projected Generation - 1997)
-1960.7	(Projected Incineration On-site - 1997)
352.1	(*Projected Alternate Technology Capacity - 1997)
<u>-303.2</u>	(Projected Sewer Disposal - 1997)
1,302.2	CAPACITY SHORTFALL (Tons/yr)

MONMOUTH COUNTY

880.9	(Projected Generation - 1997)
-160.2	(Projected Incineration On-site - 1997)
0.0	(*Projected Alternate Technology Capacity - 1997)
<u>-3.5</u>	(Projected Sewer Disposal - 1997)

717.2 CAPACITY SHORTFALL (Tons/yr)

MORRIS COUNTY

578.8	(Projected Generation - 1997)
-395.5	(Projected Incineration On-site - 1997)
0.0	(*Projected Alternate Technology Capacity - 1997)
<u>-4.1</u>	(Projected Sewer Disposal - 1997)

179.1 CAPACITY SHORTFALL (Tons/yr)

OCEAN COUNTY

937.2	(Projected Generation - 1997)
0.0	(Projected Incineration On-site - 1997)
0.0	(*Projected Alternate Technology Capacity - 1997)
<u>-158.8</u>	(Projected Sewer Disposal - 1997)

778.3 CAPACITY SHORTFALL (Tons/yr)

PASSAIC COUNTY

617.0	(Projected Generation - 1997)
0.0	(Projected Incineration On-site - 1997)
0.0	(*Projected Alternate Technology Capacity - 1997)

-2.6 (Projected Sewer Disposal - 1997)

614.3 CAPACITY SHORTFALL (Tons/yr)

SALEM COUNTY

49.4	(Projected Generation - 1997)
-30.8	(Projected Incineration On-site - 1997)
0.0	(*Projected Alternate Technology Capacity - 1997)
<u>-0.9</u>	(Projected Sewer Disposal - 1997)

17.6 CAPACITY SHORTFALL (Tons/yr)

SOMERSET COUNTY

648.7	(Projected Generation - 1997)
-0.2	(Projected Incineration On-site - 1997)
0.0	(*Projected Alternate Technology Capacity - 1997)
<u>-8.9</u>	(Projected Sewer Disposal - 1997)

639.6 CAPACITY SHORTFALL (Tons/yr)

SUSSEX COUNTY

100.2	(Projected Generation - 1997)
0.0	(Projected Incineration On-site - 1997)
0.0	(*Projected Alternate Technology Capacity - 1997)
<u>-1.8</u>	(Projected Sewer Disposal - 1997)

98.4 CAPACITY SHORTFALL (Tons/yr)

UNION COUNTY

1,630.5	(Projected Generation - 1997)
-367.9	(Projected Incineration On-site - 1997)
-78.3	(*Projected Alternate Technology Capacity - 1997)
<u>-6.3</u>	(Projected Sewer Disposal - 1997)
1,178.1	CAPACITY SHORTFALL (Tons/yr)

WARREN COUNTY

102.8	(Projected Generation - 1997)
0.0	(Projected Incineration On-site - 1997)
0.0	(*Projected Alternate Technology Capacity - 1997)
<u>-2.5</u>	(Projected Sewer Disposal - 1997)
100.3	CAPACITY SHORTFALL (Tons/yr)

b. Thirty-year Planning Projections:

In 1995 the population of New Jersey is projected to be 8,052,002, an increase of 4.2% over the 1990 population. The amount of RMW generated in the state is projected to be 20,825 tons, an increase of 800 tons from the 1990 amount. By 2020 the projected state population is projected increase by 19.2% to 9,216,555 and the amount of RMW generated is expected to increase to 23,747 tons. This information along with five and 30-year projections by county are detailed in Table 22a (Population Projections & Generation by RMW class).

The base population used in these projections is taken from the decennial census of April 1, 1990. The first Annual Generator Regulated Medical Waste Report results in the base data for the RMW generation and composition projections (Table 22a Population Projections & Generation by RMW class).

As stated previously and reported in Table 22a, it is projected that New Jersey will experience between 1990-1995 a 4.2% increase in population and RMW generation. The following counties are projected to have the greatest increases in the state: Cape May County (9.7%), Ocean County (9.3%), Hunterdon County (8.6%), Atlantic County (8.4%), Sussex County (7.7%), Somerset County (7.5%), and Mercer County (7.4%).

It is projected that the state's population and tonnage of RMW generated will increase by 19.2% between 1990-2020. The following counties will sustain the greatest increases: Atlantic County (47.3%), Ocean County (42.7%), Sussex County (34.1%), Hunterdon County (33.5%) and Cape May County (33.0%).

The Economic-Demographic Model used in the population projections is based on

standard demographic projection procedures as modified by the Office of Demographic and Economic Analysis (ODEA), New Jersey Department of Labor. This model is based on the ODEA's assumptions as stated in their population projection documents, that employment growth is the predominant determinant of population migration in the counties and the state for persons under 65 years of age. Taken into consideration is the fact that current low fertility rates and the aging of the "baby boom" generation into retirement will probably act as a constraint on employment and population growth after the year 2000. Employment projections reflect the historical growth of industries in the state and counties.

The trends that developed in projecting population changes in the state were directly applied to the base data on RMW to forecast the five and 30 year projections of the amount of RMW that will be generated by waste class in the state and counties. The lack of available data on RMW generated per occupied bed per day based on the age of patients at New Jersey hospitals, long-term and residential health care facilities (nursing homes and rest homes or boarding homes for the elderly), prevented the department from taking into consideration what may prove to be a significant factor, the aging of the population. It is projected that between 1990-2020 the number of people in New Jersey 65 years of age and older will increase substantially and proportionately to the total population. Generally, as people age they are more likely to need medical care and thus, would cause the generation of greater per capita amounts of RMW.

It is important to note that the projections beyond the year 2000 are precautionary because the accuracy of historically based assumptions (the basis for the Economic-Demographic Model) declines with increasing departure from the base year (1990). The department believes that the amount of RMW generated and disposed of in the future may also be affected by the movement in the state and counties towards the goal of at least a 60% recycling rate and the public's growing acceptance of source reduction initiatives.

A thirty-year planning projection for New Jersey's medical waste concerning generation, transport, and disposal is another issue. Any projections the DEPE makes concerning RMW will involve long-term remedies which may require high capital investment. Currently, the DEPE is acquiring and reviewing available data concerning population projections and trends in the generation and management of RMW.

Table 22b (SIC Total) shows a summary of 30 year projections of RMW generation for all counties by SIC Code and waste class. It is projected that in the year 2020 the largest generators of RMW in New Jersey by tonnage will be the following types of organizations: general medical and surgical hospitals; commercial laboratories; medical laboratories. These service areas are projected to generate 80% of the total state RMW generated in 2020.

Following the completion of Table 22a, United States census population projections, as well as estimates of per capita RMW generation trends, were used to forecast RMW generation from 1990-2020. Tables 22c, 22d, and 22e (RMW generation estimates and per capita generation) represent the three alternative scenarios considered. In each case, population statistics from the 1990 census have been used. These population figures were applied uniformly within the generation estimate columns under each of the three scenarios.

Per capita generation assumptions have been applied differently under each scenario. Table 22c represents an assumption of no change in per capita generation throughout the thirty-year study period. Table 22d considers a 6% per capita increase from 1990-2000; a 6% increase for years 2000-2010; and a 6% increase for years 2010-2020. This scenario also assumes that no advances in source reduction programs will be achieved. Finally Table 22e assumes the achievement of a 6% reduction in per capita generation by the year 2000 through aggressive source reduction programs. The per capita assumptions remain constant thereafter to the year 2020.

For the purposes of calculating Tables 22c and 22d, the initial baseline 1990 per capita rates were kept uniform. Based upon 1990 population figures, per capita RMW generation rates (pounds of medical waste generated per person per day) were also calculated for each county. On a statewide basis, the average per capita RMW generation rate is equal to 0.0142 pounds per person per day. For all cases, the statewide per capita rates found within Table 22c were used.

Table 22c, indicates that with no per capita change RMW generation will increase 16.2% from 1900-2020. Table 22d represents a per capita increase scenario that would result in an 18.6% increase in RMW generation between 1900-2020. Finally, Table 22e the "no per capita increase" scenario (which assumes a 6% decrease between 1990-2000) shows a significantly lower 10.8% increase in RMW generation by 2020.

5. Monitoring and Enforcement

a. The Role of Statutory Enforcement and Penalty Provisions:

Pursuant to the Comprehensive Act, civil liabilities and criminal penalties are permitted to ensure compliance with the Comprehensive Act and implementing regulations. The Comprehensive Act has assigned enforcement of the rules and regulations to the Department of Environmental Protection and Energy (DEPE) and the Department of Health (DOH). Civil liabilities were incorporated to provide remedial or corrective action for the medical waste regulations. Criminal penalties were established to punish violators and to offer a deterrent to the regulated

TABLE 22a - Page 1 of 8

30-YEAR RMW PROJECTION GENERATION SUMMARY

PROJECTION OF POPULATION BY COUNTY (1990-2020)					PROJECTION OF RMW GENERATION BY CLASS (1990-2020)							
		1990 CENSUS	% INC/DEC	PROJ. POP.	CLASS 1	CLASS 2	CLASS 3	CLASS 4	CLASS 5	CLASS 6	CLASS 7	TOTAL
ATLANTIC	1990	224,327			0.00	8.83	185.50	44.12	1.54	17.85	0.09	311.72
COUNTY	1995		8.4%	243,234	58.32	9.57	201.14	47.84	1.66	19.36	0.09	337.99
	2000		8.0%	262,575	62.96	10.33	217.13	51.64	1.80	20.90	0.10	364.86
	2005		6.7%	280,068	67.15	11.02	231.59	55.08	1.92	22.29	0.10	389.17
	2010		6.2%	297,471	71.33	11.71	245.99	58.51	2.04	23.68	0.11	413.35
	2015		5.1%	312,527	74.94	12.30	258.44	61.47	2.14	24.87	0.11	434.27
	2020		5.7%	330,385	79.22	13.00	273.20	64.98	2.26	26.30	0.12	459.09
	PERCENT INCREASE 1990 - 2020			47.3%				PERCENT INCREASE 1990 - 2020				47.3%
BERGEN	1990	825,380			322.70	50.42	1,512.92	697.25	3.39	3.82	0.58	2,591.07
COUNTY	1995		1.0%	833,931	326.05	50.94	1,528.60	704.47	3.42	3.86	0.58	2,617.92
	2000		1.9%	849,916	332.30	51.91	1,557.90	717.98	3.49	3.93	0.59	2,668.10
	2005		1.8%	865,429	338.36	52.86	1,586.33	731.08	3.55	4.00	0.60	2,716.80
	2010		1.6%	879,235	343.76	53.71	1,611.64	742.74	3.61	4.07	0.61	2,760.14
	2015		0.9%	886,916	346.76	54.17	1,625.72	749.23	3.64	4.10	0.62	2,784.25
	2020		1.1%	896,712	350.59	54.77	1,643.67	757.51	3.68	4.15	0.63	2,815.00
	PERCENT INCREASE 1990 - 2020			8.6%				PERCENT INCREASE 1990 - 2020				8.6%

TABLE 22a (cont'd.) - Page 2 of 8

		1990 CENSUS	% INC/DEC	PROJ. POP.	CLASS 1	CLASS 2	CLASS 3	CLASS 4	CLASS 5	CLASS 6	CLASS 7	TOTAL
BURLINGTON	1990	395,066			180.54	101.36	249.32	80.98	9.99	64.94	3.52	690.66
COUNTY	1995		6.7%	421,716	192.72	108.19	266.14	86.45	10.66	69.32	3.76	737.24
	2000		6.0%	447,071	204.31	114.70	282.14	91.64	11.30	73.49	3.98	781.57
	2005		4.0%	464,811	212.42	119.25	293.34	95.28	11.75	76.41	4.14	812.58
	2010		3.3%	480,009	219.36	123.15	302.93	98.40	12.13	78.90	4.28	839.15
	2015		2.4%	491,707	224.71	126.15	310.31	100.79	12.43	80.83	4.38	859.60
	2020		2.5%	504,240	230.44	129.36	318.22	103.36	12.75	82.89	4.49	881.51
	PERCENT INCREASE 1990 - 2020			27.6%				PERCENT INCREASE 1990 - 2020				27.6%
CAMDEN	1990	502,824			257.26	102.87	459.33	143.71	1.42	354.80	0.05	1,319.43
COUNTY	1995		5.0%	527,866	270.07	107.99	482.21	150.87	1.49	372.47	0.05	1,385.14
	2000		4.4%	551,192	282.00	112.76	503.52	157.53	1.56	388.93	0.05	1,446.35
	2005		3.9%	572,512	292.91	117.12	522.99	163.63	1.62	403.97	0.05	1,502.30
	2010		3.0%	589,771	301.74	120.65	538.76	168.56	1.67	416.15	0.05	1,547.58
	2015		2.6%	605,162	309.62	123.80	552.82	172.96	1.71	427.01	0.06	1,587.97
	2020		1.8%	616,209	315.27	126.06	562.91	176.11	1.74	434.81	0.06	1,616.96
	PERCENT INCREASE 1990 - 2020			22.5%				PERCENT INCREASE 1990 - 2020				22.5%
CAPE MAY	1990	95,089			5.39	10.77	39.72	19.64	0.00	1.05	0.00	76.57
COUNTY	1995		9.7%	104,280	5.91	11.81	43.56	21.53	0.00	1.16	0.00	83.97
	2000		8.1%	112,681	6.39	12.76	47.07	23.27	0.00	1.25	0.00	90.74
	2005		4.4%	117,689	6.67	13.33	49.16	24.30	0.00	1.30	0.00	94.77
	2010		3.2%	121,398	6.88	13.75	50.71	25.07	0.00	1.35	0.00	97.76
	2015		1.9%	123,687	7.01	14.01	51.67	25.54	0.00	1.37	0.00	99.60
	2020		2.3%	126,513	7.17	14.33	52.85	26.12	0.00	1.40	0.00	101.88
	PERCENT INCREASE 1990 - 2020			33.0%				PERCENT INCREASE 1990 - 2020				33.0%

TABLE 22a (cont'd.) - Page 3 of 8

		1990 CENSUS	% INC/DEC	PROJ. POP.	CLASS 1	CLASS 2	CLASS 3	CLASS 4	CLASS 5	CLASS 6	CLASS 7	TOTAL
CUMBERLAND	1990	138,053			10.74	0.67	84.19	18.79	0.04	46.42	0.00	160.85
COUNTY	1995		4.0%	143,537	11.17	0.70	87.53	19.54	0.04	48.26	0.00	167.24
	2000		3.8%	149,022	11.60	0.72	90.88	20.28	0.04	50.10	0.00	173.63
	2005		2.4%	152,661	11.88	0.74	93.09	20.78	0.05	51.33	0.00	177.87
	2010		1.8%	155,454	12.10	0.75	94.80	21.16	0.05	52.27	0.00	181.13
	2015		1.2%	157,296	12.24	0.76	95.92	21.41	0.05	52.89	0.00	183.27
	2020		1.3%	159,328	12.40	0.77	97.16	21.69	0.05	53.57	0.00	185.64
	PERCENT INCREASE 1990 - 2020			15.4%				PERCENT INCREASE 1990 - 2020				15.4%
ESSEX	1990	778,206			829.40	274.71	1,250.76	285.00	59.36	1,164.09	3.66	3,866.99
COUNTY	1995		-0.4%	775,421	826.43	273.73	1,246.28	283.98	59.15	1,159.93	3.65	3,853.15
	2000		0.5%	779,103	830.35	275.03	1,252.20	285.33	59.43	1,165.44	3.67	3,871.45
	2005		0.3%	781,225	832.61	275.78	1,255.61	286.11	59.59	1,168.61	3.68	3,881.99
	2010		0.2%	782,702	834.19	276.30	1,257.99	286.65	59.70	1,170.82	3.68	3,889.33
	2015		0.1%	783,626	835.17	276.63	1,259.47	286.99	59.77	1,172.20	3.69	3,893.92
	2020		0.1%	784,365	835.96	276.89	1,260.66	287.26	59.83	1,173.31	3.69	3,897.60
	PERCENT INCREASE 1990 - 2020			0.8%				PERCENT INCREASE 1990 - 2020				0.8%
GLOUCESTER	1990	230,082			9.74	1.69	61.63	17.29	0.00	43.62	0.00	133.97
COUNTY	1995		5.3%	242,280	10.25	1.78	64.90	18.20	0.00	45.93	0.00	141.07
	2000		5.0%	254,290	10.76	1.87	68.11	19.10	0.00	48.21	0.00	148.06
	2005		3.6%	263,332	11.15	1.94	70.54	19.78	0.00	49.92	0.00	153.33
	2010		2.7%	270,518	11.45	1.99	72.46	20.32	0.00	51.28	0.00	157.51
	2015		2.0%	275,918	11.68	2.03	73.91	20.73	0.00	52.31	0.00	160.66
	2020		2.1%	281,717	11.92	2.07	75.46	21.16	0.00	53.41	0.00	164.03
	PERCENT INCREASE 1990 - 2020			22.4%				PERCENT INCREASE 1990 - 2020				22.4%

TABLE 22a (cont'd.) - Page 4 of 8

		1990 CENSUS	% INC/DEC	PROJ. POP.	CLASS 1	CLASS 2	CLASS 3	CLASS 4	CLASS 5	CLASS 6	CLASS 7	TOTAL
HUDSON	1990	553,099			73.39	27.16	334.94	91.88	0.04	75.45	0.18	603.04
COUNTY	1995		0.4%	555,285	73.68	27.27	336.26	92.24	0.04	75.75	0.18	605.43
	2000		1.3%	562,666	74.66	27.63	340.73	93.47	0.04	76.75	0.19	613.48
	2005		0.7%	566,431	75.16	27.82	343.01	94.09	0.04	77.27	0.19	617.58
	2010		0.8%	570,981	75.76	28.04	345.77	94.85	0.04	77.89	0.19	622.54
	2015		0.3%	572,869	76.02	28.14	346.91	95.16	0.04	78.14	0.19	624.60
	2020		0.2%	573,964	76.16	28.19	347.57	95.34	0.04	78.29	0.19	625.79
	PERCENT INCREASE 1990 - 2020			3.8%				PERCENT INCREASE 1990 - 2020				3.8%
HUNTERDON	1990	107,776			76.75	17.65	82.98	282.15	0.00	0.00	0.22	459.75
COUNTY	1995		8.6%	117,097	83.39	19.17	90.16	306.56	0.00	0.00	0.24	499.52
	2000		8.3%	126,775	90.28	20.76	97.61	331.89	0.00	0.00	0.26	540.80
	2005		4.3%	132,287	94.20	21.66	101.86	346.32	0.00	0.00	0.27	564.31
	2010		4.3%	137,990	98.26	22.59	106.25	361.25	0.00	0.00	0.28	588.64
	2015		2.1%	140,952	100.37	23.08	108.53	369.01	0.00	0.00	0.29	601.28
	2020		2.1%	143,914	102.48	23.56	110.81	376.76	0.00	0.00	0.30	613.91
	PERCENT INCREASE 1990 - 2020			33.5%				PERCENT INCREASE 1990 - 2020				33.5%
MERCER	1990	325,824			235.64	5.91	443.38	172.33	29.14	89.14	0.03	975.57
COUNTY	1995		7.4%	349,919	253.06	6.35	476.17	185.07	31.29	95.73	0.04	1,047.71
	2000		5.3%	368,350	266.39	6.68	501.25	194.82	32.94	100.78	0.04	1,102.90
	2005		4.1%	383,423	277.29	6.96	521.76	202.79	34.29	104.90	0.04	1,148.03
	2010		3.3%	395,885	286.30	7.18	538.72	209.39	35.40	108.31	0.04	1,185.34
	2015		2.1%	404,312	292.40	7.33	550.18	213.84	36.16	110.61	0.04	1,210.57
	2020		2.3%	413,572	299.09	7.50	562.78	218.74	36.99	113.15	0.04	1,238.30
	PERCENT INCREASE 1990 - 2020			26.9%				PERCENT INCREASE 1990 - 2020				26.9%

TABLE 22a (cont'd.) - Page 5 of 8

		1990 CENSUS	% INC/DEC	PROJ. POP.	CLASS 1	CLASS 2	CLASS 3	CLASS 4	CLASS 5	CLASS 6	CLASS 7	TOTAL
MIDDLESEX	1990	671,780			282.97	717.83	2,395.51	143.55	42.18	12.18	11.38	3,605.60
COUNTY	1995		6.4%	714,575	300.99	763.56	2,548.11	152.70	44.87	12.95	12.11	3,835.30
	2000		5.4%	753,080	317.21	804.71	2,685.42	160.93	47.29	13.65	12.76	4,041.96
	2005		3.8%	781,615	329.23	835.20	2,787.17	167.03	49.08	14.17	13.24	4,195.11
	2010		2.9%	803,969	338.65	859.08	2,866.88	171.80	50.48	14.57	13.62	4,315.09
	2015		2.4%	823,478	346.87	879.93	2,936.45	175.97	51.71	14.93	13.95	4,419.80
	2020		2.1%	840,982	354.24	898.63	2,998.87	179.71	52.81	15.25	14.25	4,513.75
	PERCENT INCREASE 1990 - 2020			25.2%				PERCENT INCREASE 1990 - 2020				25.2%
MONMOUTH	1990	553,124			78.80	61.58	468.34	145.13	3.57	48.22	0.14	805.77
COUNTY	1995		6.8%	590,503	84.12	65.74	499.99	154.94	3.81	51.48	0.14	860.22
	2000		6.0%	626,170	89.20	69.71	530.19	164.30	4.04	54.59	0.15	912.18
	2005		4.2%	652,283	92.92	72.62	552.30	171.15	4.21	56.87	0.16	950.22
	2010		3.4%	674,627	96.11	75.10	571.22	177.01	4.35	58.81	0.16	982.77
	2015		1.3%	683,313	97.34	76.07	578.57	179.29	4.41	59.57	0.17	995.42
	2020		1.7%	694,814	98.98	77.35	588.31	182.31	4.48	60.57	0.17	1,012.18
	PERCENT INCREASE 1990 - 2020			25.6%				PERCENT INCREASE 1990 - 2020				25.6%
MORRIS	1990	421,353			24.10	90.71	311.77	124.34	1.25	1.20	0.11	553.48
COUNTY	1995		3.2%	434,855	24.88	93.61	321.76	128.33	1.29	1.23	0.12	571.22
	2000		3.3%	449,006	25.68	96.66	332.23	132.50	1.34	1.27	0.12	589.81
	2005		3.0%	462,601	26.46	99.59	342.29	136.52	1.38	1.31	0.12	607.67
	2010		2.7%	474,891	27.17	102.23	351.38	140.14	1.41	1.35	0.13	623.81
	2015		1.4%	481,404	27.54	103.63	356.20	142.07	1.43	1.37	0.13	632.37
	2020		1.6%	488,875	27.97	105.24	361.73	144.27	1.45	1.39	0.13	642.18
	PERCENT INCREASE 1990 - 2020			16.0%				PERCENT INCREASE 1990 - 2020				16.0%

TABLE 22a (cont'd.) - Page 6 of 8

1990 CENSUS			% INC/DEC	PROJ. POP.	CLASS 1	CLASS 2	CLASS 3	CLASS 4	CLASS 5	CLASS 6	CLASS 7	TOTAL
OCEAN	1990	433,203			85.92	100.46	538.18	106.47	0.02	1.66	0.25	832.96
COUNTY	1995		9.3%	473,377	93.89	109.78	588.08	116.34	0.02	1.81	0.27	910.21
	2000		7.4%	508,347	100.83	117.89	631.53	124.93	0.03	1.95	0.30	977.45
	2005		6.2%	539,671	107.04	125.15	670.44	132.63	0.03	2.07	0.31	1,037.68
	2010		6.2%	573,323	113.72	132.96	712.25	140.90	0.03	2.20	0.33	1,102.38
	2015		3.4%	592,928	117.60	137.51	736.60	145.72	0.03	2.27	0.34	1,140.08
	2020		4.3%	618,229	122.62	143.37	768.04	151.94	0.03	2.37	0.36	1,188.73
PERCENT INCREASE 1990 - 2020				42.7%				PERCENT INCREASE 1990 - 2020				42.7%
PASSAIC	1990	453,060			91.79	152.29	151.22	125.43	0.13	62.68	2.80	586.34
COUNTY	1995		3.9%	470,903	95.41	158.28	157.18	130.37	0.14	65.15	2.91	609.43
	2000		3.1%	485,537	98.37	163.20	162.06	134.42	0.14	67.17	3.00	628.37
	2005		2.8%	499,092	101.12	167.76	166.59	138.18	0.15	69.05	3.08	645.91
	2010		1.5%	506,796	102.68	170.35	169.16	140.31	0.15	70.11	3.13	655.89
	2015		9.6%	555,596	112.57	186.75	185.45	153.82	0.16	76.87	3.43	719.04
	2020		4.3%	579,304	117.37	194.72	193.36	160.38	0.17	80.14	3.58	749.72
PERCENT INCREASE 1990 - 2020				27.9%				PERCENT INCREASE 1990 - 2020				27.9%
SALEM	1990	65,294			16.19	12.37	9.19	5.60	0.00	4.98	0.01	48.35
COUNTY	1995		1.3%	66,170	16.41	12.53	9.32	5.68	0.00	5.05	0.01	49.00
	2000		1.8%	67,332	16.70	12.75	9.48	5.78	0.00	5.14	0.01	49.86
	2005		1.2%	68,112	16.89	12.90	9.59	5.85	0.00	5.20	0.01	50.44
	2010		0.9%	68,698	17.04	13.01	9.67	5.90	0.00	5.24	0.01	50.87
	2015		0.1%	68,797	17.06	13.03	9.69	5.91	0.00	5.25	0.01	50.94
	2020		0.4%	69,091	17.13	13.09	9.73	5.93	0.00	5.27	0.01	51.16
PERCENT INCREASE 1990 - 2020				5.8%				PERCENT INCREASE 1990 - 2020				5.8%

TABLE 22a (cont'd.) - Page 7 of 8

		1990 CENSUS	% INC/ DEC	PROJ. POP.	CLASS 1	CLASS 2	CLASS 3	CLASS 4	CLASS 5	CLASS 6	CLASS 7	TOTAL
SOMERSET	1990	240,279			42.09	359.11	21.54	96.39	63.67	2.70	0.33	585.84
COUNTY	1995		7.5%	258,406	45.27	386.20	23.16	103.66	68.47	2.90	0.36	630.03
	2000		7.4%	277,536	48.62	414.79	24.88	111.34	73.54	3.12	0.39	676.67
	2005		4.7%	290,590	50.91	434.30	26.05	116.58	77.00	3.26	0.40	708.50
	2010		3.6%	300,932	52.72	449.76	26.98	120.73	79.74	3.38	0.42	733.72
	2015		2.0%	307,002	53.78	458.83	27.52	123.16	81.35	3.45	0.43	748.52
	2020		2.3%	314,177	55.04	469.55	28.16	126.04	83.25	3.53	0.44	766.01
	PERCENT INCREASE 1990 - 2020			30.8%				PERCENT INCREASE 1990 - 2020				30.8%
SUSSEX	1990	130,943			7.52	1.39	62.51	18.93	0.00	0.01	0.07	90.44
COUNTY	1995		7.7%	140,965	8.10	1.50	67.30	20.38	0.00	0.01	0.07	97.36
	2000		7.3%	151,249	8.69	1.61	72.21	21.87	0.00	0.01	0.08	104.46
	2005		5.0%	158,845	9.13	1.69	75.83	22.97	0.00	0.01	0.08	109.71
	2010		5.0%	166,807	9.59	1.77	79.63	24.12	0.00	0.01	0.08	115.20
	2015		2.6%	171,124	9.83	1.82	81.69	24.74	0.00	0.01	0.09	118.19
	2020		2.6%	175,537	10.09	1.87	83.80	25.38	0.00	0.01	0.09	121.23
	PERCENT INCREASE 1990 - 2020			34.1%				PERCENT INCREASE 1990 - 2020				34.1%
UNION	1990	493,819			553.39	138.55	346.07	126.28	5.60	457.77	0.28	1,627.93
COUNTY	1995		-0.1%	493,426	552.94	138.44	345.79	126.18	5.59	457.40	0.28	1,626.63
	2000		0.6%	496,550	556.45	139.32	347.98	126.98	5.63	460.30	0.28	1,636.93
	2005		0.3%	497,922	557.98	139.70	348.94	127.33	5.64	461.57	0.28	1,641.45
	2010		0.0%	498,119	558.20	139.76	349.08	127.38	5.65	461.75	0.28	1,642.10
	2015		0.2%	499,002	559.19	140.01	349.70	127.60	5.66	462.57	0.28	1,645.01
	2020		0.1%	499,591	559.85	140.17	350.11	127.75	5.66	463.12	0.28	1,646.95
	PERCENT INCREASE 1990 - 2020			1.2%				PERCENT INCREASE 1990 - 2020				1.2%

TABLE 22a (cont'd.) - Page 8 of 8

1990 CENSUS			% INC/DEC	PROJ. POP.	CLASS 1	CLASS 2	CLASS 3	CLASS 4	CLASS 5	CLASS 6	CLASS 7	TOTAL
WARREN	1990	91,607			8.91	17.26	62.39	9.82	0.00	0.52	0.00	98.91
COUNTY	1995		2.9%	94,256	9.17	17.76	64.20	10.11	0.00	0.54	0.00	101.77
	2000		2.6%	96,707	9.41	18.22	65.87	10.37	0.00	0.55	0.00	104.42
	2005		2.3%	98,938	9.63	18.64	67.38	10.61	0.00	0.56	0.00	106.83
	2010		2.3%	101,221	9.85	19.07	68.94	10.85	0.00	0.58	0.00	109.29
	2015		2.3%	103,556	10.08	19.51	70.53	11.10	0.00	0.59	0.00	111.81
	2020		1.4%	105,035	10.22	19.79	71.54	11.26	0.00	0.60	0.00	113.41
	PERCENT INCREASE 1990 - 2020			14.7%				PERCENT INCREASE 1990 - 2020				14.7%
STATE OF	1990	7,730,188			3,247.00	2,254.00	9,071.00	2,755.00	221.00	2,453.00	24.00	20,025.23
NEW JERSEY	1995		4.2%	8,052,002	3,382.18	2,347.84	9,448.63	2,869.69	230.20	2,555.12	25.00	20,858.90
	2000		4.0%	8,375,158	3,517.91	2,442.06	9,827.84	2,984.86	239.44	2,657.67	26.00	21,696.04
	2005		3.0%	8,629,537	3,624.76	2,516.24	10,126.34	3,075.52	246.71	2,738.39	26.79	22,355.02
	2010		2.6%	8,850,797	3,717.70	2,580.75	10,385.98	3,154.38	253.04	2,808.60	27.48	22,928.20
	2015		2.2%	9,041,172	3,797.67	2,636.26	10,609.38	3,222.23	258.48	2,869.01	28.07	23,421.37
	2020		1.9%	9,216,555	3,871.34	2,687.40	10,815.18	3,284.73	263.49	2,924.66	28.61	23,875.70
	PERCENT INCREASE 1990 - 2020			19.2%				PERCENT INCREASE 1990 - 2020				19.2%

TABLE 22b

RMW PROJECTIONS BY SIC CODE BY CLASS

					CLASS 1		CLASS 2		CLASS 3		CLASS 4		CLASS 5		CLASS 6		CLASS 7	
	NUMBER		TOTAL		CULTURES		PATHOLOGICAL WASTE		HUMAN BLOOD & BLOOD PRODUCTS		SHARPS		ANIMAL WASTE		ISOLATION WASTE		UNUSED SHARPS	
SIC	1990	2020	1990	2020	1990	2020	1990	2020	1990	2020	1990	2020	1990	2020	1990	2020	1990	2020
0741	17	20	3.72	4.43	1.27	1.51	1.32	1.57	0.04	0.05	1.05	1.25	0.03	0.04	0.00	0.00	0.00	0.00
0742	333	397	27.02	32.21	2.22	2.64	1.41	1.68	1.43	1.71	15.27	18.21	6.58	7.85	0.00	0.00	0.10	0.12
2815	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2833	1	1	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2834	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2844	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3221	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3585	1	1	0.08	0.09	0.00	0.00	0.00	0.00	0.08	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3662	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4911	1	1	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.01	0.00	0.00
5912	13	15	7.62	9.09	0.00	0.00	0.00	0.00	0.05	0.06	6.41	7.64	0.00	0.00	1.12	1.33	0.04	0.05
7261	378	451	124.90	148.91	0.15	0.18	3.89	4.64	119.15	142.06	0.18	0.21	0.00	0.00	1.53	1.82	0.00	0.00
7391	1	1	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.03	0.00	0.00
7948	1	1	0.05	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.06	0.00	0.00	0.00	0.00	0.00	0.00
8011	3063	3,652	329.53	392.89	63.00	75.11	29.63	35.33	141.91	169.19	76.17	90.81	0.00	0.00	17.94	21.39	0.88	1.05
8021	2574	3,069	46.61	55.58	0.15	0.17	2.93	3.49	10.82	12.90	31.54	37.60	0.03	0.04	0.63	0.76	0.51	0.61
8031	276	329	17.39	20.74	1.86	2.21	1.35	1.61	3.47	4.14	7.46	8.89	0.00	0.00	3.26	3.89	0.00	0.00
8041	1	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8043	326	389	2.92	3.49	0.20	0.23	0.69	0.83	0.59	0.70	1.28	1.53	0.00	0.00	0.14	0.17	0.02	0.03
8049	53	63	6.33	7.54	0.52	0.62	0.26	0.31	2.75	3.28	2.72	3.24	0.01	0.01	0.01	0.01	0.06	0.07
8051	198	236	56.01	66.78	0.99	1.19	4.79	5.71	7.76	9.25	11.20	13.36	0.00	0.00	31.23	37.24	0.03	0.04

TABLE 22b (cont'd.) - Page 2 of 2

					CLASS 1		CLASS 2		CLASS 3		CLASS 4		CLASS 5		CLASS 6		CLASS 7	
	NUMBER		TOTAL		CULTURES		PATHOLOGICAL WASTE		HUMAN BLOOD & BLOOD PRODUCTS		SHARPS		ANIMAL WASTE		ISOLATION WASTE		UNUSED SHARPS	
SIC	1990	2020	1990	2020	1990	2020	1990	2020	1990	2020	1990	2020	1990	2020	1990	2020	1990	2020
8052	13	15	1.41	1.68	0.53	0.64	0.00	0.00	0.00	0.00	0.61	0.72	0.00	0.00	0.27	0.32	0.00	0.00
8059	46	55	9.85	11.74	0.01	0.01	0.05	0.06	0.13	0.15	7.56	9.01	0.00	0.00	2.10	2.50	0.00	0.00
8062	101	120	16,740.63	19,959.52	2,452.9	2,924.85	2,149.	2,562.	8,272.4	9,863.0	1,499	1,787.	23.42	27.92	2,329.	2,778.8	13.80	16.45
8063	14	17	94.02	112.10	55.17	65.78	0.02	0.02	20.04	23.90	9.82	11.70	0.00	0.00	8.93	10.65	0.04	0.05
8069	24	29	96.60	117.56	20.16	24.04	3.37	4.02	8.24	9.82	19.70	23.49	0.00	0.00	47.13	56.19	0.00	0.00
8071	126	150	925.89	1,103.92	76.50	91.21	23.11	27.55	182.32	217.37	638.04	760.72	4.61	5.50	1.12	1.34	0.19	0.22
8082	68	81	36.20	43.16	0.00	0.00	0.01	0.01	27.02	32.22	5.31	6.33	0.00	0.00	0.56	0.69	3.26	3.90
8092	11	13	182.50	217.60	0.01	0.01	18.57	22.14	137.45	163.88	21.17	25.24	0.00	0.00	5.31	6.33	0.00	0.00
8093	58	69	1.45	1.72	0.08	0.10	0.00	0.00	0.05	0.06	1.32	1.57	0.00	0.00	0.00	0.00	0.00	0.00
8099	25	30	50.06	59.71	0.29	0.35	0.00	0.00	23.30	27.78	26.48	31.57	0.00	0.00	0.00	0.00	0.02	0.02
8211	301	359	0.36	0.43	0.10	0.12	0.00	0.00	0.00	0.00	0.22	0.27	0.00	0.00	0.02	0.02	0.01	0.01
8221	21	25	57.76	68.87	20.24	24.13	1.00	1.20	0.49	0.58	33.34	39.75	2.86	3.17	0.00	0.00	0.04	0.05
8374	1	1	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8731	20	24	60.24	71.82	8.39	10.01	1.87	2.23	2.09	2.49	5.74	6.85	41.52	49.51	0.53	0.63	0.09	0.11
8734	57	66	1,102.74	1,314.78	516.45	615.75	9.52	11.35	100.37	119.67	329.35	392.68	140.35	167.33	2.14	2.55	4.57	5.45
9223	17	20	1.62	1.93	0.03	0.04	0.36	0.43	0.74	0.88	0.45	0.54	0.00	0.00	0.01	0.01	0.02	0.03
9431	40	48	34.98	41.71	23.38	27.87	0.00	0.00	7.28	8.68	2.19	2.62	2.12	2.53	0.00	0.00	0.01	0.01
9711	4	5	4.67	5.56	2.34	2.79	0.00	0.01	1.39	1.65	0.93	1.11	0.00	0.00	0.01	0.01	0.00	0.00
	8,189	9,764	20,025	23,875	3,247	3,671	2,254	2,687	9,071	10,816	2,755	3,285	221	264	2,453	2,825	24	28

TABLE 22c

STATE POPULATION AND RMW GENERATION ESTIMATES: NO PER CAPITA CHANGE SCENARIO: 1990 - 2020

	1990	POPULATION (THOUSANDS)							
	LBS/DAY	(1)	(2)	(2)	(2)	(3) RMW GENERATION - TONS/YEAR			
COUNTY	PER CAPITA	1990	2000	2010	2020	1990	2000	2010	2020
Atlantic	0.0076	224	263	297	330	312	366	413	459
Bergen	0.0172	825	850	879	897	2,591	2,670	2,761	2,817
Burlington	0.0096	395	447	480	504	691	782	839	881
Camden	0.0144	503	551	590	616	1,319	1,445	1,548	1,616
Cape May	0.0044	95	113	122	127	77	91	98	102
Cumberland	0.0064	138	149	155	159	161	174	181	185
Essex	0.0272	778	779	783	784	3,867	3,872	3,892	3,897
Gloucester	0.0032	230	254	271	282	134	148	158	164
Hudson	0.0060	553	563	571	574	603	614	623	626
Hunterdon	0.0233	108	127	138	144	460	541	587	613
Mercer	0.0164	326	368	396	414	976	1,101	1,185	1,239
Middlesex	0.0294	672	753	804	841	3,606	4,040	4,314	4,512
Monmouth	0.0080	553	626	675	695	806	912	984	1,013
Morris	0.0072	421	449	475	489	553	590	624	643
Ocean	0.0105	433	508	573	618	833	977	1,102	1,189
Passaic	0.0071	453	486	507	579	586	629	656	749
Salem	0.0041	65	67	69	69	48	50	51	51
Somerset	0.0134	240	278	301	314	586	679	735	766
Sumner	0.0038	131	151	169	176	90	104	117	122
Union	0.0181	494	497	498	500	1,628	1,638	1,641	1,648
Warren	0.0059	92	97	101	105	99	104	109	113
TOTALS	0.0142	7,729	8,376	8,854	9,217	20,025	21,702	22,940	23,881

- (1) Source - U.S. Bureau of the Census - 1990
- (2) Source - New Jersey Department of Labor Population Projections 1995 - 2020; Economic Demographic Model
- (3) All generation estimates derived exclusively from population trends. Throughout the 30 year timeframe, per capita generation for each county was assumed to remain constant and no source reduction was considered.

TABLE 22d

STATE POPULATION AND RMW GENERATION ESTIMATES: PER CAPITA INCREASE SCENARIO: 1990 - 2020

	1990	POPULATION (THOUSANDS)							
	LBS/DAY	(1)	(2)	(2)	(2)	(3) RMW GENERATION - TONS/YEAR			
COUNTY	PER CAPITA	1990	2000	2010	2020	1990	2000	2010	2020
Atlantic	0.0076	224	263	297	330	312	377	426	473
Bergen	0.0172	825	850	879	897	2,591	2,750	2,843	2,902
Burlington	0.0096	395	447	480	504	691	805	864	908
Camden	0.0144	503	551	590	616	1,319	1,489	1,594	1,664
Cape May	0.0044	95	113	122	127	77	94	101	105
Cumberland	0.0064	138	149	155	159	161	179	186	191
Essex	0.0272	778	779	783	784	3,867	3,988	4,009	4,014
Gloucester	0.0032	230	254	271	282	134	152	163	169
Hudson	0.0060	553	563	571	574	603	632	641	645
Hunterdon	0.0233	108	127	138	144	460	557	605	631
Mercer	0.0164	326	368	396	414	976	1,134	1,221	1,276
Middlesex	0.0294	672	753	804	841	3,606	4,161	4,443	4,648
Mosmouth	0.0080	553	626	675	695	806	939	1,013	1,043
Morris	0.0072	421	449	475	489	553	608	643	662
Ocean	0.0105	433	508	573	618	833	1,007	1,135	1,225
Passaic	0.0071	453	486	507	579	586	648	676	772
Salem	0.0041	65	67	69	69	48	51	53	53
Somerset	0.0134	240	278	301	314	586	699	757	789
Somex	0.0038	131	151	169	176	90	107	120	125
Union	0.0181	494	497	498	500	1,628	1,687	1,690	1,697
Warren	0.0059	92	97	101	105	99	107	112	116
TOTALS	0.0142	7,729	8,376	8,854	9,217	20,025	22,353	23,628	24,597

- (1) Source - U.S. Bureau of the Census - 1990
- (2) Source: New Jersey Department of Labor Population Projections 1995-2020: Economic Demographic Model
- (3) 6% Increase each 10 years.

TABLE 22e

STATE POPULATION AND RMW GENERATION ESTIMATES: PER CAPITA DECREASE SCENARIO: 1990 - 2020

	1990	POPULATION (THOUSANDS)							
	LBS/DAY	(1)	(2)	(2)	(2)	(3) RMW GENERATION - TONS/YEAR			
COUNTY	PER CAPITA	1990	2000	2010	2020	1990	2000	2010	2020
Atlantic	0.0076	224	263	297	330	312	344	389	432
Bergen	0.0172	825	850	879	897	2,591	2,509	2,595	2,648
Burlington	0.0096	395	447	480	504	691	735	789	828
Camden	0.0144	503	551	590	616	1,319	1,359	1,455	1,519
Cape May	0.0044	95	113	122	127	77	86	92	96
Cumberland	0.0064	138	149	155	159	161	163	170	174
Essex	0.0272	778	779	783	784	3,867	3,640	3,658	3,663
Gloucester	0.0032	230	254	271	282	134	139	148	154
Hudson	0.0060	553	563	571	574	603	577	585	588
Hunterdon	0.0233	108	127	138	144	460	508	552	576
Mercer	0.0164	326	368	396	414	976	1,035	1,114	1,165
Middlesex	0.0294	672	753	804	841	3,606	3,798	4,055	4,242
Monmouth	0.0080	553	626	675	695	806	857	925	952
Morris	0.0072	421	449	475	489	553	555	587	604
Ocean	0.0105	433	508	573	618	833	919	1,036	1,118
Passaic	0.0071	453	486	507	579	586	591	617	704
Salem	0.0041	65	67	69	69	48	47	48	48
Somerset	0.0134	240	278	301	314	586	638	691	720
Sumner	0.0038	131	151	169	176	90	98	110	114
Union	0.0181	494	497	498	500	1,628	1,540	1,543	1,549
Warren	0.0059	92	97	101	105	99	98	102	106
TOTALS	0.0142	7,729	8,376	8,854	9,217	20,025	20,399	21,564	22,448

(1) Source - U.S. Bureau of the Census - 1990

(2) Source: New Jersey Department of Labor Population Projections 1995-2020: Economic Demographic Model

(3) 6% Decrease first 10 years (1990-2000).

community. Other provisions of the Comprehensive Act include a strict and joint liability clause and citizen rewards.

Rulemaking and enforcement provisions for the regulations were designated to the DEPE and the DOH. Enforcement may include inspections, investigations, receiving and initiating complaints concerning violations and holding hearings or initiating legal proceedings seeking legal and equitable relief. The DEPE works through the offices of the Attorney General for civil and criminal enforcement. The regulations, as with all solid waste law, also provide for local enforcement by local boards of health or county health departments.

There are four types of civil remedies available to the departments which include violation orders, civil actions, civil administrative penalties, and actions for civil penalties. The first civil remedy is the administrative order. An administrative order requires compliance with the law, orders abatement of the violation and gives to a person the right to an administrative hearing. If a request for a hearing is not made within 20 days, the order becomes final. An administrative order may be issued by the Commissioner of the DEPE or the Commissioner of the DOH.

The second civil remedy is a civil action. A civil action may encompass an action or proceeding in court for injunctive and other relief. Other relief may include a temporary or permanent injunction and assessment for the costs and damages involved. A civil action is usually brought by the Attorney General's office on behalf of the Commissioner of the DEPE, or the Commissioner of the DOH. A local board of health or a county health department also has a right to use this remedy.

The third action is a civil administrative penalty. A civil administrative penalty is initiated by the Commissioner of the DEPE and may reach up to \$50,000.00 per violation. Each day a violation continues is an additional offense with penalties of up to \$50,000.00 per day. When issuing a civil administrative penalty the Commissioner of the DEPE must take into consideration the history of the violator, the severity of the violation, measures which were taken to mitigate or prevent further violations, and whether the penalty will constitute an appropriate deterrent. Persons assessed with a civil penalty have a right to a hearing on notice within twenty days of the assessment.

The fourth and final type of civil enforcement is legal action to assess and collect a civil penalty. An action may be instituted for a civil penalty of up to \$50,000.00 per day for violation of the act. Violation of an administrative order or a court order or failure to pay an assessment under the act subjects the person to penalties of up to \$100,000.00 per day of each violation.

The Comprehensive Act also provides for criminal enforcement of the RMW

regulations. A criminal action may be instituted within five years of the date of discovery of the violation. Violations of this law are third and fourth degree crimes depending on the nature of the violation. Purposeful or knowing violations of the Act, making false or misleading statements, or omitting information on documents or to the authorities, as well as the failure to properly treat wastes may constitute a third degree crime. A third degree crime is subject to a jail term and a fine of up to \$50,000.00 for the first offense and not more than \$100,000.00 for each subsequent offense. A fourth degree crime may include reckless or negligent violations or false or misleading statements. It is a fourth degree crime to transport RMW to an unauthorized facility or to transport or receive it without completing and submitting a tracking form. In addition, the criminal statute N.J.S.A. 2C:43-3 states that fourth degree crimes include fines up to \$7,500. Further, any vehicle used in a willful discharge is subject to forfeiture to the state.

The Comprehensive Act also incorporated provisions for strict liability and citizen rewards. The strict liability clause (N.J.S.A. 13:1E-48.21) of the Comprehensive Act states that any person who violates the regulations shall be strictly liable, jointly and severally, without regard to fault, for all costs. This includes the responsibility for all costs sustained by anyone associated with the clean-up and removal of the waste. In addition, the Comprehensive Act offers a reward to informants who supply information which leads to a successful enforcement action (N.J.S.A. 13:E1-48.24). The informant is entitled to a reward of ten percent of the penalty collected or \$ 250.00, whichever amount is greater.

b. Enforcement Strategy and Interagency Agreements:

The Comprehensive Act and the federal USEPA's Demonstration Program, defined the USEPA, DEPE and DOH and local health departments as the multiple agencies responsible for carrying out the enforcement provisions of the medical waste law. This law also prescribed the authority these organizations have to enforce the state and federal laws provisions, but did not outline an enforcement strategy for the organizations to carry out. A medical waste enforcement strategy was developed during the first year of the medical waste program based on the laws' requirements, the agencies' broader floatables action plan and general long-standing agency enforcement goals. Both formal written agreements between the agencies and informal understandings have been established to frame the implementation of the strategy.

Even before the signing of the Comprehensive Act in March 1989, the DEPE had begun developing a cooperative interagency agreement among the various agencies which would be involved with responding to incidents of medical waste being improperly disposed of and incidents of medical wastes washing up on New Jersey's beaches. This agreement, prepared in May 1989, became known as the "Interagency Protocol for Incident Response to Medical Waste and Marine

Floatables Incidents (Interagency Protocol)." The Interagency Protocol is updated each year, but closely mirrors the original 1989 procedure. The 1992 Interagency Protocol is included with this RMW State Plan for reference purposes as Appendix A.

The Interagency Protocol was developed by the DEPE, Division of Solid Waste Management, DOH and the Office of Enforcement as well as the various other agencies participating in the protocol outlined below. The protocol, or standard operating procedures for notification, verification and response to an incident, assures expeditious dissemination of information and will maximize the ability of the agencies to respond to an incident. Agencies involved in the protocol are:

- New Jersey Department of Environment Protection and Energy (DEPE)
 - Division of Solid Waste Management (Enforcement Element)
 - Division of Solid Waste Management (Office of Recycling and Planning)
 - Office of Enforcement
 - Division of Responsible Party Site Remediation (Trenton Dispatch)
- New Jersey Department of Health (DOH)
- New Jersey Department of Law and Public Safety (DL&PS)
 - Office of the Environmental Prosecutor
 - Division of Criminal Justice (DCJ)
 - Division of State Police
- United States Environmental Protection Agency (USEPA).

Trenton Dispatch, Bureau of Communication and Support Services, DEPE, maintains a Medical Waste Incident Directory of all incidents reported to DEPE.

The Interagency Protocol Response Flow Diagram for 1992 is included on the following page as Figure 27. This flow diagram clearly depicts the interagency chain of communication to both land-based and coastal incidents. The Documentation Protocol Flow Diagram for last year, 1992, Figure 28 on page 183, outlines the formal documentation created in the various participating agencies during incident responses.

When the medical waste program was originally developed in 1989, the DEPE determined that annual compliance inspections would be performed at all generator facilities. The DEPE believed annual inspections were necessary, at least initially for the first few years of the program's development, to ensure the proper compliance of the regulated community with the new and often complicated requirements of the regulations. The field inspector was expected to perform the important function of helping to train the registrants during the program's first few years. On-site training is a particularly effective way of instructing the regulated community. While inspectors are at the generator's site, they are able to instruct the generator in proper compliance procedures and answer any questions about

FIGURE 27

NEW JERSEY PROTOCOL FOR MEDICAL WASTE AND MARINE FLOATABLES INCIDENT RESPONSE 1992 FLOW DIAGRAM

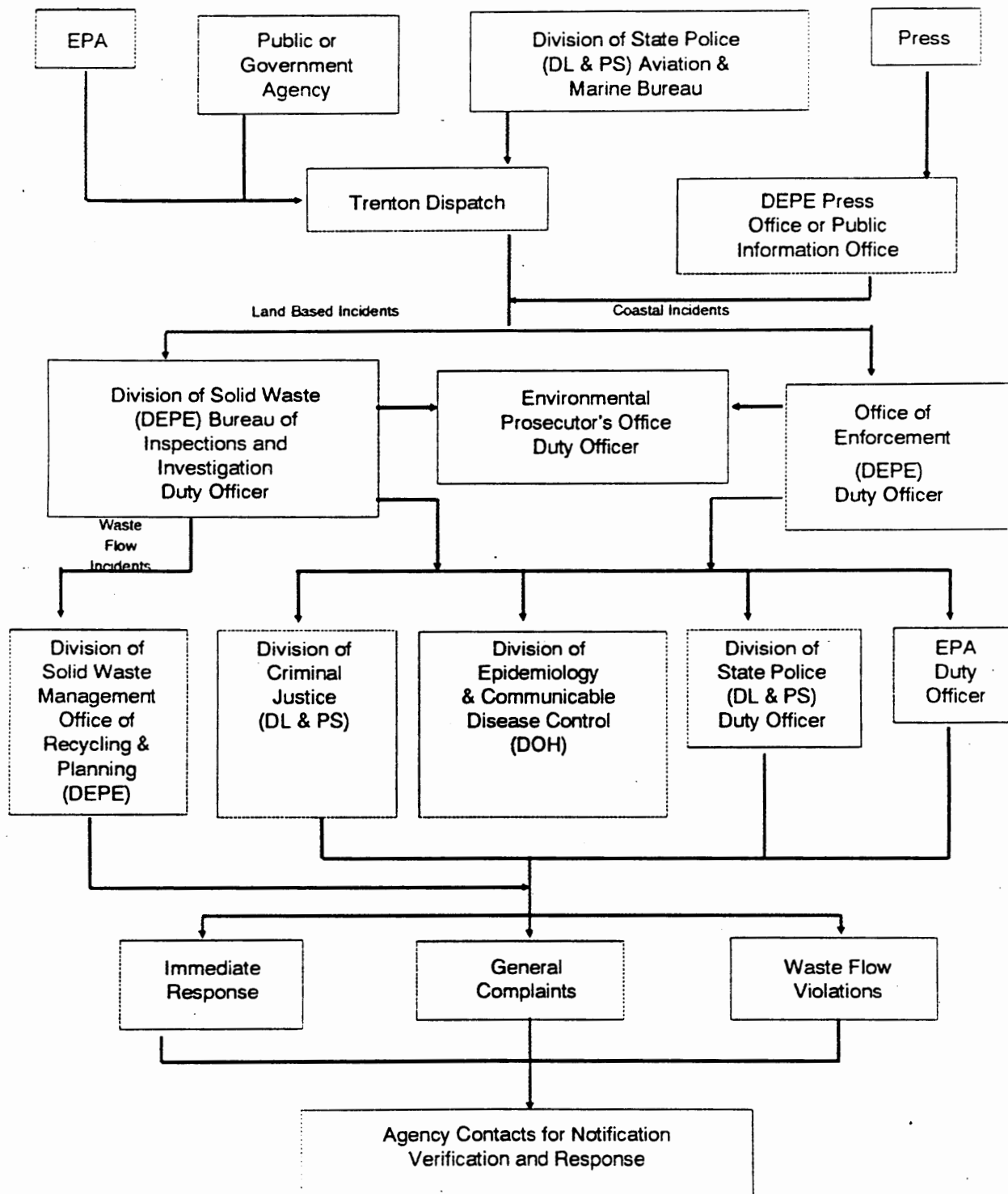
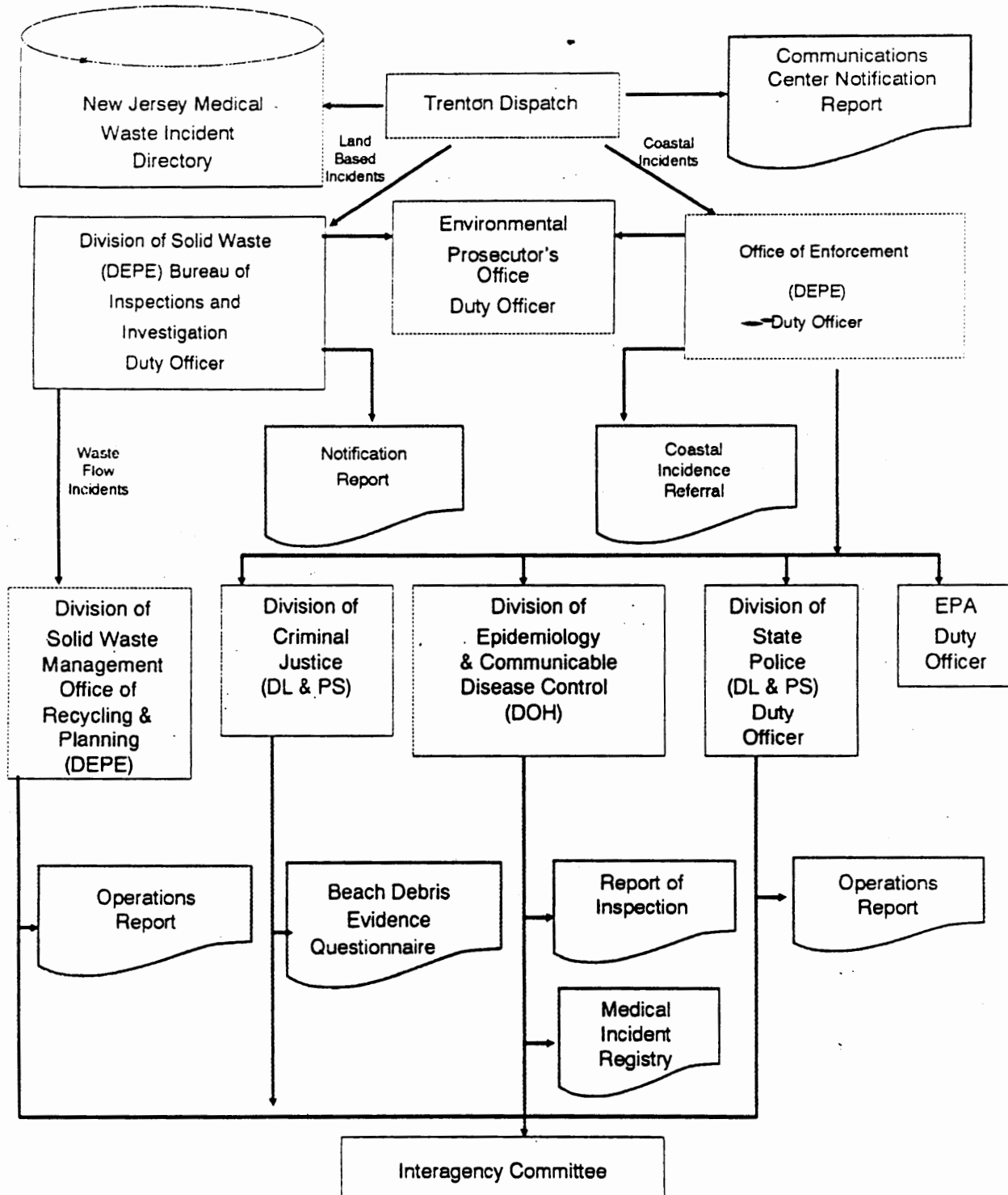


FIGURE 28

NEW JERSEY DOCUMENTATION PROTOCOL FOR
MEDICAL WASTE AND MARINE FLOATABLES
INCIDENT RESPONSE 1992 FLOW DIAGRAM



particular rule prescriptions. The new significantly reduced fees, however, as implemented by legislative amendment to the Comprehensive Act, do not provide sufficient funding for annual compliance inspections. Field compliance inspections now and in the future will be conducted on a planned two to three year cycle because of the limitations imposed on the program's funding by the Legislature.

Coordinated enforcement and compliance inspection efforts are important to both effective implementation and maintenance of the medical waste program's standards. Compliance inspections and enforcement activities are conducted at the state level by the DEPE and the DOH. A Memorandum of Understanding was developed by the two agencies (See Appendix B). The agreement establishes a formal basis for cooperative inspection and enforcement activities between the two agencies. The Memorandum of Understanding describes the following interagency enforcement division of labor in effect in 1992, with the DEPE concentrating its enforcement efforts on individual medical practitioners such as doctors, dentists and veterinarians, as well as other miscellaneous generators such as funeral homes and weight loss centers. At the end of 1992, the DEPE and DOH divided the state by county and municipality. Each agency inspects all of the RMW registrants in their agency's respective areas. The DEPE is the inspecting authority for all transporters and disposal facilities.

The DEPE had also formed a formal agreement with the USEPA to promote the most effective use of the agencies' resources during the Demonstration Program. At the time of the Demonstration Program, USEPA and DOH concentrated inspections on the DOH regulated health care facilities such as hospitals, nursing homes, blood banks, state institutions, and clinical laboratories. The Memorandum of Agreement or M.O.A., was agreed to by representatives of the two agencies in November of 1989. This M.O.A. describes how the two agencies coordinated inspection, enforcement and response action activities. In brief, this agreement calls for the exchange between the agencies of information concerning where inspections were conducted, formal enforcement actions, and the agencies' incident response policies and protocols. The M.O.A. may be found in Appendix C of this document for historical reference.

c. Past and Present Enforcement Activity:

The USEPA, DOH, DEPE and local health agencies are the agencies involved with enforcement of the RMW rules in New Jersey. These agencies conduct both individual and joint inspections as well as case investigations.

As a result of this intensive inspection and investigation effort by the DEPE and DOH, during the period from June, 1989 to August 6, 1992, 124 Notices of Civil Administrative Penalty Assessments have been issued to medical waste generators and transporters for violations pursuant to the provisions of the Solid Waste

Management Act (N.J.S.A. 13:1E-1 et seq.). The total penalties assessed equals \$1,037,950.00. Currently there are 700 cases under review by the Bureau of Compliance and Enforcement. The most frequent violations that have been assessed penalties are: failure to register as a generator of RMW [N.J.A.C. 7:26-3A.8(a)]; failure to use a tracking form when transporting or offering for transport RMW [N.J.A.C. 7:26-3A.19(a)] and failure to maintain a log of RMW generated [N.J.A.C. 7:26-3A.21(e)]. Unfortunately, despite the departments' emphasis of merging site inspection and generator education functions during the initial years of the RMW regulatory program, many generators failed to register. This led to a high percentage of the 700 cases now pending. Further, the number of violations over the past four years pertains to less than 5% of the regulated community, which is not uncommon for any new regulatory program. The DEPE believes that in keeping with the intent of the medical waste program to track RMW from "cradle to grave," it is important that RMW generators and transporters comply with all the medical waste regulatory requirements.

The following is a list of inspections conducted to carry out the provisions of the Comprehensive Act by the agencies from June 1989 to August 1, 1992.

TABLE 23a

COMPLETED INSPECTIONS

	*USEPA	DEPE	DOH	SUB TOTAL
Hospitals	---	29	305	334
Clinics	---	151	253	404
Laboratories	---	171	334	505
Veterinarians	---	145	356	501
Dentists	---	2,202	589	2,791
Physicians	---	4,883	983	5,866
Funeral Homes	---	129	401	530
Nursing Homes	---	66	442	508
Transporters	---	192	--	192
Disposal Facilities	---	4	--	4
Dialysis Facilities	---	--	1	1
State Institutions	---	--	52	52

Miscellaneous	---	527	389	916
SUB TOTAL (Not USEPA)	425	8,499	4,105	12,604
GRAND TOTAL				13,029

* Figures by generator type not available.

One situation frequently noted by inspectors is the presence at disposal facilities of mixtures of regular solid waste and RMW. Solid waste transporters who service hospitals pick up both household and unregulated medical waste for disposal at registered transfer stations. Frequently, some RMW is mixed with the waste and deposited on the transfer station floor, where employees must sift through the waste to segregate it. The quantities vary from load to load and some hospitals are more careless than others. After segregation, the violator hospital must reclaim the RMW for proper disposal. In the interim, waste from homeowners which looks medical in nature and which is transported out-of-state for disposal, will continue to receive heightened scrutiny and potential over-classification by out-of-state facility operators beyond the DEPE's control.

Of first concern is the health and safety of the operations personnel. The second concern is the difference between the acceptable nature of wastes between the State of New Jersey and other states where the final disposal may take place through landfilling. As an example, if one small part of RMW appears in the load of waste brought to an Ohio landfill, the whole load is rejected and returned to the county of origin where it is deemed medically contaminated. This unnecessarily increases the costs to the rate payer for solid waste disposal.

The homeowner exemption often causes a situation to arise which produces a conflict between the solid waste transporter and the solid waste disposal facilities. The disposal facilities do not recognize the homeowner exemption because out-of-state final disposal sites will reject the load. As a result, the New Jersey transfer station will not accept the homeowner wastes; the transporter will no longer pick-up the waste from the curb, and unless the homeowner disguises the waste, it must be stockpiled. Unfortunately, this situation could eventually lead to illegal disposal in an unprotected area. Despite efforts to educate transporters and facility operators on this "look alike" problem, where homeowners generated solid waste is treated as RMW, it is clear that there is no simple answer. Only through achievement of disposal self-efficiency can more rationality be brought forth to address this situation where state and county officials can work with in-state transporters and facility operators to eliminate this problem.

Several other typical violations of RMW regulations are encountered. First from continued registration of existing businesses as RMW generators, the DEPE

estimates that about 5% of all RMW generators are still unregistered at this time. It should be noted that while most generators in the unregistered category do apparently follow some aspects of the regulations, which is determined when these delinquent program registrants are located, in many cases the department does not know where their RMW was being disposed of. The departments believe the vast majority of the RMW generators will achieve regulatory compliance by the end of 1993. Secondly, the DEPE and DOH have responded to a number of incidents where RMW such as syringes, blood vials containing blood, carpules, along with other items were dumped, abandoned in a public place or found in abandoned private buildings or trailers. While these types of potentially serious incidents have, in general declined because of the RMW regulatory program, they still occur occasionally. Thirdly, DEPE investigations of illegal disposal of RMW at solid waste transfer stations, have nearly always determined that a hospital was the source of the waste. In these situations, either general medical or "look alike waste" was often a contributing problem when actual RMW was mixed with the solid waste load. During the course of the RMW program and enforcement efforts coupled with education, these types of incidents are declining in frequency. Over the course of the RMW program, the departments, and various other agencies have responded to numerous incidents like those described above, involving the improper and illegal disposal of RMW. These incidents are summarized in Table 23 below.

TABLE 23b

REPORTED RMW INCIDENTS

	June 1989 to Dec 1989	Jan 1, 1990 to Aug 1, 1992
DEPE Response	20	121
DCJ Response	14	51
USEPA Response	1	5
DWR Response (DEPE)	-	3
DOH Response	6	23
County & Local Health Response	19	109
BCUA Transfer Station	--	307
TOTALS	60	619

6. Training and Education

Education and training are perhaps the key ingredients to the successful implementation of any new regulatory program. The regulated community initially needed to be informed about the program, and then provided with sufficient detailed information about the regulations to understand how program requirements would affect a specific regulated party and what measures must be taken to ensure compliance.

During the first year of the medical waste program, the DEPE and DOH launched an "extensive" outreach effort of technical assistance to the regulated medical community. The DEPE's technical assistance program responded to over twenty-five thousand telephone inquiries and three hundred letters from the regulated community as just part of the program's effort to thoroughly educate medical practitioners in the requirements and implications of the new rule. The departments also provided presentations to well over 100 organizations, such as regional groups of certain classes of generator or associations representing medical practitioners, and workshops sponsored by both the DEPE and the USEPA. Telephone and written regulatory assistance has continued during the last two years, though slightly below those levels. Estimates are that over eight thousand persons have attended the departments' presentations since the inception of the medical waste program. The departments believe their educational efforts were very successful, as reflected in the relatively low number of regulatory violations found in RMW registered generators. The table below lists the types of organizations and number of presentations performed.

TABLE 24

PRESENTATIONS BY DEPE & DOH: 1989-1992

TYPE OF AUDIENCE	DEPE	DOH
USEPA Seminars (general audience)	10	3
Government Activities (state & local)	17	14
Housekeeping	2	3
Schools	8	4
Home Health Services	1	6
Medical Doctors	10	0
Dentists	2	3

Labs	1	0
Nurses	2	2
Health Care Facilities	1	5
Hospitals	9	5
Solid Waste Coordinators	3	2
Attorneys	2	0
Medical Waste Conference	4	6
Transporters	1	0
Medical Related Businesses	7	0
Miscellaneous	4	9
TOTALS	84	62

As background, in December, 1989, letters were sent to major medical association directors informing them of the DEPE's and DOH's intention to continue outreach and training in the medical community, and their assistance was requested to structure and coordinate the programs. To date, many training programs have been held in conjunction with associations such as the New Jersey Medical Society and the New Jersey Hospital Association. Additionally, training surveys have been published in medical society newsletters to assess educational needs. The DEPE and DOH will continue to conduct training sessions as needed for generators on an on-going basis.

As required by the Comprehensive Act, the DEPE is planning to continue specific training sessions to provide all transporters, and intermediate handlers' and destination facilities' supervisory personnel with a thorough knowledge of the regulations. A training session for transporters was held in 1991 with another session being planned for 1993.

In 1990 and 1991 training seminars and workshops were held for staffs of hospitals and other major institutions on the permitting and procedural requirements of DEPE and DOH for the construction and operation of RMW disposal machinery, such as incinerators and mechanical destruction/chemical disinfection machines. These types of disposal equipment require, at a minimum, registration with DEPE, and in some cases, permits from: the Division of Solid Waste Management to operate as a solid waste facility and a medical waste destination facility; the Air Quality Regulation Unit to ensure that air pollution standards are met; and the Wastewater Facilities Regulation Unit to permit discharges to the municipal sewer system.

In addition to training the regulated medical community, state personnel also received training during the Fall of 1989. A comprehensive three-part training program was conducted for medical waste enforcement personnel by the DEPE, DOH and Division of Criminal Justice (DCJ). The training addressed the following issues: an overview of the federal and state laws; a technical review of the medical waste regulations; generator inspection protocol and procedures; an overview of the civil and criminal enforcement alternatives; coordinating civil and criminal enforcement efforts; search and seizure laws and evidence preservation; report writing and testifying in administrative proceedings and in court; use and decontamination of personal protection equipment; basic principles of microbiology, chain of infection, and barrier precautions; and incident response protocols. The three training sessions were video-taped and can be shown to new enforcement personnel. DEPE, DOH and DCJ will continue to offer seminars and workshops to upgrade the knowledge and skills of the field inspectors/investigators.

The DEPE and DOH are in the process of developing a series of training videos for use by the regulated community and new personnel. Each video will be approximately 10 to 15 minutes in length and will address segments of the regulations. For example, one video will discuss in detail RMW definitions and waste classifications, and attempt to modify waste handling behaviors. Other videos will deal with: the use of the tracking form and recordkeeping; pre-transport standards; the impact of medical waste regulations on the regulated community, as well as the positive environmental, social and economic impacts; and requirements for transporters, intermediate handlers and destination facilities.

Written materials have also been developed for distribution. The medical waste unit prepared an easy-to-read information package and distributed nearly 50,000 copies of that document and registration forms to generators for the August 1988 rule and again in response to the adoption of the present rule which became effective June 26, 1989. These packages not only contained report and registration forms, but also guidance documents to assist generators with complying with the complex requirements of the regulations. These guidance documents, in the form of fact sheets, available from DEPE, Bureau of Medical Waste, Residuals Management and Statewide Planning's RMW technical assistance unit at (609) 530-8599, are continually updated and are being distributed to generators at seminars and to persons making inquiries about the regulatory requirements. RMW program information was also sent to the New Jersey Licensure Unit of the Board of Medical Examinations in the Division of Consumer Affairs of the Department of Law and Public Safety. The Board makes the RMW program information and registration forms available to newly licensed practitioners in New Jersey to ensure that all new medical offices are in compliance with the RMW regulations.

The USEPA has published an excellent series of very informational guides to the federal demonstration program, which were obtained during the program through summer 1991, by calling the RCRA Hotline at (800) 424-9346. The following publications were

prepared for generators, transporters, and treatment, destruction and disposal facilities:

1. "Managing and Tracking Medical Wastes- A Guide to the Federal Program for Generators;"
2. "Managing and Tracking Medical Wastes- A Guide to the Federal Program for Transporters;" and
3. "Managing and Tracking Medical Wastes- A Guide to the Federal Program for Treatment, Destruction, and Disposal Facilities."

Each booklet contains two main sections as well as a glossary, a list of figures and tables, and sample forms. Section 1 offers general information about the medical waste tracking program, and the waste management system. Section 2 includes the requirements for the specific target audience. The booklet for generators provides a profile of a generator; pre-transport procedures, including segregating, packaging, labeling, marking, and storing; tracking requirements; recordkeeping and reports; and medical waste generator checklists. Section 2 of the transporter booklet includes a profile of a transporter; USEPA and state notification requirements; vehicle requirements; tracking information; recordkeeping and reporting; and medical waste transporter checklists. Section 2 of the booklet for treatment, destruction and disposal facilities similarly includes a profile section; tracking requirements; recordkeeping and reporting; and a medical waste facility checklist. Although the USEPA produced excellent informational guides, they should be used in conjunction with the New Jersey regulations. The guides describe the federal program only, which at this point has expired as a demonstration, and some of New Jersey's rules are more stringent as mentioned earlier in this state plan. The DEPE, with the permission of the USEPA, plans to modify the guide for generators to reflect the specific New Jersey regulations.

Today, the DEPE is continuing to staff its technical assistance program within the Bureau of Medical Waste, Residuals Management and Statewide Planning in the Division of Solid Waste Management. The technical assistance staff, with assistance from DOH technical staff, is thoroughly trained to assist the regulated community with any technical questions or other inquiries concerning the medical waste regulations. The bureau also continues to provide speakers to relate medical waste regulatory requirements to groups throughout the state. Tracking forms for use in disposal of RMW off-site are also available from this unit. The telephone number for the medical waste technical assistance unit is (609) 530-8599. This unit is staffed during normal business hours from 8:00 a.m. - 5:00 p.m., Monday through Friday.

D. INTERRELATIONSHIP OF STATE AND FEDERAL PROGRAM

1. Overview of Federal Demonstration Program and Results

As reviewed in the USEPA publication "Environmental Backgrounder," March 1989, the federal medical waste program is described as follows. President Bush, in an address before a Joint Session of Congress on February 9, 1989, stated his commitment to end ocean dumping by the end of 1991 and to prosecute medical waste violators:

"The FBI and USEPA will be instructed to prosecute illegal dumpers of medical waste and new penalties against medical waste dumpers will be sought."

On November 1, 1988, President Reagan signed into law the "Medical Waste Tracking Act of 1988," which required USEPA to establish a two-year demonstration program to track medical waste from generation to disposal. The Act specifically included New York, New Jersey and Connecticut as "Covered States" and made participation in the program mandatory unless a state could show it already had a medical waste program in place which was at least as stringent as that developed by USEPA. While New Jersey did have a detailed program in place at that time, the department did not pursue exclusion and participated actively in the program. Although the Act also specifically invited the seven Great Lakes states to take part in the demonstration program, participation was optional. Other states were allowed to participate in the tracking program and USEPA made it clear it would welcome any state or territory that wished to join. As a result, in addition to New York, New Jersey and Connecticut, the state of Rhode Island and Puerto Rico all were part of the two-year federal demonstration program.

In March 1989, USEPA issued rules establishing medical waste tracking requirements for the participating states. The participating states and territories were given 90 days to implement the program.

USEPA defined medical waste as follows:

- cultures and stocks of infectious agents;
- human blood and blood products;
- human pathological wastes, including those from surgery and autopsy;
- all used sharps (needles, scalpels, etc.) and certain unused sharps;
- contaminated animal carcasses from medical research; and
- wastes from patients isolated with certain highly communicable diseases.

The tracking system required the waste generator, the transporter, and disposal facility to use a tracking form to ensure that the waste arrived at its intended destination. The generator was to receive a copy of the tracking form signed by the facility operator acknowledging receipt of the wastes within 45 days of shipment. If not received by that

time, the generator was obligated to notify USEPA and the state. The rules also set standards for labeling, packaging, and reporting.

The tracking system rules were applied to small producers, such as doctors, dentists, clinics and laboratories, as well as to large health-care facilities, such as hospitals. However, the law specifically exempted medical waste generated by individuals or families. Businesses generating less than 50 pounds per month did not have to use the tracking form, but were required to keep logs. Transporters shipping the smaller loads and facility operators receiving them had to use the tracking form.

Violators in states implementing the tracking system were subject to civil penalties of up to \$25,000 a day for each violation. They also were subject to criminal penalties of up to \$50,000 per day per violation and jail terms of up to five years.

At the conclusion of the two-year demonstration tracking program, USEPA was required to submit a Report to congress on a number of medical waste issues, including:

- The success of the demonstration program.
- The types, number, and size of generators of medical waste (including small quantity generators) in the United States; the types and amounts of medical waste generated; and the on-site and off-site methods currently used to handle, store, transport, treat, and dispose of the medical waste, including the extent to which such waste is disposed of in sewer systems.
- The present or potential threat to human health and the environment posed by medical waste or its incineration.
- Other available and potentially available methods for tracking medical waste, their advantages and disadvantages, and the pros and cons of extending tracking requirements to rural areas and small quantity generators.

The fundamental scope of the demonstration program outlined above closely mirrored many aspects of the medical waste program that had been put in place in New Jersey in 1988. In fact, it can be stated that part of the framework and specific provisions of the federal act and subsequent federal regulations were derived from New Jersey's initial regulatory programs. Four months after passage of the federal act, New Jersey's own statute was passed putting in place a long-term program for the proper management of RMW. The Act also recognized the federal statute and, to ensure consistency in program administration, required the DEPE to adopt rules and regulations identical to these promulgated by USEPA.

Federal Regulations were adopted in March 1989 and DEPE followed suit as required by the Comprehensive Act in promulgating nearly identical regulations through

emergency rulemaking three months later in June 1989. The only differences between the provisions of the demonstration program and New Jersey's requirements were briefly as follows:

- New Jersey's program had and continues to have an ongoing regulatory effect, as opposed to the limited 2-year nature of the demonstration program;
- The Demonstration Program allowed for a 50 pound small quantity generator exemption from use of the tracking form. New Jersey's program applied and continues to apply to all generators regardless of size;
- The state program had and continues to have district generator, transporter, intermediate handler and treatment and disposal facility registration, reporting and fees assessment provisions;
- The state program required development of a 30-year master plan for RMW which is the subject of this Comprehensive RMW State Plan;
- The state program placed a moratorium on the plan inclusion or permitting of any proposed new commercial RMW disposal facility prior to completion of the RMW State Plan.

(Chapter E of this RMW State Plan provides more detail on the regulatory history surrounding the New Jersey and Federal Demonstration Programs.)

Results of the USEPA Medical Waste Demonstration Program:

Under Subtitle J of RCRA the federal Medical Waste Tracking Act of 1988, the USEPA is required to submit three reports to Congress to address specific topics regarding medical waste management and to outline the results of the USEPA two-year demonstration program.

In the USEPA's Medical Waste Management in the United States (First Interim Report to Congress)," (EPA/530-SW-90-051A), published in May 1990, USEPA discussed the components of its demonstration program, basically focusing on the twelve subject areas listed in the federal act as topics for discussion in all three reports to congress. Generally, the information in the first interim report reflected USEPA's planned information gathering activities, presents criteria for determining the success of the demonstration program, assesses the appropriateness of federal hazardous waste requirements and discusses state/local requirements as nationwide medical waste controls.

The USEPA's "Medical Waste Management in the United States (Second Interim Report to Congress)," (EPA/530-SW-90-087A), published in December 1990, provided an

update on the USEPA's research activities and forecasts on each of the twelve subject areas. The report also included extensive appendices of the "Harbor Studies" program, enforcement information, instructional materials, Home Health Care Disposal Tip Pamphlet, grant proposals and a description of USEPA grant projects and detailed information charts and materials from the first transporter and on-site incinerator reporting period.

The USEPA Reports to Congress are available from the U.S. Department of Commerce, National Technical Information Service, Springfield, Virginia 22161.

While the USEPA Demonstration Program has ended, through USEPA sponsorship of New Jersey's RMW regulatory program the departments were able to complete many significant program reports a few of which are summarized below and described in detail throughout the balance of this report:

- Completed over five thousand compliance inspections of generators, transporters and facilities from June 1989 through June 1991;
- Registered nearly 13,000 generators by June 1991;
- Performed training and education of over eight thousand program registrants; and
- Completed the medical waste technology assessment contained in Section D.3 of this report.

The results of the USEPA medical waste program and its investigations and research into effective medical waste management methods are presently being compiled into the USEPA's Third Report to Congress. This final report will outline research findings, assess medical waste health hazards and treatment technologies and discuss the effectiveness of the Demonstration Program. In general terms, the final report will also address each of the twelve subjects preliminarily discussed in the two interim reports to Congress. The USEPA is tentatively projecting completion and publication of its third and final report sometime during 1993.

The impact of the federal program has been felt throughout the nation as concerns over infectious waste management arose in many states. Over forty states have some degree of medical waste regulations in effect at this time. Many of these programs are modeled on the USEPA Demonstration Program even before the USEPA issues its final program results.

Other USEPA Technical Assistance:

In its comprehensive approach to medical waste management, USEPA also has undertaken a wide range of studies and prepared reports on various aspects of medical

waste:

- USEPA is developing additional data that will be presented in its final report to Congress that is expected to be published during 1993 for use in setting emissions standards for medical waste incinerators under the federal Clean Air Act. Such incinerators may be subject to federal requirements depending on their size or the time they were installed and all are also subject to New Jersey standards. USEPA believes that currently available emissions control technology (combustion controls and add-on controls such as scrubbers and filters) can substantially reduce emissions.
- USEPA believes optimum incinerator performance and maintenance enhance combustion and reduces pollutants in the emissions. As a result, USEPA published several incinerator operation training and inspection manuals for the operation and maintenance of incinerators. The "Operation and Maintenance of Hospital Medical Waste Incinerators" presented operation and maintenance procedures and is for use by federal, state and local agency personnel, hospital waste management personnel, and hospital incinerator operators. Since the first report, USEPA also has published "Hospital Incinerator Operating Training Course: Volumes I and II", and the "Handbook: Operation and Maintenance of Hospital Medical Waste Incinerators" in an effort to improve operating practices by improving operator training.
- USEPA's research and development office is summarizing known information about the risk of infection through exposure to the emissions or residues from medical waste incineration for its final report to Congress expected to be published during 1993. Some reports such as "Emissions of Airborne Bacteria from a Hospital Incinerator" and "Evaluation on a Hospital Refuse Incinerator at Cedars Sinai Medical Center" also reviews medical waste incineration emissions. The report also will compare microbial contamination of medical waste with contamination from other kinds of waste and with sludge.
- USEPA's research and development office is assessing the need to conduct research in several areas, including monitoring methods and procedures to determine incinerator performance, medical waste treatment options, medical waste minimization, and the need for data to better characterize potential public health impacts from medical waste for its final report to Congress.

Oceans, Harbors, and Beaches:

- USEPA in a report titled "Inventory of Medical Waste Beach Wash-ups, June-October 1988", analyzed data on the type of debris washed up on beaches in six east coast states during the summer of 1988. The report stated that over half of the medical waste found was syringe - related, but was thought to be produced mostly

by home health-care and illegal drug users.

- USEPA funded a 1988 and 1989 study by a non-government group, the Center for Marine Conservation (previously called the Center for Environmental Education), to collect and analyze data on debris found on beaches during the Center's voluntary beach cleanup days. The two reports generated from this study are entitled "Cleaning America's Beaches: 1988 National Beach Clean-up Results" and "Cleaning America's Beaches: 1989 National Beach Clean-up Results".
- USEPA's regional office in New York City completed a study titled "Characterization of Medical Waste Generation Management, and Disposal Practices New York and New Jersey". The report quantifies the medical waste generated, and provides information on handling, treatment and disposal practices, costs, and interstate transportation of medical wastes.
- USEPA collected marine debris from harbors in Boston, New York, New Jersey, Philadelphia, Baltimore, Miami, Seattle, and San Francisco. Preliminary information indicates that less than one percent is medical waste or drug-related. The Agency believes the sources of this waste include street runoff and storm sewer overflows. The study will be reviewed in USEPA's final report to Congress expected to be published by the end of 1993.
- DEPE in collaboration with USEPA conducted a study, the "New Jersey Floatables Study: Drifter Study Results" that found that drifters (deliberately released materials) released in the Hudson/Raritan Estuary area are deposited on New York and New Jersey bay and ocean beaches.

Plastics:

- USEPA is studying plastics for its final report to Congress and is looking at plastics on land and at sea, improper disposal practices, an evaluation of using substitute materials, and on the potential for recovery, recycling, and biodegradability. Currently, plastics make up six percent of New Jersey's total waste stream; less than one percent is recycled.
- The Coast Guard developed rules, 33 C.F.R. Part 151, implementing the "Marine Plastics Pollution Research and Control Act", 33 U.S.C. 1901. The law prohibits the discharge of plastics and other persistent debris into the marine environment from boats of all sizes and ships, effective December 31, 1988.
- In October 1988, Congress passed the "Degradable Plastic Ring Carriers Act", 42 U.S.C. 6914(b). Under this law, USEPA must require, by October 1990, that plastic ring carriers used to carry cans and bottles be made of naturally degradable material. USEPA is scheduled to propose rules in March of 1993 (40 C.F.R. Part

234) pursuant to this law.

Federal Agencies:

- USEPA is analyzing data from federal agencies on their medical waste generation and disposal methods. USEPA will encourage all federal agencies to follow waste tracking requirements established under the "Medical Waste Tracking Act of 1988" (see below). Federal agencies in those states participating in the pilot tracking program are required to comply with the law.

SECTION D.1. - BIBLIOGRAPHY

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2. Federal Funding to New Jersey for RMW

The federal "Dire Emergency Supplemental Appropriations Act of 1989" was signed on June 20, 1989 and provided \$3 million in financial support for the states for implementation of the medical waste demonstration program. The \$3 million was divided into two allocations, \$2.25 million for participating states and \$750,000 available to all states on a project-specific basis. The grants were to be awarded with at least a 5% match requirement. Grantees were able to fulfill this requirement with cash or with in-kind services. Although these funds were appropriated for FY 1989, they were carried over to FY 1990 and supported the negotiated state activities through the end of the demonstration program (June 22, 1991). The USEPA made two separate grants of \$612,000 and \$122,266 available to New Jersey to conduct the activities noted in the summaries below:

a. Medical Waste Compliance Inspections:

Source:	USEPA
Amount:	\$612,000
	<u>32,211</u> plus 5% state match
Total:	\$644,211

One of USEPA's major goals during its Demonstration Program for regulated medical waste management was to ensure compliance with the regulations by carrying out numerous compliance inspections of generators and transporters and disposal facilities. To promote the ability of states to carry out inspections, the USEPA provided funding to New Jersey for this purpose. New Jersey applied the entire grant to compliance inspection and enforcement activities: New Jersey has a sizable medical waste regulated universe estimated to include over 14,000 generators 30 transportation companies and over 100 disposal facilities. The USEPA grant provided funding for approximately ten positions for 1-1/2 years to carry out compliance inspections of medical waste program registrants including generators, transporters and disposal facilities. The department carried out over 2,700 inspections during the term of the grant. The department and USEPA believes that compliance inspections must be a major component of the department's medical waste regulatory activity in order to ensure compliance with the regulations that were put in place in 1989.

b. New Technology for Treatment and Destruction of Medical Waste:

Source:	USEPA
Amount:	\$122,266
	<u>6,438</u> plus 5% state match
Total:	\$128,704

New Jersey's Comprehensive Act, required the department to do an investigation into alternative technologies to incineration. This federal grant provided the primary funding for the investigation and assessment of new technologies for the treatment and destruction of regulated medical waste as outlined in Section D.3. immediately below. Most of the grant activities were carried out in the DSWM by the Bureau of Medical Waste and Residuals Planning. An important aspect of the state regulated medical waste program is to investigate and assess new technologies for managing medical waste. Traditionally, incineration has been used to dispose of most highly infectious and pathological medical wastes. The technology investigation involved reviewing published literature and experimental data on the performance of new technologies to determine whether they are capable of treating medical waste in accordance with the existing guidelines. The division's investigation centers around seven types of treatment methods with over fifteen different devices actually being examined. Data obtained from the investigation will aid USEPA and the department in planning for the on-going management of regulated medical waste. The department completed its investigations under this grant during 1992.

3. DEPE Technology Assessment

a. Purpose and General Overview

(1) Background

As explained in the beginning of this state plan, the RMW program was developed in the period of the end of 1988 to the beginning of 1989 as a response to beach washups during the summer of 1988 of medical waste and to incidents of medical waste being disposed of in open dumpsters. Both the beach washups and incidents of injuries from inappropriate medical waste disposal created public disapproval of the lack of control over medical waste.

At that time landfill owners were becoming increasingly reluctant to accept medical waste and in some instances were simply refusing to accept this waste stream. There was another complication. The composition of medical waste had shifted toward containing more plastics as a result of the increasing use of supplies, disposable medical appliances and equipment. The incineration of medical wastes in hospitals was posing a health hazard due to the lack of adequate air pollution control equipment on these units and increasing concern over air emissions due to burning plastics.

It was clearly necessary to establish a regulatory framework to control the disposal of medical waste. This would serve the dual purpose of safeguarding the public through proper disposal of medical wastes and helping the hospitals with their

disposal problems, such as declining acceptance of medical wastes at landfills. In the context described above, regulatory development concerning medical waste disposal was carried out at the state and federal levels as noted in Section C. and Section D. 1. above.

Among the other requirements of the Comprehensive Act, the state Legislature directed the DEPE to perform an evaluation of the environmental and public health impacts of all reasonably available RMW treatment and destruction technologies. In the broadest sense the Legislature also requires a recommendation concerning the extent to which non-incineration technologies may be utilized as an alternative to incineration technologies. The technologies evaluation was to serve as the basis for New Jersey's future medical waste disposal planning efforts.

Within approximately the same time frame, the Congress of the United States adopted the Medical Waste Tracking Act of 1988 and it was signed into law on November 1, 1988. USEPA, as directed by Congress, developed a RMW demonstration program to operate from June 22, 1989 through June 22, 1991. As part of this demonstration program, USEPA gave a grant under this program to the DEPE to aid in the investigation of new technologies for the treatment and destruction of RMW as referenced in Section D. 2. above.

The department investigated various treatment methods in carrying out this assessment: chemical treatment, microwaving, autoclaving, thermal inactivation, gamma radiation, pyrolysis, and encapsulation. Department personnel used assistance from the DOH, available literature from USEPA, the academic community and manufacturers of equipment in performing the assessment. For each type of technology, an examination was carried out and an explanation drafted of the basic method. Then an investigation was conducted of specific equipment using that technology. The departments are conducting this investigation to determine the efficacy and economic feasibility of new technologies to supplement or replace incineration in the management of RMW.

The information obtained regarding "New Technology Assessment" through this federal grant study, as well as the recommendations developed, will be forwarded to both the state Legislature and the USEPA. This will aid both the state and the federal government in determining which new technologies are effective for the treatment and destruction of RMW and what role incineration will play in this program. In this regard, a draft of this technology assessment overview was forwarded to USEPA for review and comment in February, 1992.

Many, if not most, of the technologies reviewed here are still undergoing design refinement by the manufacturers as more operational data becomes available from users both in New Jersey and perhaps other states. The departments have developed a technological review program to provide an on-going mechanism in the

future to review new or modified technologies as they are developed. The DEPE coordinates this effort to ensure the basic functional requirements of the technology, solid waste plan inclusion and the obtaining of other permits if actual use of the technology is applied for. NJDOH performs an analysis of the technology's efficacy in destroying biological organisms and establishes an operational protocol for efficacy assurance for the technology, which is site specific for actual facility applications.

(2) New Technology Review

The traditional methods of disposing of medical waste have been 1) to mix with municipal solid waste, 2) incineration with landfilling of the ashes or 3) autoclaving with landfilling of the residue. Preliminary results of a national survey of 200 acute-care hospitals across the United States in July 1987 showed that:

- 70% of the responding hospitals either own or share an incinerator for waste disposal;
- 49% use steam sterilization;
- 11% dispose of infectious waste in a sanitary landfill without prior sterilization;
- 23% dispose of blood or blood products to a sewer system;
- 21% dispose of dialysis wastes to a sewer system; and
- 14% grind infectious wastes and discharge them down the sewer (1).

TABLE 25

HOSPITAL RMW DISPOSAL METHODS

	NATIONAL (a)	NEW JERSEY (b)
On-Site Incinerator	70%	46% (c)
Steam Sterilization	49%	18%
Sewer Disposal of Blood or Blood Products	23%	12%
Grind/Discharge to Sewer	14%	---
Grind/Chemical Disinfection	---	9%

- a. 200 acute-care hospitals, national survey, July 1987 (1).
- b. 104 general hospitals, New Jersey, 1990 Annual Generator Report-Regulated Medical Waste.
- c. Survey, USEPA-Region II, 1988.

In a survey carried out for USEPA-Region II in 1988, there were 48 functioning NJ hospital incinerators licensed by the DEPE. At that time, according to department records there were 104 general hospitals. Therefore, 46% of New Jersey hospitals had incinerators (2). According to data obtained from the Annual Generator Report (June 22, 1989 to June 21, 1990), approximately 23% of RMW generated at New Jersey hospitals is incinerated on-site. Approximately 1.6% of hospital generated RMW in New Jersey is autoclaved at the hospital before being disposed of. A comparison of a national sampling of hospitals with New Jersey hospitals regarding disposal methods for RMW is shown in Table 25, above.

The adoption of the RMW rules (N.J.A.C. 7:26-3A) on June 23, 1989 established definitions of RMW and disposal tracking requirements within New Jersey, changing the disposal procedures for much of the medical waste stream. More than half of the RMW, as defined in New Jersey, is incinerated in hospital incinerators or transported to commercial incinerators for treatment and destruction.

Incineration of RMW is presently the most widely used method of treatment and destruction but it has an uncertain future due to concerns over air emissions and other issues, as well as the high cost of new, more advanced incineration equipment. There are various new technologies for the treatment and/or destruction of RMW being offered to the regulated community. These involve a variety of methods: chemical treatment, microwaving, autoclaving, thermal inactivation, gamma radiation, pyrolyzing, and encapsulation.

This study of new technologies was initiated in May 1990. Since that time various companies have either submitted information to the department or been contacted by staff personnel due to news items or professional journal reports. The major part of the study was conducted between May 1990 and June 1991 with some minor investigative work carried out from July to September 1991. The department has investigated the use of equipment from a number of different companies that utilize one of the methods listed above. The companies involved in this study submitted their descriptive literature to the department and in many instances responded to a standard questionnaire developed by the department. Some of the companies are manufacturing equipment for sale to facilities. Others are still in the planning stage or at best have a prototype for demonstrations. Some of the technologies discussed in this study are already being used in New Jersey.

The department reviewed the information submitted by vendors and manufacturers of new technology including ABB Sanitec (Vetco), Delphi Research, Medical Safe TEC, San-I-Pak, Stericycle, Puretech Systems, Inc. and Winfield Corp. As stated above, standard questionnaires were sent out and the information obtained was incorporated into our reviews. Follow-up letters and telephone calls were employed to clarify certain data. In some instances, vendors made presentations to staff about equipment they were marketing. Staff members have had the opportunity to see

some new technology equipment in operation at hospitals.

As a result of these investigations, the department developed a report for each type of equipment where the vendor supplied sufficient information. The typical report describes:

- the treatment and/or destruction process;
- space requirements for the equipment;
- other physical requirements such as electrical supply, water supply, sewer lines, disposal chute and collection bin, etc.;
- volume capacity;
- required state permits and authorizations to operate;
- operational costs;
- efficacy of treatment; and
- advantages and disadvantages of the particular equipment.

Some vendors were reluctant to give specific cost information because they intended to establish commercial facilities, quote different prices to customers based on specially tailored services or otherwise considered this information proprietary. Other vendors were only able to give estimated costs because they were still in a development phase.

In the extensive report that follows, seven different technologies for the treatment and/or destruction of RMW are discussed: chemical treatment, microwaving, autoclaving, thermal inactivation, gamma radiation, pyrolyzing, and encapsulation. An explanation of each method is given and then specific technologies and equipment are described and reviewed based on the investigations carried out for this study. For each technology, there is an overview followed by specifics such as:

- process description,
- operating specifications,
- performance specifications,
- economics,
- recommended controls and required permits, and
- summary of problems and/or advantages.

The following table (Table 26) consolidates information about the seven technologies from the in-depth reviews contained in this report. Table 26 shows the seven technologies including, chemical treatment, microwaving, large-scale autoclaving, thermal inactivation, gamma irradiation, pyrolysis and encapsulation. Currently, the technologies that are in use in New Jersey are chemical treatment and microwaving. Twelve New Jersey facilities are permitted to use the chemical treatment technology and two facilities are permitted and 5 more are awaiting approval to use the microwaving technology. Pyrolysis treatment was used on a

demonstration basis in November 1991 and June 1992 in one New Jersey facility.

Table 26 also shows the range of operation and maintenance cost per pound for the various technologies. Costs range from \$0.20 (chemical treatment and large scale autoclaving) to \$1.51 (pyrolyzing treatment) per pound. For gamma irradiation and encapsulation technologies, operation and maintenance costs were submitted by the vendors.

Some technologies, for example pyrolysis, have the ability to treat all of the RMW classes. All of the others, chemical treatment, thermal inactivation and gamma irradiation, microwaving, large-scale autoclaving, and encapsulation can treat only some of the seven RMW classes or only minimal amounts of RMW. It is also important to note that the department was unable to determine capital cost in dollars per pound for any of the technologies except for microwaving. This was due to a few reasons. Some of the technologies are planned as commercial facilities, or the equipment is leased by the generator, so in these instances, capital cost does not apply. Other vendors did not include capital cost data to the department during the time of review.

There are also tables included in Appendix D summarizing technical, economic and operating data regarding the equipment reviewed in this study.

Through the information in this study, the departments expect to assist the regulated community in dealing with the problem of treating and destroying RMW as safely and economically as possible. In the pages that follow, the department is presenting information with the goal of assisting generators in making long-term RMW management decisions. Issues of on-site versus off-site treatment and destruction, liability considerations and facility specific economic analysis is the responsibility of each generator.

Beyond policy decision-making in terms of technology selection and incorporation within the county solid waste plans, the DEPE conducts performance based, as opposed to technology based, reviews toward permit issuance. Any proposed technology will be evaluated following plan inclusion, but must meet the department's standards for operations before any permit will be issued. A fee may be charged by the department for performing an alternate technology review. Therefore, the following is intended to be an objective presentation of research findings derived from a literature search of various technologies and neither supports nor rejects any specific system.

Please Note: The legal validity of any trademarked name or otherwise registered or protected name is not meant to be nullified by use in this report without the accompanying trademark designation.

TABLE 26

GENERAL COMPARISON OF MEDICAL WASTE TREATMENT AND DESTRUCTION TECHNOLOGIES

Technology	⁽¹⁾ Classes-RMW	Treatment/ Destruction	Shredder/ Grinder	On-site/ Off-site	Reduction Volume/Weight	Waste Handling Capacity (lb/hr)	Estimated Operating Unit Cost	Operating in NJ or US
D.3.c CHEMICAL TREATMENT	1,2,4,7 3,5,6 (a)	Treats & Destroys	Shredder/ Grinder	On-site	2:1 to 8:1 Volume Reduction	100-200 200-400 700-1500	\$0.20 - 0.30/lb. - -	NJ US
D.3.d MICROWAVING	1,6 3,4,7 (a)	Treats & Destroys	Shredder	On-site	8:1 Volume Reduction	165-275 500	\$0.44/lb. -	NJ US
D.3.e LARGE SCALE AUTOCLAVING	1,3,4,6,7	Treats	None	On-site	2:1.5 or 2:1 Volume Reduction	100 180 350	\$0.20-0.29/lb. - -	US None-NJ
D.3.f THERMAL INACTIVATION	4,6,7 1,2,3,5 (b)	Treats & Destroys	Shredder/ Compactor	Off-site	5:1 Volume Reduction	3500	NA	US
D.3.g GAMMA IRRADIATION	4,6,7 1,2,3,5 (b)	Treats & Destroys	Shredder	Off-site	4:1 Volume Reduction	3500	NA	US
D.3.h PYROLYZING TREATMENT	1,2,3,4,5,6,7	Treats & Destroys	None	On-site	99% Volume & 97% Weight Reduction	5-40 lb/8hrs	\$1.51-1.69/lb.	NJ (Testing Only)
D.3.i ENCAPSULATION	4,7	Treats	None	On-site	None	NA	NA	US None-NJ

- (1)
 Class 1 - Cultures and Stocks
 Class 2 - Pathological Wastes
 Class 3 - Human Blood and Blood Products
 Class 4 - Sharps
 Class 5 - Animal Waste
 Class 6 - Isolation Wastes
 Class 7 - Unused Sharps
- (a) Some restrictions
 (b) Accepts minimal amounts
 NA Not available

(3) Treatment Efficacy

In considering the efficacy of various technologies for treating RMW, the terms "sterilization" and "disinfection" will be used. It should be noted that the term "sterilization" refers to any process that kills all bacteria, viruses, etc. within a host regardless of whether they are harmless or pathological. The term "disinfection" refers to any process that may kill or destroy most disease-producing organisms, such as bacteria, viruses, etc. Disinfection rarely kills all spores.

For purposes of testing the degree of disinfection of a particular technology, a bacterial agent is selected that is known to be extremely resistant to that technology. The waste stream is spiked with 10^6 units of that bacterial agent and then treated with the technology in question. If an acceptable number of units are killed or rendered incapable of growth, it is assumed that any other viruses and/or bacteria have been destroyed to an acceptable level. Sterilization is rarely attained and when it is, this state does not last due to natural contamination by bacteria and viruses in the surrounding environment. New Jersey regulations require treatment to reduce or eliminate the infectiousness of the waste and not sterilization. Many states and EPA are apparently considering a 4 Log reduction standard for treatment as described below.

The degree of disinfection or percent reduction can be expressed in terms of $\log_{10}$. On the basis of the presence of 10^6 or 1,000,000 units of a bacterial spore, if 900,000 are killed or rendered harmless the disinfection would be described as a 90% reduction or 1 Log. Increasing degrees of disinfection would be:

990,000 killed	99% reduction	2 Log
999,000 "	99.9% "	3 Log
999,900 "	99.99% "	4 Log
999,990 "	99.999% "	5 Log
999,999 "	99.9999% "	6 Log

In judging the efficacy of a technology for treating and destroying RMW, a disinfection rate of 4 Log is considered minimally acceptable at this time. Efforts are under way to reach consensus on a minimally acceptable disinfection rate for all states including New Jersey. A rate of 5 Log or 6 Log is preferred. This is based on the assumption that an untreated sample of RMW contains 10^6 units.

Efficacy standards have been specifically developed by DOH for the Sanitec microwave system. A review of these standards can be found in Section D.3.d.(3). Also an outline of the DOH Sample Microwave Operating Protocol can be found in Attachment D.

b. Authorizations and Permitting Requirements

A facility intending to install a system that treats and/or destroys RMW is required to contact and obtain from the department and the DOH, or other agencies, all required and applicable authorizations and permits. Discussions of the authorizations and permits known to be required for the new technologies described herein are reviewed in this following section. Under each permit or authorization discussed below, the program name, address and phone number is provided. In addition to the general requirements discussed below, each RMW technology section has information on any additional permitting or specific authorization requirements necessary for that technology. This review of the authorizations and permits required before the installation and operation of any device using any technology for the management of RMW is intended to be used only as a guide. Persons planning to install equipment to manage RMW must consult the applicable regulations and guidelines of authorizing authorities prior to installation of the system. Persons utilizing RMW management systems within the Pinelands Area may be subject to additional authorization required by the Pinelands Commission, New Lisbon, New Jersey.

County Planning Process:

It is necessary for any new facility, which will treat and/or destroy RMW, to be formally incorporated within the approved District Solid Waste Management Plan (DSWMP) of the solid waste district (county within which the RMW facility will be located (see N.J.A.C. 7:26-2.4(b)). This process requires a public hearing by the respective Board of Chosen Freeholders followed by a formal resolution, and review and approval of the amendment by the Commissioner of the department. Pursuant to the Comprehensive Act, a county or the department may not consider any plan amendment for new commercial RMW disposal facilities until the comprehensive RMW State Plan is completed. However, new non-commercial facilities may be processed through the county/state planning and permitting process. The department agency responsible for coordinating solid waste plan authorizations is:

Office of Recycling and Planning
Division of Solid Waste Management
Department of Environmental Protection and Energy
CN 414
840 Bear Tavern Road
Trenton, NJ 08625
(609) 530-8203

Licensing and Rate Setting:

Any facility operating as a commercial (in the business of disposing of wastes from

other generators for profit) RMW disposal facility must undergo a background investigation per N.J.A.C. 7:26-16 to operate in New Jersey. New commercial facilities were prohibited by the Comprehensive Act until after the department submits this RMW State Plan to the Governor and Legislature (see N.J.S.A. 13:1E-48.1). RMW non-commercial disposal facilities are defined in the Comprehensive Act (P.L. 1989, c.34, section 3) as facilities that accept RMW for disposal for charges not exceeding the costs of disposal. The noncommercial facilities may operate without the N.J.A.C. 7:26-16 background investigation, as provided by the Comprehensive Act at N.J.S.A. 13:1E-48.1. The agency responsible for issuing the authorizations above is:

Bureau of Disclosure Review
Division of Solid Waste Management
Department of Environmental Protection and Energy
CN 414
840 Bear Tavern Road
Trenton, NJ 08625
(609) 530-8210

A facility operating as a commercial RMW disposal facility may be subject to regulations setting the facility's rates for the disposal of RMW. The agency responsible for issuing the authorizations above is:

Bureau of Rates and Tariffs
Division of Solid Waste Management
Department of Environmental Protection and Energy
CN 414
850 Bear Tavern Road
Trenton, NJ 08625
(609) 530-8225

Solid Waste Permits:

The department's Division of Solid Waste Management requires any facility wishing to utilize RMW technologies to obtain authorization to operate as a solid waste facility in accordance with the RMW regulations and guidance provided by the Division. The division also requires this type of facility to register as a RMW intermediate handler or destination facility with the Bureau of Registration. A facility is required to be included in the solid waste management plan of the county in which it is located. The agency responsible for coordinating all of the authorizations in this section is:

Bureau of Medical Waste, Residuals Management and
Statewide Planning

Division of Solid Waste Management
Department of Environmental Protection and Energy
CN 414
Trenton, NJ 08625-0414
(609) 530-8599

Department of Health Approvals:

The following information must be submitted through the DEPE to DOH, Consumer Health Services, Regulated Medical Waste Project, as part of the application for evaluation and approval of the treatment/destruction efficacy of any system to be used to treat and destroy RMW on a site-specific basis:

- detailed technical specifications of the equipment with emphasis on the treatment/destruction aspects of the operation;
- detailed explanation of the established operating and maintenance parameters of the equipment specific to treatment/destruction;
- detailed feed stock analysis including specific types and quantities of regulated and unregulated wastes to be processed and any preprocess treatment to be performed (e.g. autoclaving of microbiological waste);
- copies of all pertinent efficacy studies performed (internal and independent) supplied by the manufacturer/vendor of the unit;
- copies of manufacturer's recommended quality assurance/quality control programs to be implemented by the applicant to monitor and ensure that proper treatment/destruction is achieved; and
- manufacturer's recommendations and operator's policies regarding occupational health and safety controls.

A complete description of the DOH Sample Microwave Operating Protocol is contained in Attachment D.

In addition, for technologies capable of processing Class 1 RMW, it must be stressed, that with those systems that are being categorized as "disinfection" rather than "sterilization" units, the DOH requires pre-treatment of waste by sterilization of cultures of nine specific pathogenic microorganisms: Bacillus anthracis; Blastomyces dermatitidis; Brucella Species; Coccidioides immitis, sporulating mold forms; Francisella tularensis; Histoplasma capsulatum; Mycobacterium bovis; Mycobacterium tuberculosis and Yersinia pestis.

The agency responsible for issuing the authorizations described above is:

Public Health Sanitation and Safety Program
New Jersey Department of Health
CN 369
Trenton, NJ 08625-0369
(609) 588-3124

Air Permits:

The department's Division of Environmental Regulation, Air Quality Regulation Program requires an air pollution control permit (Permit to Construct, Install, or Alter Control Apparatus or Equipment and Certificate to Operate Apparatus or Equipment) for any equipment that may produce air emissions.

This air pollution control permit is required for manufacturing operations processing more than 50 pounds per hour. Airlocked equipment may qualify for "no APC permit required" status. The agency responsible for issuing the authorization and permit described above is:

Bureau of New Source Review
Air Quality Regulation Program
CN 027
Trenton, NJ 08625-0027
(609) 633-8230

Water (NJPDES) Permits:

The department's Division of Environmental Regulation, Wastewater Facilities Regulation Program is responsible for issuing NJPDES permits to discharge wastewater to surface water, ground water, or to a domestic treatment works (sanitary sewer). They also issue treatment works approvals for conveyance, storage and/or treatment of wastewater. Permit requirements are normally site specific. A facility utilizing a RMW technology system would need to contact the Wastewater Facilities Regulation Element to determine if any permits or approvals are required. The agency responsible for issuing the authorization and permits described above is:

Bureau of Industrial Discharge Permits
Wastewater Facilities Regulation Program
Division of Environmental Regulation
CN 029
Trenton, NJ 08625-0029
(609)292-4860

Bureau of Construction and Connection Permits
Wastewater Facilities Regulation Program
Division of Environmental Regulation
CN 029
Trenton, NJ 08625-0029
(609) 984-4429

Hazardous Waste Permits:

No permits are normally required by the Division of Environmental Regulation, Hazardous Waste Regulation. In accordance with N.J.A.C. 7:26-8.5, generators of solid wastes are required to determine that their solid wastes are not hazardous wastes. The agency responsible for providing information concerning hazardous waste authorization is:

Hazardous Waste Regulation
Division of Environmental Regulation
CN 028
Trenton, NJ 08625-0028
(609) 292-8341

Radiation Control Permits:

No permits are normally required by the Division of Science and Technical Program's, Environmental Safety, Health and Analytical Programs. The agency responsible for providing information concerning radiation control authorization is:

Radiation Protection Programs
Division of Environmental Safety, Health
and Analytical Programs
CN 415
Trenton, NJ 08625-0415
(609) 987-6389

Land Use Permits:

The department's Land Use Regulation Program is responsible for issuing permits for construction/placement of structures or activities that impact Waterfronts, Tidal Wetlands, Floodways, Freshwater Wetlands along with their Transition Areas or are in the Coastal Zone (CAFRA). Permit requirements are site specific. A facility proposing to construct infrastructure or dredge or fill lands or waters would need to contact the Land Use Regulation Program. The agency responsible for issuing the authorization and permits described above is:

Land Use Regulation Program
Division of Environmental Regulation
Department of Environmental Protection and Energy
CN 401
Trenton, NJ 08625-0401
(609) 984-3444

c. Chemical Treatment

(1) Technology Review

Several of the new technologies use chemical methods to treat the infectious nature of the RMW.

As applied to infectious waste treatment, chemical disinfection is treatment of the waste by addition of chemicals that kill or inactivate the infectious agents. This type of treatment usually results in disinfection rather than sterilization. Chemical disinfection is best suited for use in treatment of liquid wastes. Chemical disinfection can also be used to treat solid infectious waste that is shredded before or during treatment in a device such as a hammermill. With intact solid infectious wastes, chemical treatment provides only surface disinfection (3). The shredding of solid infectious waste before treatment vastly increases the surface area available for disinfection but increases the risk of transmission of infectious agents through aerosols. It is important at this stage of the treatment process to use precautions such as wetting, HEPA filters and negative pressure to prevent release of infectious aerosols.

In order to treat infectious wastes effectively by chemical disinfection, it is essential:

- to use the proper disinfectant
- to add a sufficient quantity of the chemical
- to allow sufficient contact time and
- to control other conditions as necessary (3).

Shredding the infectious wastes to increase surface area is one of the other conditions required.

USEPA, in its first of three reports to Congress, described the chemical treatment method generally as follows:

"Chemical disinfection processes involve contacting medical wastes with a liquid chemical disinfectant. The wastes are initially ground to ensure that the

chemical agent can penetrate the wastes and to aid in disposal of the residues. The materials then enter a bath where they are mixed with the disinfectant. The resulting liquids, including any remaining disinfecting agents, are released to the sewer system while the solid residues are drained of the disinfectant and disposed of in a landfill (4)."

...

"The Agency is concerned that certain pathogens may remain infectious even after they pass through a sewage treatment plant. Dischargers should not dispose of any medical wastes to the sewer without first checking with public health and municipal sewage treatment authorities to determine whether the disposal presents any risk to the public (4)."

In chemical disinfection, infectious agents must be exposed to a chemical disinfectant that acts against the microorganisms present in the waste. Waste particle size, porosity and permeability all affect the ability of the chemicals to penetrate the material. Grinding the waste prior to treatment reduces the size of the material and increases the potential effectiveness of the method.

In testing the efficacy of treatment methods using appropriate biological indicators, the waste sample is spiked with a container of the bacterial or other infectious organism. The waste sample then is treated by the process being tested and the container with the spiking organism is recovered for testing. This is defined as a "standard procedure" in biological testing.

Currently, no standard procedures exist to monitor the effectiveness of chemical disinfection or treatment. Since the wastes are ground prior to treatment, it is not possible to place a separate container of indicator organisms in the waste and recover it in the test to monitor the treatment. Such a method however, can be used to evaluate survival of organisms introduced directly into a waste stream. After treatment, a direct contact procedure to culture bacteria still present in the waste can be used (5).

In New Jersey today, there are 12 facilities that are permitted to use chemical disinfection in a mechanical destruction unit. Before a unit may begin operation today, the facility is required to have solid waste plan inclusion, a solid waste facility permit, a medical waste registration, an air pollution control permit from DEPE, and approval from the DOH. The DOH continues to evaluate alternate procedures to monitor disinfection efficacy as they become available. Further, any use of chemical disinfectants in New Jersey for treatment of RMW must be approved by USEPA under its FIFRA program.

As with other treatment alternatives, efficacy of the method needs to be demonstrated through the development of a biological testing program and

monitoring on a periodic basis using appropriate indicators in order for the system to be adopted and used on a routine basis. Generally, chlorine bleach has been found to be an effective treatment for medical wastes contaminated with vegetative bacteria and viruses, but is less effective against spore-forming bacteria (6).

Chemical disinfectants commonly used are chlorine compounds, alcohols, phenolic compounds, iodine compounds, quaternary ammonium compounds, formaldehyde and glutaraldehyde. Most of these are usually used for disinfection of contaminated surfaces and medical equipment, while formaldehyde is commonly used to preserve and disinfect pathological specimens. Chlorine compounds (primarily sodium hypochlorite) constitute the only type of disinfectant that is used routinely to disinfect infectious wastes (7).

In the use of sodium hypochlorite solution (liquid bleach) as a disinfectant, the active ingredient is hypochlorous acid. The hypochlorites, both organic and inorganic when added to water will react as shown in the following example to form hypochlorous acid:



The chlorine atom of the hypochlorous acid may be considered positive (valence of plus 1). Hypochlorous acid has outstanding bactericidal power which is generally attributed to its ability to diffuse through cell walls and reach the vital parts of the bacterial cell. The hypochlorite ion has little if any bactericidal effect since its negative charge impedes penetration of the cell wall.

The bactericidal power of a chlorine-containing solution, whether dissolved chlorine, a hypochlorite, or a chloramine is related to the hypochlorous acid content. It is directly proportional to the hypochlorous acid concentration. The percent available chlorine as undissociated hypochlorous acid is the true measure of the bactericidal effectiveness of a sodium hypochlorite solution (bleach) or a solution containing one of the other chemicals of the available chlorine family.

Commercial liquid bleach usually contains 12 to 15 percent available chlorine. If liquid bleach is to be stored, it should contain sufficient excess caustic soda to maintain stability of the solution. The amount of excess caustic soda will vary with the degree of stability desired and may vary up to 10 percent of the available chlorine content (8).

Chlorine can be considered in regard to its use for water chlorination and sanitary and industrial wastes treatment and then the information thus obtained applied to RMW treatment. Chlorine in water treatment is used because of its toxicological characteristics and its oxidative capacity. It is employed to destroy bacteria and other microorganisms and to modify the chemical characteristics of the water being

treated. In the treatment of sanitary and industrial wastes, chlorine's utility is due to toxicological characteristics, oxidative ability and its adaptability as a coagulant.

Chlorine or sodium hypochlorite used in sanitary waste treatment is very reactive and while its primary purpose may be disinfection, it has other effects as well. Sanitary wastes, as well as industrial wastes, contain a large and complex variety of suspended and dissolved inorganic and organic materials in addition to various bacteria, protozoa and other organisms. This factor necessitates the use of a sufficient quantity of sodium hypochlorite to achieve disinfection. For example, when sufficient chlorine is added to domestic sewage to carry out the oxidation reaction to an equilibrium in a 10 minute reaction period, the nonsettleable solids consume about 50 percent of the chlorine added. The settleable substances consume about 25 percent of the chlorine and the soluble substances approximately 25 percent of the chlorine, while only a negligible amount of chlorine is consumed by bacterial cells and higher biological forms (9).

RMW contains a variety of materials that will consume the hypochlorous acid in a bleach solution lessening its potency for disinfection. It is important to keep this in mind when determining solution concentration to attain a sufficient level of disinfection in RMW.

All of the new technologies under consideration in this review of chemical treatment depend on the disinfectant qualities of chloride ion. These are:

<u>Technology</u>	<u>Vendor</u>
MeDETOX	Delphi Research, Inc.
Z5000 & Z12,500	Medical SafeTEC, Inc.
Winfield Condor Process	Winfield Corp.
FI 1000 Pure Flow	Puretech Systems, Inc.
Safeguard 1000	CS Medical Supply Corp.
Omega SDS 100	Environmental Disposal Systems, Inc.

(2) Evaluations:

USEPA's, May 1990 report, titled Medical Waste Management in the United States First Interim Report to Congress, reviews several medical waste treatment techniques. The issues which the report reviews include the advantages, disadvantages, factors impacting effectiveness, quality assurance and quality procedures, and maintenance and operator training for the chemical disinfection and

grinding method which are summarized below. In future reports, the USEPA plans to expand this information and report the results of testing of the efficacy of certain treatment techniques including mechanical grinding and chemical disinfection systems.

The first issue the report discusses is the advantages and disadvantages of chemical disinfection and grinding. Some advantages are that the volume is reduced and the waste is rendered unrecognizable. A disadvantage discussed was that the chemicals used in the system pose a moderate risk to operators and maintenance personnel. Another disadvantage is that the method's ability to render the waste less infectious has not been thoroughly evaluated.

The second issue the report reviews is the factors impacting the effectiveness of the chemical disinfection and grinding method. The report emphasizes that factors such as particle size, porosity, and permeability affect the ability of the chemicals to penetrate the waste material. Soiling or organic matter on the surface of the waste can also reduce effectiveness. All of these factors influence the effectiveness of chemical disinfection and grinding as a treatment method of medical waste.

Another issue the report describes is quality assurance and quality control procedures for the chemical disinfection and grinding treatment method. There are currently no standard procedures to monitor the effectiveness of the treatment. The DOH has initiated the process to develop standards for efficacy testing at this time.

The last issue the report discusses is the maintenance and operator training necessary for chemical disinfection and grinding. The report states that periodic maintenance of the equipment is required and the grinding apparatus is subject to wear. There is little specialized operator training required.

A 1991 report, Infectious and Medical Waste Management, by P.A. Reinhardt and J.G. Gordon discusses treatment and destruction techniques for medical wastes. Three techniques, steam sterilization, disinfection/grinding and incineration were reviewed and compared.

Reinhardt and Gordon state that when selecting the best system for a particular facility, it must be an individual decision based on the facilities needs and which system best meets those needs. Reinhardt and Gordon discuss some advantages and disadvantages associated with the hammermill/chemical treatment system.

An advantage Reinhardt and Gordon presented was that the system can treat a wide selection of medical wastes. It also destroys RMW so that it is no longer recognizable as RMW. Another advantage is the flexibility of the system because the concentration of sodium hypochlorite can be varied with the type of waste being processed in order to achieve maximum effectiveness. Reinhardt and Gordon also

state the hammermill/chemical treatment system is less expensive to install and operate than incinerators, but generally more expensive than steam sterilizers.

Disadvantages include that the system requires trained operators who must be familiar with the control variables to ensure effective treatment. Reinhardt and Gordon state there are some occupational hazards as well to consider such as the chemicals involved, injury from moving parts, and the high noise level. They note that all of these risks can be minimized by protective equipment for the workers. Reinhardt and Gordon also question the quality of the discharge if the system is not functioning properly.

A third evaluation, Medical Waste Treatment Techniques by T.K. Pierson, D.R. Greenwood, and C.M. Norheim reviews treatment techniques for medical wastes. One of the six treatment techniques reviewed in the document is Medical SafeTEC's mechanical/chemical system. The report summarizes several studies which have been performed on the effectiveness of chlorine bleach as a disinfectant. The report also summarizes three studies which have been performed on the Medical SafeTEC unit for microbiological efficacy.

Another evaluation, Finding the Rx for Managing Medical Wastes, reviews non-incineration treatment technologies of which mechanical/chemical disinfection is one. The report states the system is popular because of its ability to destroy RMW so that it's no longer recognizable. Another benefit is that it's capable of treating infectious liquid waste before it's discharged into the sanitary sewer. The report questions the risks involved if direct discharge results to the sanitary sewer. The report notes that concerns have been raised about the effluent from the system, specifically metals, organics, and high levels of chlorine. The report also states that there is a concern with the potential of volatile chemicals or microbes being produced during the shredding process. The report summarizes that the alternative systems which have developed appear to have fewer emission concerns compared to incinerators, but the health risks associated with these new systems have not and should be evaluated.

USEPA, Office of Solid Waste, Medical Waste Management in the United States, First Interim Report to Congress, EPA/530-SW-90-087A, May 1990.

(3) Recommended Controls And Required Permits:

General permits and controls for systems which treat and destroy RMW are described earlier in Section D.3.b. Any specific requirements or additional information for a RMW technology system are described below:

County Planning Process;
Licensing and Rate Setting;
Solid Waste Permits;
Department of Health Approvals;
Air Permits;
Water Permits;
Hazardous Waste Permits;
Radiation Control Permits; and
Land Use Permits.

Refer to Section D.3.b.

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA):

The department requires that any chemical treatment system being used in New Jersey for RMW treatment have USEPA approval under the FIFRA program. The agency responsible for issuing the authorizations above is:

Registration Division
USEPA
H7504-C 401 M Street, S.W.
Washington D.C. 20460
(703) 305-7964

The following is an overview of the six specific chemical treatment systems for which the department received information. For each, an overview of the system, process description, statement of operating and performance specifications, brief economic analysis and summary of general advantages and disadvantages has been included. In some cases, detailed information in each of these areas was not submitted by the vendor or was otherwise unavailable for inclusion. Generally, the information supplied represents the claims of each vendor. The DEPE does not support or challenge their claims in this overview, but has framed potential advantages and disadvantages of each system.

(4) MeDETOX

Delphi Research, Inc.
701 Haines Ave. N.W.
Albuquerque, NM 87102

i. Overview

There is not a complete working model of the MeDETOX equipment available at this time. An experimental prototype device has been built by Delphi Research, Inc. with a reaction chamber, a treatment chamber and associated tubing connecting the two chambers but does not pre-shred the waste. There are no integral parts to the experimental prototype device which shreds the infectious waste into the treatment chamber and removes the treated, destroyed waste from the treatment chamber.

In the MeDETOX process the waste is shredded and then treated with a solution containing FeCl_3 , CuCl_2 and RuCl_3 in the presence of H_2SO_4 . This treatment solution is maintained at the pH of zero and a temperature of 95°C .

The infectious waste is shredded in a separate device and placed in the treatment chamber. The solution is heated in the reaction chamber (glass lined) and passes through a combination of PVC tubing and polypropylene tubing to the treatment (oxidation) chamber. In the treatment chamber, the 1M H_2SO_4 solution acts on the infectious waste in a manner that reduces the ferric chloride (FeCl_3) in the solution to ferrous chloride (FeCl_2). The vendor claims that this process oxidizes the infectious waste and destroys the viruses, vegetative bacteria and bacterial spores. The solution has a pH of zero due to the quantity of sulfuric acid present. After passing through the infectious waste, the pumping system brings the solution back to the reaction chamber where the ferrous chloride is oxidized to ferric chloride (FeCl_3). The solution is heated to 95°C again and is available for further treatment use.

The treated waste is rinsed twice and the rinsates added to the solution in the reaction chamber. The third rinse should have a pH of 4.5 or higher and be safe to discharge to the sewer system. In addition to treating the infectious waste, the solution (containing sulfuric acid and ferric chloride) dissolves needles and other metallic objects.

The biological assays carried out on samples of the treated and destroyed wastes indicate the effectiveness of the treatment. It is not entirely clear whether this is due to the oxidizing effect of ferric chloride, the acidity of the solution (1M sulfuric acid) or a combination of the two effects. The MeDETOX system is expected to operate at a capacity of 200 lbs/hr. but can be designed for a larger capacity. The system vendor also claims that it can accommodate all RMWs with the possible exception of Class 5 (Animal Carcasses) or large human pathological wastes. The MeDETOX system can treat animal carcasses but the time of treatment would be longer and capacity would consequently be drastically reduced. Delphi Research does not appear to consider small pathological specimens to be a problem.

ii. Description Of Process:

MeDETOX, as described by Delphi Research, Inc., is a wet oxidation process which will be capable of treating and destroying medical wastes. MeDETOX will destroy the waste by shredding it and then treating it by oxidation which destroys the organic structure of the viruses, bacteria and spores. The system, as described, uses a catalyst solution also called the working fluid which treats the waste by oxidation. The working fluid is composed of dilute acid, a catalyst and a cocatalyst. The acid is maintained at a pH of zero and a temperature of 95°C. The oxidizing agent is the species Fe(III) and upon reduction, the valence changes to Fe(II). The cocatalyst is the agent which makes the reaction proceed rapidly. During the process a regenerator reoxidizes the Fe(II) to Fe(III).

The waste to be processed will be placed in an air locked compartment with a shredder. The shredder will reduce the particle size of waste to 1/2 inch square or smaller, which acts to increase the surface area and the rate of oxidation. The waste then will enter the treatment chamber. The reactor tank contains the catalyst regenerator (reaction chamber) and heater, a pump, a treatment chamber, and a condenser. The electric heater mounted inside the tank will maintain the working fluid at a temperature of 95°C. The waste to be processed will then be treated with the working fluid. The catalyst regenerator will return the iron catalyst to its oxidized form. An external loop includes the collection and reuse of the condensate as a rinsing agent for the residue. The pump serves to circulate the working fluid through the treatment chamber and return it to the reaction chamber.

The processed waste, which will include plastics, glass, rubber and paper, may then be disposed of as municipal (institutional) type 10 solid waste in a landfill. Plastics and glass may be recovered for potential recycling.

Delphi plans to operate a facility in a hospital. Another option is to operate a regional commercial facility for several hospitals. Delphi Research is working with the New Mexico Health and Environment Department to operate a pilot or demonstration study. As of May 1991, Delphi received authorization from the State of New Mexico to proceed with a full scale plant with a capacity of approximately 200 lbs per day. Recently, in September 1992, the department discovered that Delphi Research has ceased planning a facility to process RMW, and instead is planning on processing hazardous waste. The company does plan to research processing RMW in the future.

iii. Operating Specifications:

According to the manufacturer's specifications the MeDETOX system is expected to have a 200 lb./hr. capacity, but may be modified to meet the

generator's requirements. It can range in processing capacity from 1500 pounds per day to 15 tons per day. The MeDETOX system with a 200 pound per hour capacity requires 500-1000 square feet in space. It requires a water source and a standard 2 inch drain line to the sanitary sewer. Electrical requirements include 230V, 220 amp A.C. or 115V, 10 amp A.C. Delphi intends to provide the chemicals required through routine maintenance of equipment. Delphi will also provide trained personnel to operate and maintain the equipment.

iv. Performance Specifications:

Delphi Research Inc. literature indicates that the MeDETOX system achieves a 2.5/1.0 volume reduction which is primarily due to shredding. The processed waste is approximately 1/2 inch in diameter and will meet the standard for the destruction of RMW. There is no reduction in the weight of processed material. The infectious nature of the waste, i.e. the microbiological activity, is reduced by 99.999%. All bacteria and viruses are rendered non-viable and spores may have a limited survival rate of <0.001%.

v. Economics:

Delphi Research Inc. estimates that they will be able to provide the MeDETOX system to hospitals at approximately \$0.17 to \$0.35 per pound, depending on the volume processed during a specific period of time. This estimate includes capital and operating costs, except transporter costs. Prices also include operating labor, maintenance, quality control testing, depreciation, insurance, energy costs and administrative costs required to perform the reporting functions.

vi. Summary of Advantages and Disadvantages:

An advantage with the MeDETOX system is that the system as proposed appears to treat and destroy RMW. The manufacturer states that the MeDETOX system can handle all RMW Classes except Class 5 - Animal Waste. Available biological assays indicate that the treatment method is effective. The vendor claims that the MeDETOX system achieves a volume reduction of approximately 2:1. The processed waste can be disposed of as ID 10 municipal solid waste in a landfill. MeDETOX states the solid residue is dried and does not contain corrosive or metal content in excess of limits defined in federal or NJ state regulations. Plastics and glass may have a potential to be recovered for recycling.

A disadvantage with the MeDETOX system is that it is not recommended for animal carcasses, which are Class 5 of the RMW classes. If carcasses were processed by the system they would require an extended period of time for

treatment. Larger pathological wastes would also not be recommended.

Other disadvantages may be storage of the chemicals for the unit and the disposal of rinsates from the treatment process. This system contains sulfuric acid in solution among other things which would have a potential for creating hazardous spills during storage or mixing solution or making solution. The third rinsate from the treatment process is intended to be disposed of through the sewer system. It may be necessary to obtain approval from the Wastewater Facilities Regulation Element for this discharge. This system also has a very limited operating history in the United States and no track record in New Jersey. Furthermore, as noted earlier, this company has ceased research in using this process for RMW and instead, is now interested in processing only hazardous waste.

Delphi Research Inc. projects that they will be able to provide the MeDETOX system to hospitals at a cost of \$0.17 to \$0.35 per pound, depending on volume processed within a specific time frame. This estimate includes all costs except transporter charges.

(5) Z5000 & Z12,500

**Medical SafeTEC Inc.
5610 West 82nd Street
Indianapolis, IN 46278**

i. Overview

Medical SafeTEC manufactures and sells a mechanical grinding and chemical disinfection unit which treats and destroys medical waste. It was available in several models (Z5000, Z5000 HC and Z12,500) which varied in waste handling capacity from 100-200 lbs/hr up to 700-1500 lbs/hr. The Z5000 cost approximately \$51,000 to purchase and \$4,100 to install. The Z12,500 cost approximately \$379,000 to purchase and \$27,000 to install.

Information obtained in June 1992 indicates the product line has been modified and now consists of the models MST 300L, MST 500 & MST 1200. The MST 300L is apparently equivalent to the Z5000 and the MST 1200 to the Z12,500. The MST 500 appears to be a new model with a capacity of 500 lbs/hr. The purchase costs for these devices are approximately - MST 300L, \$61,875; MST 500, \$149,750 and MST 1200, \$379,500.

There are currently twelve "Z" units in operation in the State of New Jersey. They are as follows:

1.	Cytogen Corporation	Princeton	Z5000
2.	GIB Laboratories	Newark	Z5000
3.	Hackensack Medical Center	Hackensack	Z12,500
4.	Kennedy Memorial Hospital	Cherry Hill	Z5000
5.	Kennedy Memorial Hospital	Turnersville	Z5000
6.	Muhlenberg Medical Center	Plainfield	Z12,500
7.	Muhlenberg Medical Center	Plainfield	Z5000HC
8.	N.J. DOH Public Health and Environmental Labs.	Trenton	Z5000
9.	Roche Biomedical Labs., Inc.	Raritan	Z12,500
10.	St. Michael's Medical Center	Newark	Z5000HC
11.	Underwood Memorial Hospital	Woodbury	Z5000
12.	Valley Hospital	Ridgewood	Z12,500

The department is in the process of issuing permits for these devices. No new facilities shall operate in New Jersey without solid waste plan inclusion and receipt of all required permits. As of February 1993, there are no MST series units for RMW treatment/destruction operating in New Jersey and no applications pending for MST series units.

There are also "Z" units operating in other states for the purpose of treating and destroying infectious waste. These are listed below:

	<u>No. of Units</u>
1. California	one
2. Connecticut	three
3. Delaware	two
4. Georgia	one
5. Hawaii	one
6. Indiana	one
7. Kansas	two
8. Kentucky	one
9. Louisiana	one

10. Maryland	two
11. Michigan	two
12. Missouri	two
13. Ohio	two
14. Oregon	one
15. New York	four
16. South Carolina	one
17. Wisconsin	one

The waste is fed into a closed system where it is sprayed with the disinfectant solution, shredded and hammermilled. The disinfectant solution should contain free available chlorine (FAC) in the range of 1500-2000 ppm. Sufficient disinfectant solution is added to wet the extensive surface areas created by the shredding and hammermilling processes. After processing, the liquid waste is separated from the solid by gravity drainage in a sedimentation or weir separation tank and discharged to the sanitary sewer. The solid waste is then sent to a sanitary landfill or incinerator for disposal.

The Medical SafeTEC units can achieve volume reductions of RMW varying from 2:1 to 8:1, depending on the nature of the waste stream. There is some increase in volume when the waste stream contains a large amount of paper. There is usually an increase in weight due to the retention of some liquid from the treatment process. Depending on the water retentive properties of the waste stream, overall weight might increase by a factor of 1.5. This is based on allowing the treated and destroyed waste to drain for 15 minutes before transferring to a disposal container. The vendor claims that the difference in disposal costs on a per pound basis for solid waste and RMW results in a considerable savings on total disposal cost even though the weight of the waste stream is increased by the treatment process.

A test of this treatment technology was conducted by Dr. Gerald A. Denys at Methodist Hospital of Indiana, Indianapolis, IN. Complete kills of Enterococcus faecalis and Serratia marcescens were achieved within 5 minutes at 1500 parts per million (ppm) FAC. Treatment of sporeforming or gram positive bacilli were less successful though significant. For Bacillus subtilis, a level of $>6 \times \log_{10}$ was achieved at 2000 ppm FAC within 5 minutes. The level of Mycobacterium fortuitum was $2-3 \times \log_{10}$ after 5 minutes at 2000 ppm FAC.

The manufacturer recommends that certain items in Classes 3 (Human Blood and Blood Products), 5 (Animal Wastes) and 6 (Isolation Wastes) are not amenable to treatment by the Medical SafeTEC process and require an alternate treatment method. The liquid waste from the process requires monitoring to comply with state wastewater discharge requirements. The solid waste stream

from the process also should be sampled and tested on a regular basis to verify the effectiveness of the treatment method. The shredding and hammermilling procedure produces a solid waste meeting the criteria for destruction of RMW and is not recognizable as such.

ii. Description of Process:

RMW is manually loaded into the feed hopper which is then automatically fed into the hammermill chamber. Next, disinfectant solution and diluted water are automatically added to the hammermill chamber. In larger units, the waste is moved into the hopper by a continuous conveyor, is preshredded and sprayed with disinfection solution before it is fed into the hammermill chamber. In this chamber the waste is mechanically destroyed by the hammermills and chemically treated with disinfectant solution. The entire process is maintained under negative pressure and air is discharged through a high efficiency particulate air (H.E.P.A.) filter to the outside.

After processing, the liquid waste is separated from the solid by gravity drainage in a sedimentation or weir separation tank and discharged to the sanitary sewer. The solid waste is then sent to a sanitary landfill or incinerator for disposal.

The Medical SafeTEC system does increase the weight and thus cost for solid waste disposal. However, it decreases the cost for RMW disposal. For example, Valley Hospital, Ridgewood, NJ, during a site visit by the department, reported that the waste is 2.5 times heavier after processing by their Z-12,500 and 1.5 times heavier after it has drained for approximately 15 minutes and is loaded into the dumpster. The processed waste which is 1.5 times heavier is disposed of as regular municipal waste at \$156/ton at the Bergen County transfer station. Since Valley Hospital processes approximately 2.25 tons of medical waste a day by the Z-12,500, when this waste is disposed of as municipal solid waste, it now weighs 3.375 tons and costs \$525/day for disposal. The disposal of 2.25 tons of municipal solid waste at \$156/ton would be \$351/day. Valley Hospital is therefore paying an extra \$175/day to dispose of regular municipal solid waste because of the extra weight added by the process. It must be noted though that disposal of the waste as RMW would be significantly higher since medical waste usually costs approximately \$.50/lb or in this case about \$2,250/day to dispose of.

iii. Operating Specifications:

Medical SafeTEC offers three models which vary in capacity. The Z-5,000 has a capacity of 100-200 lbs/hr and requires 270 x 300 cm of working space, the Z-5,000 HC has a capacity of 200-400 lbs/hr and requires a working space of

300 x 330 cm, and the Z-12,500 has a capacity of 700-1500 lbs/hr and requires a 490 x 750 cm working space. Small units require a 1/2 inch water supply line with an anti-back siphon preventer which must yield a 6 gallon per minute (g.p.m.) flow rate after the backflow device and a 2 inch drain line to the sanitary sewer which must be able to accept a 6 g.p.m. flow rate. Larger units require a 1/2 inch water supply line with a backflow preventer capable of delivering 35 g.p.m. at 60-100 pounds per square inch (p.s.i.) and a 4-6 inch drain line to the sanitary sewer which must be able to accept 30 g.p.m. Electrical requirements include 200, 208, 230, 460 v.a.c., 60 hz, 3 phase for small units and 460 v. 3 phase for large units. A 4 inch exhaust vent is required for small units and a 6 inch vent for large units. The chemicals required for the unit include a supply of sodium hypochlorite solution, germicidal hand soap, water soluble mineral oil, and detergent/disinfectant floor cleaner. Medical SafeTEC will provide staff training as part of the factory installation.

iv. Performance Specifications:

The Medical SafeTEC unit is claimed by its manufacturers to achieve a 8:1 reduction in volume of infectious wastes and a 6:1 volume reduction of paper type wastes. There is a 2:1 reduction of liquid entrained wastes and a gain on paper items because of the disinfectant solution which is added. Destruction is accomplished by high speed hammermills that pulverize the waste and render it unrecognizable. Glass is reduced to large gravel or sand-like pieces, paper to pulp, needles are blunted and bent, tubing is cut into pieces and soft material is cut to sizes averaging less than 2 inches. Treatment is accomplished by combining the waste with a disinfectant, usually sodium hypochlorite, during the process. The concentration of the free available chlorine (FAC) is dependent on the flow rate of sodium hypochlorite and water in the system. Medical SafeTEC has available documentation from independent studies of the disinfection or treatment capability of the Medical SafeTEC system.

v. Economics:

The Z-5,000 has a capital cost of \$51,425 plus approximately \$4,100 for installation costs. The Z-5,000 HC has a capital cost of \$61,875 and approximately \$4,100 for installation costs. The Z-12,500 has a capital cost of \$379,000 and installation costs of approximately \$27,200.

Medical SafeTEC states that the Z-5,000 processing 400 lbs/hr of medical waste has a cost of \$0.07/lb and the Z-12,500 operating at 1000 lbs/hr has a cost of \$0.037/lb. These estimates include the cost of consumables such as sodium hypochlorite, water, sewer, and electrical power and replacement parts such as the hammers, belts and H.E.P.A. filters.

Muhlenberg Hospital, Plainfield, NJ, which has a Z-12,500 and processes approximately 30,000 lbs/month estimates that disposal costs are \$0.28/lb. This estimate does not include labor and cost of supplies, but does include amortization of the equipment. During a site visit to Valley Hospital, Ridgewood, NJ, which also has a Z-12,500 and processes about 4000-5000 lbs/day, estimates were given of a cost of \$0.37/lb. This estimate includes operation cost of equipment, but does not include labor or amortization of purchase cost. The following summary gives total annual costs for MST series units as "Z" units are no longer commercially available from Medical SafeTEC. As of February 1993, no MST series units are being used for RMW in New Jersey and no applications are pending for MST series units.

SUMMARY OF PROJECTED MEDICAL SAFETEC COSTS

		TOTAL ANNUAL COST		
	COST CATEGORY	MST 300L	MST 500	MST 1200
1.	Purchase Cost	\$7,962	\$24,436	\$48,937
2.	Energy (Electricity)	1,973	1,894	1,118
3.	Installation	266	1,000	1,800
4.	Labor	22,550	9,020	3,758
5.	Disposal	12,515	12,515	12,515
	TOTAL/YR	\$45,266 (\$0.20 per lb.)	\$48,865 (\$0.22 per lb.)	\$68,128 (\$0.30 per lb.)

1. Based on 3/19/93 capital cost of unit (MST300L - \$61,750; MST500 - \$189,500; MST1200 - \$379,500); payment based on 10% interest rate on a 15 year loan.
2. Based on total energy needed to process typical quantity of RMW at a New Jersey hospital, with unit operating at maximum capacity. Energy cost based on Public Service Electric and Gas Company's industry charge of \$0.075/kwh of electricity. Typical quantity of RMW (113 tons/yr) is the mean of 96 hospitals' RMW generated after the removal of four hospitals with excessive quantities reported. Source of data - 1990 AGR.
3. Installation cost (MST300L - \$4,000L; MST500 - \$15,000; MST1200 - \$27,000 divided by life of unit (15 years).
4. Based on total labor hours needed to process typical quantity of RMW at

a New Jersey hospital, with unit operating at maximum capacity. Labor costs based on information from New Jersey Department of Labor's hourly wages plus overhead for two housekeeping aides.

5. Based on state average of \$74 per ton of MSW.

vi. Summary of Advantages and Disadvantages:

An advantage of Medical SafeTEC's system is that it both treats and destroys RMW. The processed waste is considered municipal solid waste.

The Medical SafeTEC system is able to accommodate Class 1 (Cultures and Stocks), Class 2 (Pathological Wastes), Class 4 (Needles, Syringes and Sharps) and Class 7 (Unused Needles, Syringes and Sharps). It also can handle some wastes from Class 3 (Blood and Blood Products) and Class 6 (Isolation Wastes), but this is generally not recommended.

Biological testing of the treated and destroyed waste stream has shown this technology to be effective in disinfecting RMW.

There are presently twelve units from Medical SafeTEC Inc. operating in New Jersey for the purpose of treating and destroying RMW. Facility experience with these units appears to be very good.

Although this system does treat and destroy medical waste, it significantly increases the processed waste's weight. As a result, this may increase disposal costs for the processed waste which is now considered municipal solid waste, but it is still less expensive than disposing of the waste as RMW.

This grinding/disinfection process also has some disadvantages in the types or classes of waste which can not be processed or extra precautions that need to be taken. Medical SafeTEC recommends that culture slants from tuberculosis research, which are classified under Class 1 (Cultures and Stocks), be autoclaved before processing to insure complete treatment. It is recommended that soft items in Class 3 (Blood and Blood Products) and Class 6 (Isolation Wastes) not be processed due to feed chute restrictions and entanglement in the hammermills. Some animal carcasses which are Class 5 (Animal Wastes) should not be processed because of their greasy nature which may cause problems in the straining process. Detergents and hot water may be incorporated into the system to reduce this problem if carcasses were to be processed.

Another disadvantage with the Medical SafeTEC system involves the chemical, sodium hypochlorite, required for disinfection. Department personnel observed during several site visits to facilities with the Medical SafeTEC units that there

is a noticeable odor of chlorine in the air. Workers must wear safety glasses, masks, gloves and aprons for personal protection. There also exists a potential for spills of the sodium hypochlorite.

According to the available data, the Z12,500 from Medical SafeTEC processes RMW at a cost somewhat in excess of \$0.28 to \$0.37 per pound. Muhlenberg Hospital, Plainfield, NJ reports a cost of \$0.28 per pound, not including labor and cost of supplies. Valley Hospital, Ridgewood, NJ estimates a cost of \$0.37 per pound, not including labor or amortization of purchase cost.

The Medical SafeTEC system does produce an effluent to be disposed of via the sewer system. It is necessary to contact the Wastewater Facilities Regulation Element, Division of Environmental Regulation to determine whether a discharge permit is required.

A disadvantage noted by some users of the Medical SafeTEC unit is the excessive amount of noise the units produce. This can necessitate isolating the unit from public areas and could require noise damping barriers and special ear protection for operators.

(6) WINFIELD CONDOR MEDICAL WASTE TREATMENT SYSTEM:

**Winfield Corporation
9750 Distribution Avenue
San Diego, CA 92121**

i. Overview

The Condor System, according to the most recent information from the vendor, has a purchase price of \$400,000. Installation costs still have to be determined. Operating costs would include personnel, electricity, water, maintenance and disposal costs (landfill). The system capacity is 600 lb/hour. There is no reduction in weight of the waste stream but there is a 70 to 80% reduction in volume.

The Condor System is being used at two facilities in West Virginia, one in Charleston and one in Morgantown and at one facility in New York.

The Condor System employs a chlorine based disinfectant. This process combines conventional shredding technology with special red bags containing a dry disinfectant and a colorant. The special red bags have the dry disinfectant and colorant incorporated in a seam of the bag and are electronically coded to distinguish them from conventional bags. An electronic bag reader allows only the coded bags to pass through a sealed "entry door".

Once inside the machine, the entire bag is simultaneously sprayed with disinfectant solution and shredded. The sealed "entry door" and the use of a disinfectant solution prevents the release of dust or aerosols. The disinfectant is recycled and continuously replenished through dissolving the dry disinfectant in the bags. The waste material then passes into a granulating chamber where it is further reduced in particle size. The granular waste material passes into a wash tank filled with liquid disinfectant at 1000 ppm and 120°F and mechanically agitated. The disinfectant is filtered through a fine mesh screen and is recirculated.

An auger conveyer then removes the granulated and treated waste stream from the wash tank. The waste enters the auger tube which is heated with band heaters to maintain the wastes at an elevated temperature and to extend the treatment cycle. The dewatering valve, a spring loaded seal at the exit end of the auger tube prevents the wastes from exiting until they are sufficiently squeezed and "dewatered". The damp granular waste is not recognizable as medical waste and may be disposed of as municipal solid waste. The colorant mixed with the dry disinfectant serves as a visual indicator that the waste stream has gone through the disinfection process.

Apparently the liquid in the wash tank is also circulated to spray the red bags when they enter the shredding chamber. Excess liquid from the shredding chamber, granulating chamber and auger tube are recirculated into the wash tank. A level sensor monitors fluid level in the wash tank and signals a solenoid to admit additional fresh water to the tank when its level drops below nominal. The wash tank's temperature, pH and disinfectant concentration are continuously monitored through probes and a data logger provides a "hard copy" printout of the system parameters.

The Condor System is meant to be used primarily for Class 4 (Needles, Syringes and Sharps). It can accept the presence of Class 3 (Blood and Blood Products) at a load of up to 10% of the waste stream. This process can also be used to some extent on Class 1 (Cultures and Stocks) and Class 6 (Isolation Wastes) though testing would be required to determine the efficacy with these wastes. The Condor System cannot be used with large body parts from Class 2 (Pathological Waste) and Class 5 (Animal Waste) wastes. It is not certain whether it can be used effectively to treat smaller scale wastes from these classes.

The Winfield Corp. has submitted test data showing the effectiveness of chlorine dioxide against various bacteria, viruses and other organisms. They have not submitted any field test data concerning RMW treated by the Winfield Condor Process in other states.

ii. Description of Process:

The Condor System combines conventional shredding technology with special red bags. The bags incorporate a small amount of formulated, water activated disinfectant, together with a colorant. Once inside the machine, the entire bag is simultaneously sprayed with disinfectant and shredded. The disinfectant is recycled and continuously replenished through the powder in the bags. An auger conveyer, operated with a slightly elevated temperature provides both a fixed exposure period and final dewatering. The end product is reliably disinfected and reduced in volume and no longer recognizable as RMW. The department is awaiting a reply and a completed background questionnaire for this process.

iii. Operating Specifications- Requirements:

An electronic bag reader allows only the proper bags to enter a sealed "entry door." In the shredding chamber, counter rotating discs shred bags at low speeds and high torque, without release of dust or aerosols. The wastes pass into the granulating chamber to the next set of rotating blades which finely "slice" the wastes. A screen prevents larger sized material from passing through to the wash tank. Wastes enter a wash tank filled with liquid disinfectant at 1000 ppm and 120°F and are mechanically agitated. The disinfectant is filtered through the fluid filter, a fine mesh screen and is recirculated. The auger also serves the purpose of wiping materials stopped by the fine mesh screen and conveying them through the auger barrel. Waste enters the auger tube which is heated with band heaters to maintain the wastes at nominal temperature. The dewatering valve, a spring loaded seal at the exit end of the auger prevents the wastes from exiting until they are sufficiently squeezed and "dewatered." Liquid level sensors automatically monitor and signal a solenoid to allow replenishment of fluid in the wash tank. Temperature, pH and disinfectant concentration are monitored by probes. A data logger provides a printout of all system parameters.

iv. Performance Specifications - Standards:

The Winfield Corporation states that the reduction in volume is 70-80% and there is no reduction in weight. The vendor claims that reduction in recognizability is accomplished by shredding to a particle size of less than a 1/4 of an inch. They also state that reduction in the infectious nature is accomplished by a chlorine based disinfectant.

v. Economics:

The Winfield Condor Medical Waste Treatment System has a capital cost of

\$400,000 which includes training and installation assistance. Actual installation costs are not specified and are the responsibility of the user. Freight cost is an estimated \$2,000 to \$3,000 for locations in New Jersey.

SUMMARY OF PROJECTED CONDOR SYSTEM COSTS

	COST CATEGORY	TOTAL ANNUAL COST
1.	Purchase Cost	\$51,903
2.	Energy (Electricity)	700
3.	Labor	7,517
4.	Disposal	8,344
	TOTAL/YR	\$68,464 (\$0.30 per lb.)

1. Based on 2/12/93 equipment and installation cost of \$400,000 plus \$2,500, the mid point of freight charges that vary from \$2,000 to \$3,000, borrowed for fifteen years, at an interest rate of 10%, interest and principle payable every month.
2. Based on total energy needed to process typical quantity (113 tons/yr) of RMW at a New Jersey hospital, with unit operating at maximum capacity. Energy cost based on Public Service Electric and Gas Company's industry charge of \$0.075/kwh of electricity. Typical quantity of RMW is the mean of 96 hospitals' RMW generated after the removal of four hospitals with excessive quantities reported. Source of data - 1990 AGR.
3. Based on total labor hours needed to process typical quantity of RMW at a New Jersey hospital, with unit operating at maximum capacity. Labor costs based on information from New Jersey Department of Labor's hourly wages plus overhead for two housekeeping aides.
4. Based on state average of \$74 per ton of MSW.

vi. Summary of Advantages and/or Problems:

The Condor System is meant to be used primarily for Class 4 (Needles, Syringes and Sharps) and Class 7 (Unused Needles, Syringes and Sharps). It can be used for Class 1 (Cultures and Stocks) and Class 6 (Isolation Wastes) but testing would be required to ascertain the efficacy of the process with these wastes.

The Condor System reduces volume of waste with little increase in weight. A sample of the end product has been supplied which appears to attest to the

manufacture's claims. The manufacturer provided results of tests of the efficacy of chlorine dioxide against bacteria (gram negative and gram positive), yeast and spores (bacterial and fungal), individually and combined, under laboratory conditions. The results indicated that a 1000 ppm concentration of chlorine dioxide will kill 99.9% of the test organisms (A. niger, B. subtilis, C. albicans, E. coli, Pseudomonas, S. aureus) in 2 minutes or less.

There are certain disadvantages with the Condor System. This process can accept Class 3 (Blood and Blood Products) at a load up to 10% of the waste stream and can not be used for large body parts from Class 2 (Pathological Wastes) and Class 5 (Animal Wastes). It is not certain whether it can be used effectively to treat smaller scale wastes from these classes. Results attesting to the machine's capability to reduce the infectious nature of wastes using chlorine dioxide under field conditions with simulated and/or actual medical waste are desired but lacking at this time. There is a relatively limited track record with only three operating systems in the United States, two in West Virginia and one in New York. Finally, no economic information was provided in order to compare this system with others.

(7) FI 1000 PURE FLOW:

**Pure Tech Manufacturing Inc.
5657 W. 79th Street
Indianapolis, IN 46278-1711**

i. Overview:

The FI 1000 Pure Flow Process from Pure Tech Systems, Inc. is a system which chemically treats a waste stream with a disinfectant and mechanically destroys medical wastes by grinding. The Pure Flow Process is primarily designed for funeral facilities. Pure Tech Systems, Inc. is modifying the system to process wastes from medical facilities such as hospitals and clinical laboratories.

There are three operating units being used in funeral facilities in Indiana. Pure Tech Manufacturing expects to have an operational prototype for clinical laboratory use by the summer 1992.

ii. Description of Process:

The PureFlow Process is a system which chemically treats with a disinfectant (a chlorine based dry powder chemical) and mechanically destroys by grinding medical wastes. The PureFlow Process renders solid and liquid waste produced

in funeral facilities unrecognizable by mechanically grinding the wastes to an emulsion. The waste is treated by means of a mixing cycle with a chlorine based chemical. The emulsion is then discharged to the sanitary sewer.

iii. Operating Specifications:

The PureFlow Process machine may vary in capacity according to the waste stream and facility. The unit being marketed for the funeral industry has a capacity of 30 fluid gallons and is 27 inches high, 23 inches in width and 35 inches in length. It requires a 1/2 inch water supply line with hot and cold mixing ability. It also requires a 1 inch drain to a sanitary sewer or septic system. Electrical requirements include 110 volts, single phase, 60 Hz, 30 amp fused disconnect. The unit also requires a 1 inch air vent. The chemicals required for the unit include a chlorine based dry powder chemical with additional additives. The system will require a four hour session for staff training.

iv. Performance Specifications:

Pure Tech Manufacturing, Inc. states that the reduction in volume and weight will vary in accordance with the waste stream. Reduction in recognizability is accomplished by grinding/maceration. Reduction in the infectious nature is accomplished by chemical treatment with a chlorine based chemical.

v. Economics:

As of 2/10/93, the FI 1000 Pure Flow, designed for the funeral industry, has a capital cost of \$10,000 plus \$250 for installation. The unit has a useful life of 15 years and is to be refurbished at the end of 8 years at a cost of \$2,000. Normal maintenance and repair is assumed to be \$250 annually. Pure Tech estimates a \$4.77 cost per embalming, based on an average of 158 embalming procedures annually. Pure Tech also takes into consideration, chemical cost, electricity cost, water cost savings over that for traditional embalming and tax savings through deductions.

Units designed for other medical facilities also have cost estimates. For example, the vendor claims that hospitals will be able to process their medical waste for under \$0.10 per pound, including capital write-off and the required chemicals. Clinical operations can process wastes for a cost between \$6-10 per day.

vi. Summary of Advantages and Disadvantages:

The unit was designed for the funeral industry. It is advantageous because it

both treats and destroys the medical waste it processes. The system is designed to accept blood, body fluids and soft tissues produced during the embalming process in funeral homes. These wastes fall in Class 2 (Pathological Wastes) and Class 3 (Blood and Blood Products). Pure Tech Manufacturing, Inc. indicated that the unit may be able to process additional items, such as syringes, occasionally.

A disadvantage may be that the funeral facility may generate moderate volumes of waste which the unit cannot process and the facility would still need to dispose of these portions of the waste stream as RMW. Another disadvantage is that the currently operating units are very limited in scope, accepting only Class 3 and part of the Class 2 waste stream. Also, Pure Tech Manufacturing technology has a limited history in the United States with only three units operating in funeral homes in Indiana. Another disadvantage is that there is a chemical effluent discharged from the system into the sanitary sewer system which might require regulation.

Pure Tech Manufacturing, Inc. also intends to design and manufacture a unit, for other medical facilities, such as dentists, physicians, clinics, veterinarians, small hospitals or certain hospital departments which will accept a wider selection of medical waste. This waste may include glass, syringes, rubber gloves, cottons, intravenous bags, pathological waste, blood and other liquids. The system would not be able to accept RMW containers or bags. In the clinical machine there will be a discharge to the sanitary sewer and a solid waste discharge.

(8) SAFEGUARD 1000 & OMEGA SDS 100

**Safeguard Medical Supply, L.P.
26 Firemens Memorial Drive
Pomona, New York 10970**

**Inserv Corp.
Riverbend Industrial Park
540 N. Main Street
Manchester, CT 06040**

i. Overview:

The Safeguard 1000 and the Omega SDS 100 are meant to treat and destroy sharps. They both are advertised as grinding sharps to a size where the waste

will not be recognizable as RMW and they employ a chlorine based disinfectant. The Safeguard 1000 weighs approximately 25 pounds and is intended as a table top unit in a doctor's office or small laboratory. The Omega SDS 100 is a somewhat larger device and appears to be a floor model mounted on wheels. It is not entirely clear from the literature received what the capacity is of this device, but it might be intended for hospitals and large laboratories. The Safeguard 1000 is from CS Medical Supply Corp. and the Omega SDS 100 from Environmental Disposal Systems, Inc.

ii. Description of Process:

A detailed description of the processes of these two systems are not available. The first vendor did not respond to department attempts to contact by mail or phone to supply additional information. The second vendor has agreed as of 2/16/93 to supply additional information.

iii. Operating Specifications:

Operating specifications are not available, see explanation in Section ii. Description of Process.

iv. Performance Specifications:

Performance specifications are not available, see explanation in Section ii. Description of Process.

v. Economics:

Economic information is not available, see explanation in Section ii. Description of Process.

vi. Summary of Advantages and Disadvantages:

The manufactures' brochures for the above referenced devices to treat and destroy RMW are not sufficiently detailed to write extensive reviews. These devices appear to have the advantage of allowing treatment and destruction of RMW within a doctor's office or a clinical laboratory. This would alleviate these individuals of the expense of disposing of Class 4 (Needles, Syringes and Sharps) as RMW.

Among the disadvantages regarding this system are:

1. It does not accept Classes 1,2,3,5 and 6 RMW.

2. Treatment should occur during or before grinding, in order to disinfect any aerosols containing pathogens that might become airborne during the grinding phase and be released from the unit that might be hazardous to human health and the environment.
3. There may be a need for a water discharge permit in order to properly dispose of effluent. This is determined by state level regulations and county or municipal regulations.
4. These systems must be registered with FIFRA.

d. Microwaving

(1) Technology Review

Microwaves can be used to disinfect medical waste. The microwaves generate heat inside the medical waste and thus the process does not depend on heat penetrating from the outside. The microwave process is a type of thermal process. Microwaves are electromagnetic waves with a wavelength ranging from 1 meter to 1 millimeter and with a frequency ranging from 300 Mhz to 300 Ghz. Microwaves are situated between the ranges of radio waves and infrared waves on the electromagnetic scale and overlap both.

Microwaves will heat water to the boiling point and destroy living cells by this mechanism. All living organisms need water for internal cell processes and are susceptible to destruction by this process. Spores such as tetanus and Botulinus bacillus contain nearly no water and are resistant to microwave energy. In these cases microwave energy can be effective if water is present on their surfaces so that the spores can be sufficiently heated up and therefore destroyed. Dry infectious waste requires the addition of a sufficient quantity of water to obtain complete destruction of all microorganisms including the more resistant forms.

Microwaves are being used to treat medical wastes on a commercial and non-commercial basis in the United States. Using this technique, wastes are first ground and shredded to improve the effectiveness of the treatment system. Next the wastes are sprayed with water. An auger moves the wastes past a series of microwave power packs which subject the waste to microwaves. The microwaves heat the waste to 200°F and volatile materials and water are driven off during the process (10).

The volume and density of the waste is an important factor and affects the required treatment time. Microwaves are limited in their ability to penetrate large and dense objects. Consequently, this treatment is limited in effectiveness for pathological

wastes such as body parts or animal carcasses.

The microwave frequency is also an important parameter. Increasing the intensity of the microwaves decreases the time required to decontaminate the waste and increases the ability of the waves to penetrate large objects. However, as noted above, there is a limit to the depth of penetration by microwaves. Pathogen destruction can be tested on a periodic basis through the use of spore strips and spiked samples (11).

The application of microwave technology to disinfect medical waste was introduced in Europe several years ago. The technology is from West Germany and just recently is being marketed in the United States. The units can be on-site or mobile facilities. In microwave technology, the disinfection process takes place through microwave heating, which occurs inside the waste material (unlike other thermal treatment methods which heat wastes externally). Wetting and shredding the waste will facilitate heating and steam penetration of the waste (12).

Research Triangle Institute reports that although the method is essentially a steam sterilization method, it is necessary to confirm that conditions required for steam sterilization exist in the microwave process. There are studies which indicate the effectiveness of microwaving. Studies conducted in Germany by the Institute of Hygiene, University of Gottingen concluded that the process treated material to a lower level of bacteria content than ordinary household wastes. Performance tests at a unit operating in the United States, using a Bacillus subtilis microbiological spore test indicator, found the wastes to be treated under conditions to render it sterilized (12).

The new technologies being investigated in regard to microwaving are:

MediSter - Information provided by Meteka Medizinalbedarf and

Sanitec - Information provided by ABB Env. Services, Inc. (VETCO SANITEC)

(2) USEPA Evaluation:

An October 1989 report titled "Medical Waste Treatment Techniques" by T.K. Pierson, D.R. Greenwood, and C.M. Norheim of Research Triangle Institute was prepared for the Dynamic Corporation, Rockville, MD, for the USEPA. Microwave treatment is one of the six treatment techniques reviewed. The authors summarize that the process is essentially a steam sterilization method and it has not yet been demonstrated that the microwave process achieves the conditions of steam sterilization.

USEPA's May 1990 report, titled "Medical Waste Management in the United States

First Interim Report to Congress", reviews several medical waste treatment techniques. The issues which the report reviews such as the advantages, disadvantages, factors impacting effectiveness, quality assurance and quality procedures, and maintenance and operator training for the microwave treatment method are summarized below.

The first issue the report discusses is the advantages and disadvantages of microwave treatment. Some advantages are that the volume and recognizability of the waste is reduced by 80% and portable facilities could potentially be available. A disadvantage discussed was that the method is not capable of treating human pathological waste or animal carcasses. Another disadvantage is the potential for the release of volatile material during processing.

The second issue the report reviews is the factors impacting the effectiveness of the microwave treatment method. The report emphasizes that the volume and density of the waste is important because it affects the treatment time. Secondly, microwaves are limited in their ability to penetrate large and dense objects. Also, microwave frequency is important because increasing the intensity of microwaves decreases the time required to decontaminate the waste and increases the ability of the waves to penetrate larger objects. All of these factors influence the effectiveness of microwave treatment of medical waste.

Another issue the report describes is quality assurance and quality control procedures for the microwave treatment method. The operating parameters of power and wave attenuation are used to monitor the device continuously. Unfortunately, direct measurements of pathogen destruction are not made on a continuous basis. Testing by the use of spore strips and spiked samples must be performed on a periodic basis.

The last issue the report discusses is the maintenance and operator training necessary for the microwave treatment method. The report states the processing unit is complex therefore, maintenance and operating training would be significant.

Another evaluation, Finding the Rx for Managing Medical Wastes, reviews non-incineration treatment technologies of which the microwave treatment and destruction system is one. The report basically reviews the operation of the system noting that the technology originated in Europe and recently has been introduced in the United States. The report noted that the system is comparable to autoclaving since the time and temperature conditions necessary for sterilization are the same. Also, both autoclaving and the microwave system can treat about 90 percent of medical wastes. The report identifies concerns such as the health risks associated with maintenance of the shredder, and exposure to volatilized chemicals during loading or cleaning and maintenance. The report summarizes that collectively the

alternative systems which have developed appear to have fewer emission concerns compared to incinerators, but the health risks associated with these new systems have not and should be evaluated.

(3) Recommended Controls and Required Permits:

General permits and controls for systems which treat and destroy RMW are described earlier in Section D.3.b. Any specific requirements or additional information for a RMW technology system are described below:

Solid Waste Permits;
County Planning Process;
Licensing and Rate Setting;
Department of Health Approvals;
Water Permits;
Hazardous Waste Permits; and
Land Use Permits.

Refer to Section D.3.b.

The DOH has reviewed and accepted the use of the Sanitec microwave disinfection system after conducting a thorough technology assessment. The technology assessment consisted of the following:

1. Detailed assessment of the manufacturer's technical specifications and operations and maintenance manual;
2. Detailed review of manufacturer supplied efficacy and QA/QC findings performed by independent laboratories.
3. A site visit to a hospital in North Carolina (August 1991) where one of these systems is in operation;
4. Physical plant site evaluations of each of the three applicants;
5. Consultation with the USEPA which is also conducting technology assessments;
6. Consultation with regulatory officials in the states of California, North Carolina, and Connecticut which have issued approvals for this technology; and
7. Consultation with our department's Division of Public Health and Environmental Laboratories.

In addition, an operating protocol for initial and continuous efficacy testing has been specifically developed by DOH for microwave systems and is being implemented within DEPE air permits for the systems on a site-specific basis. This testing involves using B. subtilis as a test organism for testing the efficacy of the disinfection during operation of a microwave unit. A 95% or greater "kill" will be considered an acceptable level of treatment. The operating protocol includes set testing schedules for the start up, shakedown, and routine stages of operation. The schedule is as follows:

Week 1:	Feedstock:	Solid non-regulated medical waste only.
	Test:	40 samples on each of three alternate days.
Week 2:	Feedstock:	Solid non-medical and/or solid non-regulated medical waste mixed, in hopper, with less than 20% RMW, preferably no sharps.
	Test:	40 samples on each of five consecutive days.

The feedstock for the third and subsequent weeks may contain non-medical, non-RMW and RMW in any mix ratio including sharps.

Week 3:	Test:	40 samples on each of three alternate days.
Week 7:	Test:	40 samples on one day.
Week 15:	Test:	40 samples on one day.
Week 28:	Test:	40 samples on one day.

Thereafter, at 13-week intervals: Test: 40 samples on one day.

The DOH Sample Microwave Operating Protocol for the Sanitec microwave is contained in Attachment D. The testing procedures for RMW that has been microwaved/shredded are given in detail.

Air Permits:

The department's Division of Environmental Regulation, Air Quality Regulation Program requires an air pollution control permit (Permit to Construct, Install, or Alter Control Apparatus or Equipment and Certificate to Operate Apparatus or Equipment) for any equipment that may produce air emissions. This air pollution control permit is required for manufacturing operations processing more than 50 pounds per hour.

Radiation Control Permits:

The Division of Science and Technical Programs, Environmental Safety, Health and Analytical Programs states that a microwave system employs a device which emits radiofrequency radiation. Under the Radiation Protection Program there is currently

no registration/fee requirement for such devices but the radiofrequency radiation emitted by them must meet the regulatory limits specified in N.J.A.C. 7:28-42, Radio Frequency Radiation. This can be determined through the Radiation Protection Programs.

(4) MediSter

**Meteka Medizinalbedarf
Burggasse 108
Austria 8750 Judenburg**

i. Overview

The MediSter microwave equipment comes in two models, the model 60 with a charge time of ten minutes and a capacity of approximately 55 liters and the model 160 with a charge time of twenty minutes and a capacity of approximately 144 liters. The generator might be able to use an alternate container to hold and treat the medical wastes. However the manufacturer recommends the use of his containers carrying the trademarked name "MediTainer". These boxes are apparently polyethylene coated cardboard boxes.

The MediSter manufacturer claims that this microwave system is capable of processing all types of medical waste including isolation wastes, blood and blood products, sharps, body parts, dialysis wastes and laboratory wastes. The MediSter system is claimed to be designed to produce an even distribution of microwaves within the treatment chamber and thus a uniform treatment of the medical wastes. The vendor claims that it avoids the problem of "cold" and "warm" areas within the treatment chamber. The system is exclusively dependent on disinfection by microwaving and does not involve any shredding or other process to destroy RMW.

The manufacturer, Meteka Medizinalbedarf, recommends the addition of exact amounts of water based on the volumes of waste before MediTainers are loaded into the MediSter for treatment. The water is essential to properly wet wastes not containing sufficient intracellular water. This step improves the effectiveness of the microwave treatment.

The manufacturer refers to some biological tests run on the treated wastes which indicate the efficacy of the microwave treatment. However, insufficient data is supplied to make an accurate assessment. No reduction in volume and recognizability is achieved and the end product in the container is still obviously RMW. An indicator label is present on the outside of the container

to verify that treatment has taken place. Unfortunately this does not guarantee the effectiveness of the treatment of the contents, merely the effect of the treatment process on the outside indicator label. The medical waste still needs to go through a destruction process before being disposed of.

ii. Description of Process:

Infectious waste undergoes thermal disinfection by exposure to microwave radiation in this process. The device houses a microwave resonance chamber, which, unlike traditional microwave chambers, ensures an even distribution of energy ensuring total disinfection. The end product is claimed to be disposed of safely as normal refuse. Additional information has not been supplied despite the department's request.

iii. Operating Specifications:

MediSter comes in two models. Model 160 weighs 200 kg and model 60 weighs 120 kg and both are made of aluminum. Charge times are 20 and 10 min. respectively. Both use a microwave frequency of 2450 ± 25 Mhz, from a maximum of 6500 W power input. The units require a 380 V/50 Hz electrical line and a 3x16 A power socket. No units of measurement are provided for dimensions of the equipment, disinfection area capacity and maximum charge capacity.

iv. Performance Specifications:

General trash, infectious waste, disposables, isolation wastes, wastes from laboratories, dialysis and experimental departments, body parts, medicine and chemicals are claimed to be processed. Exact amounts of water, depending on the volume of waste are recommended to be added before initiation of disinfection process. "Special" boxes for collection and disposal are also available from the manufacturer. An indicator label attests to the completion of disinfection.

v. Economics:

No economic data was provided by the vendor.

vi. Summary of Advantages and/or Disadvantages:

In light of state regulations concerning the status of treated RMW, the advantages in the use of the MediSter microwave system as it currently operates, appear to be minimal. The treated RMW would still have to be disposed of as RMW since it has not been destroyed. If a suitable shredding

or other destruction method was combined with the treatment method, the evaluation of this system would change. The manufacturer claims that this system can effectively treat Classes 1 to 7 (all classes of RMW).

As the MediSter microwave system presently operates, no reduction in volume and recognizability is achieved and the end product is still perceivable and classified as RMW. An indicator label is present on the outside of the disinfection container, but it is probably just heat sensitive and not indicative of the efficacy of the treatment process.

The descriptive literature specifies that exact amounts of water based on the volume of dry waste must be added to ensure the efficacy of the MediSter microwave system. There is no description of the effects, good or bad, of the addition of excess water. Further, there is a question of how moist wet regulated medical waste must be to be treated effectively by this method.

No information on the costs of the equipment or on operating expenses has been supplied in response to the department's request. Neither has MediSter sent further information in reply to questions about the operation of this system. The equipment has not been tested locally to confirm claimed results and no United States operations were reported by the company.

The utility of the MediSter microwave system as presently proposed is questionable. The objective of the process, to serve as an alternative to incineration, is defeated since the vendor suggests the methods of ultimate disposal of the treated waste are pyrolysis and incineration.

(5) SANITEC

**ABB Sanitec, Inc.
Seven Becker Farm Road
Roseland, NJ 07068**

i. Overview

Sanitec microwave equipment from ABB Environmental Services, Inc. (VETCO SANITEC) treats and destroys medical waste. The Sanitec system has two models, the smaller one processes 165-275 lbs/hour and the larger one can process a maximum of 550 lbs/hour. The larger model costs approximately \$570,000 to purchase and install.

The Memorial Hospital of Burlington County, Mount Holly and Cooper Hospital/University Medical Center, Camden have been permitted in regard to

operating a Sanitec microwave system for the treatment and destruction of RMW. Hospitals that have solid waste plan inclusion or permit applications awaiting action for the Sanitec microwave system as of September 1992 are:

1. Greater Freehold Area Hospital (CentraState Medical Center);
2. University of Medicine & Dentistry of New Jersey, Newark;
3. John F. Kennedy Medical Center, Edison;
4. Our Lady of Lourdes, Camden; and
5. Dover General Hospital, Dover.

The Sanitec microwave system is also being used for the treatment and destruction of infectious waste in the following states:

	<u>No. of Units</u>
California	two
Connecticut	five
New York	four
North Carolina	one
Pennsylvania	one
Tennessee	one

The Sanitec system achieves up to an 8:1 reduction in volume of medical wastes but no reduction in weight. Reduction in the infectious nature of the waste is determined by monitoring microbiological destruction through the use of indicators such as Bacillus subtilis which are commonly used for monitoring the performance of disinfection or sterilization methods. A Vetco Sanitec unit is currently in use for the treatment of infectious medical waste at the Forsythe Memorial Hospital in Winston-Salem, NC. This microwave unit has been tested using a protocol approved by the State of North Carolina. Testing using biological test samples of Bacillus subtilis has resulted in 100% sterilization.

The Sanitec microwave system has the advantage of treating and destroying medical waste. The Sanitec system has the disadvantage of being limited in the waste types it can process. Class 2 (Pathological Waste) and Class 5 (Animal Wastes), specifically animal carcasses are not recommended for aesthetic reasons. In Class 3 (Bulk Blood and Blood Products), liquid waste is restricted to less than 10% by weight, because it decreases the processing capacity of the

system. Moisture content must be maintained under 10% or the throughput of waste must be decreased to allow the effectiveness of the treatment method to remain unchanged. Class 4 (Needles, Syringes & Sharps) can be processed by the Sanitec microwave system but the metallic content (needles) must be restricted to 1% or less by weight to avoid damage to the system. Unusually large and heavy metallic items should be restricted from processing because of potential damage to the shredder.

ii. Description of Process:

The first part of the system destroys the waste. The process begins with the waste automatically being fed into a hopper where the air is evacuated through a two-stage filter and purged with steam. This is performed prior to the start of the feed operation to avoid the possibility of airborne germs. A rotating feed arm in the hopper initially breaks the material so that it can be fed through a shredder.

The second function of the system is disinfection. Once the material is shredded, it is wetted which intensifies the heating process and discharged into a transfer hopper. The transfer hopper is designed with controls that regulate the movement of material into the treatment chamber. The shredded material is conveyed from the transfer hopper through the microwave chamber by a screw conveyer. The treatment chamber is initially heated internally to the desired operating temperature. The material is not conveyed through the chamber until the pre-determined temperature is met. Microwave generators maintain the required operating temperature. The speed of the conveyer is regulated automatically to ensure that the material reaches the desired temperature for a minimum of 25 minutes. The material enters a hold section from the treatment chamber and is maintained at a minimum outlet temperature of 203 degrees F for 30 minutes. The treated and destroyed medical waste is then conveyed to a storage bin for disposal as municipal solid waste.

iii. Operating Specifications:

The Sanitec system has two models with specific operating specifications. Model No. HG-A-100 processes 165-275 lbs/hr and is approximately 11 feet long by 5 feet wide by 7 feet 10 inches high. The second model, the HG-A-250 processes a maximum of 550 lbs/hr and is approximately 20 feet long by 8 feet wide by 11 feet high. Each model requires a 1/2 inch water connection and does not require a sewer connection. Electrical requirements for both the HG-A-100 and HG-A-250 include a 440V/60 Hz/3 phase. The system requires a 6 inch exhaust louver for air which is discharged from a HEPA filter. Sanitec will provide an operations and maintenance training program at the time of installation. The system requires water softening chemicals for the electric

steam generator.

iv. Performance Specifications:

ABB's Sanitec system is supposed to achieve a 8:1 reduction in volume of infectious wastes and no reduction in weight. ABB Sanitec states that destruction is accomplished by a shredder which reduces the particle size to 1/2 - 3/4 inches. Reduction in the infectious nature is determined by monitoring the microbiological destruction through the use of indicators such as Bacillus subtilis which are commonly used for monitoring the performance of disinfection or sterilization methods. The Sanitec system subjects medical waste to a temperature of 203°F - 212°F for a minimum of 55 minutes.

v. Economics:

Sanitec estimates that the system provides treatment and destruction of medical wastes in the amount of 4800 lbs/day at an operating cost of \$0.04/lb. This estimate includes the capital cost but does not include waste disposal costs. The Sanitec unit, model HG-A-250-S which processes approximately 500 lbs/hr has a capital cost of \$610,000 which includes installation costs.

SUMMARY OF PROJECTED ABB SANITEC COSTS

	COST CATEGORY	TOTAL ANNUAL COST
1.	Purchase Cost	\$83,819
2.	Energy (Electricity)	1,691
3.	Labor	6,442
4.	Disposal	8,343
	TOTAL/YR	\$100,000 (\$0.44 per lb.)

1. Based on 3/24/93 capital and installation cost of unit (\$650,000); payment based on 10% interest rate on a 15 year loan.
2. Based on total energy needed to process typical quantity (113 tons/yr) of RMW at a New Jersey hospital, with unit operating at maximum capacity. Energy cost based on Public Service Electric and Gas Company's industry charge of \$0.075/kwh of electricity. Typical quantity of RMW is the mean of 96 hospitals' RMW generated after the removal of four hospitals with excessive quantities reported. Source of data - 1990 AGR.
3. Based on total labor hours needed to process typical quantity of RMW at

- a New Jersey hospital, with unit operating at maximum capacity. Labor costs based on information from New Jersey Department of Labor's hourly wages plus overhead for two housekeeping aides.
4. Based on state average of \$74 per ton of MSW.

vi. Summary of Advantages and Disadvantages:

The Sanitec system is advantageous because it is capable of treatment and destruction of medical wastes. It is capable of disinfecting Class 1 (Cultures and Stocks), Class 2 (Pathological Waste) except for body parts, Class 4 (Needles, Syringes and Sharps) when metal content is less than 1%, Class 6 (Isolation Wastes) and Class 7 (Unused Needles, Syringes and Sharps). This process converts RMW to municipal solid waste (ID 10) which is not subject to RMW tracking regulations and may be landfilled. While the weight of the wastestream is not reduced, the volume is reduced by 8:1 and thus requires less landfill space. This is similar to the volume reduction achieved by incineration.

Among other advantages of the Sanitec Microwave system are available tested technology for disinfection, electromagnetic waves that are easily shielded to protect the public, absence of an effluent to be disposed of via a sewer system and the relative ease of meeting permitting requirements. The air pollution control permit requirements can protect public health while not being as onerous as those required for incinerators.

The RMWs are shredded before treatment, thereby increasing treatable surface area and reducing bulk that might shield interior areas from disinfection. This increases the efficacy of the microwave process. There is test data available indicating the efficacy of the Sanitec system. Finally, the track record to date for various operations around the country, including New Jersey, are very good.

The Sanitec system has some disadvantages, for example, there are limitations on the types or classes of waste which the system can process. Class 2 (Pathological Waste) and Class 5 (Animal Wastes), specifically animal carcasses are not recommended for aesthetic reasons. In Class 3 (Bulk Blood and Blood Products), liquid waste is restricted to less than 10% by weight, because it decreases the processing capacity of the system. The disinfection performance of the unit is not affected. ABB Sanitec claims the Sanitec system is capable of processing sharps (Class 4), however the metallic content in the total waste stream is restricted to 1% or less, by weight. Unusually large and heavy metallic items should be restricted from processing because of potential damage to the shredder.

One disadvantage with the Sanitec system, at least for earlier versions of the

system, may be that it is incapable of destroying needles. The State of North Carolina, Department of Environment, Health, and Natural Resources, approved the unit for treatment of medical waste, but excluded syringes because in repeat testing it did not fully destroy the syringe needles. Later versions of the Sanitec system operating in New Jersey, appear to be destroying needles satisfactorily when the systems are properly operated. The second state to approve the Sanitec system was California for the treatment of medical wastes. California state regulations do not require the waste to be rendered unrecognizable, but California statutes require sharps to be either incinerated or disinfected and encased in a solid or semi-solid material prior to disposal.

Questions have also arisen as to the potential for airborne particles when the waste is added into the hopper and hammermill. Worker exposure and personal protection are also a concern.

Two studies were reviewed and are summarized below concerning the efficacy of microwave technology. The first study reviewed some common clinical pathogens exposed to microwave irradiation (Latimer and Matsen). The test organisms which were used included, B. subtilis, E. cloacae, K. pneumonia, S. marcescens, P. mirabilis, P. aeruginosa, alpha Streptococcus group D, E. enterococcus, S. aureus and S. epidermidis. Results indicated that microwave irradiation for decontamination in clinical microbiology labs is feasible. The study noted that microwaves do not heat glass without the presence of moisture and that the sterilization of glass pipettes would not be accomplished. The study also mentioned that "good ventilation" is needed because microwaving the test organisms produced odors.

A second study reviewed was submitted by ABB Sanitec as test data to support their system. The data included biological test samples from an operating unit at Forsythe Memorial Hospital in Winston-Salem, North Carolina, which processes approximately 4500-5000 lbs of medical wastes per day. One day's tests, June 5, 1990 were submitted in which the systems effectiveness for disinfection was conducted. ABB Sanitec claims the tests resulted in 100% sterilization of B. subtilis which was the indicator organism.

ABB Sanitec estimates that the system will treat and destroy medical wastes in the amount of 4800 pounds/day at an operating cost of \$0.04 per pound. This estimate includes capital costs, but not disposal costs.

e. Large-Scale Autoclaving

(1) Technology Review

Steam sterilization, also known as autoclaving, is a treatment method involving the

use of steam in specially designed closed containers where the parameters of temperature, pressure and time can be controlled. Steam has been used to sterilize medical supplies, equipment and instruments for many decades. More recently, steam sterilization has been proven to be a reliable way to treat certain types of infectious waste (25). According to R. Spurgin (Spurgin & Associates) autoclaving has been used as a treatment method in laboratory settings to sterilize microbiological laboratory cultures. The first commercial steam sterilization process for medical infectious waste was introduced in California in 1978 (26).

Autoclaving (steam sterilization) depends on the use of steam at temperatures above 100°C which can only be attained with increased pressures. The steam sterilizer contains a metal chamber constructed to withstand the increased pressure and temperature required to insure the destruction of all bacteria, viruses and bacterial spores. The use of retorts and autoclaves to treat infectious waste is based on the standard of sterilization: destruction of all vegetative microorganisms and their spores. Since the identity of the infectious agents in any waste may vary or be unknown, it is necessary to place a standard biological indicator in a waste load to test for sterilization. Steam sterilization is defined as the destruction of spores of Bacillus stearothermophilus, which was chosen because of its resistance to steam sterilization. The spores of Bacillus stearothermophilus are placed in a waste load before loading and removed after the steam sterilization process is completed. The spore samples are then cultured and tested by established standard procedures. B. stearothermophilus spore samples are available commercially (27). Bacillus stearothermophilus is also referred to as a biological indicator for sterilization with moist heat by Pierson, Greenwood and Norheim, op.cit., page 28.

There are two basic types of steam sterilizers: the gravity displacement sterilizer and the mechanical evacuation sterilizer. The gravity displacement sterilizer relies on gravity for the displacement of cool heavy air into an outlet at the bottom of the chamber while steam enters at the top of the chamber. This system is appropriate for unwrapped instruments, utensils and liquids. The mechanical evacuation sterilizer uses a high-vacuum pump to remove air from the treatment chamber prior to the introduction of steam. Most steam sterilizers in use for the treatment of infectious waste are of the mechanical evacuation type (28).

Steam sterilization is more than a simple enhancement of dry heat sterilization with steam. Steam sterilization relies on the fact that saturated steam is a powerful sterilizing agent on its own. When comparing identical temperatures, steam sterilization is 30 to 200 times faster than dry heat sterilization. This attests to the sterilizing properties of steam (25).

The steam must be saturated for efficient disinfection to occur. Saturated steam is water vapor just on the gas side of the gas/liquid phase boundary. Part of the steam is produced from the heating of the waste, which typically contains some moisture.

If heat is added to saturated steam beyond the point at which all of its free moisture is removed, the steam becomes superheated. Superheated steam is not useful for disinfection and is to be avoided (29). Direct contact of saturated steam with infectious agents is vital. In addition to the parameters of temperature, pressure and time, the factor of saturated steam contact has a major impact on the effectiveness of autoclaving (30).

Steam sterilization can be used for any waste that allows steam to easily penetrate it or is inherently moist. The National Research Council and USEPA recommend steam sterilization as the method of choice for treating waste cultures, stocks of infectious agents, associated biologicals and contaminated labware. The USEPA also recommends steam sterilization for isolation wastes, blood and blood products, and contaminated sharps. While steam sterilization may be useful for pathological wastes and animal carcasses, USEPA notes that for aesthetic reasons these wastes should be incinerated or otherwise rendered unrecognizable before final disposal (31). Generally, it is not recommended to treat pathological waste, animal carcasses or body parts by steam sterilization (32). In an experiment where guinea pig carcasses were autoclaved, a period of time in excess of eight hours was required for the center of the waste load to reach sterilization temperature (33). In addition to aesthetic considerations, steam sterilization for large, solid objects is not a practical method.

In carrying out steam sterilization, the material of the containers and the placement of the loads in the autoclave are important factors in the efficiency of the autoclaving process. Selecting optimal containers, carriers and load configuration requires knowledge of supplied materials and operator practices and consideration of the factors that can interfere with steam sterilization (31).

Many of the materials used as primary containers for infectious waste (plastic bags, composite paper-plastic bags, boxes and bins) are of a thickness, construction and nature that will affect steam penetration. The term "autoclavable" may refer only to a material's thermal stability at disinfection temperatures (meaning it won't melt) and may not assure that steam can penetrate it (31). The presence of moisture in the waste material may alleviate this problem to some extent.

Double bagging nearly always impedes steam penetration. One method to avoid this problem is the use of meltable polyethylene plastic bags for collecting RMW. These bags are then placed inside heat-stable polypropylene bags. Before loading into the autoclave the exterior bag is opened and folded down. At disinfection temperatures, the interior bag melts and allows direct steam contact, while the exterior polypropylene bag contains the waste. After processing, the exterior bag can be closed to contain the waste for transport and disposal (34).

The size of the load and the material of the autoclave bag and container affect the

length of time required for the waste material to reach the temperature required for disinfection (35). A stainless steel container with a thin or open interior bag which may contain water appears to reduce the time required for disinfection. This is in comparison with a polyethylene bag inside polypropylene (32).

The size and placement of loads within an autoclave affect the efficacy of disinfection and dictate temperature and time requirements. In one study done with 5, 10 and 15 pound loads contained in polypropylene containers or in stainless steel trays, the smallest load (5 pounds) heated up faster than the larger loads. However, no significant difference was found between the 10 and 15 pound loads in time required for sterilization. Results with stainless steel trays were significantly better than with the use of polypropylene containers (36). In another study, cages contaminated with test spores were placed in different configurations within an autoclave, subjected to steam sterilization and then tested. Further, some simple mechanical devices were deliberately contaminated, autoclaved and tested. They were disassembled, contaminated, autoclaved and tested. The testing results indicate that placement of the cages (stacked vertically or placed on their sides) affected time required for sterilization. The disassembled simple mechanical devices required one hour at 250°F for sterilization while the assembled devices required four hours at 250°F (37).

Due to the variability that load size and placement can cause in efficacy of steam sterilization, standard procedures should be established at each institution or office. These procedures should be strictly followed and verified by use of test spores.

Each facility should establish a standard load for steam sterilization. In facilities such as hospitals, where a varied mixture of wastes is generated, it is often difficult to define a single standard load. Two or more standard loads may need to be designated, each with its own nominal conditions. As an example, if needle boxes require unique sterilizing conditions, then standard load, time, temperature and placement conditions would be established for needle boxes.

In commercial facilities which shred RMW before the autoclaving process, placement or position of different loads within the autoclave is not a consideration. It is still necessary to establish standard conditions which will be effective for a "worst case" load. Any load of destroyed RMW will be placed in the same position in a large commercial autoclave or retort. However, the exact content of any load will vary from a previous load or the next load. One may have more plastics and sharps, another more contaminated hospital gowns and linens for example. The use of commercially available spore test strips, along with monitoring procedures, can establish effective standard operating conditions.

If a relatively small scale generator of RMW has a variety of waste types, it is necessary to establish a procedure that is effective for the worst type within the

load. These procedures should consider waste mass, heat capacity and ability to conduct heat as well as the containers, load carriers and configuration (27). Once the conditions required for disinfection are established by testing, procedures should be written to document proper sterilizer operation. The procedures should specify all parameters that have been determined to ensure consistent disinfection. These include: waste categories, load size, load carriers, containers, position in autoclave, exposure period duration and temperature, and the speed of the warmup and cooldown periods (38). The waste load, whether one or several containers, should be positioned within the autoclave to allow air to be easily displaced by steam (34).

In addition to the load restrictions noted earlier concerning certain pathological wastes and animal carcasses, there can be a problem with odors from autoclaves. If the wastes contain certain solvents (such as formaldehyde), the removal of air by vacuum pump and the operation of the autoclave can result in air emissions that are a health hazard. Another consideration is that one or more autoclaves at a facility be dedicated to treating only RMW. Even though the process sterilizes the load being treated, there are potential problems in using the same autoclave to sterilize instruments and/or products after using it to treat RMW.

A remaining major problem regarding autoclaving under the current RMW rules involves situations where the waste has been treated but not destroyed. It must still be managed as a RMW unless it is shredded, incinerated or otherwise rendered unrecognizable. This keeps in place all packaging, labeling, tracking, transportation and disposal requirements and associated cost considerations. One vendor marketing this technology has added a shredder to the system to address this problem.

A major advantage of autoclaving in comparison to incineration is the capacity a single autoclave unit can provide in a smaller space than an equivalent incinerator would need. An autoclave capable of disinfecting 4000 lbs/hr of medical waste measures 8 feet in diameter by 24 feet in length and occupies about as much space as a 500 lbs/hr incinerator (39). The addition of shredding and grinding equipment to destroy RMW in coordination with the autoclaving operation would increase the space requirements but the total space requirements would still be less than for an incinerator.

The investigation of new technology in autoclaving is discussed for the following two companies:

Mark-II, Mark-VI & Mark-VII - Information provided by San-I-Pak Pacific, Inc.

ZDA M 3 - Information provided by GTH Roland North America, Inc.

(2) Evaluation:

USEPA's, May 1990 report, titled Medical Waste Management in the United States First Interim Report to Congress, reviews several medical waste treatment techniques. The issues which the report reviews includes the advantages, disadvantages, factors impacting effectiveness, quality assurance and quality procedures, and maintenance and operator training for steam sterilization and are summarized below. In future reports, the USEPA plans to expand this information and report the results of testing of the efficacy of certain treatment techniques including steam sterilization.

The first two issues the report discusses are the advantages and disadvantages of steam sterilization. Some advantages are that the method can treat most medical wastes, can reduce volume and is capable of destruction of certain, though limited types of materials that melt entirely during the process, as well as treatment of some plastic medical waste. A disadvantage is that steam sterilization does not reduce the mass of the medical waste. Other disadvantages are that the method emits odors and possibly volatile organic compounds and toxic emissions.

The third issue the report reviews is the factors impacting the effectiveness of the steam sterilization method. The report emphasizes that factors such as temperature, pressure, exposure time, size of load, autoclavable bags, and the waste form (solid or liquid) can affect steam penetration and heat transfer.

Another issue the report describes is quality assurance and quality control procedures for steam sterilization. Biological indicators, such as heat resistant bacteria, and chemical indicators, such as tape which changes color when a specific temperature has been reached, can be used to monitor effectiveness.

The last issue the report discusses is the maintenance and operator training necessary for chemical disinfection and grinding. The report states that some operator training and maintenance is required.

A 1991 report, Infectious and Medical Waste Management, by P.A. Reinhardt and J.G. Gordon discusses treatment and destruction techniques for medical wastes. Reinhardt and Gordon devote one chapter to reviewing steam sterilization of infectious waste. The book discusses that the steam sterilization method is able to treat most types of infectious waste. The authors note that waste which is untreatable, such as pathological waste must be segregated from the medical waste stream before processing. The book describes that autoclave units are usually easy to operate, but some operator training is required. One disadvantage noted, is that the appearance of the waste remains unchanged after treatment and may cause a disposal problems in some areas of the country. Some advantages that Gordon and Reinhardt note are that autoclaving is capable of 30% reduction in volume,

monitoring is easy and inexpensive and the system can be modified for both on-site or off-site treatment facilities.

Another evaluation, Finding the Rx for Managing Medical Wastes, reviews non-incineration treatment technologies of which steam sterilization is one. The report reviews the principals of steam sterilization, and issues such as capacity and citing, associated risks, cost and volume reduction. The report also reviewed a new system, autoclaving followed by compacting. The report states one advantage for steam sterilization or autoclaving is it's versatility. It is available for different processing capacities and can be made to fit for on-site or off-site facilities. The report states that autoclaves can treat most medical wastes. Another advantage is that autoclaves are also less costly than incinerators which are the traditional way to treat and destroy medical wastes. The report notes that some disadvantages are that the waste is not destroyed which may present a problem in landfilling of the waste in states covered by the Federal Medical Waste Tracking Act. The report notes that there are odors associated with the system and there is a possibility of emissions. The report also recommends further study.

DOH historically has viewed autoclaving, when operating properly, as a viable means of treating medical wastes to significantly reduce pathogenicity.

(3) Recommended Controls and Required Permits:

A system that treats RMW is required to obtain from the DEPE and the DOH any and all applicable authorizations and permits which are discussed below:

General permits and controls for systems which treat and destroy RMW are described earlier in Section D.3.b. Any specific requirements or additional information for a RMW technology system are described below:

County Planning Process;
Licensing and Rate Setting;
Solid Waste Permits;
Department of Health Approvals;
Air Permits;
Water Permits;
Hazardous Waste Permits;
Radiation Control Permits; and
Land Use Permits.

Refer to Section D.3.b.

(4) SAN-I-PAK

San-I-Pak Pacific, Inc.
23536 S. Bird Road
P.O. Box 1183
Tracy, CA 95378-1183

i. Overview:

The series of sterilizer/compactors marketed by San-I-Pak Pacific are named Mark II, Mark VI and Mark VII. These units are steam sterilizers which have the following capacities:

Mark II	100 lbs per hour RMW
Mark VI	180 lbs per hour RMW
Mark VII	350 lbs per hour RMW

The steam sterilizers marketed by San-I-Pak Pacific, Inc. are used for the treatment of infectious waste by a number of states. Currently, there are no San-I-Pak units in use in New Jersey because it is not cost effective at this time. In New Jersey, after processing by the San-I-Pak system, the waste would be considered treated RMW and would be subject to treated RMW disposal requirements that usually involve a higher disposal cost than municipal solid waste. As of October 1991, San-I-Pak has notified the department that they now offer a system which sterilizes, shreds and compacts medical waste, although no operations employing the additional shredding feature are currently in operation. A summary of usage in the United States follows:

	<u>No. of Units</u>
Alabama	1
Alaska	1
Arkansas	1
California	83
Colorado	6
Georgia	1
Hawaii	1
Indiana	4
Kansas	1
Kentucky	1
Maryland	1
Missouri	2
Montana	1
Nevada	1

New York	13
North Carolina	1
Pennsylvania	5
Tennessee	2
Texas	1
Virginia	2
Washington	1
Washington, DC	2
Wisconsin	2

These are mechanical evacuation sterilizers which operate by removal of air by vacuum pump followed by steam sterilization at elevated temperature and pressure. In these units the RMW is subjected to saturated steam at a temperature of 281-284°F and a pressure of 35-36 psi. These conditions are maintained for approximately 35 minutes.

The air which is drawn off from the treatment chamber before the steam sterilization begins is exposed to steam at a temperature of 307°F at a pressure of 60 psi. This is meant to kill any airborne pathogens and prevent infection of facility personnel.

After the sterilization cycle has been completed, the waste is discharged from the treatment chamber and compacted into a liquid sealed roll-off container. When the container is full, the container opening where the unit interfaces is sealed. The container can then be hauled to a sanitary landfill, transfer station or MSW incinerator that is permitted to accept treated RMW. As mentioned previously, in New Jersey waste processed by the San-I-Pak system would need to be disposed of as treated RMW because it has not been destroyed. New Jersey regulations define destroyed as waste that has been ruined, torn apart, or mutilated so that it is no longer generally recognizable as medical waste. The liquids which collect in the sterilizer are discharged into the liquid sealed roll-off container. All steam used in the sterilization cycle is vented into a condensate tank, condensed back to water and discharged into a sanitary sewer.

There are two potential problems with the above described process. The RMW has not been destroyed and may not be accepted by any landfill since it has been treated but not destroyed. Further, it contains free liquids and landfills may not accept the waste stream due to that factor.

The steam sterilization process is apparently effective. Written correspondence from Betty Thomas, Permanente Medical Group, Inc., Berkeley, CA to, San-I-Pak, Tracy, CA gives the results of testing with Kilit ampules (Bacillus stearothermophilus). This correspondence states that the autoclaved sample showed no growth, indicating complete sterilization.

ii. Description of Process:

San-I-Pak is a sterilization and compaction process which is capable of treating medical and solid waste. The autoclave is a high vacuum type which serves to evacuate air out of the autoclave chamber prior to introduction of steam. The removed air is subjected to steam at a temperature of 307°F and a pressure of 60 psi. At the completion of the vacuum phase, the sterilization chamber is pressurized with saturated steam to a temperature of 281 - 284°F and a pressure of 35-36 psi. Once the internal temperature of the chamber reaches 225°F the waste will remain for 35 minutes in the chamber for sterilization. The treated waste is then hydraulically fed into the waste hopper where it is compacted and automatically fed into a liquid sealed roll-off container for transport to a waste disposal facility when full. Any liquid discharge is contained in the liquid sealed roll-off container. All steam used in the sterilization cycle is vented into a condensate tank where it is condensed into water and discharged into the sanitary drain.

iii. Operating Specifications:

San-I-Pak offers three different units which vary in waste capacity. The Mark-II is designed for a facility with 50-175 beds and has a capacity of 100 lbs/hr. The Mark-VI is designed for a facility with 175-400 beds and has a capacity of 180 lbs/hr and the Mark-VII is designed for larger facilities with 400-800 beds and has a capacity of 350 lbs/hr. A San-I-Pak unit requires a maximum of 15 feet by 35 feet. The unit requires a connection to the hospital's steam line and a connection to a water source. There is also a requirement for a two inch drain line to the sanitary sewer. Electrical requirements include a 208, 240 or 480 three phase AC, and 120 VAC control voltage. There is no need for venting. The unit requires a supply of autoclave bags. San-I-Pak will provide an authorized engineer to train the hospital staff in the proper operation and maintenance of the unit.

iv. Performance Specifications:

San-I-Pak's Mark-II unit achieves a 0.4-0.5/1.0 volume reduction, the Mark-VI achieves a 0.5-0.7/1.0 volume reduction, and the Mark-VII achieves a 0.5-0.7/1.0 volume reduction. There is no reduction in weight of the processed material. The infectious waste during the process is exposed to a high vacuum, then saturated with steam in a sterilization chamber which has an internal temperature of 255°F at 35-36 psi for 35 minutes. The treated infectious waste is shriveled, melted, crushed and compacted.

v. Economics:

Based on data submitted by San-I-Pak for the sterilizer/compactor, it is estimated that treatment costs \$0.08 per pound and disposal of the treated RMW costs \$0.40 per pound. The capital cost for the Mark-II (Sterilizer/compactor) is \$53,950 and \$109,950 for the Mark-II (Sterilizer/compactor/shredder). Capital costs for the Mark-VI (Sterilizer/compactor) is \$98,725 and \$194,975 for the Mark-VI (Sterilizer/compactor/shredder). A Mark-VII (Sterilizer/compactor) has a capital cost of \$126,800 and \$223,050 for a Mark-VII (Sterilizer/compactor/shredder). Approximately \$35,000 in engineering and installation costs is estimated for all units.

SUMMARY OF PROJECTED SAN-I-PAK COSTS

		TOTAL ANNUAL COST		
	COST CATEGORY	MARK II	MARK VI	MARK VII
1.	Purchase Cost	\$10,476	\$16,782	\$21,312
2.	Energy (Electricity)	270	283	280
3.	Installation	933	933	933
4.	Labor	45,100	22,550	15,033
5.	Disposal	8,343	8,343	8,343
	TOTAL/YR	\$65,122 (\$0.29 per lb)	\$48,891 (\$0.22 per lb)	\$45,901 (\$0.20 per lb)

1. Based on 3/23/93 capital cost of unit (Mark II - \$81,245; Mark VI - \$130,145; Mark VII - \$165,270); payment based on 10% interest rate on a 15 year loan.
2. Based on information from San-i-pak, Inc.
3. Installation cost (\$14,900 for each of the 3 units) divided by life of unit (15 years).
4. Based on total labor hours needed to process typical quantity (113 tons/yr) of RMW at a New Jersey hospital, with unit operating at maximum capacity. Labor costs based on information from New Jersey Department

of Labor's hourly wages plus overhead for two housekeeping aides. Typical quantity of RMW is the mean of 96 hospitals' RMW generated after the removal of four hospitals with excessive quantities reported. Source of data - 1990 AGR.

5. Based on state average of \$74 per ton of MSW.

vi. Summary of Advantages and Disadvantages:

An advantage with this system is that steam sterilization is generally an accepted treatment method. Another advantage is that no separate fuel source is necessary because the system is powered by steam and can be taken from existing boilers in the hospital. It is capable of disinfecting Classes 1,3,4,6 and 7 of RMW. It can also disinfect smaller wastes from Class 2 (Pathological Wastes), but not body parts.

Considerable reference material exists concerning the proper operation of autoclaves, making proper operation easier to achieve. The air permitting procedure for large-scale autoclaves is less rigorous than for incinerators while still protecting human health and the environment. The steam generated by autoclaving can be captured, condensed and discharged into the sewer system.

One disadvantage is that San-I-Pak does not recommend processing Class 2 (Pathological Wastes) or Class 5 (Animal Waste) due to aesthetic reasons. Another disadvantage is that the medical waste is not destroyed and still must be handled as treated RMW. Another factor which must be taken into consideration with this system is that it may also be used to sterilize and compact municipal solid waste at the site. In this instance where there is a mixture of solid waste and treated RMW, solid waste flow issues would be pertinent for disposal. Also, according to RMW regulations mixtures of solid waste and treated RMW would need to be disposed of as treated RMW. As mentioned previously, San-I-Pak has informed the DEPE that they have incorporated a shredder into the process. The department has not been able to re-evaluate the proposal including information concerning the shredder. If San-I-Pak has indeed incorporated a shredder, then the issues mentioned above about disposal of the waste as treated would not necessarily apply. RMW that has been treated and destroyed may be disposed of as municipal solid waste.

Some disadvantages noticed during a July 1990 site visit to Lutheran Hospital, Brooklyn, NY, by the department were odor and steam problems associated with the process. The hospital attempted to control the odors by adding a freshener tag in each load which was processed. The hospital also had modified the system by adding a venting system on the front of the machine to remove the steam.

There are some liquids that collect in the containers from the autoclaving process. These liquids may necessitate the need for a water discharge permit depending on volume and nature.

Another important consideration is that the system requires a supply of autoclavable bags. San-I-Pak estimates that each bag holds approximately 20 pounds and cost \$0.44. They estimate that an average 545 bed hospital using a Mark-VI would require 69 bags a day at a cost of \$30.36/day. This is a significant cost compared to the other costs in the system (see table below.)

Total Cost Per Day For Infectious Waste *

Steam:	\$ 2.01/day
Electrical:	\$ 0.80/day
Autoclavable bags:	\$ 30.36/day
Labor:	\$ 6.70/day
Capital Expense:	\$ 32.42/day
Maintenance:	\$ 5.76/day

	\$ 78.05/day

* source: 09/09/91 correspondence from San-I-Pak, Inc. Only includes treatment cost, does not include disposal cost.

An examination of costs supplied by San-I-Pak indicates that treatment by this system costs \$0.08 per pound and disposal of the treated RMW costs \$0.40 per pound.

(5) ZDA M 3 Reduction and Disinfection Mobile Treatment Unit:

**Roland North America, Inc.
P. O. Box 572760
Houston, Texas 77257-2760**

i. Overview:

The ZDA-M3 process from GTH Roland North America, Inc. is designed to treat and destroy RMW by steam sterilization and shredding. The unit can operate as a stationary unit or be mounted on a truck for use at multiple locations.

The ZDA-M3 system is currently operating in two United States facilities, one in Edmond, Oklahoma and the other in Rochester, Minnesota. Twelve other facilities are operating outside of the United States.

ii. Description of Process:

The ZDA-M3 system begins by the waste feed container being hydraulically lifted and emptying the RMW into the waste feed hopper. The feed hopper has a rotary arm that compacts the RMW and pushes it to the bottom of the hopper where it is fed into the shredder. As the top of the hopper is closed, steam is injected to sterilize the air and any airborne microorganisms from the RMW. The shredder cuts and shreds the RMW to facilitate the sterilization process. Waste from the shredder is transferred to the steam sterilization chamber. The shredded waste is placed onto a continuous moving conveyor unit. The sterilization chamber maintains an operating temperature of 302 F. Waste is sterilized for approximately 20 minutes. Once the waste is sterilized, it is fed into a hopper which in turn transfers the waste to an interim storage container.

iii. Operating Specifications:

The ZDA-M3 system has two models, the ZDA-M3 and the ZDA-M5. The ZDA-M3 unit processes 650-950 lbs/hr. The ZDA-M5 unit processes 300 lbs/hr. The ZDA-M3 is 21 feet long by 8 feet wide and 14 feet in height. An additional 5 feet of height is required for the loading of the feed hopper. The ZDA-M3 unit requires a 3/4 inch water connection and does not require a sewer connection. A vent is required. Electrical requirements include 220/440 VAC, 3 phase, 60 Hertz, 63 AMP. At the time the proposal was submitted, GTH Roland North America did not include size specifications or utility requirements for the ZDA-M5 unit. GTH Roland North America will provide training to personnel.

iv. Performance Specifications:

GTH Roland North America claims that the ZDA-M3 process achieves an 80% volume reduction and no reduction in weight. The vendor states that the destruction is accomplished by shredding and the resulting waste is a non-recognizable homogeneous mass, fragmented, sliced and shredded. No indication of final particle size was provided. GTH Roland North America states that reduction in infectious nature is accomplished by steam sterilization under pressure. The vendor claims 100% sterilization. The equipment has not been tested locally to confirm claimed results. The company did submit reports and assessments of the system that were performed outside the United States.

v. Economics:

Information provided as of August 25, 1992 indicates that the ZDA-M3 model has a capital cost of \$650,000 and the ZDA-M5 has a capital cost of \$300,000. GTH Roland North America estimates maintenance costs involved with the

system to be \$25,000. The vendor notes that the estimate does not include labor and utility costs. The company did not provide information on the operating costs.

vi. Summary of Advantages and Disadvantages:

One advantage previously discussed in Section e.(4)vi. for the San-I-Pak system is that steam sterilization is generally an acceptable treatment method.

The ZDA-M3 process is also advantageous because it appears to be capable of treatment and destruction of medical wastes. Another advantage is that the unit can process all of the classes of RMW. The only exclusions for the unit are very large metal objects, chemotherapy and radioactive wastes.

One disadvantage is that this system has no track record in New Jersey. Another is that no operational costs were provided to enable a comparison with other technologies.

The vendor claims the process can operate as a stationary or mobile unit. Currently, New Jersey does not have any permitted RMW management mobile units in use. Refer to Section B.5 for a description of the department's policy toward mobile waste processing units.

f. Thermal Inactivation:

(1) Technology Review:

Microwave treatment, which was discussed in Section d. above, can be considered both a type of thermal treatment and a type of steam sterilization. Microwave treatment depends on water being heated to the boiling point to effect treatment of medical waste.

This section, will review the use of thermal treatment, also referred to as thermal inactivation or dry heat sterilization. This technology differs from microwave technology in that it refers to the treatment of waste with dry heat, without the addition of water or steam. Thermal treatment can be used for both solid and liquid medical wastes, also in conjunction with a shredder or compactor. Thermal treatment or inactivation is considered to be not as efficient as steam disinfection (13).

Thermal inactivation involves heating a waste to temperatures which destroy infectious agents. Generally this method is used only for large volumes of liquid wastes. Typically, the liquid wastes are placed in a chamber which is heated to a pre-determined temperature. The wastes are held in the chamber for a specified

period of time and then released. Non-liquid wastes may be subjected to dry heat in an oven (14). For dry heat methods to be effective, circulation of the heated air is necessary to ensure that all waste reaches the required temperature. Pathogen destruction monitoring involves periodically spiking the waste with a known quantity of heat-resistant bacteria and testing viability after treatment (15).

For thermal inactivation to disinfect medical waste, the waste must be maintained at a certain temperature so that the target microorganisms are exposed to that temperature for a minimum period of time. Since ideal conditions are difficult to achieve when medical waste is being treated, disinfection cycles used in actual treatment operations are usually longer than those indicated by experimental data under ideal conditions. A safety factor of two is generally used and waste is kept at the treatment temperature for at least twice the length of time needed to kill the spores of an indicator microorganism.

Thermal inactivation is usually more expensive than steam sterilization since dry heat is less efficient than moist heat as a disinfecting agent and longer treatment times are necessary. This cost should be taken into account when comparing thermal inactivation to other treatment methods. Despite the higher costs, dry heat treatment is the treatment of choice for certain wastes and in certain situations (16).

One of these situations involves the treatment of sharps (Classes 4 and 7). Sharps can be disinfected by thermal inactivation and at the same time this technique can destroy the syringes and render the sharps nonreusable. The sharps and syringes are placed together in the oven. The syringes melt at the high treatment temperature and the plastic solidifies around the sharps as the oven cools, forming a solid block. The sharps must be completely embedded within the plastic for safety considerations (17).

A large scale Electro-Thermal-Deactivation (ETD) facility from Stericycle, Inc. will be considered in this section as well as two methods of sharps encapsulation, the Plastic Syringe Thermal Compactor from Enviro-Med Products Corp. and the DS-100 Sharps Disposal System from Disposal Sciences, Inc.

(2) Evaluation:

Two publications, currently available, provide evaluations of thermal inactivation of medical wastes. These evaluations are based on the review of information from several sources.

The first evaluation is the USEPA's first interim report to Congress (1990). This report deals primarily with thermal inactivation of liquid wastes prior to their disposal via the sewer.

Under the disadvantages of this treatment technique, USEPA states that "the extensive time and energy requirements preclude common use (of thermal inactivation) for treatment of waste in solid form," and that this treatment does not reduce the recognizability or volume of waste that must be disposed of after treatment.

The report lists cycle length and temperature as the principle factors affecting the effectiveness of thermal inactivation. These factors are also said to vary with the target pathogens resistance to heat.

The report suggests circulation of heated air for effective heating of all wastes. As a quality assurance and quality control tool, USEPA offers continuous monitoring involving periodic spiking with a known quantity of heat resistant bacteria and testing viability after treatment against current practice of temperature monitoring.

The second evaluation of thermal inactivation of RMWs is by Reinhardt and Gordon (Infectious and Medical Waste Management (Lewis Publishers, Inc., 1991)). Thermal treatment is mentioned to be most suitable for liquid wastes and often ideal for treating infectious liquids and wastewater. However, for dry heat to sterilize waste, the authors note that the waste should be maintained at treatment temperatures so as to expose target microorganisms to those temperatures for a minimum period of time. Their review quotes independent studies that have established the range of times and temperatures required for dry heat sterilization under ideal conditions. Because ideal conditions are almost impossible to achieve when infectious waste is being treated, sterilizing cycles used in actual treatment operations, the authors state, are usually longer than those established. The authors indicate that a safety factor of two is generally used, i.e., retention of the waste at treatment temperature for at least twice the required length of time necessary to kill indicator organisms.

The authors also make the following observations.

Dry heat is less efficient than moist heat as a sterilizing agent, and longer treatment times are necessary. Because it is less efficient, this technique is also more expensive than steam sterilization.

However, sharps can be sterilized by heating in a hot-air oven. Depending on the procedures that are used, this technique can also serve another purpose: it can destroy the syringes and render the sharps nonreusable. The syringes melt at the high temperature, and then, as the oven cools, the plastic solidifies around the sharps forming a solid block. For the block to be handled safely, the sharps must be completely embedded within the plastic.

Other wastes, solid or liquid, can be treated effectively by dry heat sterilization in hot-air ovens. Such a procedure, however, is inefficient, time consuming, and costly. Nevertheless, Reinhardt and Gordon conclude that thermal inactivation/sterilization is an acceptable alternative technology for treatment of infectious wastes.

The length of time at treatment temperature is critical for achieving sterilization. Also, waste characteristics that are important in dry heat sterilization include mass or weight, heat capacity, heat conductivity, and barriers to heat convection.

For quality assurance and quality control purposes, the authors suggest the use of the spore of Bacillus subtilis var. niger (globigii), the form of microorganism that is most difficult to kill using dry heat, as the biological indicator for monitoring dry heat sterilization.

In an earlier publication, the United States Environmental Protection Agency (1986) indicates that dry heat treatment is applied to solid infectious wastes in an oven which is usually operated by electricity. USEPA further states that dry heat is a less efficient treatment agent than steam and, therefore, higher temperature and longer treatment cycles are needed. USEPA specifies a typical cycle for dry heat sterilization is treatment at 320° to 338°F for two to four hours.

(3) Recommended Controls and Required Permits:

General permits and controls for systems which treat and destroy RMW are described earlier in Section D.3.b. Any specific requirements or additional information for a RMW technology system are described below:

County Planning Process;
Licensing and Rate Setting;
Solid Waste Permits;
Department of Health Approvals;
Water Permits;
Hazardous Waste Permits; and
Land Use Permits.

Refer to Section D.3.b.

Air Permits:

Refer to Section D.3.b.

The facility must demonstrate that no air emissions occur from a thermal inactivation system through monitoring the operation of a reference installation. An

air pollution control permit is required for manufacturing operations processing more than 50 pounds per hour. Airlocked equipment may qualify for "no Air Pollution Control permit required" status.

Radiation Control Permits:

Refer to Section D.3.b.

However, the facility must determine through the Bureau of Environmental Radiation whether the radiofrequency radiation emitted by the system in question meets the regulatory limits specified in N.J.A.C. 7:26-42, Radio Frequency Radiation.

(4) Electro-Thermal-Deactivation Facility:

**Stericycle, Inc.
1821 Walden Office Square,
Suite 360
Schaumburg, IL 60173**

i. Overview

The ETD facility is produced by Stericycle, Inc., Schaumburg, Illinois. This system includes the electrical equipment essential to the disinfection process and the physical plant needed to receive the medical waste, treat it and then process the residues into recyclable plastics and refuse derived fuel.

Stericycle, Inc. is currently operating two ETD facilities, one in West Memphis, Arkansas and the other in Morton, Washington.

The ETD process uses low frequency radiowaves to rapidly and uniformly heat the wastes to 90-98° C. The wastes are maintained at this temperature for 2 hours. Before undergoing this thermal treatment, the wastes are processed to give a homogeneous waste stream. The wastes are shredded and then compacted to achieve a volume reduction of approximately 5:1 and produce a uniform waste mixture. This process is carried out in an enclosed area with negative pressure and a filter system to treat any air that does escape. This naturally is done to prevent the spread of infectious aerosols.

After the medical wastes have passed through the disinfection process, the waste stream goes through a five step process which produces polypropylene fragments and refuse derived fuel with the trade name STERIFUEL. The STERIFUEL is secured into baled cubes weighing approximately 1200 pounds

each. This refuse derived fuel has a fuel value of 15,900 BTU's per pound. Stericycle claims that there is no waste residue to dispose of from this process. The treated waste is converted to 40% recyclable plastics and 60% STERIFUEL. However, the description of the five steps mentions some type of residue being generated in four of the steps in the process. It is not clear what happens to these four residues, whether they are sold separately for reuse or incorporated into STERIFUEL or otherwise disposed of.

Returning to the beginning of the ETD process, Stericycle is selective in the wastes it accepts. It specifically will not take pathological wastes (described as human and animal body parts, tissues, diagnostic specimens and other animal wastes). This eliminates Class 2 (Pathological Waste) and part of Class 5 (Animal Waste) wastes from the waste stream accepted by Stericycle. Stericycle also specifies in contracts with its' clients that it will not accept hazardous wastes as defined under RCRA, radioactive wastes as defined by the N.R.C. and certain chemicals, solvents and metals. In any case, RMW generators would have to find another disposal method for at least Class 2 and part of Class 5 wastes.

Stericycle has conducted biological testing of the ETD process which indicates that it destroys viruses and vegetative bacteria. It does not completely destroy bacterial spores but it is highly effective (example-reduction of one million to 850 in one test).

This overview and the following information is based on submittals by Stericycle prior to March 1991. There is an addendum (vii) based on information received from Stericycle in May 1992.

ii. Description of Process:

Stericycle, Inc., proposes to install and commercially operate a regional RMW treatment and recycling facility in New Jersey. The moratorium on permitting the operation of new commercial RMW disposal facilities imposed by the Comprehensive Act has delayed the company's development plans in New Jersey. Stericycle's proposed 'Electro-Thermal-Deactivation' (ETD) process involves decontamination and disinfection of shredded, compacted RMW using a dielectric heater with a high voltage electrical field coupled with low frequency radiowaves. Dielectric heating contrasts with convection and radiation heating which heat the surface of the material and rely on conduction to transfer the surface heat to the interior.

In the proposed ETD process, all containers are examined for compliance with company and state requirements upon arrival at the facility and unloaded from transport vehicles with the help of conveyers. Acceptable packages or

containers of RMW pass through an airlocked processing room via a conveyor. Airflow in and out of the processing room is regulated by heated and HEPA filtered ducts. The system is designed to prevent air from exiting the processing room back into the warehouse space. In the processing room, a variety of RMWs are passed through a shredder and a screw conveyor to achieve a more homogenous waste stream. The RMW is then automatically fed into a pneumatic press which presses them into plastic polyethylene containers. The containers of RMW are then passed through a oven housed in the center of a dielectric heater, where they are exposed to a 50,000 volts per meter electrical field. The RMW is heated by exposure to thermal radiation and electrical energy carried by low frequency radiowaves. Exit and entry tunnels to the oven area function as wave guides below cut-off vestibules. The dimensions of these tunnels are designed to prevent leakage of the applied radio frequency energy from the heating chamber to the outside. Stericycle claims that this process results in uniform, rapid and efficient heating of RMW. Although Stericycle's proposal does not indicate so, it is assumed that sharps-plastics would be processed separately from other RMW to achieve the purity desired in reclaimed plastics.

All treated material is passed onto the recovery area. Shredded sharps-plastic scraps are passed through a series of magnets, a grinder, a hot air blower-drier, an air classifier, a hot washer, and a plastics separator which are connected by a small conveyor. These machines aid in the removal of non-plastics such as metals, paper, rubber, glass, and cardboard from plastics. The exiting plastics are in the form of fine particles. These are proposed to be separated into various types of plastic based on their buoyancy characteristics. The reclaimed polypropylene is claimed to be 99.999% pure. The polypropylene is then passed through a large dryer to remove moisture. Stericycle proposes to sell these polypropylene fragments to plastic brokers as Steriplastic™. The polypropylene would ultimately be colored, pelletized and used to manufacture low technology plastic products that do not require virgin resins.

The remainder of the treated material exiting the processing room is dumped from the polyethylene containers into a baler. The material is compacted into dense cubes and baled. The baled cubes are proposed to be marketed as Sterifuel™ to cement kilns as a refuse derived fuel. Sterifuel™ is claimed to have a BTU value of 15,900/lb. and a sulfur content of less than 0.2 %. Stericycle claims that Sterifuel™ is ideal for use at cement kilns and is a viable alternative to high grade coal.

All wastes entering the plant are claimed to be converted to either reclaimed plastics or refuse derived fuel. The company claims that none of the end products from Stericycle facility is landfilled. The plant can process about 30 million lb. of wastes per year.

iii. Operating Specifications:

The Stericycle facility is a 15,000 square-foot warehouse measuring 200'x75', with 15 foot ceilings. It has four loading docks, two to service incoming trucks and two to service trucks that carry materials away.

The processing area is a room airlocked by 2 doors. Inside, negative pressure is maintained. Five heated and HEPA filtered ducts control airflow into and out of the sealed processing room. One large duct moves air out at the rate of 1000 cfm. The processing room has a model # 00-5371-D shredder manufactured by Shredding Systems, Inc. It is powered by a 50 horsepower electric motor which turns two sets of blades at 1800 revolutions per minute. The shredder has a 22"x40" opening and a screw-conveyer tube which discharges materials into a pneumatic press. The press fills about 200 lb. of shredded, densified material into a plastic polyethylene container weighing 50 lb. and measuring 24"x24"x18". All equipment inside the processing room is controlled by a programmable logic circuit.

The heating area occupies about 5,000 square feet and contains a dielectric heater. An oscillator generates high frequency power at 64 Mhz. A heavily shielded coaxial cable carries power from this component to the applicator. In the heating chamber ("oven") energy is applied at 64MHz and has a wavelength of about 15 feet. The applicator is equipped with a "matching network" to ensure uniform dispersal of power throughout the chamber and to prevent power from "bouncing back" into the coaxial cable. The dielectric heater measures 36'x13'x10', weighs about 14 tons, and is constructed out of thick sheet metal. The 20 foot long oven is flanked by tunnels each with a clearance height of 26" above the conveyer and a clearance width of 54". The oven contains a 7'x14' suspended aluminum electrode. The height of the electrodes is adjustable from 28" to 40" with the help of a reversible gear motor. Heater elements are mounted on the electrode with a radio frequency pi filter network for decoupling the electric heaters from the radio frequency circuit. The conveyer is a 54" wide Fabreeka natural rubber belt, powered by a 0.5 HP variable speed SCR drive with a reducer to provide a conveyer belt speed of 0-35 inches/minute. The power unit is a 14.5'x3.5'x7' unit of welded construction bolted to the oven. It is fabricated of 10 gauge steel and aluminum with a 4" channel base and a 0.25" steel base plate. The oscillator is housed in one compartment and a 300 KW, 3-phase power transformer serving as the rectifier is housed in the other compartment.

A 180"x50"x67" baler powered by a 15 HP electric motor is used to bale processed material.

iv. Performance Specifications:

Stericycle does not accept Class 2, (Pathological Wastes). Wastes are transported to the facility in sealed red bags in sealed containers with 200-lb. burst strength measuring about 2x2x1.5 ft. All containers of RMW are examined on arrival at the facility for proper packaging, damage and leakage. Unacceptable containers are returned to the generator.

The wastes are first shredded to lesser or equal to 1.5" size. A volume reduction of 2:1 is achieved. This passes through a screw conveyer and a pneumatic press to achieve a further reduction in volume of 3:1, totaling to projected 5:1 reduction in volume. Material entering the processing room with a density of 5 lb. per cubic foot exit at densities of 25 lb. per cubic foot. About 200 lb. of this material is packed into each plastic polyethylene container measuring 2'x2'x1.5'. The containers have sealed, removable tops to limit contact of the material with the environment.

In the "oven", the low frequency radiowaves which carry the electrical energy (applied at 64 Mhz and a wavelength of 15 feet) are directly coupled into the waste resulting in uniform heating to 90-98°C. The wastes are maintained at this temperature for 2 hours. In addition to the elimination of all viruses and disease causing pathogenic bacteria, 99.999% (a 5 log) reduction of resistant non-pathogenic bacterial spores is reported by the vendor to be achieved.

Plastics are ground to 1/8" size. The plastics are also separated to arrive at a 99.999% pure polypropylene. The non-plastic portion of the waste exiting the heating chamber is baled into 3x6x2.5' cubes of Sterifuel™, each weighing 1200 lb.

v. Economics:

None provided. Telephone discussions with company officials revealed that Stericycle proposes to charge \$0.05-0.06 per pound of RMW processed at its facility. This figure is for processing only and might not include, at the least, the costs (including labor) that the generator might bear to receive any training from Stericycle or other sources, and costs to segregate, consolidate, package, store, handle and manifest medical wastes according to Stericycle's requirements/standards. Transportation costs are also not included. A letter stating the preceding information was requested from the company, but hasn't been received to date.

vi. Summary of Advantages and/or Disadvantages:

Stericycle accepts for treatment and destruction Classes 1 through 7. They

have restricted some waste from three of the classes. Stericycle accepts small amounts of Class 2 (Pathological waste) mixed with other classes of RMW. Stericycle restricts bulk blood from Class 3 (Human Blood and Blood Products) but accepts intravenous bags with minimal blood content and accepts small amounts of animal tissue waste from Class 5 (Animal Waste). This system is claimed to reprocess acceptable wastes after treatment and destruction into two product lines: polypropylene fragments that can be used in plastic manufacturing and Sterifuel which is a refuse derived fuel (RDF) usable for combustion in cement kilns and similar applications. These proposed reuses are desirable since it leads to a reduced use of landfill capacity. The department assumes that plastic waste must be separated from the total waste stream prior to processing in order for a polypropylene product that is 99.999% pure as Stericycle claims.

Stericycle proposes to supply reusable plastic containers to generators for collection and transport of RMW. Stericycle maintains that this would eliminate costs involved in purchase and later on in disposal of single-use containers such as corrugated cardboard boxes. In addition to monetary savings, reusable containers would save energy and have a positive environmental impact.

A facility utilizing this technology exists in Arkansas. Documentation of temperatures achieved and reduction in infectious nature of wastes was provided. The equipment has not been tested locally to confirm claimed results.

The permitting/authorization process for Stericycle could have the advantage of being somewhat less difficult than permitting an incinerator. Any air emissions should be easily controlled by the use of negative air pressure and filtering systems. There would be minimal effluents to discard (from the hot washer).

As mentioned earlier, Stericycle does not take Class 2 (Pathological Waste) and animal tissue waste from Class 5 (Animal Waste). It also cannot accept quantities of bulk blood Class 3 (Human Blood and Blood Products). Alternate means to treat and destroy these classes of RMW would have to be used. Further, this system is heavily dependent on training hospital personnel to properly segregate the waste streams and on visual inspection at Stericycle's facility to ensure proper waste types being treated.

The Stericycle system is meant to operate as a commercial facility separate from hospitals and other generators of RMW. As a result, transportation costs have to be considered when looking at the economics of this system. Stericycle has not provided information on the cost of this type of facility despite repeated requests by the department.

The proposed process appears to satisfy treatment and destruction criteria in that it is designed to reduce the infectious nature of the RMWs and render them non-recognizable. However, the average size of shredded waste in the ETD process is 1.5 inches. In the preamble to their regulations, the United States Environmental Protection Agency (USEPA) recommends that a particle size of 0.5 inch be achieved by size reduction processes in order to satisfy destruction criteria. Therefore, a size reduction to meet the 0.5 inch criteria is desirable if recycling options fail and the processed materials need to be landfilled.

The ETD proposal states that uniform moisture in shredded RMW improves the efficiency of the heating system in that the water molecules absorb uniform amounts of electrical energy throughout the waste container. Stericycle assumes that medical waste would contain an average moisture content of 10-15%. The proposal also indicates that lack of moisture in dry portions of the waste could be compensated by some wastes which are primarily liquids such as dialysis fluids. Stericycle states in the proposal that only unavoidable trace amounts of pathological and bulk liquid wastes are acceptable by the Stericycle facility. If the moisture content of a batch does fall below the typical minimum, the system must have provisions for adding moisture to the waste. If moisture is essential for proper decontamination of wastes in the system, the minimum level of moisture required to ensure the desired level of decontamination of wastes needs to be investigated and documented.

Characterization and disposal of "sludge waste" from the hot washer phase have not been discussed. Similarly, no mention is made of how the wastes other than those processed into reusable plastic and RDF are disposed of. As part of the permitting process, it will be necessary to verify that all wastes are recycled into products or determine that wastes generated by the process are disposed of in accordance with New Jersey waste management regulations.

Potential effects of low frequency electromagnetic radiation might need to be studied.

vii. Addendum:

Stericycle has submitted a separate, "new" proposal describing a processing facility that uses the ETD process as above. It appears that Stericycle's different proposals are tailored to meet the requirements of different states' regulatory agencies and Stericycle provides DEPE with a copy of every "new" proposal. Even though the present proposal indicates the use of the ETD decontamination process as described previously in this subsection, and appears to be along the same general lines, it differs in the following aspects.

The physical dimensions of the facility and its buildings are different. The containers used in this proposal are reusable, leak proof and puncture resistant plastic "Steritubs" with inner liners. The liners with the wastes are processed and the "Steritubs" are decontaminated and returned to generators. In addition to being passed through a ripper/shredder, RMW is processed through two hammermills, primary and secondary before being processed. The waste is sprayed with water to achieve a typical moisture content of 10 %. The containers used in the decontamination process are larger (23 cu. ft.) tubs that can hold more (500 lbs) of shredded RMW. The "new" treatment temperature is 95-100° C up from 90-98° C. The air filtration system is more elaborate.

There is a significant change in policy concerning acceptance of containers not conforming to Stericycle's standards (leaking, etc.). They are repackaged by Stericycle and processed, rather than being returned to the generator.

Additionally, the description of the facility and the process is vague in the following aspects.

The proposal does not specify as to what classes of RMW are processable or non-processable. It does not specify reduction in volume of RMW. Stericycle proposes to reclaim only part of the RMW Class 4 - (Sharps, Needles and Syringes,) for recycling. The only other items proposed to be processed are "softs" such as drapes, patient gowns, operating room linens, latex gloves, etc., and are intended to be converted to RDF. Generally, none of these "softs" meet the definition of RMW. The proposal falls short of discussing how items from the other six RMW waste classes and the non-plastic portion of the Class 4 are proposed to be managed.

Additionally, the composition of the end product and the portion of the total waste intended to be recycled/recovered is not discussed. The process by which plastics are separated and recovered from the mixed material is not discussed. As with the previous proposal, there is mention of a layout diagram, but a copy hasn't been included.

(5) Plastic Syringe Thermal Compactor:

**Enviro-Med Products Corp.
76 Grand Avenue
Toms River, NJ 08753**

i. Overview:

The Plastic Syringe Thermal Compactor is produced by Enviro-Med Products Corp., Toms River, N.J. Enviro-Med Products Corp. claims that the process

treats the syringes by heating them at high temperatures and destroys the syringes by remolding them into a plastic mass. Enviro-Med Products Corp. offers a compactor that has a capacity of 100 syringes per hour. It heats the charge to a temperature of 300-325°F and remolds approximately 50 syringes into a disc 4 1/2 in. diameter X 1 in. thick, resembling a hockey puck. The needles are encapsulated in the disc making handling safe.

There is a volume reduction of five to one but no weight reduction of the waste stream. The manufacturer claims that the mass is heat sterilized due to remolding temperatures (300-325°F) which are higher than autoclave temperatures (250-275°F) and time exposure at these elevated temperatures longer than in an autoclave. Biological testing would have to be carried out to confirm this claim. It is uncertain whether the treated sharps are no longer recognizable as RMW.

ii. Description of Process:

A detailed description of the process was not presented to the department by the vendor and therefore is not available.

iii. Performance Specifications:

Enviro-Med Products Corp. claims that the Plastic Syringe thermal compactor achieves a 5 to 1 reduction in volume and no reduction in weight. The vendor claims that the resulting waste is not recognizable because the syringes are melted and remolded into a plastic mass. The vendor claims reduction in the infectious nature of the RMW is accomplished by the 300-325°F temperatures that are reached during the process. The company has not submitted any data to support treatment claims.

iv. Operating Specifications:

The Plastic Syringe Thermal Compactor has a capacity that will process up to 50 syringes per cycle. The unit is 18 1/2 inches wide by 24 inches deep and 36 inches high. The unit weighs 125 lbs. Electrical requirements include 120 VAC, 3 prong plug receptacle. The vendor states that no plumbing, sewer or venting is required.

v. Economics:

Enviro-Med Products Co., estimates the capital cost of a two chamber thermal compactor of \$8,250 with a capacity of 50-100 syringes per hour. A ten chamber thermal compactor's capital cost is \$39,000 with a 500-1000 syringes per hour capacity. The vendor has not submitted an estimate of operation costs

even after several attempts by the department.

vi. Summary of Advantages and/or Disadvantages:

The Plastic Syringe Thermal Compactor is designed to treat and destroy Class 4 (Needles, Syringes and Sharps) and Class 7 (Unused Needles, Syringes and Sharps) within the hospitals where these RMWs are generated. The vendor claims that the resultant treated/destroyed wastes can be disposed of as municipal waste, eliminating the expense of transporting these classes of RMW off-site for disposal.

Biological testing would have to be carried out to verify the efficacy of this treatment. It is uncertain whether the treated sharps are no longer recognizable as RMW.

A disadvantage with this system is that it is very restrictive, only two classes (Class 4 and 7) out of a total of seven classes of RMW can be processed. This technology has no track record in New Jersey or in the United States. Another disadvantage is that no operating costs were provided to enable a comparison with other technologies.

(6) DS-100 SHARPS DISPOSAL SYSTEM:

**Disposal Sciences, Inc.
8100 South Akron Street
Englewood, CO 80112-3508**

i. Overview:

The DS-100 Sharps Disposal System is produced by Disposal Sciences, Inc., Englewood, Colorado. The purpose of this system is to contain, treat and destroy Class 4 and Class 7 wastes (Needles, Syringes and Sharps, used or unused). This system is designed for use in hospitals and consists of collection units to be located at convenient places within the hospital and a central treatment unit also within the hospital. The collection unit can be placed on a stand or table or it can be attached to a wall and have a release bracket for easy removal. The collection unit is designed with a sharps deposit slot to prevent needle stick injuries to hospital personnel. It is virtually impossible to shake out sharps once deposited in collection unit. The collection unit fits into a slot on the central treatment unit and releases the accumulated sharps in the treatment unit. Upon removal of the collection unit the hatch on the treatment unit closes and the sharps deposited therein are not accessible to hospital personnel.

The treatment unit goes through a cycle of a 7 minute grinding stage, a 30 minute heating stage and a 22 minute cooling stage. During the heating stage the treatment unit is supposed to hold the temperature of the waste stream at 450°F. The central treatment unit has a charge capacity of one quart per hour. The literature for this equipment does not indicate the equivalence in number of sharps. The treatment process is claimed to reduce the volume of waste by 85%. The solid block discharged from the treatment process is similar in size and shape to a hockey puck. The needles are broken up and completely contained within the "hockey puck" or disc. The vendor claims there are no protruding sharps that could cause injury. Someone might discern that the pieces of metal contained in the disc are needle fragments.

Disposal Sciences, Inc. commissioned testing to verify the effectiveness of this process in rendering the waste stream non-infectious and reports are available attesting to its efficacy. The disc that is produced by this process can be discarded as municipal solid waste or recycled for its plastic content.

Disposal Sciences did not submit any information indicating that there were any operational facilities in the United States or any other countries.

ii. Description of Process:

Disposal Sciences offers a mechanical grinding and thermal treatment unit which processes medical wastes.

The DS-100 Sharps Disposal System consists of one or more central processing units and small reusable collection containers which are distributed throughout the medical facility. The collection canisters hold approximately 60 1cc disposable syringes and needles. When the canister is full, it is carried and emptied into the central unit for processing. The system has three phases. The first phase, the grinding phase, lasts approximately seven minutes and grinds the waste. The second phase, the heating phase, melts and sterilizes the waste at a temperature of 480 degrees F for 30 minutes. The third phase is a cooling phase which lasts for 22 minutes. The result is a sterile plastic puck of melted and sterilized syringes and needles which can be recycled for its plastic content or disposed of as municipal solid waste.

iii. Operating Specifications:

The DS-100 Sharps Disposal System is expected to process one quart per hour. The central unit is 34 inches high, 21 1/2 inches wide and 13 1/2 inches deep. Its electrical energy requirements include a 110/120 V, 900 volt-amps. It does not require a water source, sewer discharge or any chemicals. There is limited

staff training needed since the system is fully automatic.

iv. Performance Specifications:

The DS-100 Sharps Disposal System achieves a 85% reduction in volume and no reduction in weight. The waste is rendered nonrecognizable and sterile by a heating and melting process which leaves the waste resembling a plastic puck.

v. Economics:

Disposal Sciences, Inc. leases the DS-100 Sharps Disposal System which includes a central processing unit, collection devices and locking wall mounts to medical facilities. An October 1990 price list states that the lease cost per month on one central processing unit is approximately \$176.00, the cost per month for the reusable collection devices (set of six) are \$5.50 and the cost of locking wall mounts (set of six) is \$5.50 per month. The number of central processing units, collection devices and locking wall mounts would vary with the size of the facility.

Disposal Sciences, Inc. has not submitted estimates of treatment and destruction costs per pound of medical waste.

vi. Summary of Advantages and/or Disadvantages:

The DSI System is designed to treat and destroy Class 4 (Needles, Syringes and Sharps) and Class 7 (Unused Needles, Syringes and Sharps) within the hospitals where these RMWs are generated.

This eliminates the expense of the procedures for transporting RMW off-site for disposal. The containment methods within the hospital for used needles and syringes as well as the transfer method to the treatment/destruction unit minimize possible needle stick injuries.

The DSI system apparently does not require a water source, sewer discharge or any chemicals. It seems to be fully automatic and requires only limited staff training. The vendor claims to have conducted testing which verifies the efficacy of the method.

It remains to be established that the final waste form is not recognizable as RMW.

A disadvantage with this system is that it is very restrictive, only two classes (Class 4 and 7) out of a total of seven classes of RMW can be processed. This

technology has no track record in New Jersey or in the United States. Another disadvantage is that no costs were provided to enable a comparison with other technologies.

g. Gamma Radiation:

(1) Technology Review

Radiation can be used for sterilizing certain products and supplies. However, radiation is seldom used for the sterilization of infectious wastes. Some of the reasons that use of this technology is limited in the treatment of infectious waste are the high costs, the extensive protection equipment needed, the degree of training required for operating personnel and problems associated with disposal of the radioactive source (18).

Gamma radiation can be utilized in infectious waste sterilization, keeping the above problems in mind. Gamma rays from the radioisotope cobalt 60 penetrate to a sufficient depth to be practicable in treating RMW (18).

Another source also discusses the use of gamma radiation or irradiation to treat medical products and RMWs. The high cost of cobalt used in the process and high operating costs have discouraged commercial ventures from using the technology for medical waste management. In February 1990, the first commercial medical waste irradiation facility was opened in Arkansas, and additional facilities were planned in California and New Jersey (19). After six months of operation the commercial facility in Arkansas closed and then reopened after converting to an electro-thermal-deactivation method. Public resistance to the use of gamma radiation was given as the reason.

Gamma radiation sterilizes infectious waste by penetrating the waste and inactivating microbial contaminants. Gamma rays are able to penetrate solid matter to a depth of several meters (20). The process is highly predictable. Usually, verification of the conditions for disinfection involves using Bacillus pumilis as a test indicator organism. Gamma radiation is not recommended by USEPA for pathological wastes. It seems to be accepted for treatment of other forms of RMW (19).

The application of gamma radiation technology is investigated concerning a proposed facility from Stericycle, Inc. This Stericycle proposal differs from the Stericycle proposal in Section f(4) in that this process uses gamma irradiation (gamma rays) to treat and destroy RMW and the previously discussed proposal uses low frequency radiowaves to treat and destroy RMW.

(2) USEPA Evaluation:

"Gamma irradiation offers a potential treatment technique for medical waste. The radiation is highly penetrating and can sterilize hermetically sealed durable packages. This allows minimal contact of the employees with the waste while it is infectious. The ionizing radiation process is reliable and a large volume of waste can be processed because the system can operate continuously and requires less labor for large scale production. However, the radiation treatment facility requires a rather large capital investment and highly trained operators."

(3) Recommended Controls and Required Permits:

General permits and controls for systems which treat and destroy RMW are described earlier in Section D.3.b. Any specific requirements or additional information for a RMW technology system are described below:

County Planning Process;
Licensing and Rate Setting;
Solid Waste Permits;
Department of Health Approvals;
Water Permits;
Hazardous Waste Permits; and
Land Use Permits.

Refer to Section D.3.b.

Air Permits:

Refer to Section D.3.b.

In addition, it is necessary that the facility applying for the air pollution control permit demonstrates "zero" emissions are produced as a result of the gamma irradiation process. Test reports from a reference installation are required. An air pollution control permit is required for manufacturing operations processing more than 50 pounds per hour. Airlocked equipment may qualify for "no Air Pollution Control permit required" status.

Radiation Control Permits:

Refer to Section D.3.b.

However, the facility must determine through the Bureau of Environmental Radiation whether any radiofrequency radiation emitted by the system in question

complies with the regulatory limits specified in N.J.A.C. 7:28-42, Radio Frequency Radiation.

(4) GAMMA RADIATION FACILITY, STERICYCLE

**Stericycle, Inc.
1821 Walden Office Square,
Suite 360
Schaumburg, IL 60173**

i. Overview

Stericycle, Inc., Schaumburg, Illinois submitted a proposal to DEPE to license an existing gamma radiation facility in Salem, N.J. and to operate it to treat and destroy RMW. The proposed gamma radiation facility is located on 2.985 acres of land in Salem, NJ.

Stericycle proposed to install two shredding lines which would receive the wastes after treatment. Prior to packaging and transporting to the facility, the RMW would have been segregated into two components. One component would contain polypropylene which after treatment and destruction could be sold for further use in plastics applications. This would constitute 30% of the waste stream. The other component, constituting 70% of the waste stream, would be refuse derived fuel purportedly having a fuel value of 15,900 BTUs per pound. Stericycle intends to sell this product, Sterifuel, to cement kilns and possible other customers for use as a fuel.

Stericycle does not accept all RMW for this treatment process (gamma radiation). It excludes pathological wastes, animal wastes, bulk liquid laboratory cultures, blood and blood products and other body fluids. It accepts only minimal quantities (unavoidable trace amounts) of the above listed waste streams. Stericycle basically is accepting mainly Classes 4, 6 and 7. This has the effect of limiting the bioburden associated with viruses. The gamma radiation treatment is very effective regarding vegetative bacteria and bacterial spores. It is less effective in destroying viruses. However, the usual dosage Stericycle uses is more than sufficient to destroy the HIV virus and hepatitis B virus.

Under the company's proposal, RMWs would be packaged in cardboard boxes and transferred from generators to the Stericycle facility by registered RMW transporters. Cartons containing only Class 4 and Class 7 wastes would be labeled SHARPS PLASTIC ONLY. Other cartons of RMW would contain disposable linens, some plastic tubings, latex gloves and similar articles used

in patient care settings. These cartons are referred to as general RMW by Stericycle.

Both types of cartons would be placed on pallets which are moved by a conveyer system through the gamma irradiation chamber. Each irradiator must undergo an exhaustive dose mapping study before it can be commissioned by the NRC. This would enable the operator to determine the total dose received by any carton based on its path through and time in the irradiation chamber. A computer would be programmed to control the progress of any carton or group of cartons through the gamma irradiator so that the batch absorbs the required 1.5 Mrad dose. Three indicators would be used to verify this dosage requirement: 1. a red paper sensitive to radiation which changes to yellow on exposure; 2. a film strip which is radiation sensitive and can be developed to quantify the dosage received; and 3. a biologic indicator strip containing the bacterial spore former, Bacillus Pumilis.

After the cartons have passed through the gamma irradiator, the cartons labeled SHARPS PLASTIC ONLY are separated and sent on a second conveyer. The cartons are opened, the contents are fed into a plastic shredder and the cardboard container is placed into a cardboard baler. The material passing through the plastic shredder is fed into 55 gallon drums. This shredder has a ram assist and a negative pressure canopy hood to minimize personnel exposure. The drums of shredded plastic are shipped to plastic brokers for recycling. The cartons containing general RMW are fed through another shredder also fitted with a negative pressure canopy hood and the shredded waste is collected in standard metal carboy containers. The metal carboys are loaded into trailers and transported to industrial sites where the shredded waste is used as refuse derived fuel (RDF).

ii. Description of Process:

In the Gamma Irradiation process, packaged wastes are treated by exposure to a gamma irradiation source and decontaminated and harmless materials are recycled. All wastes entering the plant are claimed to be converted to either reclaimed plastics or RDF. The company claims that None of the end products from the Stericycle facility are landfilled. The plant can process about 28 million lbs. of wastes per year. Additional information has not been supplied despite the department's request.

iii. Operating Specifications:

The system is a pallet load irradiator, accepting any single or multiple component containment system having sizes up to 40"x48"x60". Wastes pass on a conveyer into the irradiation chamber and complete a 360° rotation to

ensure complete exposure to the radiation source. The treatment process results in the elimination of all vegetative bacteria and fungi in the waste stream. The process is reported by the vendor to accomplish a 17 log reduction of bacteria. Boxes marked sharps-only are separated from others. The cardboard boxes are opened, the boxes baled and the contents fed into the shredder. Ram-assist, conveyer-fed, shredder-grinder systems reduce decontaminated wastes to approximately 1/4 to 1/2 inch in diameter. The process reduces the volume of the wastes by a 4:1 ratio. The end product typically is sold for "low technology" product remanufacturing applications which do not require virgin polymers. The rest of the waste is passed through shredders and given to cement kilns for use as RDF.

iv. Performance Specifications:

Stericycle accepts only unavoidable trace amounts of pathological wastes, bulk liquid laboratory cultures and liquid wastes such as blood and other body fluids. Wastes transported to the facility are examined for appropriate packaging, labeling and marking, weight, and manifest prior to pickup. All containers are re-examined for compliance with requirements upon arrival at the facility. Unacceptable containers are returned to the generator.

v. Economics:

No economic information is available because the vendor did not supply the information to the department.

vi. Summary of Advantages and/or Disadvantages:

Stericycle claims that its Gamma Irradiator facility is a highly efficient and verifiable system for treating and destroying RMW. The gamma irradiation chamber must be mapped as to dosage delivered at each point in order to obtain NRC licensing. It is known what minimum dosage of gamma rays are needed to disinfect RMW and dosage delivered can be determined by time in and path through the gamma irradiation chamber. The facility must comply with NRC requirements which safeguard the employees and the general public.

The facility accepts Class 4 (Needles, Syringes and Sharps), Class 6 (Isolation Waste) and Class 7 (Unused Needles, Syringes and Sharps) with minimal amounts of other RMWs. It claims to be able to treat, destroy and recycle 100% of the RMWs that the facility accepts. The description of the treatment and destruction process makes this claim seem possible. It would be advantageous to see this equipment in operation elsewhere to verify this claim. One facet which should be investigated is the amount of metals present in the end products of this treatment and destruction process.

The waste is removed from the cardboard cartons and shredded after treatment, thus eliminating the problems of infectious aerosols. The shredder is still operated with negative air pressure to prevent dust inhalation by facility personnel. Even though the waste is treated, dust inhalation is a potential health hazard. The shredding-grinding process reduces the volume of wastes by approximately 75%.

The gamma irradiation process is claimed to produce no effluent to be discharged to a sewer system. Air permitting may be required to control air emissions from the gamma irradiator and the shredder/grinder. This is not expected to be as rigorous a procedure as permitting an incinerator.

Documentation of the technology's efficacy in treating medical wastes is not available. Moreover, the equipment has not been tested locally to confirm claimed results.

The gamma irradiation system has certain disadvantages that must be considered. It does not take Class 2 (Pathological Waste) or Class 5 (Animal Waste). It also can accommodate only small amounts of Class 1 (Cultures and Stocks) and Class 3 (Blood and Blood Products). Alternate means to treat and destroy these classes of RMW would have to be used. Further, this system is heavily dependent on training hospital personnel to properly segregate the waste streams and on visual inspection at Stericycle's facility to ensure proper waste types being treated.

The gamma irradiation system is meant to operate as a commercial facility separate from hospitals and other generators of RMW. As a result, transportation costs have to be considered when looking at the economics of this system. Stericycle has not provided information on the cost of this type of facility despite repeated requests by the department.

This system is a type of recycling/recovery facility and might involve additional permitting requirements besides those for a RMW destination facility.

h. Pyrolysis Treatment:

(1) Technology Review:

The use of pyrolysis, the subjection of organic compounds to very high temperatures, to treat and destroy RMW includes a variety of electricity-based equipment. It eliminates the need for grinding and shredding to improve the efficacy of treatment as in microwaving and chemical treatment.

One technology that has been developed to thermally destroy biomedical wastes uses an electric molten glass furnace. The wastes are fed into the furnace and are subjected to intense heat (2,300°F), air and water vapor. The result is the vaporization or oxidation of some wastes and an inert stable glass residue (21).

Some other technologies that are being investigated are plasma torch technology, an electrocatalytic oxidation system and a "pyroxidizer"; a small pyrolysis on-site laboratory waste disposal unit (13). The Pyroxidizer has been developed by Partnerships Limited Inc. and is based on the electric heating of waste (22). This device will be discussed in more detail below.

In plasma torch technology, electricity is used to heat gas to the plasma stage and the plasma stream is directed to treat and destroy RMW. Plasma temperatures of up to 10,000,000°K can be produced in some laboratories. For the application to RMW treatment and destruction, the usual temperature range is 3000°K to 10,000°K (approximately 7000-21,000°F). This defines the lower range of plasma energy systems (23).

The new technologies being investigated in this review of pyrolyzing treatment are:

Pyroxidizer - Information provided by Partnership Limited, Inc.

Plasma Energy Waste - Information provided by Mason & Hanger National, Inc.

(2) Evaluation:

Neither USEPA nor the other sources the department used for this technology assessment has completed a review or evaluation of the pyrolysis technology.

(3) Recommended Controls and Required Permits:

General permits and controls for systems which treat and destroy RMW are described earlier in Section D.3.b. Any specific requirements or additional information for a RMW technology system are described below:

County Planning Process;
Licensing and Rate Setting;
Solid Waste Permits;
Department of Health Approvals;
Water Permits; and
Land Use Permits.

Refer to Section D.3.b.

Air Permits:

Refer to Section D.3.b.

The permitting procedure is similar to that for a conventional incinerator. The Air Quality Regulation Program may authorize a trial burn to quantify emissions before control. This would be followed by further trial burns after installation of controls to determine efficacy.

Hazardous Waste Permits:

Refer to Section D.3.b.

The residue from treatment and/or destruction of RMW must be tested by the TCLP method specified by USEPA. If the testing procedure shows the residue (ash) to be hazardous, it must be disposed of as a hazardous waste in accordance with the hazardous waste management regulations found at N.J.A.C. 7:26-1 et seq.

Radiation Control Permits:

Refer to Section D.3.b.

The facility must determine through the Bureau of Environmental Radiation whether any radiofrequency radiation is emitted by the system in question which must meet the regulatory limits specified in N.J.A.C. 7:26-42, Radio Frequency Radiation.

(4) Pyrooxidizer:

Partnership Limited Inc.
5 Crescent Avenue, Building C-2
P.O. Box 666
Rocky Hill, NJ 08553

i. Overview:

This equipment will be marketed by Partnerships Limited Inc., based in Rocky Hill, NJ. There is a one gallon prototype used for demonstrations and a twenty gallon prototype is being used for field demonstration and emissions testing. The Pyrooxidizer is reported to be capable of treating and destroying all seven classes of RMW. It appears that this system is intended for use on-site in laboratories. The equipment can handle 10-20 gallons (5 to 40 lbs depending on density) of RMW in an eight hour cycle.

There is insufficient economic data available at this time for comparison to other methods of treating and destroying RMW. The available information is given under "Economics" below. The Pyroxidizer is viewed by the Division of Environmental Quality as a type of incinerator and will have to be tested according to a similar protocol in order to obtain an air pollution control permit.

ii. Description of Process:

Wastes placed in the Pyroxidizer undergo a sequential batch pyrolysis and oxidation process. The product has a timer which locks the door and initiates the process. Waste is heated under anaerobic conditions in the pyrolysis chamber to achieve initial reduction in mass and volume by pyrolysis. The rate of production of vapors is metered and controlled by regulating the energy input to the pyrolysis chamber which is insulated from the succeeding oxidation process. The vapors generated in the pyrolysis process are oxidized to completion in a regenerative, electrically heated oxidizer, designed quantitatively based on rate of vapor production ensuring uniform thermal treatment of vapors and complete destruction of any organic material in the vapor stream. The oxidation chamber revolves and reverses to achieve pyrolysis and oxidation in sequence. All exhaust products pass through cartridges and filters which absorb them. The pyrolysis process is continued until all the organic material has either been volatilized or reduced to a solid char. When pyrolysis is complete the char residue is exposed to hot air and is agitated to completely oxidize the solids to a pulverized residue (sterile ash) in which only inorganics such as ceramics and metals are recognizable. The company claims that residuals will be disposed of as hazardous waste by an associated company unless demonstrated to be non-hazardous by TCLP extraction analysis or EPTOX extraction analysis.

iii. Operating Specifications:

Pyroxidizer model B-20 requires a 6x5x3' space, 5Kw, 208v 3 phase electric connection, and venting of 1860 cfm @ 150°F maximum. It requires a 6" aluminum/plastic duct. The equipment can handle 10 to 40 lb. of RMW in an eight hour cycle. Total disinfection is assured at a processing temperature above 600° C. Thermal regeneration with a high efficiency heat exchanger reduces both energy required and exhaust temperature. Hot exhaust products pass through the heat exchanger. Hot exhaust exiting is ducted to a induced draft fan and dilution air is added. Hcl is removed from the exhaust stream using an absorber containing dolomite and particulates are removed using a filter. A charcoal bed traps minor amounts of volatile organics and odorants, if any. Hot gas from the oxidizer is cooled in a heat exchanger. The activated charcoal cartridge used in the unit can neutralize chlorine released from

consumption of approximately 50 lb. of polyvinylchloride plastic and is fitted with an indicator for timely replacement.

Another model, the Pyrooxidizer model B-100, has been developed. It has 25% more capacity than the B-20 in the same cabinet size. It is claimed to contain other improvements such as a better control system and better cooling system. As of February 1993, detailed descriptions of the Model B-20 and Model B-100 were not available to DEPE.

In the one gallon prototype, the pyrolysis chamber is a 4 liter stainless steel beaker (diameter 16.5cm, depth 19 cm) contained in a 8 liter beaker with insulation in between and heated from below with a 350 watt electric disc heater. The oxidation chamber is situated above the pyrolysis chamber and the two are separated by a stainless steel valve plate and a matching pyrophyllite valve plate. The metal plate has four fuel jets and associated primary air passages. The oxidation chamber is heated by a 1200 watt heater, has a mullite tube (inside diameter 12.7 cm; length 30 cm) and a regenerative heat exchanger made of Corning Celcor honeycomb consisting of a 5 cm layer with 100 cells per square inch and two 2.5 cm layers with 25 cells per square inch oriented at 45° to one another.

The unit is driven by a gear motor and a reversible chain drive operating at 4 revolutions/minute on the pyrolysis unit. Four 0.58 cm diameter orifices on top of the unit accommodate the passage of air downward through the heat exchanger. Two iron-constant thermocouples monitor the temperature of hot exhaust gasses that pass back up through the heat exchanger. A shop vacuum cleaner blower serves as the induced draft fan for the entire unit with a damper to add dilution air and another thermocouple at the sampling point to calculate dilution factors. The vacuum cleaner provides space for an absorbent canister for Hcl removal and a filter to remove particulates. The nominal air flow is 6.1 kg/hr. at a draft of 0.5 cm of water and the maximum 12.2 kg/hr. at a draft of 2 cm.

iv. Performance Specifications:

The Pyrooxidizer is claimed to be able to treat and destroy all seven waste classes of RMW. The wastes can be processed on-site. It appears that this system is intended for laboratories.

v. Economics:

Some preliminary economic information was provided by the vendor regarding the model B-100 Pyrooxidizer. The vendor is considering a leasing fee of

\$1500/month but this amount is subject to change. It is claimed that this model can process 700 pounds a week. In addition to the leasing fee, the facility using a Pyroxidizer will be paying for electricity, TCLP testing, solid waste disposal and hazardous waste disposal for some residues.

The vendor claims that a facility handling 21,000 lbs RMW a year will incur electricity costs of \$2150 a year based on \$0.07/Kwh. Using data from trial runs submitted by the vendor to DEPE, it has been calculated that electricity costs will actually be \$4500 per year for 21,000 lbs RMW. Current costs for TCLP testing necessary to determine if wastes are hazardous wastes can be obtained from reputable laboratories. The cost of solid waste disposal is heavily dependent on the weight reduction effected by the Pyroxidizer. The weight reduction naturally depends on the amount of glass or metal in any batch compared to the amount of combustible material. Further, the cost of disposal for some hazardous waste residues should be included. Approximately 25% of the batches result in hazardous waste residues which are much more expensive to dispose of than solid waste residues.

Installation charges are difficult to project, but based on the Pyroxidizer's modest needs for an electric line of 208/230/240 Volts, 50 amps and a 4 inch air vent, installation costs may range from \$1,500 to \$5,000 depending on the existing physical plant at a facility. The required electric line may be in place.

SUMMARY OF PROJECTED PYROXIDIZER COSTS

		RESIDUE DISPOSAL AS:	
	COST CATEGORY	RMW	SOLID WASTE
1.	Annual Lease	\$18,000	\$18,000
2.	Energy (Electricity)	4,500	4,500
3.	Installation	217	217
4.	Analyses of Residues	8,800	8,800
5.	Disposal Costs	4,032	158

	TOTAL/YR	\$35,549 (\$1.69 per lb.)	\$31,675 (\$1.51 per lb.)
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1. Based on information from Partnerships Limited, Inc.
2. Calculated from data in the September 18, 1992 report submitted by Dr. Paul Kydd, Partnerships Limited, Inc.
3. Installation charges may range from \$1,500 to \$5,000. The value shown is calculated by taking the mid-point (\$3,250) and dividing by 15 years, the life expectancy of the unit.
4. Based on a minimum of two TCLP analyses per quarter at a cost of \$1,100 per analysis.
5. Based on 15% residue from pyrolysis/oxidation of 21,000 lbs. or 3,150 lbs.; \$1.28/lb. for small generators disposing of RMW to approximate hazardous waste disposal rates; \$0.05/lb for disposal of treated/destroyed waste as solid waste.

vi. Summary of Advantages and/or Disadvantages:

The Pyrooxidizer is claimed to be capable of treating and destroying all seven classes of RMW. Obviously the one gallon prototype can not accommodate large body parts or carcasses. The Pyrooxidizer may produce volume and weight reductions similar to those achieved by an incinerator. The limiting factor for throughput is the size of the unit and processing times.

Partnership Limited, Inc. has submitted information on March 23, 1992 and on September 18, 1992 concerning demonstration testing at Atlantic City Medical Center (ACMC), Pomona. This information indicates that approximately one batch out of every four treated and destroyed in the Pyrooxidizer is found to be hazardous by the TCLP testing procedure. Further, in some batches of residue from test runs, there are still sharps (needles) in the residue recognizable as RMW, necessitating the use of a grinder to reduce these residues to solid waste, otherwise the residues containing whole needles would need to be managed as RMW.

Since the Pyrooxidizer is a thermal destruction unit it will require an air permitting process similar to that for an incinerator. Another disadvantage is that the ash has to be tested and might have to be disposed of as a hazardous waste. This system was undergoing demonstration testing at ACMC, Pomona during May and June 1992. The testing indicated that the system (model B-100) has technical problems requiring resolution. The software control program is supposed to control the operation of the Pyrooxidizer so that a batch of RMW may be placed in the treatment chamber, the equipment turned on and then run for eight hours without staff monitoring or exercise of manual

controls. Detailed descriptions of individual runs from the March 23, 1992 letter and the September 18, 1992 letter do not support this.

The vendor did not indicate in any of the literature submitted to the department if any units were operating in other states. Based on the economic information available at this stage of the technology's development, Pyrooxidizer destruction of RMW appears to be much more costly than the cost of off-site disposal or other on-site management options.

(5) PLASMA ENERGY WASTE PROCESSING SYSTEM

**Mason & Hanger National, Inc.
2227 Drake Ave., Suite 10-D
Huntsville, AL 35805**

i. Overview:

This system is sold by Mason & Hanger National, Inc., Huntsville, AL. This waste processing system utilizes electricity to ionize gas to a plasma-like state and then directs the gas into a chamber to pyrolyze RMW. The plasma-like gas is fed into the bottom of the chamber and the RMW comes onto the top of the chamber by a conveyer system. The gas has an initial temperature of approximately 12,000°F. The chamber temperature is approximately 3000 to 5000°F. The treatment/destruction process produces a glassy rock or slag and gases. The gases pass through a treatment process to remove contaminants in order to comply with air pollution control requirements. The plasma energy system is capable of a ninety (90) percent reduction in volume of RMW and an eighty (80) percent reduction in weight.

Mason & Hanger National, Inc. plans to offer three types of systems. The first system is a small mobile unit which is capable of processing one ton per day. It will cost approximately one million dollars. The second system is an intermediate transportable unit which is capable of processing 25 tons per day. Its cost is estimated at four million dollars. The third system is a full scale fixed facility which is capable of processing 100-250 tons per day. A full scale facility might cost between 18 and 28 million dollars.

The Plasma Energy Waste Processing System is similar to an incinerator. A facility using this system will be required to obtain an air pollution control permit through the Air Quality Regulation Program, Division of Environmental Regulation. Because the facility would be treating and destroying RMW, it also will need a solid waste facility permit and have to register as a RMW destination facility. A permit might be required from the Wastewater

Facilities Regulation Program, Environmental Regulation's if the system is discharging any effluent.

The Plasma Energy Waste Processing System appears useful compared to some other systems because it both treats and destroys RMW. It also causes a large reduction in volume and weight of the RMW. If the supplier's claims are true the gases produced by the process might be less toxic and easier to control than gas emissions from standard incinerators.

ii. Description of Process:

Mason & Hanger National, Inc. offers a plasma energy processing system for wastes. This waste processing system utilizes electricity to ionize gas to a massless heat which is in turn used to pyrolyze waste. The results from the process are gas and a vitrified material which resembles a glassy rock or slag.

Correspondence was mailed by the department October 3, 1990 requesting more information. A reply was not received. Follow-up requests were not responded to and the information that follows is therefore limited in nature.

iii. Operating Specifications:

Mason & Hanger National, Inc. plans to offer three types of systems. The first system is a small mobile unit which is capable of processing 1 ton per day. The second system is an intermediate transportable unit which is capable of processing 25 tons per day. The third system is a full scale fixed facility which is capable of processing 100-250 tons per day.

iv. Performance Specifications:

The plasma energy system is capable of an 90 percent reduction in volume and an 80 percent reduction in weight.

v. Economics:

Mason & Hanger National, Inc. estimated costs for three different sized facilities. A small, 1 ton per day, facility might cost 1 million dollars. An intermediate, 25 tons per day, facility might cost 4 million dollars. A full scale facility, 100-250 tons per day might cost between 18-28 million dollars.

vi. Summary of Advantages and/or Disadvantages:

An advantage with the plasma energy system is that it would appear capable of both treating and destroying RMW. The vendor also claims that it can

accommodate all seven classes of RMW. It also may be advantageous because of the large reduction of volume and weight of the RMW. The estimated costs for this plasma energy system are: one ton per day unit, one million dollars; 25 tons per day unit, four million dollars; and 100-250 tons per day unit, 18-28 million dollars. Operating costs and labor costs were not given.

The principle disadvantage of the plasma energy system is the need for an air permitting process similar to that for an incinerator. This is obviously an energy intensive technology using large quantities of electricity. Further the ash residue has to be tested and might have to be disposed of as a hazardous waste. Another disadvantage is that there is no track record of this system in New Jersey or the United States. The lack of information submitted makes it difficult to compare this system with the other technologies.

i. Encapsulation

(1) Technology Review:

New technologies for containing needles and facilitating their safe handling continue to emerge. One company has developed a process which uses polymers to treat and encapsulate sharps (and other infectious wastes) into a solid block-like form. A number of companies have developed other encapsulating systems and other sharps disposal processes (e.g., a shredder with chemical treatment of needles and other sharps). These processes have the potential to be cost-effective disposal options for doctor's offices and other small generators of sharps and other infectious wastes, provided landfill operations will accept the encapsulated wastes (24). Additionally, as stated in Section II. B. 2. and 6, systems that add large amounts of "extra" solid waste, that is the encapsulating system, to the RMW being disposed of, are the least favored disposal systems, since their very principle of operation is counter to the DEPE's source reduction policy.

One method of encapsulation involves adding a polymer powder and hot water to needles and syringes which hardens and encapsulates them. Another method involving encapsulation uses a polymer to treat and encapsulate sharps and a mixture of reagents to disinfect the sharps while forming into a polymer which encases them. Two related or similar processes discussed earlier, under the Thermal Inactivation (see f.5 and f.6) were the Plastic Syringe Thermal Compactor and the DS-100 Sharps Disposal System that involved encapsulation, differs because they heat the plastic syringe until they melt and encase the needles.

The new technologies under review in this section are:

Rightway Disposal System- Information provided by Safetec Advisory Group, Inc.

MedEvac/Isolyser System- Information provided by MedEvac Inc.

(2) Evaluation:

Neither the USEPA nor the other sources the department contacted, evaluated this specific technology.

(3) Recommended Controls and Required Permits:

Not determined at this time.

However, the department does require that any chemical treatment system being used in New Jersey for RMW have USEPA approval under the FIFRA program. The agency responsible for issuing the authorizations above is:

Registration Division
USEPA
H 7504-C
401 M Street, S.W.
Washington, DC 20460
(703) 305-7964

(4) RIGHTWAY DISPOSAL SYSTEM

Safetec Advisory Group, Inc.
1333 Strad Avenue
N. Tonawanda, NY 14120

i. Overview:

This sharps disposal system is distributed by Safetec Advisory Group, Inc., N. Tonawanda, N.Y. It appears to be meant for home health care use.

The instructions for use recommend rinsing out a two liter soda bottle and removing the label. Then the label supplied with the Rightway Disposal System should be put on the bottle. This is a biohazard label and carries an additional warning to keep the bottle and contents out of the reach of children.

When the bottle is approximately three-quarters filled with syringes, one-half of the enclosed pouch of RED-Z powder should be added to the bottle. Then fill the bottle with warm water up to the top of the syringes. Add the rest of the RED-Z powder, apply the cap and shake the bottle. Seal the top of the

bottle with tape, place in the accompanying bag and tie.

There is another label included in the kit stating "Treated Home Health Care Waste" - "Do Not Recycle" - "Safetec Advisory Group". The instructions do not make it clear that this label should also be put on the bottle after treating the sharps.

There is a problem with the disposal of the encapsulated sharps. It is not clear whether the needles and syringes are visible or whether the encapsulating polymer is opaque. If the contents of the bottle can be identified, it is liable to cause a problem at transfer stations in New Jersey. Furthermore, the labeling identifies the contents as RMW. A strict interpretation of the RMW rules would state that the waste had been treated but not destroyed. Without an amendment of the regulations to allow for this method, it is possible that this system could not be used in New Jersey. Additionally, further review of this treatment-system is needed to determine if it could be safely used by the individual and family in the residential environment. No information is available on residual chlorine in the soda bottle. Reaction of chlorine with other components of the general trash is possible if the bottle breaks during transport or on compaction.

ii. Description of Process:

This is a disposal system aimed at home self care clients. Syringes and needles are encapsulated and treated with chlorine in a rigid container and disposed of as regular garbage after placing in a bag. Both the bag and the container are labeled before disposal. The end product is non-biodegradable and should be disposed of in a landfill.

iii. Operating Specifications:

The Rightway disposal system is a kit that contains a packet containing RED-Z (a encapsulator with 10,000 ppm of available chlorine), a plastic bag, tie and tape to seal container and, labels for container and outer bag.

iv. Performance Specifications:

A rigid plastic container is necessary for syringe and needle disposal.

v. Economics:

Safetec Advisory Group, Inc. sells a case of 72 kits to retail stores for \$208.80. The vendor claims that individual kits may be purchased through retail stores

for between \$4.50-\$4.79 per kit.

vi. Summary of Advantages and/or Disadvantages:

This system, which encapsulates needles and syringes, does not qualify as a treatment and destruction process. It adds bulk and weight to waste, but does not render it unrecognizable as RMW. It is increasing the weight of RMW to be disposed of by at least one order of magnitude.

The Rightway disposal system may disinfect the needles and syringes but that has not been established by testing or as a FIFRA registered system. Further, if these bottles are disposed of with municipal solid waste, they will probably be ruptured in waste compactor trucks, exposing trash collectors and landfill personnel to needle stick injuries. This process has no track record in New Jersey. The vendor did not submit any information about current operation in any other states.

(5) MEDEVAC/ISOLYSER SYSTEM

**MedEvac Inc.
79 E. Fox Chase Road
Chester, NJ 07930**

i. Overview:

This system is supplied by MedEvac Inc., Chester, N.J. and apparently is manufactured by the Isolyser Company, Norcross, GA. The container is rigid, leakproof and puncture resistant. The neck of the container is sized to allow easy disposal of sharps but to make removal of the disposed sharps difficult. A combination of water and chemicals are added to the container that the vendor claims disinfects and encapsulates the RMW prior to disposal.

Due to the RMW rules in effect in New Jersey, and the question of effective treatment, these containers can not be disposed of as municipal solid waste. The contents of the container are not treated and are still recognizable, even though encapsulated, thus they have not been treated or destroyed and are considered RMW, if the sharps placed in the system originally met the classification criteria at N.J.A.C. 7:26-3A.6.

ii. Description of Process:

Sharps are collected and disposed of in the Isolyzer container. The container has a disinfectant powder in it and the user is instructed to fill the container

one-third full with water. When the container is full of sharps, the capsules sent with the container should be separated over the mouth of the container and the capsules and their contents dropped into the container. The container should be filled with water, capped and shaken for ten to fifteen seconds.

The vendor claims that the chemicals added to the solution in the container will cause it to solidify. An enclosed treatment label can be placed over the biohazard label on the container. MedEvac/Isolyzer claims that the container can be disposed of with regular trash if federal, state and local laws do not state otherwise.

iii. Operating Specifications:

The operating specification are not available. The vendor did not complete the department's survey or submit detailed information about the operating specifications.

iv. Performance Specifications:

MedEvac Inc. submitted results of several testing studies done by several independent companies. One study tested microbial efficacy using B. subtilis as a test organism. Results showed no growth. A second test studied the antimicrobial preservative effectiveness on the isolyzer process. Test results showed that the test material met the USP Antimicrobial Preservative Effectiveness Test as a preservative, but was not shown to be sporicidal. Another test evaluated the Isolyzer process for its efficacy as a disinfectant. Results showed that the pre-gel solution was effective against P. aeruginosa, S. cholerasuis, and S. aureus after 1 hour exposure. The gelled product showed efficacy against S. cholerasuis and S. aureus after a one hour exposure, and proved effective against P. aeruginosa after a 24 hour exposure period. Another study tested for volatile organic contaminants. No conclusions were drawn from the results. Isolyzer had another test conducted, the California Department of Health Services 96 hour acute aquatic toxicity bioassay, involving the Isolyzer gel. A bioassay is a technique for determining the power of a drug or other substance by measuring its effects on a test specimen against those of a standard substance. In this type of test, death is the effect measured and toxicity is reported as percent survivorship at different concentrations. Results showed that the gel passed the test. The California Code of Regulations requires waste samples to pass the testing with greater than 50% survival at the 500 mg/l concentration for compliance. Fathead minnows were the first test fish used in the 96 hour acute toxicity testing.

v. Economics:

No economic information is available, see Section iii. Operating Specifications for explanation.

vi. Summary of Advantages and/or Disadvantages:

An advantage with this system is that it offers a management and disposal method for generators that only produce Class 4 (Needles, Syringes and Sharps) and Class 7 (Unused Sharps).

A disadvantage with this system is that the department cannot determine from the testing submitted by the vendor that the RMW is treated. Any chemical used for medical waste treatment must be registered with FIFRA. Also destruction is not achieved. As a result, in New Jersey these containers still must be disposed of as RMW. Another disadvantage that was witnessed by the department was that the process did not solidify the RMW, but remained gelatin-like. Because the process apparently encases the material in a gelatin-like substance for some period of time, another disadvantage is that the needles could puncture the container if subjected to stress or compaction.

The encapsulation process also makes the RMW very heavy and, as a result, would make it very costly to transport or dispose of via the mail system because RMW disposal cost is usually based on the weight of waste being disposed of. This concept of adding material to a wastestream to manage it for disposal is contrary to the DEPE's policy of source reduction. For further discussion of this issue refer to Section B.3.

SECTION D.3.- REFERENCES

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E. PROGRAMMATIC BACKGROUND

1. Historical Overview and Legal/Institutional Framework of New Jersey RMW Program

Few areas within the field of environmental protection have ever received as much statutory and regulatory attention over such a short period of time as medical waste management in New Jersey. During a mere ten-month timeframe, from August 1988 through June 1989, five distinct sets of laws and rules were passed at the federal and state levels which significantly impacted medical waste management in our state. These included both federal and state laws, as well as one federal and two stages of state regulations. In an attempt to place these laws and regulations into historical perspective, each is briefly outlined below. Further, the timeframe prior to formal rulemaking is briefly discussed to provide additional background.

a. Background:

Strict governmental control of waste disposal is a relatively recent development in this country, dating from approximately the late 1960s. The December 1987 Grand Jury Presentment on medical waste management in New Jersey offers a useful review of the medical waste side of this issue, as summarized below. Prior to that time, there was comparatively little regulation of the disposal of most types of waste, including medical waste, then referred to as infectious waste. Solid waste was historically grouped into a number of different categories by the DEPE, based on various characteristics of the waste, with each category having an assigned identification number. Prior to 1984, infectious waste was identified as a special waste category with its own identification number. Medical waste management was jointly administered by the DOH (control of materials within health care facilities) and DEPE (control of materials once they are transported off-site).

Prior to 1988, primary regulatory guidance and control within health care facilities was administered through the DOH. The DOH, through its authority to license and accredit hospitals and certain other health care providers, established certain regulations governing infectious waste treatment and disposal in its Hospital Licensure Manual developed pursuant to N.J.S.A. 26:2H-1 et seq. The regulations directed hospitals to develop and implement policies and procedures to handle their infectious and pathological wastes, and prescribe certain minimum standards to which hospitals were to adhere. These standards included various regulations concerning solid wastes, including requiring hospitals to autoclave (sterilize by steam treatment) or incinerate solid wastes from microbiological laboratories and to autoclave liquid microbiological wastes prior to their disposal in the sewer. Pathology specimens and wastes, such as tissues, were generally required to be incinerated. Solid sharp or rigid items, such as needles, syringes, or scalpel blades,

were to be autoclaved prior to disposal. Finally, solid, non-rigid contaminated waste materials, such as blood tubing and disposable equipment and supplies, were required to be incinerated, autoclaved, or removed from the hospital and disposed of in a manner approved by the New Jersey Department of Environmental Protection. The Hospital Licensure Manual further provided that "[a]ll such materials not autoclaved or incinerated within the hospital shall be doubly packaged in impervious plastic heavy duty bags, prior to removal from the hospital and disposal in a manner approved by the [DEPE]."

In actual practice, infectious waste generated by hospitals in this state was managed under the provisions of the Hospital Licensure Manual until the adoption of the regulations at N.J.A.C. 7:26-3A for "Special Medical Waste" in August, 1988. A portion was incinerated at the point of generation, that is, the hospital itself. A substantial quantity, however, was also transported by privately retained haulers from the health care provider to another location, frequently an in-state landfill, for final disposal.

Prior to 1987 and 1988, very few problems arose in the medical waste area. The handful that did pertained to illegally stockpiled materials, needle sticks involving health care workers and sanitary landfill employees, and several grotesque episodes with aborted fetuses. These latter episodes were extremely newsworthy and began an intensive focus upon medical waste management practices.

In 1987, two significant beach closings took place along the Monmouth/Ocean County coast in New Jersey. From May 27 through May 29, an extensive wash-up of floatables took place. During this episode, the source of which was never identified, condoms, tampon applicators, grease-covered organic particles and remnants of a major algal bloom littered New Jersey's shores. Later, during the period of August 13 through August 16, a second major floatables wash-up took place. This episode was marked by the presence of medical waste in the form of needles, syringes and intravenous tubing.

During the summer of 1988, fueled by the garbage slick episodes of the season before, tremendous attention once again focused upon New Jersey's coast. Unfortunately, once again, medical waste, garbage, algal bloom remnants, and solidified grease balls landed ashore. The result was devastating as summer tourism, New Jersey's third leading industry at that time, was estimated to be down by 15 - 40% and the image of the Garden State was negatively impacted.

As a result, the State Attorney General's Office convened a Grand Jury which commenced an investigation in February 1987 into the handling, treatment and disposal of medical waste. The investigation encompassed the entire scope of medical waste disposal as generated by hospitals and other health care providers in New Jersey, as well as the disposal impact on New Jersey by adjacent states.

Specifically, the Grand Jury's inquiry into medical waste management was prompted by (1) an alleged absence of statutes and meaningful regulations controlling the handling and disposal of medical waste in New Jersey; (2) the importation and abandonment in the state of medical waste from states with more stringent regulations; and (3) a number of incidents, including the improper disposal into a landfill of fetal waste, that was generated out-of-state.

As a result of the investigation by the Grand Jury, a presentment was issued which concluded that there exists a potential for harm both to those handling and disposing of medical waste, as well as to the general public. Moreover, it was determined that the impact of medical waste improperly disposed of is both valid and significant to warrant regulatory reform and action.

The 47 page presentment recommended that six measures be undertaken by state agencies:

- (1) Enactment of comprehensive statutes and regulations which encompasses a "cradle-to-grave" regulatory scheme by both the DEPE and DOH;
- (2) Development of a special medical waste manifest system to assure waste is disposed of properly; clearly define medical practitioner responsibilities and; identify the waste for appropriate handling by landfill personnel;
- (3) Special licensing of medical waste haulers;
- (4) An interagency, intergovernmental approach to remedy the problem of illegal disposal practices;
- (5) Legislative action to establish civil and criminal penalties for those who improperly store or dispose of medical waste; and
- (6) Regulatory consideration by the New Jersey Department of Environmental Protection, and the New Jersey Board of Public Utilities (NJBPU), now consolidated within the DEPE, which seeks to ensure that health care providers have an economical and orderly means for disposing of medical waste.

Following the release of the Grand Jury's Presentment in December 1987, it was clear that significant regulatory initiatives were imminent. A series of meetings were held between DOH and DEPE which resulted in significant efforts to add comprehensive regulations into the New Jersey Administrative Code. In the spring, the charge was also taken-up by the Legislature as a draft of a state medical waste statute was introduced in the New Jersey Senate.

b. 1988 Emergency Rules:

As a result of floatables washing up on coastal beaches during the summer of 1987, the Grand Jury Presentment of December 1987, and continued wash up problems during the summer of 1988, it was decided that emergency measures were necessary to begin to effectively control medical waste. In a positive display of interstate cooperation, Governors Thomas H. Kean of New Jersey and Mario Cuomo of New York, signed authorizations to implement emergency rules in each state on August 10, 1988.

In New Jersey, these emergency rules contained provisions which applied to nearly all generators of medical waste, and hundreds of transporters and disposal facilities in the State (see 20 N.J.R. 2321 and 20 N.J.R. 2760). The rules were comprised of five major categories as follows:

1. The State's first comprehensive definition of RMW (termed "Special Medical Waste" in 1988) consisting of a six-part classification system as follows:
 - Class A: Cultures and stocks of infectious agents;
 - Class B: Bulk blood, blood products and body fluids (except urine) at least 20cc's in volume;
 - Class C: Pathological waste;
 - Class D: Needles, syringes and sharps;
 - Class E: Carcasses, body parts and bedding of animals intentionally exposed to pathogens; and
 - Class F: Waste from rare or unusual cases of highly communicable diseases, i.e. small pox, Lassa fever and other viral hemorrhagic fevers.
2. Four-part special medical waste manifest system;
3. Small quantity generator manifest exemption of 220 pounds per calendar month;
4. Record-keeping provisions which required all generators to keep continuous daily logs of generation, transportation and disposal practices; and
5. Summary reporting where all generators were required to submit a one month compilation of their continuous daily log information which expressed generation by waste class definition, transportation practices and methods and locations of on-site and off-site disposal.

This latter requirement was particularly critical in providing an initial medical waste database for New Jersey. This database was essential to framing the scope of the medical waste program in 1989.

c. Federal "Medical Waste Tracking Act of 1988"

On November 1, 1988, then-President Reagan signed into law the "Medical Waste Tracking Act of 1988" (Act), Subtitle J of the "Solid Waste Disposal Act" 42 U.S.C. 6992. The Act established a two-year demonstration program for the tracking of medical waste and set forth new, more stringent enforcement authority. States were included in the demonstration program in three categories. The Atlantic Coastal States of New York, New Jersey and Connecticut were defined as "Covered States" which could "opt out" only on a showing to the USEPA that their existing statutory and regulatory requirements were no less stringent than those imposed by the demonstration program. A second category were the Great Lakes States of Illinois, Indiana, Michigan, Minnesota, Ohio, Pennsylvania and Wisconsin. These states were given the opportunity to "opt out" of the demonstration program by merely contacting the USEPA Administrator of their decision not to participate. Finally, all other forty states, as well as the U.S. Territories, were given the opportunity to "petition in" to the demonstration program by contacting the USEPA Administrator. From this three tiered system, New Jersey, New York and Connecticut participated in the program, all the Great Lakes States opted out, thus declining to participate, and the states/political subdivisions of Rhode Island and Puerto Rico opted into the program.

Substantively, the Act required USEPA to: (1) list the types of medical waste to be tracked; (2) develop a uniform cradle-to-grave tracking system; (3) set standards as part of the tracking system for segregation, packaging, labeling, record-keeping and reporting; and (4) to consider a small quantity exemption from tracking for generators of less than 50 pounds of RMW per calendar month.

Without question, the most controversial and challenging aspect of USEPA's job of developing regulations to implement the Act, was the listing of the types of medical waste to be covered under the demonstration program. The Act required inclusion of the following waste types, all of which were covered under New Jersey's Emergency Rules:

- Cultures and Stocks of Infectious Agents
- Pathological Wastes
- Human Blood and Blood Products
- Sharps
- Contaminated Animal Waste

The Act further provided for six additional waste types which the USEPA Administrator could exclude from the demonstration program, if they were determined not to "pose a substantial present or potential hazard to human health or the environment." These discretionary categories included the following:

- Surgery or Autopsy Waste
- Laboratory Waste
- Dialysis Waste
- Discarded Medical Equipment
- Isolation Waste
- Any Other Type of Medical Waste Deemed Necessary

In light of the perceived urgency of the medical waste problem, Congress gave USEPA six months, or until April 1989 to promulgate regulations to implement the demonstration program. While the USEPA was moving at an unprecedented rulemaking rate, the New Jersey Legislature was also finalizing a state act.

d. New Jersey "Comprehensive Regulated Medical Waste Management Act"

As early as the spring of 1988, the New Jersey Legislature was seriously approaching passage of a state act to address the beach wash-up problems of the summer of 1987. The bill, however, became the subject of major debate, and was the focus of frequent and extensive technical re-writes. Following this debate, compromises were reached and a final product was signed by then-Governor Kean on March 6, 1989. This timing is extremely important, as the state act was in final development after the passage of the federal act noted above, but before enactment of the federal regulations. As a result, the Comprehensive Act contained some unique provisions, which will be further addressed under Section E.1. f below.

The title of the Comprehensive Act was most appropriate, inasmuch as its provisions are extremely comprehensive in nature. Further, the Comprehensive Act addressed the "aesthetics v. health risk" debate which surrounds the regulation of medical waste right up front in the legislative findings, which read, "in addition to the actual and perceived risks associated with the management of medical waste, there are important aesthetic concerns that must be addressed."

There are three major components of the Comprehensive Act; the definition of regulated medical waste, the scope of the mandated comprehensive RMW State Plan, and authorized enforcement provisions. All of the significant provisions of the Comprehensive Act are contained below in Table 27. In terms of the definition, the Comprehensive Act, in recognition of the provisions of the federal act, basically incorporated the five mandatory waste type listings of Cultures and Stocks, Pathological Waste, Waste Human Blood, Sharps and Contaminated Animal Waste. Further, in consideration of the six discretionary types listed in the federal act, the Comprehensive Act incorporated as a contingency, "any other

substance or material as may be required to be regulated by, or permitted to be exempted from, the federal act." With this carefully crafted definition, New Jersey was ensured of consistency with the federal demonstration program provisions.

TABLE 27

MAJOR PROVISIONS OF THE NEW JERSEY
"COMPREHENSIVE REGULATED MEDICAL WASTE MANAGEMENT ACT"

- Consistency in program requirements and definition of RMW with the federal demonstration program;
- No small quantity generator exemption authorized initially;
- Registration requirements established for all generators, transporters and disposal facilities;
- Tracking requirements established for all generators, transporters and disposal facilities;
- Training mandate established for the Departments of Environmental Protection and Health to educate all generators, transporters and facility operators;
- Waste flow control, similar to that applied in solid waste management in New Jersey, is mandated following completion of the RMW State Plan;
- Comprehensive state master plan for medical waste must be developed within one year;
- Delay on the development of new commercial disposal capacity until master plan is completed;
- Exemptions which allow for continued development of "non-commercial" facilities (mainly hospital microwave systems and other treatment and destruction facilities operated on a cost-fee basis) created;
- A county/state planning process created for the future development of disposal capacity;
- Broad enforcement powers established with significant civil and criminal penalties;
- State pre-eminence over municipal and county planning and regulation specifically noted; and
- Initial start-up funding of \$1,250,000 provided, along with the authorization to charge annual fees to generators, transporters and facility operators.

During the development of this plan, the Legislature delayed the development of new commercial disposal capacity of any kind and, essentially, placed the implementation of treatment and disposal technologies on hold until the one-year study was completed. A definition of "noncommercial facility" was crafted and could be used provided a system was developed which assesses "a cost-based fee not in excess of the costs actually incurred by the disposal facility" as an exemption to foster the on-site management of regulated medical waste. This noncommercial facility exemption allowed hospitals, for example, to proceed to install new microwave systems, upgraded incinerators or use alternative technologies to dispose of other RMW on site during the past three years. Further, the exemption and other provisions of the Act served as an incentive for hospitals to accept regulated medical waste from nearby hospitals and private practitioners.

The heart of New Jersey's program lies in the mandate for the DEPE to formulate a Comprehensive State Medical Waste Management Plan which this document represents. In general, it is fair to say that, unlike municipal solid waste, very little was initially known about medical waste management practices. Private practitioners were originally thought to represent a potential universe in excess of 40,000 generators which had never been regulated under explicit New Jersey environmental or health law. As a result, through its new program, New Jersey essentially opened an entirely new facet of the environmental field with little to no background data or experience to work from. In recognition of this reality, the Legislature ordered the DEPE to perform an extensive one-year study of all aspects of medical waste management and to formulate a master plan covering a 30-year planning horizon.

Table 28 below summarizes the major required components of the Comprehensive RMW State Plan.

TABLE 28
MAJOR PROVISIONS
COMPREHENSIVE MEDICAL WASTE MANAGEMENT PLAN
STATE OF NEW JERSEY

- Generator Inventory
- Composition Analysis
- Generation Analysis (Quantities Produced Per Year by Generator Type)
- Recommendation as to a Small Quantity Generator Exemption After the First Year During Which No Exemption is Authorized

- 30-Year Planning Projections of Composition and Generation
- Existing Collection System Analysis
- Existing Disposal System Analysis
- County-by-County Five-Year Disposal Capacity Assessment
- Formulation of a Statewide Medical Waste Management Strategy
- Recommendations as to the Maximum Use of Recycling and Resource Recovery in Medical Waste Management
- Statewide Needs Assessment and Consideration of Regionalized Disposal Capacity
- Economic Analysis
- Treatment and Disposal Technology Assessment

A third notable component of the State Act is the enforcement area. Table 29 sets forth the penalty structure for both civil and criminal violations of the Act. In addition to this structure, a citizen bounty provision pursuant to N.J.A.C. 7:26-5.5 et seq. which entitles members of the public who supply information leading to the collection of civil or criminal penalties "to a reward of 10% of the penalty collected, or \$250, whichever amount is greater."

TABLE 29

ENFORCEMENT PROVISIONS COMPREHENSIVE REGULATED MEDICAL WASTE MANAGEMENT ACT STATE OF NEW JERSEY

Civil Administrative Penalties:

- \$50,000/Violation

Violation of an Administrative Order:

- \$100,000/Violation

Knowing Violation:

- \$50,000 1st Offense
- \$100,000 for Each Subsequent Offense
- 3 to 5 Years Imprisonment

Reckless Endangerment:

- Not More Than \$7,500
- Not More Than 18 Months Imprisonment

Strict Liability

e. Federal Regulations for Demonstration Program:

Federal regulations to establish the Demonstration Program noted earlier were adopted by USEPA on March 24, 1989, approximately three weeks after the Comprehensive Act was passed and five months after the federal act was signed into law. Briefly, these regulations provided specific prescriptions for tracking, segregation, packaging, decontamination, labeling and identification of RMW, and added record-keeping and reporting requirements for generators, transporters, intermediate handlers and destination facilities. The specifics of these prescriptions became embodied within the New Jersey Administrative Code as part of the department's "unifying" emergency rules of 1989 as outlined below.

As noted earlier, six discretionary types of regulated medical waste were listed in the federal Act. In its adoption of specific regulations, USEPA opted to include, in addition to the five mandated categories, Isolation Waste from patients diagnosed as having a disease caused by an organism requiring Biosafety Level 4 containment, and unused discarded sharps. Further, the agency chose to exclude from listing surgery and autopsy waste, laboratory waste, dialysis waste, and contaminated medical equipment. The agency reached this position following extensive discussions with health care professionals, independent scientists and physicians, government officials from fourteen states, the Centers for Disease Control, National Institute of Health and through a search of available scientific literature. The overwhelming consensus from USEPA's research indicated that there was no scientific evidence documenting health or environmental risk from such materials as: Dressings, sponges, drapes, lavage tubes, drainage sets, underpads and gloves from surgery or autopsy; disposable gloves, laboratory coats and aprons from laboratories; tubing, sheets, towels, gloves, aprons and laboratory coats from dialysis patients; and discarded medical equipment.

The State of New Jersey supported USEPA's definition due to the above fact and in recognizing that the significant materials of concern from surgery and autopsy, laboratories and dialysis treatment were already incorporated under other listed categories. Further, aside from the scientific risk argument noted above, the regulation of such materials as dressings, sponges, drapes, underpads, gloves, laboratory coats, aprons and disposable equipment would undoubtedly result in significant overregulation of the solid waste stream, inasmuch as it would be impossible to distinguish between these items when used in general patient care or in other more specialized applications.

This could have the impact of having all patient-related medical waste falling under regulation Where no health threat or extraordinary aesthetic concern exists.

f. 1989 Emergency Rules

The Comprehensive Act required the DEPE to "adopt, without regard to the 'Administrative Procedures Act,' rules and regulations identical to, and as required by, the rules and regulations adopted by the United States Environmental Protection Agency under the federal act." Thus, the Comprehensive Act required additional rulemaking to ensure consistency between the state and federal programs. This final set of requirements was adopted as a second promulgation of emergency rules on June 26, 1989 (21 N.J.R. 2109) at N.J.A.C. 7:26-3A. The provisions of the federal act and regulations, as well as earlier state regulations were therefore "unified" in one comprehensive rulemaking package.

In the interest of brevity, the major components of the "unifying" 1989 Emergency Rule, at N.J.A.C. 7:26-3A, are listed in Table 30 below:

TABLE 30

MAJOR PROVISIONS OF THE NEW JERSEY
1989 EMERGENCY RULE ADOPTION

- An expanded seven-part definition of RMW;
- Pre-transport requirements including packaging, marking, labeling, storage, segregation, and handling;
- A comprehensive RMW tracking system with no small quantity exemption;
- User fee and generator registration provisions;
- Education and training mandate for all transporters, intermediate handlers and destination facilities' supervisory personnel;
- Registration and fee provisions for all transporters, intermediate handlers, and destination facilities;
- Logging requirements for all generators of RMW; and
- An annual report of RMW generation, transportation and disposal practices.

Beyond the embodiment of the technical USEPA requirements, the New Jersey program had a number of distinct provisions which went well beyond the Federal Demonstration Program. These distinctions are as follows:

- The Federal Demonstration Program had a 2 year timeframe associated with it prior to consideration of a broader national program. New Jersey's program was embodied within state law and will continue indefinitely or until such time as repealed or amended by future legislation.
- The Federal Demonstration Program allowed for a fifty (50) pound small quantity generator exemption from use of the tracking form. In New Jersey, all generators must register with the DEPE, pay fees, use tracking forms for all shipments and comply with all technical provisions despite their degree of RMW generation. The only generator exemption pertains to home self-care.

TABLE 31

ORIGINAL AND AMENDED FEE REQUIREMENTS

GENERATOR CATEGORY	ORIGINAL ANNUAL VOLUME CRITERIA FOR GENERATORS	ORIGINAL FEE PER SITE
1	<300 lbs	\$ 528.50
2	300-1000 lbs	\$ 687.14
3	>1000 lbs	\$ 845.78
GENERATOR CATEGORY	AMENDED VOLUME CRITERIA FOR GENERATORS	PRESENT FEE PER SITE
1	<50 lbs	\$ 100.00
2	50 to 200 lbs	\$ 300.00
3	200 to 300 lbs	\$ 500.00
4	300 to 1000 lbs	\$1,000.00
5	>1000 lbs	\$3,500.00

- All generators of RMW are required to register with the DEPE. The Comprehensive Act gives authority to the DEPE to collect fees to support its

regulatory services. The DEPE was required by the Comprehensive Act to set annual fees in accordance with a sliding scale based on the volume of RMW generated. Originally, fees were assessed based on three generator categories. However, the Senate and General Assembly passed legislation, which then-Governor Kean signed into law on January 2, 1990 as an amendment to the Comprehensive Act to restructure the original RMW fee schedule (P.L. 1989, c. 240). This amendment to the Comprehensive Act established maximum fees for the five categories of generators based on the volume generated per year. The department adopted the fees at their maximums. Table 31 outlines the original as well as the present fee requirements for all generators of RMW.

- The Comprehensive Act requires the development of a comprehensive state master plan for RMW. Because so little was known about RMW management at the time the Comprehensive Act was passed, the Legislature ordered the DEPE with DOH's assistance, to perform an extensive one-year study of all aspects of medical waste management and to formulate a master plan covering a 30-year planning horizon;
- All transporters of RMW must comply with the registration requirements and pay fees to the DEPE. In addition, all transporters of RMW shall register with the DEPE as solid waste transporters, pay the appropriate registration fees, comply with the requirements of N.J.A.C. 7:26-3.1, 3.4, 3.7, and 16; and obtain a Certificate of Public Convenience and Necessity from the DEPE, Division of Solid Waste Management, Bureau of Registration, incorporated into the DEPE Division of Solid Waste Management in 1991;
- All intermediate handlers and destination facilities must register with the DEPE and pay fees to cover the costs the DEPE incurs in administering and monitoring those facilities;
- RMW intermediate handlers (i.e., facilities that either treat or destroy RMW) and destination facilities (i.e., treatment and destruction facilities, incinerators, and disposal facilities) are also required by N.J.A.C. 7:26-3A.42 to submit annual intermediate handler and destination facility reports to the DEPE covering the period from January 1 through December 31.

g. Issues Impacting RMW State Plan Development:

Since the Comprehensive Act was signed into law, a number of issues prevented the DEPE from more rapidly completing the study of RMW management practices and preparation of a statewide medical waste management plan as presented through this document.

The major impediments encountered concerned adequate early staffing of the program to provide sufficient resources to fully complete all of the complex analyses for the

study. Even with the \$1,250,000 funding appropriation authorized by the Comprehensive Act, the DEPE was unable to hire any permanent staff for the medical waste program until the summer of 1989. The delay was due to the continued hiring freeze on all state employees instituted in December 1988, budget problems, and the inability to hire before a fee assessment structure was approved in regulatory form and fee revenues collected as authorized in the law. Coupled with these delays is the timeframe normally associated with government hiring. The standard process of creating positions, determining funding sources, and hiring personnel generally consumes as much as three to five months. The DOH also experienced serious difficulties in this matter.

The vacant positions in DEPE and DOH were only filled in late 1990 and 1991, because of the hiring freeze, which further delayed the program's work efforts. Beyond problems with staffing the medical waste program, New Jersey's fiscal crisis, resulted in the imposition of additional financial controls. In this regard, a freeze was imposed on the use of private consulting services by the DEPE. This impacted the completion of the RMW State Plan in terms of the critically important technology assessment. The DEPE had planned to contract out the technology assessment to evaluate all existing RMW treatment and disposal technologies. However, the Request for Proposals generated toward this end was delayed and had to be abandoned due to financial constraints imposed at that time. Fortunately, through EPA funding, an in-house analysis was completed as presented earlier in Section D.3.

By the March 6, 1990 RMW State Plan submission deadline, the departments had prepared an interim state plan which addressed most elements required by the statute. The departments' intent was to submit this interim report to the Governor and Legislature to achieve basic compliance with the requirements of the Comprehensive Act.

While the departments were completing the interim report, Governor Florio issued Executive Order No. 8 on April 6, 1990, creating the "Emergency Solid Waste Assessment Task Force." This task force was ordered to completely reevaluate solid waste policy for the state and submit specific recommendations to the Governor within 120 days of the date of the order or by August 6, 1990. The task force completed this charge and submitted a revised solid waste management strategy premised upon maximizing source reduction, achieving at least a 60% recycling rate within five years, reducing long-term dependence upon incineration facilities and regionalizing disposal capacity needed following achievement of the source reduction and recycling goals. The final report of the task force and its recommendations were accepted by the Governor in mid November 1990.

Medical waste is a subset of the total solid waste stream. As such, the policies, procedures, goals and objectives must be consistent within the broader context of solid waste management. The recommendations of the task force and shift in fundamental

policy required substantial revisions to the interim report and hence the state medical waste plan. In addition, in order to move forward with the medical waste plan and to reflect the most accurate information available, the data base was completely updated with more reliable and comprehensive information. This was a major undertaking in collating and summarizing annual summary reports required by the Act and DEPE regulations from over approximately 8,700 individual generators. This effort took the first six months of 1991 to complete. Since that time, the DEPE has moved forward to adopt a total update to the statewide solid waste management plan in three major sections to ensure policy consistency. In January 1993, a 300-page update to New Jersey's "Municipal and Industrial Solid Waste Management Plan" was completed. The document was noticed on the New Jersey Register in February 16, 1993 and public hearings were held on March 16, 17 and 18. This separate statewide medical waste plan also reflects the task force recommendations and is being developed as Section II of New Jersey's updated solid waste state plan. Section III, which is an update to the 1987 statewide sludge management plan, is actively under development and is anticipated to be completed by mid 1993.

In view of the difficulties surrounding RMW State Plan development as described above, the DEPE has attempted to make the most productive use of the personnel available. Staff have been applied to the most immediate objectives required by the Comprehensive Act to establish a long-term medical waste management program for New Jersey to ensure the safe management of RMW throughout the state. In addition to preparing this RMW State Plan, the staff of the medical waste program have performed such tasks as regulatory development, compliance inspections, incident responses, document preparation, education, mailings to over 40,000 prospective generators, completing the complex technological assessment section of this RMW State Plan, and staffing a technical assistance advisory service to assist the regulated community with understanding the requirements of the new regulations, among many other tasks required of the regulations. For example, to list just the major RMW program's efforts to date, the DEPE has performed 84 presentations to the regulated community and the DOH also has done more than 60. The technical assistance advisory service of the DEPE alone has responded to over 1000 written requests for regulatory interpretations, and in addition handled over 60,000 telephone inquiries for information. Concentrating on compliance inspections to ensure regulatory compliance by RMW generators, transporters and disposal facilities and to help educate registrants in the new rule's requirements, the DEPE performed 8503 compliance inspections and the DOH 4105 through August 1992. The departments also responded to well over 600 incidents of improper RMW disposal during that period.

h. History of the Regulated Medical Waste Definition:

Prior to the RMW rules adopted on an emergency basis in August 1988 and June 1989, medical wastes were managed within the medical community and when appropriate, through the municipal solid waste disposal system. No unified definition of medical

waste existed and terms such as "infectious wastes," "red bag wastes," "pathological wastes," "biomedical wastes," "biohazard wastes" and "medically hazardous wastes" were used interchangeably. In 1986, federal guidelines were developed by the USEPA in a document published as "USEPA Guide For Infectious Waste Management," to offer guidance for infectious waste management. The federal guidelines defined infectious wastes as wastes capable of producing an infectious disease and require that four factors be met for transmission of disease to occur. First, there must be the presence of a pathogen which is capable of causing disease. Second, there also must be a sufficient dose or quantity of the pathogen to cause disease. Third, a suitable point of entry into the host such as the mucous membranes or a wound must be present. Finally the host's natural resistance and defense mechanisms against disease must be overcome. In addition to these federal guidelines, the DOH promulgated regulations in the form of manuals of standards for hospitals and all other health care facilities in the state, pursuant to N.J.S.A. 26:2H-1 et seq., which applied to all DOH regulated health care facilities. These manuals stated that all infectious wastes must be treated before land disposal was permitted. Infectious wastes that were not autoclaved or incinerated were required to be double-bagged prior to land disposal. Prior to 1988, some other groups such as funeral homes, doctors, dentists, veterinarians essentially were unregulated concerning medical waste management and disposal practices.

On August 10, 1988 New Jersey adopted regulations on an emergency basis for "special medical waste." This rule contained six classes of medical waste subject to regulation. These classes were nearly identical to the classes of waste defined by USEPA in 1986. On June 26, 1989 RMW regulations were adopted which were similar, but included some major differences to the original adopted regulations of August 10, 1988. The definition of RMW was adopted from the Federal Medical Waste Tracking Act of 1988. A major difference between the state's August 1988 definition and the June 1989 definition concerns the number of waste classes. The original August 1988 regulations categorized medical waste into six classes. The June 1989 regulations included an additional class of "Unused Sharps." The August 1988 and June 1989 definitions of the medical waste classes are summarized in Table 32, below.

TABLE 32

MEDICAL WASTE CLASSES

<u>AUGUST 1988</u>	<u>JUNE 1989</u>
Class A - Cultures and Stocks of Infectious Agents and Biologicals	Class 1 - Cultures and Stocks of Infectious Agents and Biologicals
Class B - Bulk Blood and Body Fluids	Class 2 - Pathological Wastes

Class C - Pathology Wastes

Class 3 - Human Blood and Blood Products

Class D - Needles, Syringes, and
Sharps

Class 4 - Sharps

Class E - Animal Carcasses and
Bedding of Research Animals

Class 5 - Animal Wastes

Class F - Wastes from Cases of
Communicable Diseases

Class 6 - Isolation Wastes

Class 7 - Unused Sharps

Another major difference between the August 1988 regulations and the June 1989 regulations concerns pathological wastes and the classification of animal tissues and related wastes. Pathological wastes in the August 1988 rule did not differentiate between animal and human tissues; therefore, all animal tissues were considered a pathological waste. The June 1989 regulations altered this by specifying that pathological wastes should only include human tissues.

Other differences between the August 1988 definition and the June 1989 definition involve blood, blood products, body fluids and items saturated with blood or body fluids. Bulk bloods and body fluids were identified as Class B in the August 1988 regulations, and pathology wastes were identified as Class C. In the June 1989 regulations, human blood and blood products were identified as Class 3, and pathological waste was identified as Class 2. The June 1989 regulations also include items which are saturated and/or dripping with blood and body fluids in Class 3. These items were not covered in the original state regulations.

i. Existing Definition of Regulated Medical Waste:

The present definition of RMW is very complex. The best way to understand it is to first examine the broad definition found at N.J.A.C. 7:26-3A.6(a). Secondly, it is important to examine the more detailed classification found at N.J.A.C. 7:26-3A.6(a)1-6. Next, RMW's relationship to solid waste must be examined. Lastly, "other medical wastes" and wastes excluded from the definition will be examined. By examining all of these aspects, a fuller understanding of the limits to the scope of the definition of RMW will be gained.

The RMW rule at N.J.A.C. 7:26-3A, first addresses the definition at N.J.A.C. 7:26-3A.6 in a broad sense as being "any solid waste, generated in the diagnosis, treatment, (e.g., provision of medical services), or immunization of human beings or animals, in research pertaining thereto, or in the production or testing of biologicals . . ." This definition identifies material which is generated in some type of medical facility where the

possibility exists that the waste may pose a threat to the people who handle it, and waste which has the potential to come in contact with the public or the environment. Wastes which are not generated from the diagnosis, treatment or immunization of humans or animals are automatically excluded from the definition. For example, wastes produced by manufacturers of medical supplies or wastes such as syringes used for injecting chemical samples into gas chromatographs which are produced in non-medical laboratories are not a RMW. After N.J.A.C. 7:26-3A.6 defines RMW in a broad sense, it then provides a more detailed definition by establishing classes of material.

The second part of the definition of RMW at N.J.A.C. 7:26-3A.6(a), creates seven waste classes that specify the waste classification criteria for RMW. First, these waste classes contain specific listed wastes such as used syringes for example, that are always classified as RMW Class 4. Second, the rules also define the waste classes according to characteristics, by which other non-listed RMWs can be classified into one of the first six of the seven RMW waste classes based on physical characteristics and the waste's potential for harboring or transmitting pathogens capable of causing disease in humans. The plethora of existing medical devices and the constant development of new implements that could be regulated as RMW makes listing each device impossible. By using specific waste characteristics as classification criteria, the rule enables generators to properly classify all of their medical wastes under any circumstances.

The first RMW waste class defined is Cultures and Stocks (Class 1). Class 1 includes cultures and stocks of agents infectious to humans. An infectious agent is defined as any organism capable of being communicated by invasion and multiplication in body tissues and capable of causing disease. Also included in Class 1 are associated biologicals produced in the diagnosis, treatment, or immunization of humans or animals. Specifically included is waste from medical, pathological, research and industrial laboratories. Class 1 includes the culture dish itself and any device used to transfer, inoculate or mix the culture or stock. Also included in this class are discarded live and attenuated vaccines. Many vaccines, particularly viral vaccines, contain live or live attenuated virus able to stimulate an immunologic response in a host without an adverse response or causing disease normally associated with the virus. Some common vaccines that fall into Class 1 are BCG (tuberculosis; Calmette and Guerin), measles, mumps, rubella, polio (oral) and typhoid (oral) and yellow fever vaccines.

The second class of RMW is Pathological Wastes (Class 2). Class 2 wastes include human pathological wastes, including tissues, organs, and body fluids that are removed during surgery or autopsy, or other medical procedures, and specimens of body fluids and their containers. For example, extracted teeth from dentist's offices and mycotic or endodermal tissues removed during surgical podiatric procedures are also included in this class. Class 2 body fluids are liquids emanating or derived from humans and limited to blood; cerebrospinal, synovial, pleural, peritoneal and pericardial fluids; and semen and vaginal secretions.

The third specific waste class is defined as Human Blood and Blood Products (Class 3). Human blood includes serum, plasma, and other blood components, and their containers. Blood products include items that are saturated and/or dripping or items that had previously been saturated and/or dripping but are now dried and caked with blood. Generally, items such as gauze, dressings, band-aids and cotton swabs that were used to wipe blood from wounds or slightly stained with blood are not considered RMW because they are not saturated and dripping. Also included in this category are all intravenous bags.

The fourth class of RMW is Sharps (Class 4). Class 4 includes used sharps, hypodermic needles, syringes, Pasteur pipettes, scalpel blades, blood vials, needles with attached tubing and culture dishes used in human or animal care and treatment. Syringes, regardless of whether a needle is attached, are included under this class to minimize improper disposal of aesthetically offensive medical wastes into the environment. Blood vials and culture dishes are also included in this class because they have the potential to become sharp when broken and the packaging requirements for sharps are more protective of waste handlers. Also included are other types of glassware that were in contact with infectious agents, such as used slides and cover slips. Also typically included in this definition are carpules and burrs used in dentistry. Class 4 captures any item used in a medical procedure that is sharp or is capable of becoming sharp through breakage and has the potential to pierce the skin either by its inherent nature or on breaking during the handling and disposal process.

The fifth specific class of RMW is Animal Wastes (Class 5). Class 5 only includes animal wastes intentionally exposed to or contaminated with agents infectious to humans. Class 5 also includes contaminated carcasses, body parts and bedding of animals that are known to have been intentionally exposed to agents infectious to humans. This commonly refers to animals that were injected with agents infectious to humans as part of scientific research projects. Animals that die due to natural causes are not considered a RMW.

The sixth specific class is Isolation Wastes (Class 6). Class 6 waste includes wastes contaminated with blood, excretion, exudates or secretions from humans or animals that are isolated to protect others from highly communicable diseases. The Class 6 definition specifies that certain wastes from patients isolated with "highly" communicable diseases are RMW. The USEPA in the March 24, 1989 Federal Register stated only "highly" communicable diseases are included and specified as an example those diseases caused by agents listed in Classification 4 of the Centers for Disease Control's (CDC's) 1974 document "Classification of Etiologic Agents on the Basis of Hazard." These highly communicable diseases include Lassa fever, smallpox, and viral hemorrhagic fevers. Blood borne diseases such as "Acquired Immune Deficiency Syndrome" (AIDS) and "Hepatitis B" (HBV) are not included since many of the waste items of concern from these patients are already covered under other regulated waste classes and the remaining waste materials pose little or no potential to cause infection

based on the principles of infectious disease transmission and our knowledge of the human immunodeficiency virus and the hepatitis B virus.

The seventh specific class of RMW is Unused Sharps (Class 7). Class 7 includes unused discarded sharps, hypodermic needles, suture needles, syringes, and scalpel blades. Wastes which have passed their expiration date or will not be used for some reason are considered RMW. The logic behind the addition of this class is that regardless of the fact that a sharp has or has not been used, it still could result in physical injury if improperly discarded, and it has negative aesthetic impacts.

The third important aspect which must be discussed when defining RMW is its relationship with solid waste. Before New Jersey adopted emergency regulations in 1988, medical waste was treated and managed as a solid waste. New Jersey solid waste regulations (N.J.A.C. 7:26-3A) define solid waste as a "garbage, refuse, and other discarded materials resulting from industrial, commercial and agricultural operations and from domestic and community activities, . . ." The new RMW regulations (N.J.A.C. 7:26-3A) define RMW as a "solid waste which has been generated in the diagnosis . . ." It is important to note that even though specific regulations have been adopted to pay particular attention to the management of medical waste in the state, RMW is a solid waste not a hazardous or special waste. RMW is not classified or categorized under solid waste regulations with a waste class number as most solid wastes are; instead it is considered a subset of municipal solid waste at this time. It is therefore subject to all the medical waste regulations in addition to regulation as solid waste. As part of its management, it can be included in solid waste plans such as county waste flows and county management plans. In fact, the Comprehensive Act directed the DEPE and the Board of Public Utilities, now both consolidated into the DEPE, to adopt rules or administrative orders to provide for the waste flow control of RMW once the state plan has been completed (see N.J.S.A. 13:1E-48.12).

Describing wastes that are not classified as RMWs is also very useful for gaining a clearer picture of what constitutes RMW. The New Jersey regulations at N.J.A.C. 7:26-3A.6(b) exclude or exempt certain wastes from the definition of RMW. These include the following: domestic sewage, hazardous wastes, household waste, ash from incineration of RMW, and human remains intended for interment or cremation. Another aspect that must be taken into consideration is a mixture of waste and RMW becomes RMW. Once formed, such mixtures cannot be separated to deregulate the solid waste portion. With this in mind, generators should design their waste handling systems to ensure proper segregation of the waste streams prior to disposal.

To understand the complete picture of what are considered RMWs, other potential medical wastes and excluded wastes must also be examined. Other medical wastes may include any waste that was generated from a medical facility. One example of a medical facility would be hospitals that produce a wide variety of wastes such as disposable bedpans, disposable wash basins, or drapes, disposable trays, and cafeteria waste. These

wastes could be considered medical waste because they were generated in a medical facility, but after careful consideration of the seven waste classes, they do not by definition fall under RMW. Another example of a medical facility might be a physician's office. Physician's offices commonly discard items such as disposable gowns, table covers, plastic gloves, and tongue depressors. Again, when these items are compared against the seven RMW classes, they are normally not classified as RMW unless soaked with blood or other regulated body fluids.

In summary, RMW is defined first as any solid waste produced from the diagnosis, treatment, or immunization of humans or animals, in research pertaining thereto, or in the production or testing of biologicals. Secondly, such wastes are categorized into seven specific classes which include cultures and stocks, pathological wastes, blood and blood products, sharps, animal wastes, isolation wastes and unused sharps. RMW is a very specific type of waste and is not merely any waste generated in a medical facility. It cannot be diluted with other less infectious wastes. In addition, any mixture with another waste designates the combined material as a RMW.

j. Treatment and Destruction:

RMW that has been both treated and destroyed is excluded from regulation as RMW per N.J.A.C. 7:26-3A.6(b) and can be disposed of in the municipal solid waste stream. The treatment and destruction of RMW effectively deregulates it, however, the process of treating and destroying RMW is a regulated activity in accordance with N.J.A.C. 7:26-3A. Any facility that either treats and/or destroys RMW is required to register with the DEPE as a destination facility or an intermediate handler. The management criteria for treatment and destruction were developed federally by USEPA to address both the aesthetic and legitimate health concerns posed by medical wastes. Federal regulations originally defined treatment as that which removed the legitimate health concerns associated with a material. To be considered treated, the waste's biological character or composition must be changed to reduce or eliminate its potential for causing diseases. Methods of treatment include incineration, steam sterilization, chemical disinfection, irradiation, thermal inactivation or any other method which has been approved by the DOH. Destroyed RMW is medical waste that has been ruined, torn apart, or mutilated through processes such as thermal treatment, melting, shredding, grinding, tearing or breaking, so that it is no longer generally recognizable as medical waste. Encapsulation or compaction are not considered acceptable destruction methods. Residues from treatment and destruction and ash from incineration are no longer considered RMW and, therefore, are excluded from the medical waste tracking system.

k. Fee Schedule:

The Comprehensive Act authorizes the DEPE to collect fees to support its regulatory services. The Comprehensive Act also provided the DEPE and the DOH with \$1 million startup funds to initiate their new regulatory programs and \$250,000 to conduct

the RMW State Plan. This amount was for start-up costs and was not intended to fund the entire regulatory program. This user fee ideology is consistent with the trend the Legislature has set, particularly for environmental programs, by requiring such programs to be funded with user fees assessed against the regulated community rather than through appropriations from the state's general fund. The entire fee based program, which affects all aspects of the regulated community, whether it be the generator, transporter, intermediate handler or destination facility, is assessed based on services provided by the departments. The fees will provide the funding necessary for the DEPE and the DOH to provide their respective services for a base program as required by the Comprehensive Act.

In accordance with the requirements of the Comprehensive Act, twenty-five percent of the fees collected is allocated to the DOH to cover the cost of their monitoring and other activities associated with implementing and administering the medical waste program.

Originally in the initial adoption of the RMW rule, the computation of the annual generator fee was based on program costs assigned to generators as included in one of three waste class categories as outlined in Table 33.

TABLE 33

JUNE 26, 1989 FEE SCHEDULE

GENERATOR CATEGORY	POUNDS GENERATED PER YEAR	BASE FEE
1	<300 lbs	\$ 528.50
2	300-1,000 lbs	\$ 687.14
3	>1,000 lbs	\$ 845.78

On January 2, 1990 then-Governor Kean, responding to an outcry from the generators in Category 1 believing their fee was unnecessarily high, signed legislation to restructure the RMW fee schedule. Generators of medical waste were divided by this legislation into categories as outlined in Table 34 below, according to the amount of waste generated; and maximum fees were established for each category.

The legislation, which empowered the DEPE to make these fee schedule revisions, required the DEPE to adopt new fees through a formal rulemaking procedure. Due to the revenue requirements for the medical waste program, the DEPE adopted the new fees at the legislatively authorized maximum level. The fee schedule both before and

after the statutory revisions is shown graphically in Figure 29. In this graph, Category I represents waste generation of under 50 pounds per year; Category II represents 50 to 200 pounds per year; Category III, over 200 to 300 pounds per year; Category IV over 300 to 1000 pounds per year; and Category V, over 1000 pounds per year. Clearly, virtually all of certain types of large volume generators, such as general hospitals, will fall into Category V, and most of other types, such as dentists, will fall into Category I, as can be seen from Table 35, based on the 1990 data discussed in Section C.2.

TABLE 34

JANUARY 2, 1990 FEE SCHEDULE

GENERATOR CATEGORY	POUNDS GENERATED PER YEAR	MAXIMUM ANNUAL FEE PER SITE
1	<50 lbs	\$ 100.00
2	50 to 200 lbs	\$ 300.00
3	200 to 300 lbs	\$ 500.00
4	300 to 1,000 lbs	\$1,000.00
5	>1,000 lbs	\$3,500.00

In 1990, it was not clear which registration category would receive most of certain other types of generators, such as physicians. As can be seen from Table 35 below, the estimated average yearly generation of physicians is 207 pounds. From this, one could assume that most physicians will register as Category II generators. However, the skewed nature of the distribution of pounds of waste generated by physicians, as is shown in the graph (see above, section VI), suggests that a disproportionate share of these generators produce less than the average amount of waste. (Of the group of 3,097 physicians described in Section C.2., Fig 3, 64%, generated approximately 23 pounds per year, which would place them in Category I.) While the average or mean value for RMW generated by physicians is 207 pounds, the median value is closer to 23 pounds per year. Half the physicians responding to the 1990 AGR generate more than approximately 23 pounds and half generate less. A small number of Category V physicians caused the skewed mean of 207 pounds. The same skewed distribution, apparent for the other private practitioners, may hold true for the waste generation distributions of most types of health care facilities as well. An examination of the distribution of registered generators by category shows the same type of skewed distributions.

FIGURE 29

REGISTRATION FEES - OLD AND NEW FEE SCHEDULES

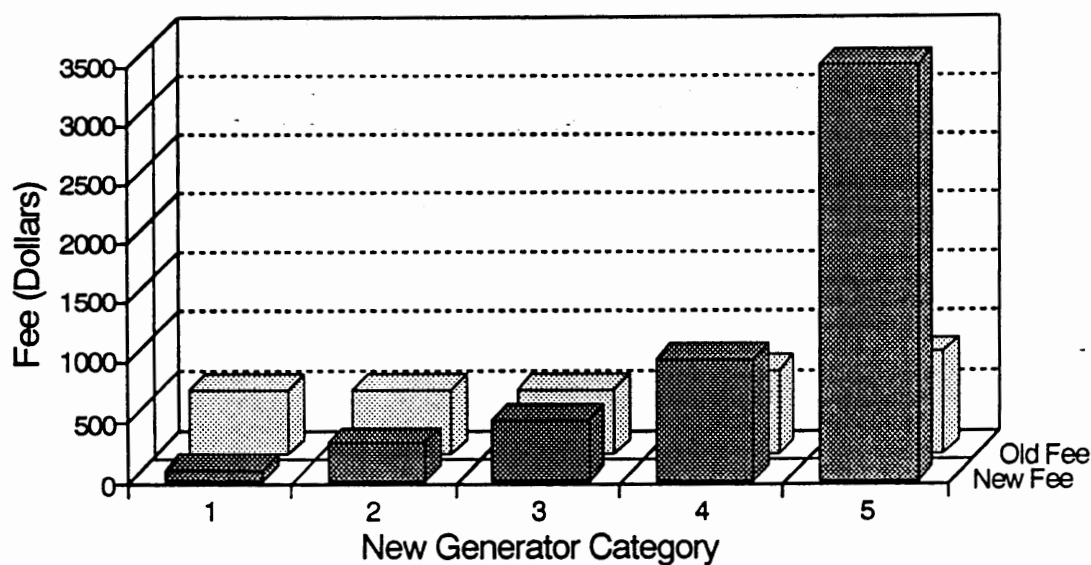


TABLE 35

TYPICAL GENERATION RATES FOR VARIOUS TYPES OF GENERATOR
(1990 annual report data)

TYPE OF GENERATOR	ESTIMATED AVERAGE POUNDS PER YEAR
General Hospitals	331,488
Renal Dialysis Centers	37,941
Clinical Laboratories	14,696
Special Hospitals	8,216
Health & Allied Services	4,006
Private Psychiatric Hospitals	13,431
Funeral Homes	668

Skilled Nursing Care Facilities	565
Intermediate Nursing Care Facilities	301
Veterinarians	167
Health Departments	1,749
Physicians (M.D. & D.O.)	207
Podiatrists	17
Home Health Agencies	294
Dentists	36
Elementary & Secondary Schools	2

I. Program Workload Analysis:

The workload analysis for the RMW program represents the original assessment presented by the DEPE in the July 17, 1989 New Jersey Register in the summary for the emergency rule adoption at N.J.A.C. 7:26-3A. The issue of the initial fee structure for generators was hotly debated during the summer of 1989 and a formal legal challenge was brought by a number of associations representing private practitioners. A restatement of the fees established through this workload analysis is presented here merely for historical purposes due to the extensive debate that the original fee amounts caused. With the revised fee schedule noted above, much of the initial controversy has subsided. However, due to the great deal of confusion over the initial fees assessment strategy, the DEPE is once again reiterating its workplan logic originally set forth within the 1989 emergency rule.

In order to understand the original medical waste fee structure, it is important to recognize the fundamental basis on which the DEPE originally developed the medical waste program. The basic premise of the medical waste program was the department's determination of the need for annual compliance inspections at generator facilities at least during the first few years of the program. The DEPE felt strongly that an enforcement presence in the regulated community, to inspect each site and assist the generator with interpreting the regulations would facilitate the process of acclimating the generating community to the new regulations. The need for an enforcement staff sufficient to monitor the generators of RMW annually was a significant factor in framing the size of the medical waste program, and hence, the ultimate fees that would be paid by each of the program's registrants.

The DEPE computed the registration fees based on normal cost accounting principles for the services the program would be providing. The operating costs for the RMW

program were constructed from a thorough workload analysis to include all of the necessary start-up costs as well as the normal annual operating costs for an established program. Staffing costs, indirect costs and normal operating expenses were all taken into consideration for fee assessment. Staffing costs were based on an eight hour work day for the DEPE and a seven hour work day for the DOH. This results in 1,720 hours per staff year in the DEPE and 1,540 hours per staff year in the DOH. The division of labor between the departments does not reflect an exact allocation of 75% of each specific workload to the DEPE and 25% allocation of each program workload to the DOH. Rather, a larger percentage of agency staff allocation as compliance monitoring has been allocated to the DOH which will designate all of its workload to generator compliance monitoring, while planning, legal services and data analysis activities have been allocated to the DEPE along with the balance of the compliance monitoring workload. This results in positions of different cost values being allocated to each of the departments, which, combined with the differences in position workday length, accounts for the unequal value unit cost of an average position in each of the departments. The cost of specific DEPE activities on which the fee amounts are based is calculated by determining the number of staff hours required for the activity and multiplying this figure by the average cost per staff hour. The average cost of each is made up of salary and normal operating expenses. These costs and the complete workload analysis for the medical waste program are contained in the department's June 26, 1989 emergency rule adoption. The percentage of the workload projected for each activity is presented below, in Table 36.

TABLE 36

GENERATOR BUDGET WORKPLAN

ACTIVITY	PERCENTAGE OF WORKLOAD
Registration	9
Report Analysis	6
Compliance Monitoring	45
Advisement/Education	5
Waste Flow Determination	2
Waste Reduction Analysis	2
Legal Support Services	9

Administrative Support	6
Clerical, Data Management and Supervisory Services	16
TOTAL	100

At this juncture, the medical waste program is nearly four years old. The DEPE believes its original workload allocation was appropriate to formulate a program to effectively regulate RMW management in the state. While many staff positions took time to fill, the departments are now focusing on compliance inspections and diligently monitoring all transporters and disposal facilities to ensure the proper and safe management of RMW. The workplan allocates sufficient staff to provide for inspection of about one third of the generators each year. This frequency of inspection will ensure the continued safe management of RMW by the state's medical community.

m. Conclusion:

A new level of regulatory initiative has been directed toward medical waste management in New Jersey over the past four years. This level of attention primarily arose in response to two consecutive summers, 1987 and 1988, where infrequent, yet graphic wash-ups of blood vials, syringes, and intravenous tubing and bags littered beaches on the east coast. Obviously, there are no guarantees that these regulatory initiatives will eliminate beach wash-ups in future summers. It is now apparent, that a complex combination of inadequate trash handling at New York City's marine transfer stations and the Fresh Kills Landfill, combined sewer overflow, litter from commercial, military and pleasure boating, beach litter, wood dumping and burning at sea, and illegal disposal, all contributed to the problems of the past. However, the departments take the position that the prior federal and present state medical waste programs have, and will continue to, add considerably to other planned coastal and land-based initiatives to help ensure a safe and quality environment for residents, health care and waste management employees, and visitors of New Jersey. The state's detailed tracking, segregation, packaging, labeling, transportation, treatment and destruction requirements structure a long-term management program to help preserve our high quality environment. Ongoing education, inspection and enforcement activities are also critical to inform the regulated community of its waste management obligations and to deter violations of the law. Finally, it is anticipated that federal legislation authorizing some level of medical waste regulatory program may occur in the future. It is premature to anticipate the level of this effort, but the initiative may be linked to the future RCRA reauthorization process.

SECTION E - BIBLIOGRAPHY

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APPENDICES

- A Interagency Protocol and Memorandums Implementing Responses to Medical Waste Wash-Ups
- B DEPE/DOH, Memorandum of Understanding (M.O.U.)
- C DEPE/USEPA, Memorandum of Agreement (M.O.A.)
- D Summary of New Technology Data (Table 37)



State of New Jersey
Department of Environmental Protection and Energy
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Scott A. Weiner
Commissioner

Steven Gabel
Director

M E M O R A N D U M

MAY 22 1992

TO: Distribution

FROM: *GS* Gary Sondermeyer, P.P., Assistant Director
Office of Recycling and Planning

SUBJECT: "1992 Interagency Protocol for Response to
Medical Waste and Marine Floatables Incidents"

Thank you for your assistance in updating the 1992 Interagency Protocol for Response to Medical Waste and Marine Floatables Incidents.

The attached protocol has been revised based on your comments on the previous document discussed at our meeting on March 6, 1992, as well as those comments you and your staff sent to my office in response to the draft "1992 Protocol" mailed to you after the March meeting.

The following amendments from the prior year's protocol are worthy of note:

- . A definition for "community exposures" has been added to the Glossary of Terms (Page 3).
- . The Division of Environmental Quality has been changed to the Division of Responsible Party Site Remediation.
- . Paragraph H Response to Community Exposures (Page 8) has been added to Section I Summary of the Interagency Protocol for Incident Response.
- . There are changes to the Response Protocol Flow Diagram (Page 9) and the Documentation Protocol Flow Diagram (Page 17) to reflect the deletion of the New Jersey Board of Public Utilities and the addition of the Division of Solid Waste Management, Office of Recycling and Planning. Also the Division of Water Resources, Bureau of Monitoring Management has changed to the Office of Enforcement Coordination (DEPE).

- . Anthony Monaco has been added as an agency contact for the Department of Health, Division of Epidemiology and Communicable Disease Control (Page 14).

These amendments have necessitated corresponding changes in the protocol text.

The following protocol attachments have been revised.

- . Local Health Departments
- . List of District Solid Waste Management Officials
- . Confidential Telephone Numbers (These numbers represent the personal home telephone numbers of the agency representatives and should not be distributed to the public).
- . Agency Incident Reports (New Jersey Board of Public Utilities deleted).

Should any issues develop in the future which have an impact on this protocol, please contact Robert M. Confer, Chief, Bureau of Medical Waste and Residuals Planning at (609)530-8599 or me at (609)530-8203.

Attachment

KK/pt
C/B-92-399

cc: Rick Sinding, Assistant Commissioner
Steven Gabel, Director

Distribution: Ed Neafsey, Director, NJDEPE
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Wayne Smith, NJDCJ
Patrick Kane, NJ State Police
Mike Pepe, NJ State Police, Marine Bureau

**1992 INTERAGENCY PROTOCOL
FOR
RESPONSE TO MEDICAL WASTE AND
MARINE FLOATABLES INCIDENTS**

1992 INTERAGENCY PROTOCOL
FOR
RESPONSE TO MEDICAL WASTE AND MARINE
FLOATABLES INCIDENTS
(REVISED MAY, 1992)

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1992 INTERAGENCY PROTOCOL
FOR
RESPONSE TO MEDICAL WASTE AND MARINE
FLOATABLES INCIDENTS
(REVISED MAY, 1992)

INTRODUCTION

This interagency protocol for a coordinated response to all incidents involving regulated medical waste and marine floatables in New Jersey, was initiated in the summer of 1989, and was developed and recently updated for 1992 by the New Jersey Department of Environmental Protection and Energy, Division of Solid Waste Management, Office of Enforcement Coordination and the New Jersey Department of Health, Division of Epidemiology and Communicable Disease Control, as well as the various other agencies participating in the protocol outlined herein. The protocol, or standard operating procedures for notification, verification and response to an incident, will assure expeditious dissemination of information and will maximize the ability of the agencies to respond to an incident. The agencies involved in the protocol are:

New Jersey Department of Environmental Protection and Energy
(DEPE)
Division of Solid Waste Management, Bureau of
Inspections and Investigations
Division of Solid Waste Management, Office of Recycling
and Planning
Office of Enforcement Coordination
Division of Responsible Party Site Remediation,
Environmental Hotline, Bureau of Emergency
Response
Press Office
New Jersey Department of Health (DOH)
Division of Epidemiology and Communicable Disease
Control, Bureau of Public Health, Sanitation and
Safety
New Jersey Department of Law and Public Safety (DL&PS)
Environmental Prosecutor's Office
Division of State Police, Field Operations Section
Division of Criminal Justice, Environmental
Prosecutor's Section
United States Environmental Protection Agency (EPA)

Trenton Dispatch, Bureau of Communication and Support Services, DEPE, will maintain a Medical Waste Incident Directory of all incidents reported to DEPE.

This protocol will remain in effect until amended by future revised editions or superseded by an appropriate executive order.

I. SUMMARY OF THE INTERAGENCY PROTOCOL FOR
INCIDENT RESPONSE

A. GLOSSARY OF TERMS

1. Coastal Based - Incidents limited to the land and water lying adjacent to the shoreline and may include floating debris, slicks, algal bloom and discharge of effluent.
2. Community Exposures - An accidental exposure to medical waste by a citizen or an employee outside the health care profession (i.e.; policeman, solid waste worker, etc.) which will vary with the type of medical waste encountered and the condition of the waste at the time of exposure. Exposures of greatest concern are parenteral, mucous membrane, or cutaneous exposures to non intact skin (i.e., cut, scratch, puncture, or splash of blood and body fluids into the eyes, mouth or non intact skin).
3. Land Based - Incidents involving the presence of, or improper disposal of medical waste at a distance from the coastal shoreline making it unlikely that the medical waste was washed up on the coastline. This definition includes incidents on the land and on inland surface water systems.
4. Marine Floatables - Solid waste that floats or remains suspended in the water column.
5. Medical Waste Incident Directory - The official record of incidents beginning May 29, 1989, maintained by Bureau of Communications and Support Services.
6. Regulated Medical Waste - Means any of the following per N.J.A.C. 7:26-3A:

Class 1: Cultures and Stocks:

Cultures and stocks of infectious agents and associated agents and associated biologicals, including: cultures from medical and pathological laboratories; cultures and stocks of infectious agents from research and industrial trial laboratories; wastes from the production of biologicals; discarded live and attenuated vaccines; and culture dishes and devices used to transfer, inoculate, and mix cultures.

Class 2: Pathological Wastes:

Human pathological wastes, including tissues, organs, and body parts and body fluids that are removed during surgery or autopsy, or

other medical procedures, and specimens of body fluids and their containers.

Class 3: Human Blood and Blood Products:

(1) Liquid waste human blood; (2) products of blood; (3) items saturated and/or dripping with human blood; or (4) items that were saturated and/or dripping with human blood; including serum, plasma, and other blood components, and their containers, which were used or intended for use in either patient care, testing and laboratory analysis or the development of pharmaceuticals. Intravenous bags are also included in this category.

Class 4: Sharps:

Sharps that have been used in animal or human patient care or treatment or in medical, research, or industrial laboratories, including hypodermic needles, syringes (with or without the attached needle), pasteur pipettes, scalpel blades, blood vials, needles with attached tubing, and culture dishes (regardless of presence of infectious agents). Also included are other types of broken or unbroken glassware that were in contact with infectious agents, such as used slides and cover slips.

Class 5: Animal Waste:

Contaminated animal carcasses, body parts, and bedding of animals that were known to have been exposed to infectious agents during research (including research in veterinary hospitals), production of biologicals, or testing of pharmaceuticals.

Class 6: Isolation Wastes:

Biological waste and discarded materials contaminated with blood, excretion, exudates, or secretions from humans who are isolated to protect others from certain highly communicable diseases, or isolated animals known to be infected with highly communicable diseases.

Class 7: Unused Sharps:

The following unused, discarded sharps: hypodermic needles, suture needles, syringes, and scalpel blades.

7. **Minor Incidents** - Incidents that involve a few medical devices (e.g., several syringes are found which are not posing an immediate direct health threat). An exception would be any number of

blood vials, because they are readily identifiable as "regulated medical waste". (The use of the term "minor" relates to the level of response from various agencies. It is acknowledged that even a single syringe on a beach can be of major concern to the individual who finds it.)

8. Sand Hotline - Provides 24-hour phoneline updates on beach and water conditions and water quality analysis (800-648-SAND).
9. Trenton Dispatch - New Jersey Department of Environmental Protection and Energy Hotline for the reporting of all environmental incidents [(609) 292-7172].
10. Waste Flow Violations - Solid waste that has not been disposed of in accordance with and DEPE regulations.

B. NOTIFICATION OF INCIDENTS TO TRENTON DISPATCH

1. Federal and state governmental agencies including EPA, state law enforcement and the public will report all environmental incidents to the DEPE Environmental Hotline, Trenton Dispatch at (609) 292-7172. Incidents may be reported on a 24-hour basis.
2. Incidents reported to any of the agencies involved in this protocol will be reported to Trenton Dispatch by the receiving agency or the receiving agency will refer the caller to Trenton Dispatch.
3. Incidents reported by governmental agencies or State law enforcement to Trenton Dispatch must inform Trenton Dispatch that the incident requires immediate response and, where available, provide the following information:
 - Identify if land or coastal based
 - Specific location
 - Type and quantity of waste (i.e., description)
 - Date and time of observation
 - Individuals involved with incident
 - Citizen exposure
 - Press involvement

C. VERIFICATION OF INCIDENT REPORTS

Incident reports from any entity will be verified as follows:

1. Trenton Dispatch will call:
 - a. DEPE, Division of Solid Waste Management for land based incidents

- or -

- b. DEPE, Office of Enforcement Coordination for coastal based incidents
2. DEPE will notify any of the following agencies where appropriate: (Exception a. and d. below will not be notified when minor incidents are reported.)
- a. DL&PS - Environmental Prosecutor's Office
 - b. DOH, Division of Epidemiology and Communicable Disease Control
 - c. County or local health department
 - d. DL&PS - Division of Criminal Justice
 - e. DL&PS - Division of State Police
 - f. DEPE - Division of Responsible Party Site Remediation
 - g. EPA

D. IMMEDIATE RESPONSE INCIDENTS

The description (type, location, extent) of the incident as assessed by the parties involved in the verification of the incident will determine the type of response action. The DEPE Division of Solid Waste Management and Office of Enforcement Coordination will each have a duty officer on call 24-hours via pager or home telephone number after business hours. Duty officers will assume responsibility for the appropriate response action after Trenton Dispatch reports the incident. The duty officer will contact the State Environmental Prosecutor and all other appropriate agencies and implement a response plan. (Exception: The State Environmental Prosecutor and the Division of Criminal Justice will not be notified when minor incidents are reported.)

E. RESPONSE TO OTHER INCIDENTS

For response to other incidents, Trenton Dispatch will contact the DEPE Division of Solid Waste Management and Office of Enforcement Coordination. Both divisions will have a duty officer on call 24-hours via pager or home telephone number after business hours. Duty officers will assume responsibility for the appropriate response action after Trenton Dispatch reports the incident. The DEPE will determine which agencies to contact for response action. Non-emergency incidents will include general complaints and waste flow violations that do not present an immediate threat to the health and safety of citizens or the environment,

or undue media attention. In these cases, the DEPE will investigate these incidents within the framework of their normal investigatory procedures.

F. DATA COLLECTION

1. The Medical Waste Incident Directory will be maintained by Trenton Dispatch. Each agency will maintain records of medical waste incidents as illustrated on the New Jersey Documentation Protocol of Medical Waste and Marine Floatables Incident Response, Page 17.
2. The Department of Health, Division of Epidemiology and Communicable Disease Control, will maintain a Registry of nonoccupational citizen exposures, such as needlesticks which are normally reported directly to the Department of Health and do not require a response by regulatory agencies for enforcement or remedial action.

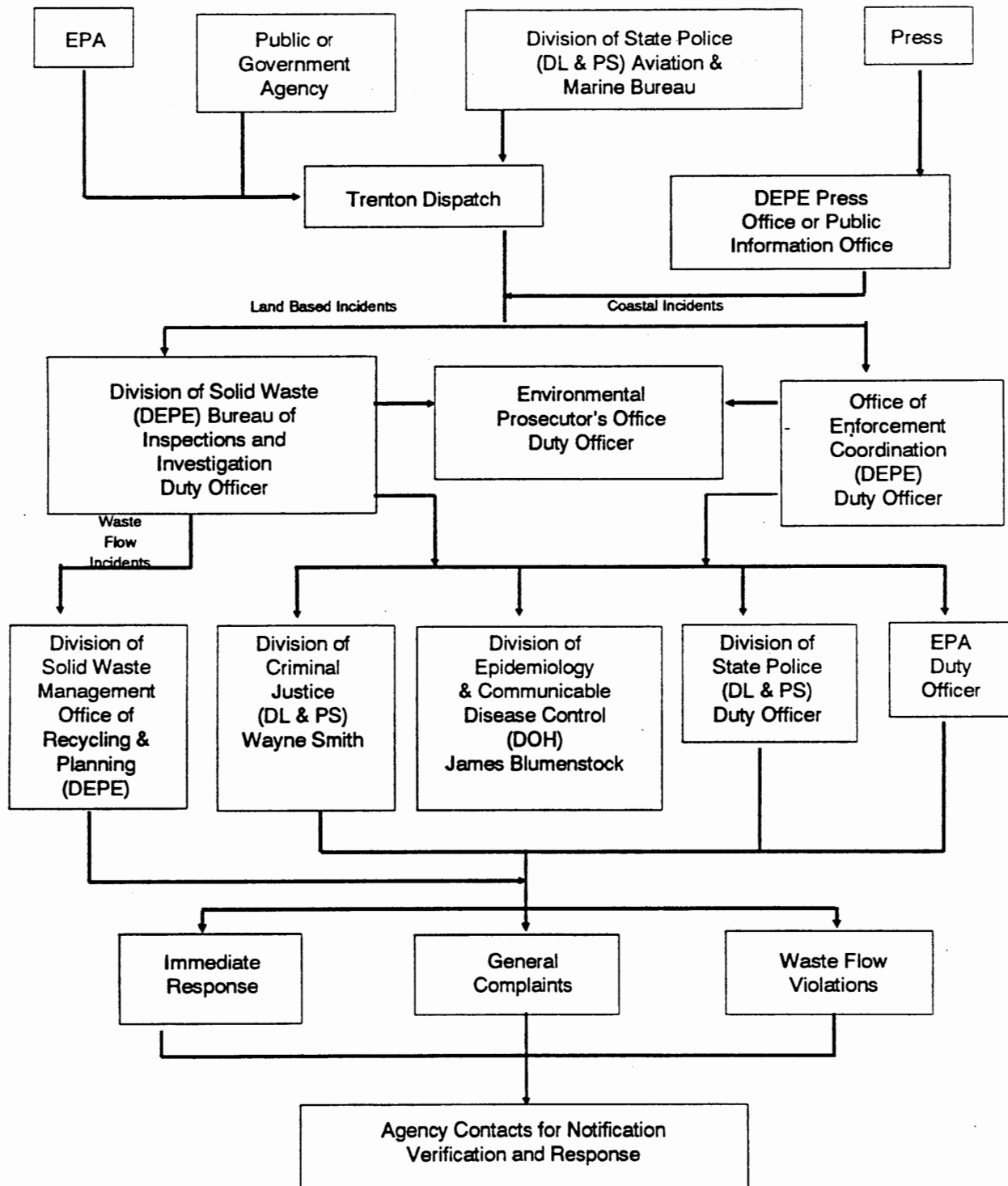
G. DISPOSAL OF MEDICAL-TYPE WASTES AND FLOATABLES

Governmental agencies in New Jersey may contact the Department of Environmental Protection and Energy, Division of Solid Waste Management to have medical-type wastes and floatables picked up. Collections can be arranged with the Division by contacting the Central Field Office at (609) 584-4250. The Division will utilize its enforcement staff to collect these materials, obtained from beach clean-ups and enforcement samples, for proper disposal.

H. RESPONSE TO COMMUNITY EXPOSURES

The Department of Health, Division of Epidemiology and Communicable Disease Control, will respond to all community exposures to medical waste. Program personnel provide consultation to victims and attending physicians regarding post exposure treatment. In addition reports of community needlesticks require retrieval of the syringe and/or needle for examination and possible HIV and HBV testing at the Department's laboratory. All incidents involving community exposures to medical waste should be reported directly to the Department's Regulated Medical Waste Management Program at (609)588-3124.

NEW JERSEY PROTOCOL FOR MEDICAL WASTE AND MARINE FLOATABLES INCIDENT RESPONSE 1992 FLOW DIAGRAM



II. INTERAGENCY PROTOCOL FOR INCIDENT RESPONSE

A. IMMEDIATE RESPONSE PROCEDURE

1. NOTIFICATION

- a. LAND BASED: DEPE, Division of Solid Waste Management, Bureau of Inspections and Investigations

- or -

- b. COASTAL BASED: DEPE, Office of Enforcement Coordination

- c. DEPE will notify the State Environmental Prosecutor and any of the following agencies where appropriate: (Exception: The State Environmental Prosecutor and the Division of Criminal Justice will not be notified if a minor incident is reported.)

- . DL&PS, Division of Criminal Justice
Wayne Smith

- . DOH, Division of Epidemiology and Communicable Disease Control
James Blumenstock

- . DEPE, Division of Solid Waste Management,
Office of Recycling and Planning

- . County/Municipal/Regional Health Department

- . County Solid Waste Coordinator

- . DL&PS, Division of State Police

- . DEPE, Division of Responsible Party Site
Remediation

- . DEPE, Press Office

- . EPA

2. VERIFICATION

- a. LAND BASED: DEPE, Division of Solid Waste Management, Bureau of Inspections and Investigations

- or -

- b. COASTAL BASED: DEPE, Office of Enforcement Coordination

- c. Any of the following agencies may assist in verifying the incident:
- . DL&PS, Environmental Prosecutor's Office
Steven Madonna
 - . DL&PS, Division of Criminal Justice
Wayne Smith
 - . DOH, Division of Epidemiology and
Communicable Disease Control
James Blumenstock
 - . DEPE, Division of Solid Waste Management,
Office of Recycling and Planning
 - . County/Municipal/Regional Health Department
 - . County Solid Waste Coordinator
 - . DL&PS, Division of State Police
 - . EPA

3. RESPONSE

- a. LAND BASED: DEPE, Division of Solid Waste Management, Bureau of Inspections and Investigations

- or -

- b. COASTAL BASED: DEPE, Office of Enforcement Coordination
- c. Any of the following agencies may respond to incident:
- . DL&PS, Environmental Prosecutor's Office
Steven Madonna
 - . DL&PS, Division of Criminal Justice
Wayne Smith
 - . DOH, Division of Epidemiology and
Communicable Disease Control
James Blumenstock
 - . DEPE, Division of Solid Waste Management,
Office of Recycling and Planning
 - . County/Municipal/Regional Health Department
 - . County Solid Waste Coordinator

. DL&PS, Division of State Police

. EPA

B. GENERAL COMPLAINTS

1. NOTIFICATION

- a. LAND BASED: DEPE, Division of Solid Waste Management, Bureau of Inspections and Investigations
- b. COASTAL BASED: DEPE, Office of Enforcement Coordination
- c. DEPE will notify any of the following agencies where appropriate: (Exception: the Environmental Prosecutor's Office and the Division of Criminal Justice will not be notified if a minor incident is reported.)
 - . DL&PS, Environmental Prosecutor's Office
Steven Madonna
 - . DL&PS, Division of Criminal Justice
Wayne Smith
 - . DOH, Division of Epidemiology and Communicable Disease Control
James Blumenstock
 - . DEPE, Division of Solid Waste Management,
Office of Recycling and Planning
 - . County/Municipal/Regional Health Department
 - . County Solid Waste Coordinator
 - . DL&PS, Division of State Police
 - . DEPE, Division of Responsible Party Site
Remediation
 - . EPA

2. VERIFICATION

Any of the following agencies may assist in verifying the complaint:

- a. DEPE, Division of Solid Waste Management
- b. DL&PS, Environmental Prosecutor's Office
- c. DOH, Division of Epidemiology and Communicable Disease Control
- d. DL&PS, Division of Criminal Justice
- e. County/Municipal/Regional Health Departments

- f. County Solid Waste Coordinators
- g. DL&PS, Division of State Police
- h. EPA

3. RESPONSE

Any of the following agencies may respond to complaint:

- a. DEPE, Division of Solid Waste Management
Office of Recycling and Planning
- b. DL&PS, Environmental Prosecutor's Office
- c. DOH, Division of Epidemiology and
Communicable Disease Control
- d. DL&PS, Division of Criminal Justice
- e. County/Municipal/Regional Health Departments
- f. County Solid Waste Coordinators
- g. DL&PS, Division of State Police
- h. EPA

C. WASTE FLOW VIOLATIONS

1. NOTIFICATION

- a. DEPE, Division of Solid Waste Management
Bureau of Inspections and Investigations

2. VERIFICATION

Any of the following agencies may assist in verifying reported violation:

- a. DEPE, Division of Solid Waste Management
Bureau of Inspections and Investigations
- b. DEPE, Division of Solid Waste Management
Office of Recycling and Planning
- c. County/Municipal/Regional Health Departments
- d. County Solid Waste Coordinators

3. RESPONSE:

Any of the following agencies may respond to alleged violation:

- a. DEPE, Division of Solid Waste Management
Bureau of Inspections and Investigations
- b. DL&PS, Environmental Prosecutor's Office
- c. DEPE, Division of Solid Waste Management
Office of Recycling and Planning
- d. County/Municipal/Regional Health Departments
- e. County Solid Waste Coordinators
- f. DL&PS, Division of State Police

III. INTERAGENCY CONTACTS

A. AGENCY TELEPHONE NUMBERS:

1. DEPARTMENT OF ENVIRONMENTAL PROTECTION AND ENERGY:

Division of Solid Waste Management
Bureau of Inspections and Investigations -
Scott Brubaker (609) 584-4250
(Field Office)
Alan Kaczoroski (609) 530-8895 x308

Division of Solid Waste Management
Recycling and Planning Element -
Ronald Dotsey (609) 530-8595

Office of Enforcement Coordination -
David Rosenblatt (609) 984-3285

Division of Responsible Party Site Remediation
Bureau of Emergency Response -
Stanley Delikat (609) 633-2168

Division of Responsible Party Site Remediation
Environmental Hotline -
Charles Krauss (609) 633-2930

Press Office
Becky Taylor (609) 292-2994

2. DEPARTMENT OF HEALTH:

Division of Epidemiology and Communicable Disease
Control
James Blumenstock (609) 588-3120
Anthony Monaco (609) 588-3124

3. DEPARTMENT OF LAW AND PUBLIC SAFETY:

Division of Criminal Justice
Environmental Prosecution Section -
Wayne Smith (609) 984-4470

Division of State Police
Field Operations Section (609) 882-2000
Marine Bureau - Captain James Momm
Aviation Bureau - Lieutenant John R. Neeld
x2926

Environmental Prosecutor's Office
Steven Madonna (609) 292-3924

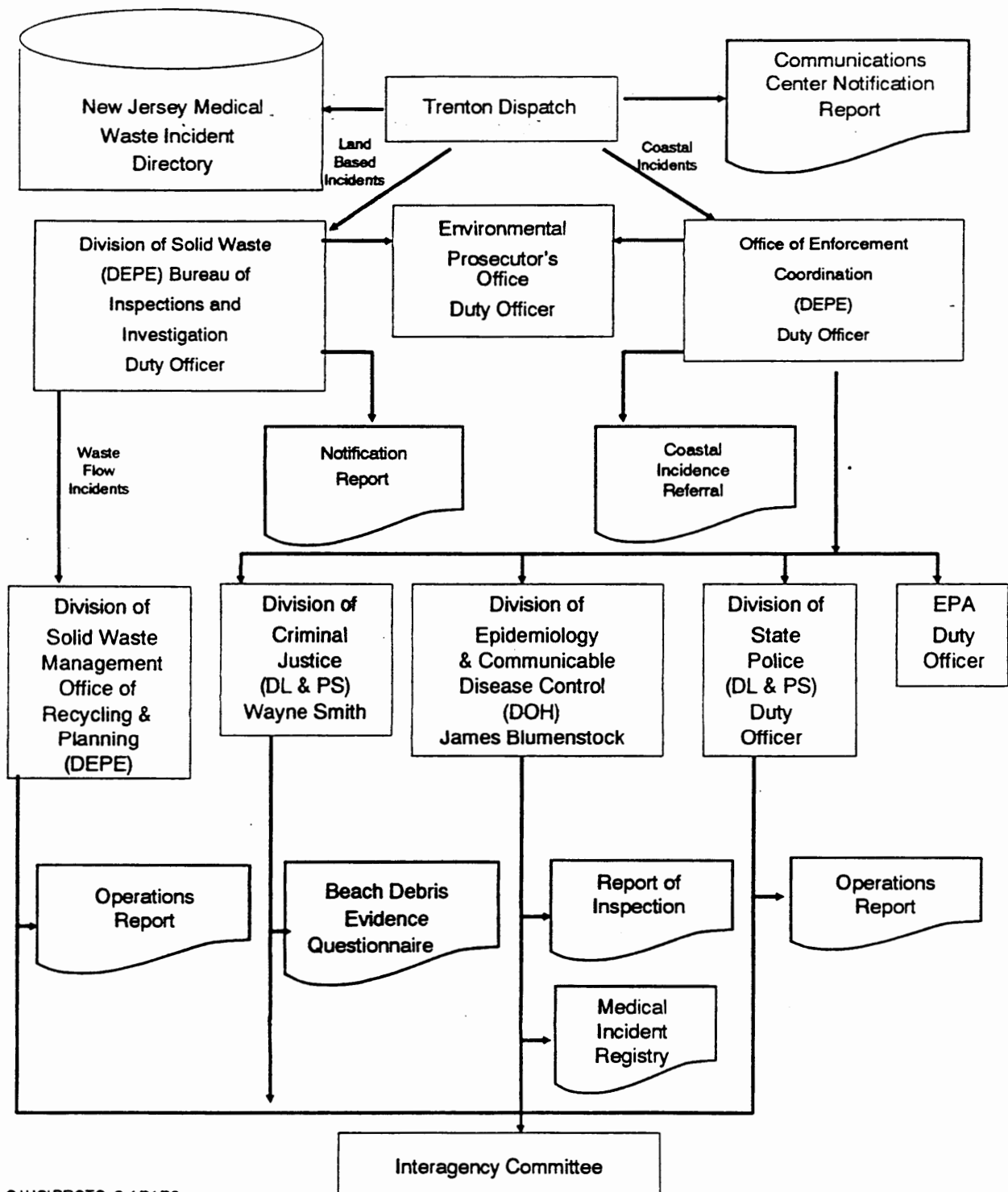
4. UNITED STATES ENVIRONMENTAL PROTECTION AGENCY:

Region II Headquarters -
Duty Officer (212) 264-5166

B. AGENCY DOCUMENTATION

1. Refer to page 17, New Jersey Documentation Protocol of Medical Waste and Marine Floatables Incident Response.
2. Refer to Attachment 4. Agency Incident Reports.

NEW JERSEY DOCUMENTATION PROTOCOL FOR MEDICAL WASTE AND MARINE FLOATABLES INCIDENT RESPONSE 1992 FLOW DIAGRAM



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SECTION III - D. ATTACHMENTS

The attachments are as follows:

1. Local Health Departments
2. List of District Solid Waste Management Officials
3. Confidential Telephone Numbers
4. Agency Incident Reports (Sample Documentation Forms)

Attachments are not included in State Plan.



State of New Jersey

DEPARTMENT OF LAW AND PUBLIC SAFETY
OFFICE OF THE ENVIRONMENTAL PROSECUTOR
25 MARKET STREET
CN118
TRENTON, NEW JERSEY 08625-0118
TELEPHONE: 609-292-3924

ROBERT J. DEL TUFO
ATTORNEY GENERAL

STEVEN J. MADONNA
STATE ENVIRONMENTAL PROSECUTOR

MEMORANDUM

TO: HEALTH OFFICERS, CHIEFS OF POLICE,
NATIONAL PARK SERVICE & OTHER INTERESTED PARTIES

FROM: Steven J. Madonna
Assistant Attorney General
State Environmental Prosecutor

DATE: May 15, 1992

RE: Medical Waste Wash-ups - 1992 Shore Season

By Executive Order of January 24, 1990, Governor Jim Florio created the position of State Environmental Prosecutor charged with establishing a coordinated policy for civil, criminal, and administrative enforcement of New Jersey's environmental statutes.

In accordance with this responsibility, I have reviewed and approved the attached policies and procedures for multi-agency response to incidents of medical waste wash-ups. It is stressed that the notification and information management procedures established in the attached guidance document must be strictly adhered to in order to ensure that all episodes are handled in an effective and efficient manner.

In anticipation of a safe, healthy and successful summer season along our shoreline, I would like to take this opportunity to acknowledge and commend your efforts and dedication to this important project and assure you of the commitment of this office to assist in every way possible.

S.J.M.

/bz
Attachments



State of New Jersey

DEPARTMENT OF HEALTH

DIVISION OF EPIDEMIOLOGY AND
COMMUNICABLE DISEASE CONTROL
CN 369, TRENTON, N.J. 08625-0369

FRANCES J. DUNSTON, M.D., M.P.H.
STATE COMMISSIONER OF HEALTH

May 15, 1992

TO: Health Officers, Chiefs of Police, National Park Service, and
Other Interested Parties

FROM: Mr. James S. Blumenstock JSB

SUBJECT: Medical Waste Wash-ups

In preparation for the upcoming recreational bathing season, enclosed you will find the department's recently revised guidance document entitled "Safeguards To Be Employed In the Collection, Removal, and Disposal of Medical Wastes Involved in Beach Wash-ups." As you are well aware, there has been a growing concern over and an increased public awareness of floatables impacting on the shorelines of this state. Floatables (solid wastes that float or remain suspended in the water column) not only represent a source of pollution that degrades the aesthetic quality of our recreational waters but may pose a human health and safety risk as well, regardless if these wastes are inadvertently or intentionally introduced into the waterways. Since a number of floatables sightings and wash-ups have involved medical wastes, the State Department of Health recognized the need to disseminate information on the proper handling and disposal of these special types of wastes so as to minimize or eliminate the potential risks associated with the handling of medical wastes. For this reason, the referenced guidance document has been prepared and distributed to the appropriate authorities, including hospital emergency rooms.

As in the years past, the State Departments of Environmental Protection and Energy, Law and Public Safety (Divisions of Criminal Justice and State Police), and Health will augment local and county efforts in the monitoring of ocean water quality and responding to and investigating pollution incidents. Additionally, the involvement of these departments will be coordinated through the Office of the State Environmental Prosecutor which will also be an integral part of these activities. As such, the enclosed document entitled "Policies and Procedures Governing Multiagency Response and Coordination to Medical Waste Wash-up Incidents" is being provided for your reference and assistance and shall supercede all other policies and procedures on this issue.

I want to take this opportunity to thank you for your continued cooperation and assistance in this matter. Should you have any questions, feel free to contact me at (609) 588-3120.

Enclosures

- c Steven J. Madonna, State Environmental Prosecutor
 - Gary Sondermeyer, DEPE, Division of Solid Waste Management
 - David Rosenblatt, DEPE, Division of Enforcement Policy
 - Captain James Momm, Division of State Police
 - James Glassen, Division of Criminal Justice
 - Charles Krauss, DEPE, Office of Emergency Response
 - Stanley Delikat, DEPE, Office of Communications
-



State of New Jersey

DEPARTMENT OF HEALTH

DIVISION OF EPIDEMIOLOGY AND

COMMUNICABLE DISEASE CONTROL

FRANCES J. DUNSTON, M.D., M.P.H.
STATE COMMISSIONER OF HEALTH

CN 369, TRENTON, N.J. 08625-0369

POLICIES AND PROCEDURES GOVERNING MULTIAGENCY RESPONSE AND COORDINATION TO MEDICAL WASTE WASH-UP INCIDENTS REVISED: MAY 15, 1992

NOTIFICATION AND INFORMATION MANAGEMENT

- o All incidents of medical waste strandings or sightings shall be reported as soon as practicable directly to the Department of Environmental Protection and Energy's Environmental Hotline ("Trenton Dispatch") at (609) 292-7172. The Division of Criminal Justice "Beach Debris Evidence Questionnaire" shall be completed only with respect to material having evidentiary value as set forth in paragraph 2 (next page) under the section entitled "Material Storage, Collection, and Disposal." Trenton Dispatch will maintain the central state registry for these incidents.
- o The following information shall be provided during this notification:
 - Time, date, and location of stranding/sighting.
 - Type and amount of material involved.
 - Name, telephone number, and affiliation of contact person.
- o In addition to the above, if the below listed exceptional circumstances exist, the following information must also be conveyed to the Environmental Hotline:
 - Citizen exposure to medical waste (e.g., cut, scratch, or puncture).
(NOTE: These incidents must be reported immediately.)
 - Medical wastes that may have value as evidence (identifying markings indicating source or point of origin) or are unusual materials such as blood vials or laboratory wastes (in these situations, the cases would be referred by the Department of Environmental Protection and Energy (DEPE) to the State Environmental Prosecutor who will coordinate with the appropriate enforcement agencies).
 - If technical guidance or manpower assistance is needed in responding to the incident, this request should also be conveyed to the Environmental Hotline dispatcher.

STATE RESPONSE

Once initial notification is made to the Environmental Hotline, the information will be provided to a DEPE Duty Officer who will assess the situation to determine the degree of state response. The DEPE Duty Officer will also notify the applicable state agencies (e.g., State Environmental Prosecutor, Division of Criminal Justice, Department of Health, etc.) where appropriate and necessary.

MATERIAL STORAGE, COLLECTION, AND DISPOSAL

- o As outlined above, basically three categories of medical waste may be presented to you for action: 1) "routine;" 2) material having evidentiary value; and 3) medical waste causing citizen exposure and/or injury.
 - 1. Routine medical waste, that is, incidental materials that periodically wash-up but do not fall into the other two categories, shall be stored in a safe and secure manner (refer to enclosed guidelines). If and when an accumulation of this type of medical waste occurs, the local police or health department should notify DEPE's Division of Solid Waste Management Duty Officer at (609) 584-4250 who will dispatch appropriate personnel to pickup the material within an arranged period of time.
 - 2. The Division of Criminal Justice "Beach Debris Evidence Questionnaire" shall be completed as soon as practicable for all material having evidentiary value. The materials shall be stored under security, separate from other materials, and rules of evidence management, including chain of custody, shall be initiated. A state investigator will be dispatched in a timely fashion to retrieve the material.
 - 3. Medical waste causing exposure or injury shall also be kept separate and stored under security until picked up by the Department of Health for examination. Notification must be initiated immediately.



State of New Jersey
DEPARTMENT OF LAW AND PUBLIC SAFETY
DIVISION OF CRIMINAL JUSTICE

MARINE POLLUTION UNIT
BEACH DEBRIS EVIDENCE QUESTIONNAIRE

ITEM(S) FOUND BY:

NAME

[] Citizen • Permanent Address • Local Address

Street

Street

City, State, Zip

City, State, Zip

() -
Telephone Number

() -
Telephone Number

[] Agency

Agency Name

() -
Telephone Number

WHERE ITEM(S) WERE FOUND:

WHEN WERE ITEM(S) FOUND

City/Town:

Date:

Beach:

Time:

Street:

By Whom:

Other than above write address on back

LOCATION OF ITEM(S) FOUND:

INJURIES REPORTED

- [] Water
[] At Water's Edge
[] Between High Tide Line & Water
[] Beyond High Tide Line (Beach)
[] In Dunes
[] Under Boardwalk
[] Other

Name:

Nature:

Address:

Telephone:

Describe:

State DOH Notified: [] Yes
[] No

DESCRIPTION OF ITEM(S):
NON-MEDICAL WASTE

MEDICAL RELATED WASTE

QTY.

- [] Prescription Bottle(s)
[] Yes or [] No Identification on Bottle
 If yes, retain
[] Drug Paraphernalia
 (crack vials, druggist papers, etc.)
[] Fireworks
[] Shopping Bags (w/logos retain)
[] Trash Retain any with dates
 or identifiers

QTY.

- [] Hypodermic Syringes
[] Dialysis Bags
[] Blood Vials
Labels or markings
[] Yes or [] No
[] Tubing
[] Small Vials

Other

Retain all Medical Waste

DISPOSITION OF ITEM(S) FOUND:

[] Discarded, send form to NJDCJ, Marine Pollution Unit, Justice Complex,
 CN 085 Trenton, New Jersey 08625

[] Retained

By Whom:

Name

IF RETAINED CONTACT NJDCJ
MARINE POLLUTION UNIT
(609) 984-4470

Agency



State of New Jersey
DEPARTMENT OF HEALTH
DIVISION OF EPIDEMIOLOGY AND
COMMUNICABLE DISEASE CONTROL
CN 369, TRENTON, N.J. 08625-0369

RANCES J. DUNSTON, M.D., M.P.H.
STATE COMMISSIONER OF HEALTH

**SAFEGUARDS TO BE EMPLOYED IN THE COLLECTION, REMOVAL, AND DISPOSAL OF
MEDICAL WASTES INVOLVED IN BEACH WASH-UPS**

REVISED: MAY 15, 1992

A. INTRODUCTION

This document prescribes prudent safeguards to be employed while handling medical wastes involved in shoreline wash-ups in order to minimize or eliminate the potential risks associated with such activities. It must be emphasized that this guidance is only applicable to incidents requiring the handling of medical wastes as a result of floatables debris wash-ups and should not be applied to situations where exposure to medical wastes is occupationally related (e.g., health care workers, emergency medical personnel, law enforcement, etc.) where the types of exposure and degree of risk may be different.

B. EVIDENCE COLLECTED AND PRESENTED BY INDIVIDUALS

- When medical wastes are presented to you by individuals, note the time, date, and location of the sighting or stranding and report the incident to the Department of Environmental Protection and Energy's Environmental Hotline at (609) 292-7172.

- If the individuals appear to have had direct contact with the material, recommend that they thoroughly wash their hands.
- Determine if parenteral exposure occurred such as a needle puncture, laceration, fluid contact with an existing open sore or wound, etc. If so, refer to the section entitled "Medical Concerns."
- If appropriate and necessary, allay the individuals' fears and provide the reassurance that casual, incidental, environmental exposure of this type poses virtually no risk of contracting a communicable disease such as hepatitis or acquired immunodeficiency syndrome (AIDS).

C. COLLECTION OF MEDICAL WASTES

- Direct contact with the material should be avoided. Shovels and rakes should be used when a manual cleanup is necessary. Forceps are extremely useful since they eliminate the need for direct contact and provide the dexterity needed for evidence collection and site remediation. If direct contact cannot be avoided, protective gloves (puncture resistant and impervious) should be issued and worn.

- During cleanup activities, beach crews should be instructed to wear foot protection (no bare feet) and such activities should be supervised by an adult. Personnel should be briefed on the standard operating procedures and safeguards prior to commencing such activities.
- Adhere to the policies and procedures established by the Department of Environmental Protection and Energy for the storage and disposal of medical wastes and other floatable debris. All medical waste should be stored in rigid, puncture proof, labeled, and covered containers pending final disposition.

D. MEDICAL CONCERNS

The medical risks from accidental exposure to medical waste vary with the type of medical waste and the condition of the waste at the time of exposure. In general, the only exposures of concern are parenteral, mucous membrane, or cutaneous exposures to non intact skin. If any individuals report such exposures, the following guide should be used.

- Administration of appropriate first aid.
- Consultation with a physician on the following:
 - Tetanus - Determine the vaccination status of the individual and if post-exposure prophylaxis is warranted.
 - Hepatitis B - After assessing the nature and degree of exposure, a determination should be made if post-exposure prophylaxis is warranted.

Hepatitis B is a hardy virus that can be transmitted through a needlestick injury. Approximately 7 percent of intravenous drug abusers are positive for the HBsAg. The vaccine series alone (without HBIG) has not been widely tested for needlestick injuries. However, the vaccine series (without HBIG) is 70-85 percent effective in preventing transmission in newborns. Since the viral load that a newborn receives from its mother is much greater than the viral load received with a needlestick, the vaccine series alone should be even more effective in preventing hepatitis B from needlestick injuries. The vaccine will also provide protection for future exposures. Three vaccines are currently licensed in the United States (Heptavax-B, Recombivax HB, Engerix-B). The package insert for the product chosen should be consulted for the appropriate dose of vaccine.

The recommended management of needlestick injuries is outlined in the table below, taken from the 1991 ACIP recommendations.(1) In most cases in which the Department of Health is contacted, the source of the blood or needle is unknown. In these cases, it is recommended that the hepatitis B vaccine series be initiated. This will provide protection not only against this needlestick exposure but also against future exposures. If the source of the needle can be tested for HBsAg, this should be done. If it is positive, HBIG should be added for an extra measure of protection.

- (1) Centers for Disease Control, "Hepatitis B Virus: A Comprehensive Strategy for Eliminating Transmission in the United States Through Universal Childhood Vaccination, Recommendations of the Immunization Practices Committee," MMWR, November 22, 1991.

TABLE A1. Recommendations for hepatitis B prophylaxis following percutaneous exposure

Exposed person	Treatment when source is found to be		Unknown or not tested
	HBsAg positive	HBsAg negative	
Unvaccinated	Administer HBIG x 1* and initiate hepatitis B vaccine†	Initiate hepatitis B vaccine†	Initiate hepatitis B vaccine†
Previously vaccinated			
Known responder	Test exposed person for anti-HBs 1. If adequate, no treatment 2. If inadequate, hepatitis B vaccine booster dose	No treatment	No treatment
Known non-responder	HBIG x 2 or HBIG x 1, plus 1 dose of hepatitis B vaccine	No treatment	If known high-risk source, may treat as if source were HBsAg positive
Response unknown	Test exposed person for anti-HBs† 1. If inadequate, HBIG x 1, plus hepatitis B vaccine booster dose 2. If adequate, no treatment	No treatment	Test exposed person for anti-HBs† 1. If inadequate, hepatitis B vaccine booster dose 2. If adequate, no treatment

*Hepatitis B immune globulin (HBIG) dose 0.06 mL/kg intramuscularly.

†Hepatitis B vaccine dose—see Table 1.

‡Adequate anti-HBs is ≥ 10 milli-international units.

- Human Immunodeficiency Virus (HIV) - The risk of HIV infections, even from a needlestick of this type freshly contaminated with HIV positive blood, is very low. Since the virus is very susceptible to temperature changes and drying, in most cases where medical waste has washed up on a beach, the conditions are such that there is virtually no risk of contracting AIDS and serological testing for HIV infection and treatment is, therefore, not warranted. For additional information, attached is a fact sheet entitled "AIDS Infection and Medical Wastes In the Ocean," prepared by the State University of New York at Stony Brook.

It is important to mention, however, that needles found in other locations (for example, a park or street) may not have been exposed to these conditions. As such, each situation must be evaluated separately based upon whether blood is present, how long the needle was in the environment, nature of exposure, and whether the needle was likely to come from a drug addict. The Department of Health will provide the necessary assistance in assessing these exposure situations to determine the appropriate course of action.

- Report incident immediately to the State Department of Health (James S. Blumenstock, Director of Consumer Health Services (609) 588-3120 or Mr. Donald Bracken, Medical Waste Management Project at (609) 588-3124.)

E. ASSISTANCE

If at any time you require assistance (technical guidance or manpower support) contact the New Jersey State Department of Health:

James S. Blumenstock, Director of Consumer Health Services
(609) 588-3120

Anthony T. Monaco, Program Manager, Public Health Sanitation & Safety Program (609) 588-3124

Mr. Donald Bracken, Research Scientist, Public Health Sanitation and Safety Program (609) 588-3124

The State Department of Health can also be reached after hours and on weekends through an answering service by calling (609) 392-2020.

Attachment

FACT SHEET ON AIDS INFECTION AND MEDICAL WASTES IN THE OCEAN

CAN I GET AIDS FROM MEDICAL WASTE IN THE WATER OR STRANDED ON BEACHES?

The risk of acquiring AIDS through floatable materials is close to zero. Here's why:

In order for transmission of any infection to occur, all of the following four links in the chain of infection must be present and not broken:

There must be an organism present capable of causing human disease.

It must be present in sufficient numbers to cause infection:

1. it must be present in large enough numbers to begin with and able to survive exposure to air, water, sediment, and sewage, or
2. it must be present in small numbers to begin with and grow to large enough numbers subsequently.

Exposure must occur by a route capable of causing infection:

1. it must escape any vessel or intermediate host, for example, an animal, and
2. it must enter a person's body by a route that will result in the survival and growth of the organism.

There must be a susceptible person who is exposed in this manner.

In marine systems, the chain has usually been broken at several points by the time a beachgoer or bather encounters the medical waste.

For AIDS, each step along the way, except the last one, everyone is believed susceptible to infection with the

AIDS virus (HIV), is likely to be broken:

1. Only a small percentage of any medical waste in the ocean or on shore is likely to come from someone who was infected with HIV.

2. The amount of virus in freshly drawn blood is very small to begin with. When the virus is out of the body, in a vial or syringe, it does not reproduce. *In fact, it promptly begins to die off.* Thus, within hours, the amount of live virus left, if any, is likely to be a very small fraction of the initial amount. This does not include the diluting and hostile effects of exposure to external environmental conditions.

3. The known routes of exposure that can transmit HIV are sexual activity, injection into the blood stream, transfer from mother to fetus and, very rarely, by splash of fresh blood onto opened skin or mucous membranes of health care workers.

Experience with hundreds of family members of AIDS patients, who have not become infected despite daily casual contact with their infected relatives, strongly suggests that similar contact with beach waste is not going to cause infection by HIV.

4. Finally, even if puncture occurs with a needle connected to a syringe containing HIV-infected blood, one would have to somehow simultaneously get that blood injected through the needle before one would risk infection.

Data from the Centers for Disease Control (CDC) show that health care workers who stick themselves with freshly drawn blood from someone known to be infected with HIV have a less than 1 in 200 chance of becoming infected.

When considering these facts, it is clear that the likelihood of infection from contact with medical waste on the beach is close to nil.



APPENDIX B

MEMORANDUM OF UNDERSTANDING BETWEEN THE DEPARTMENT OF ENVIRONMENTAL PROTECTION AND ENERGY AND DEPARTMENT OF HEALTH SPECIFIC TO REGULATED MEDICAL WASTE ACTIVITIES

WHEREAS significant programmatic and administrative agreements have been reached between the Department of Environmental Protection and Energy ("DEPE") and the Department of Health ("DOH" and together "the Departments") specific to regulated medical waste activities as authorized and required by the Comprehensive Regulated Medical Waste Management Act, N.J.S.A. 13:1E-48.1 et seq. (P.L. 1989, c. 34);

WHEREAS the Departments wish to memorialize these agreements in a Memorandum of Understanding which reflects a spirit of cooperation and commitment for the joint administration of a program to be accomplished in an effective and efficient manner;

NOW THEREFORE, by the authority vested in the Commissioner of DEPE by N.J.S.A. 13:1B-3, and the authority vested in the Commissioner of DOH by N.J.S.A. 26:1A-15, we do hereby agree to the following:

I Role of the Agencies Generally

1.01 DEPE will generally serve as the lead agency in regard to implementation of the regulated medical waste program. DEPE will also serve as the State liaison to the U.S. Environmental Protection Agency ("USEPA") for purposes of this program.

1.02 DOH will serve primarily in a secondary and consultative role.

1.03 On or about July 1 of every year, the Departments will together develop a work plan for the coming fiscal year which plan shall include the scope of work for the program, division of labor between the Departments, assignment of tasks and the time frames for completion of those tasks based on available staff and other resources and based upon established priorities for the upcoming year. This annual work plan shall be periodically reviewed during the course of the year and be revised as necessary.

II Compliance Inspections

2.01 Compliance inspections of regulated medical waste generators shall be conducted in accordance with the following division of labor:

A. DOH will have primary responsibility and jurisdiction over the following categories of generators:

- licensed health care facilities including hospitals, long-term care facilities, residential care facilities, ambulatory care facilities, drug and alcohol treatment facilities, etc.

- clinical laboratories

- blood banks

- State institutions (e.g. Departments of Corrections and Human Services)

B. DEPE will have primary responsibility and jurisdiction over the remaining categories of regulated medical waste generators such as physicians, dentists, veterinarians, funeral homes, research and development facilities.

C. Variation from the compliance inspection responsibilities set forth at A. and B. above may be necessary in order to achieve workload equity between the Departments or for purposes of cross-training. Except in the case of emergencies, variation from standard inspection assignments shall be with the advance, mutual consent of both Departments. In the case of an emergency where it is not possible to obtain advance consent, the responding agency which conducts the inspection shall inform the other Department at its earliest opportunity of the actions taken and the circumstances necessitating a deviation from the established division of labor and responsibility.

III Enforcement

3.01 DEPE will be responsible for processing all administrative and/or civil enforcement actions taken as a result of compliance inspections or other investigations conducted by either DOH or DEPE.

A. The Departments will use rules, regulations and established policies and procedures including Violation Classification Criteria and the Penalty Assessment Guidelines set forth at N.J.A.C. 7:26-5.1 et seq. in completing inspection reports and other documentation in support of a violation.

B. In cases where DOH has conducted the inspection upon which enforcement action is to be based, DOH will forward all requests to take enforcement action directly to DEPE, Division of

Solid Waste Management, Enforcement Element along with copies of all pertinent documents such as inspection reports and correspondence. In these instances, DOH will make its inspectors available for any necessary case preparation and/or testimony and will provide expert witness testimony, if necessary. DEPE will provide DOH periodic status reports on all requests for enforcement action forwarded to it including a report upon final disposition of each request.

C. To ensure consistency and standardization in all enforcement related activities, key management level enforcement personnel from both Departments will meet at least on a monthly basis to discuss issues and disseminate information regarding such topics as interpretations of federal and State laws and regulations, pending enforcement actions, workload, enforcement strategies and priorities.

D. To further ensure consistency and standardization and to foster an exchange of ideas and knowledge, periodic training sessions attended jointly by both DEPE and DOH field inspection staff will be held by mutual consent and will be administered by appropriate personnel within the responsible divisions of each Department. These sessions shall be held as frequently as necessary with at least one held every six months.

IV Reporting Format

4.01 All inspection reports and administrative correspondence such as "Notices of Violation" shall be prepared using standardized forms and/or formats developed jointly by the Departments.

4.02 Using a standardized reporting format developed in accordance with §4.01, the DOH will provide DEPE with monthly activity reports by the 15th of every month for a reporting period covering the preceeding calendar month. DEPE will then prepare a "State Report" to be submitted to the USEPA as required by the terms of the federal "Regulated Medical Waste Demonstration Program."

V General Administration of the Program

5.01 Both Departments shall establish a mechanism to ensure the effective and timely sharing of pertinent information. This shall include but not be limited to correspondence generated and received; directives and guidance from USEPA; availability of training courses, conferences and seminars; vendor literature; technical publications and releases; media coverage.

5.02 DEPE will consult with DOH on all USEPA Notices of Grant

Availability for regulated medical waste initiatives for the purpose of evaluating the necessity for and feasibility and logistical implementation of the grant(s) prior to making application for such grants.

5.03 In accordance with the work plan developed pursuant to §1.03, above, the Departments will work jointly and cooperatively in the development and eventual implementation of the Comprehensive Regulated Medical Waste Management Plan required to be developed and submitted to the Governor and Legislature by N.J.S.A. 13:1E-48.13.

5.04 The Departments will jointly study and evaluate all medical waste treatment and disposal technologies and will collaboratively draft regulatory standards governing these processes which regulations will be promulgated in accordance with the Administrative Procedure Act, N.J.S.A. 52:14B-1 et seq.

5.05 All rule or regulation revisions initiated by DEPE affecting the regulated medical waste program shall be performed in consultation with DOH.

5.06 To ensure that appropriate, reasonable, and uniform interpretations of the federal and State regulated medical waste rules are issued by the Departments, DOH will provide management level representation at all weekly DEPE Medical Waste Advisement Unit briefings. Furthermore, DOH will be available to DEPE for technical consultation purposes regarding the issuance of interpretations and guidance as the need arises. The DEPE will forward to DOH drafts of technical interpretations of an unusual nature or significant degree of difficulty and complexity for review by and concurrence of DOH prior to issuance by DEPE.

5.07 DEPE will develop, implement and serve as the primary custodian of the Regulated Medical Waste Electronic Data Management System. DOH, using specifications provided by DEPE, will purchase the necessary Data Management hardware to interface with this system for the purpose of data entry and retrieval.

5.08 The Departments will pool their resources to form an informal bi-agency "speakers bureau" on regulated medical waste to meet the ever increasing demand for competent and informative presentations on this subject matter to the regulated community, academic groups, public officials, and the general public. Scheduling will be coordinated and assignment will be made by management of the respective Departments based on staff availability, specific subject matter to be addressed, and areas of expertise.

5.09 In accordance with N.J.S.A. 13:1E-48.26 (P.L. 1989, c. 34, §31), monies collected from the registration fees imposed on generators, transporters and disposal facilities "shall be utilized by the Departments to administer and enforce this act, and shall be allocated as follows: 75% to (DEPE) and 25% to (DOH)." As the agency which administers the registration program and collects the fees, DEPE will, on a quarterly basis transfer to DOH 25% of the total fee revenues collected. DEPE will also provide DOH with a financial statement substantiating the transfer of funds.

5.10 DOH will provide disposal service for all regulated medical waste in the possession of or which comes into the possession of DEPE as a result of evidence collection, beach wash-up removal and minor site remediations necessitated by the illegal abandonment or disposal of regulated medical waste or transportation accidents.

A. DOH's Division of Public Health and Environmental Laboratories will develop standard operating procedures to be followed by DEPE and DOH in regard to the delivery of regulated medical waste to DOH for disposal which procedures shall be consistent with all applicable provisions of N.J.A.C. 7:26.

B. Compensation for expenses incurred by DOH for such disposal services will be from the funding provided to DOH as described at §5.09, above.

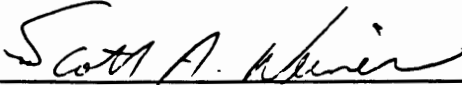
5.11 On an annual basis, the Departments will convene a meeting of applicable agencies for the purpose of reviewing and revising, if necessary, the "Interagency Protocol for Incident Response to All Medical Waste and Marine Floatables Incidents."

VI Amendment of MOU

The terms of this Memorandum of Understanding may be altered or amended in writing and signed by the respective parties except that minor technical or operational amendments may be made in writing and signed by the Director, Division of Solid Waste Management, DEPE and the Director, Consumer Health Services, DOH.

VII Effective Date

This Memorandum of Understanding shall become effective upon execution by the undersigned parties.



Scott A. Weiner
Commissioner
Department of Environmental
Protection and Energy



Frances J. Dunston, M.D., M.P.H.
Commissioner
State Department of Health

DATE: October 10, 1991

DATE: 10/28/91

Approved as to form:

ROBERT J. DEL TUFO
Attorney General of the
State of New Jersey

By:  9/19/91
Catherine A. Tormey, DAG

APPENDIX C



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION II

JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, NEW YORK 10278

DEC 26 1989

Joseph Rogalski, Assistant Director
Solid Waste Enforcement
Division of Solid Waste Management
New Jersey Department of Environmental Protection
401 East State Street CN-414
Trenton, NJ 08625-0414

Dear Mr. Rogalski:

Enclosed is a copy of the signed Memorandum of Agreement (MOA) between our two agencies with respect to enforcement of the EPA and NJDEP medical waste regulatory programs.

The MOA describes how we will coordinate our inspection, enforcement and response action activities. Attached to the MOA is the revised EPA Violation Classification Procedures.

Thank you for your cooperation in finalizing the MOA in a timely manner. I look forward to working with you in ensuring that medical waste is properly managed.

Sincerely yours,


George C. Meyer, P.E.
Chief, Hazardous Waste Compliance Branch

Enclosure

MEMORANDUM OF AGREEMENT (MOA)

Between

United States Environmental Protection Agency

and

The New Jersey Department of Environmental Protection

Division of Solid Waste Management

Introduction and Purpose

The Medical Waste Tracking Act, (MTWA) was enacted by Congress in November, 1988. The USEPA promulgated implementing regulations on March 24, 1989, which became effective June 22, 1989. Part of the USEPA's strategy for implementing the MTWA involves compliance inspections of regulated handlers, enforcement against medical waste handlers for violations of the MTWA regulations and responding to medical waste disposal incidents.

The NJDEP will also be conducting inspections and taking enforcement actions pursuant to its own laws and regulations. This MOA sets forth the manner in which the NJDEP and USEPA will coordinate in the administration of their respective programs.

Parties to MOA

The Air and Waste Management (AWM) Division of the Region II Office of the USEPA is responsible for implementing the MTWA and entering into MOA's, as appropriate. Once the MOA is signed, the USEPA contact regarding specific requests for assistance will be the Chief of the Hazardous Waste Compliance Branch (HWCB), (212) 264-8356. The NJDEP Division of Solid Waste Management Enforcement Element has overall responsibility for implementing the State Medical Waste program. The contact will be the Section Chief of Medical Waste Operations, 609-984-3158.

Duration of MOA

This MOA will become effective on the date the MOA is signed by both parties and will continue in force until 30 days after the MTWA two year demonstration program ends. The MTWA demonstration program ends June 22, 1991. If either party wishes to terminate the MOA prior to July 22, 1991, then a letter stating such will be provided to the other party at least 30 days in advance of the termination date. If either party wants to revise the MOA, then the prepared revision must be in writing and signed by the party initiating the revision and sent to the other party of the MOA.

Meetings

EPA and NJDEP will meet on a periodic basis (every 3-4 months) to review the progress of this program and discuss any problem areas.

Director

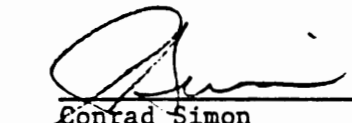
Division of Solid Waste Management
N.J.D.E.P.


John V. Czapora

9/27/89
Date

Director

Air and Waste Management Division
USEPA Region II


Conrad Simon

11/2/89
Date

JAR:ekp

APPENDIX D - TABLE 37 - pg 1 of 4 - SUMMARY OF NEW TECHNOLOGY DATA

NAME	PROCESS	REDUCTION VOLUME & WEIGHT	FINAL WASTE FORM	WASTE HANDLING CAPACITY (a)	WASTES TREATED (CLASSES 1-7)
MeDETOX	wet oxidation	vol. 60% wt. 0	Municipal solid waste	200 lbs/hr	1,2,3,4,6,7 5-limited
San-i-pak	sterilization compaction	vol. 80% wt. 0	Treated RMW	50-350 lbs/hr	1,3,4,6,7 2,5-limited
Medical SafeTec	disinfection shredding	vol. 87.5% wt. gain	municipal solid waste	100-1500 lbs/hr	2,4,7
Sanitec Disinfection System	microwave trmt. shredding	vol. 80% wt. 0	municipal solid waste	165-275 lbs/hr	1,4,6,7
Pure Flow Process	chemical treatment grinding	vol. variable wt. variable	liquid discharge	variable	1,2,3,5,6
Plasma Energy System	pyrolyzation	vol. not avail. wt. not avail.	vittrified material	1-250 tons/day	not available
DS-100 Sharps Disposal System System	thermal treatment mechanical destruc.	vol. 15% wt. 0	municipal solid waste	1 quart/hr	4,7
MediSter	microwaving & shredding	vol. reduced wt. none	municipal solid waste	1101 lb/hr	NA
Stericycle A	gamma irradiation, shredding & recycling	vol. reduced wt. none	30% reclaimed plastics; 70% refuse derived fuel	28,000,000 lb/yr	1,4,5,6,7 3-limited
Stericycle B	electro thermal deactivation, shredding & recycling	vol. reduced wt. none	40% reclaimed plastics; 60% refuse derived fuel	30,000,000 lb/yr	1,4,5,6,7 2,3-limited

APPENDIX D - TABLE 37 - pg 2 of 4 - SUMMARY OF NEW TECHNOLOGY DATA (cont'd.)

NAME	PROCESS	REDUCTION VOLUME & WEIGHT	FINAL WASTE FORM	WASTE HANDLING CAPACITY (a)	WASTES TREATED (CLASSES 1-7)
Isolyser	disinfection encapsulation	vol. gain wt. gain	treated regulated medical waste	NA	4,7-limited
Mini electric needle destroyer	NA	NA	NA	NA	4,7-limited
Plastic Syringe Thermal Compactor	Thermal treatment and compaction	vol. 80% wt. none	self-encapsulated regulated medical waste	50-100 syringes/hr	4,7-limited
Pyroxidizer (Partnership Limited)	Thermal treatment pyrolyzing Oxidizing	vol. 99% wt. 98%	hazardous solid waste	10-40 lb/hr	1,2,3,4,5,6,7
Commercial Incinerator	Thermal Treatment Oxidation	vol. NA wt. NA	municipal solid waste	varied	1,2,3,4,5,6,7
C.T.I. Pro Disposal System	Compaction	vol. NA wt. none	compacted regulated medical waste	NA	NA
Omega SDS 100	Chemical treatment grinding	vol. NA wt. NA	municipal solid waste	NA	4,7-limited
Rightway Disposal System	Treatment and encapsulation	vol. gain wt. gain	treated regulated medical waste	varied	4,7-limited
Winfield Condor	Shredding and treatment	vol. 75% wt. none	municipal solid waste	600 lb/hr	4,7 1,2,3,5,6-limited

(a) The average or range of capacities available.

NA insufficient information available

APPENDIX D - TABLE 37 - pg 3 of 4 - SUMMARY OF NEW TECHNOLOGY DATA (cont'd.)

				COSTS	
NAME	SPACE REQUIREMENTS	UTILITY REQUIREMENTS	PERFORMANCE SPECIFICATIONS	AGGREGATE COSTS (CAPITAL, INSTALLATION)	ESTIMATED OPERATING UNIT COSTS (b)
MeDETOX	dimensions: 500-1000 sq.ft. weight: not avail.	plumbing: tap water sewer: 2" drain elec: 230 V, 220 amp AC venting: yes	infectious nature: 99.999% redu. in biological activity recognizability: 1/2" diameter	capital: not available installation: not available	(c) \$0.17/lb. - 0.35/lb.
San-i-pak	dimensions: 15' x 35' max. weight: not avail.	plumbing: water & steam line sewer: 2" drain elec: 208, 240 or 480/3 phase venting: none	infectious nature: sterilized recognizability: melted, crushed	capital: \$1,245 - \$165,270 installation: \$35,000	\$0.20/lb. - 0.29/lb.
Medical SafeTec	dimensions: 20' x 24' max. weight: 1,400-15,000 lbs	plumbing: 1/2 or 1 1/2" water sewer: 4" drain elec: 208, 230, 480V/3 phase venting: 4" to 6" vent line	infectious nature: disinfected recognizability: < 2"	capital: \$61,750 - \$379,500 installation: \$4,000-\$27,000	\$0.20/lb. - 0.30/lb.
Sanitec Disinfection System	dimensions: 11'x20'x8' weight: 17,600 lbs	plumbing: 1/2" water sewer: none elec: 440V/60Hz/3 phase venting: 6" exhaust	infectious nature: disinfected (>95%) recognizability: 1/2-3/4"	capital: \$650,000 installation: (cap. & inst.)	\$0.44/lb.
Pure Flow Process	dimensions: 27"x23"x36" weight: 275 lbs	plumbing: 1/2" water sewer: std. requirements elec: 110V/60Hz/1 phase venting: std. plumbing vent via stack system	infectious nature: rendered non-infectious recognizability: grinding and maceration	capital: not avail. installation: not avail.	(c) \$0.11/lb.
Plasma Energy System	dimensions: not avail. weight: not avail.	plumbing: not avail. sewer: not avail. elec: not avail. venting: not avail.	infectious nature: rendered non-infectious recognizability: not recognizable	capital: not avail. installation: not avail.	not available
DS-100 Sharps Disposal System	dimensions: 22"x14"x34" weight: 160 lbs	plumbing: none sewer: none elec: 110/120V, 900 amp venting: none	infectious nature: recognizability: rendered non-infectious not recognizable	capital: lease installation: lease	leases equipment
HediSter	dimensions: NA weight: 441 lbs max	plumbing: NA sewer: NA elec: 3x16A socket venting: NA	infectious nature: NA recognizability: NA	capital: NA installation: NA	NA
Stericycle Facility A	dimensions: N/A - Commercial weight: N/A - Commercial	plumbing: NR sewer: NR elec: varied venting: NR	infectious nature: 99.9999999% reduction in bacteria recognizability: 1/2" size	capital: N/A - Commercial installation: N/A - Commercial	NA
Stericycle Facility B	dimensions: N/A - Commercial weight: N/A - Commercial	plumbing: NR sewer: NR elec: varied venting: 1000 cfm	infectious nature: 99.999% reduction in bacteria recognizability: 1/2" size	capital: N/A - Commercial installation: N/A - Commercial	NA

APPENDIX D - TABLE 37 - pg. 4 of 4 - SUMMARY OF NEW TECHNOLOGY DATA (cont'd.)

NAME	SPACE REQUIREMENTS	UTILITY REQUIREMENTS	PERFORMANCE SPECIFICATIONS	COSTS	
				AGGREGATE COSTS (CAPITAL, INSTALLATION)	ESTIMATED OPERATING UNIT COSTS (b)
Isolyser	dimensions: varied weight: varied	plumbing: NR sewer: NR elec: NR venting: NR	infectious nature: reduced recognizability: remains same	capital: none installation: none	NA
Mini electric needle destroyer	dimensions: NA weight: NA	plumbing: NA sewer: NA elec: NA venting: NA	infectious nature: NA recognizability: NA	capital: NA installation: NA	NA
Plastic Syringe Thermal Compactor	dimensions: 18"x24"x36" weight: 125 lbs.	plumbing: NR sewer: NR elec: 120v/1phase venting: NR	infectious nature: reduced recognizability: melted, reformed	capital: \$8,250 installation: none	NA
Pyroxidizer Model B 100	dimensions: 6'x5'x3' weight: NA	plumbing: NR sewer: NR elec: 5kw/208v/3phase venting: 1860 cfm/150F max	infectious nature: 100% reduced recognizability: pulverized ash	capital: lease \$1500/mo installation: NA	\$1.51 - 1.69/lb.
C.T.I. Pro Disposal System	dimensions: NA weight: NA	plumbing: NA sewer: NA elec: NA venting: NA	infectious nature: NA recognizability: NA	capital: NA installation: NA	NA
Omega SDS 100	dimensions: 38"x25"x28" weight: NA	plumbing: NA sewer: NA elec: 110v/30amp venting: NA	infectious nature: NA recognizability: NA	capital: NA installation: NA	NA
Rightway Disposal System	dimensions: NA weight: NA	plumbing: N/A sewer: N/A elec: N/A venting: N/A	infectious nature: NA recognizability: NA	capital: NA installation: NA	NA
Winfield Condor	dimensions: 102"x86.5"x142" weight: 11,000 lbs.	plumbing: 1/2" @30 psi sewer: 1 1/2" elec: 460v/3pha,100 amp venting: reqd NA	infectious nature: 99.9% reduced recognizability: 1/2" size	capital: \$400,000 installation: NA	\$0.30/lb.

NA - insufficient information available

N/A - does not apply

NR - not required, as per proposal

(b) - Based on DEPE calculations

(c) - Based on information from vendor

ATTACHMENTS

- A RMW Facility Permitting Information Letter
- B Alternate Technology Information Questionnaire
- C RMW Alternate Technology Demonstration Project Review Letter
- D DOH Sample Microwave Operating Protocol

Attachment A



State of New Jersey
Department of Environmental Protection and Energy
Division of Solid Waste Management

CN 414
Trenton, NJ 08625-0414
Tel. # 609-530-8591
Fax. # 609-530-8899

Scott A. Weiner
Commissioner

MAR 26 1993

Steven Gabel
Director

Dear Sir or Madam:

The Bureau of Medical Waste and Residuals Planning (BMWWRP) has updated the registration information letter for regulated medical waste (RMW) treatment/destruction systems that was originally issued on April 24, 1990. Please find the updated letter enclosed for your information. This letter describes in detail the state's RMW treatment/destruction system authorization requirements such as permitting, registration and New Jersey Department of Health (DOH) system operating protocols, which are coordinated by this bureau. The authorization requirements described in the information letter apply both to facilities installing RMW treatment and destruction systems and to facilities utilizing mobile RMW treatment and destruction systems brought on-site for varying time spans.

Any facility that is currently operating a RMW treatment and destruction system must be in compliance with the requirements contained in the enclosed information letter. A facility that is planning to purchase and install a RMW treatment and destruction system should review the enclosed information letter to determine what is necessary to be in compliance with department requirements. The BMWWRP will assist facilities in the process of obtaining the required authorizations to operate. If you have any questions concerning the requirements contained in the letter, please contact Ms. Sonya Rozansky of my staff, Bureau of Medical Waste and Residuals Planning at (609) 530-8599, for assistance.

Sincerely,

Gary Sondermeyer
Gary Sondermeyer, P.P.
Assistant Director
Office of Recycling and
Planning

Enclosure
SR/tlg
B92-1367

c: Robert M. Confer
James Blumenstock



State of New Jersey
Department of Environmental Protection and Energy
Division of Solid Waste Management

CN 414
Trenton, NJ 08625-0414
Tel. # 609-530-8591
Fax. # 609-530-8899

Scott A. Weiner
Commissioner

Steven Gabel
Director

MAR 26 1993

Dear Medical Facility Administrator:

This correspondence represents an update of the Department of Environmental Protection & Energy's (DEPE or department) process for registration, authorization and permitting requirements for regulated medical waste (RMW) treatment, destruction or disposal facilities. These requirements and procedures were first detailed in a letter to medical facility administrators on April 24, 1990. A reorganization of the department has necessitated a revision of the letter's referential information while most of the procedures outlined in the earlier letter remain unchanged. The letter describes the present registration, authorization and permitting requirements and procedures for incinerators and treatment and destruction machines such as grinder/microwave units and grinder/chemical disinfection units. A number of requirements may apply to one operating site. If you have any questions concerning these requirements after reading this letter, please contact the Bureau of Medical Waste & Residuals Planning, at (609) 530-8599, for assistance.

The letter is organized as follows to assist you with locating information pertinent to your situation:

<u>Section</u>	<u>Title</u>	<u>Content</u>	<u>Page</u>
I	General Requirements	Requirements which all RMW facilities must fulfill	2
II	Incinerators	Specific requirements for RMW facilities operating incinerators	8
III	Grinding/Disinfecting Machines	Specific requirements for RMW facilities operating grinding/disinfecting machines	10

IV	Other Devices	Requirements concerning the use of other devices to treat/destroy RMW.	11
V	Permit Application Information	General explanation	12

New Jersey's regulatory framework is meant to ensure that all RMW disposal technologies are operated to safely dispose of the wastes. The Bureau of Medical Waste & Residuals Planning (BMWRP) within the Division of Solid Waste Management (DSWM) will function as a clearinghouse of regulatory information to assure county solid waste management plan inclusion and subsequent solid waste registration and other authorizations are obtained by a facility prior to start-up. Facility authorization also involves the DEPE's Air Quality Regulation Program, Wastewater Facilities Regulation Program and Division of Environmental Safety, Health and Analytical Programs as well as the New Jersey Department of Health's (DOH) Division of Epidemiology, Environmental and Occupational Health Services.

If an applicant is planning to install a device to treat and/or destroy RMW, BMWRP should be contacted in order to advise the facility of the New Jersey plan inclusion process. BMWRP will refer the applicant to other agencies within the departments as appropriate for permit requirements. It is advisable for the applicant to have a pre-application meeting with department personnel before the submittal of technical information and permit requests. BMWRP will assist in scheduling such meetings.

Per N.J.A.C 7:26-3A.5, an intermediate handler is defined as a facility that operates devices to either treat RMW to reduce or eliminate its infectious nature, or destroy it by rendering the waste unrecognizable, but not both. A destination facility both treats and destroys RMW, rendering it noninfectious or less infectious and unrecognizable. Examples of treatment and destruction devices are incinerators and mechanical grinding machines which also disinfect the destroyed wastes. This letter describes the State's registration and permitting requirements for these devices.

SECTION I. GENERAL REQUIREMENTS: (Apply to devices discussed in Sections II-IV)

1. Disposal Facility Registration

Any facility which treats, destroys or disposes of RMW must be registered as a RMW destination facility and authorized or permitted as a solid waste facility with the DEPE. A copy of form CP1, available at the address below, must be used to register your organization's RMW facility with the division for both of these

activities. The registration and authorization of facilities to treat and/or destroy RMW will also include any operating requirements prescribed by other agencies such as DOH. Specific information concerning completing the CP1 application is available at:

Bureau of Medical Waste & Residuals Planning
Division of Solid Waste Management
Department of Environmental Protection and Energy
CN 414
840 Bear Tavern Road
Trenton, New Jersey 08625

The contact person for CP1 forms and information concerning these requirements is Ms. Sonya Rozansky who may be contacted at (609) 530-8599. Return the completed forms to the Bureau of Medical Waste & Residual Planning.

2. County Planning Process

It is necessary for any new facility, which will treat and/or destroy RMW, to be formally incorporated within the approved District Solid Waste Management Plan (DSWMP) of the solid waste district (county) within which the RMW facility will be located (see N.J.A.C. 7:26-2.4(b)). This process requires a public hearing by the respective Board of Chosen Freeholders followed by a formal resolution, and review and approval of the amendment by the Commissioner of the department. Pursuant to the Comprehensive Regulated Medical Waste Management Act (Comprehensive Act), a county or the department may not consider any plan amendment for new commercial RMW disposal facilities until the comprehensive RMW State Plan is completed. However, new non-commercial facilities may be processed through the county/state planning and permitting process. Information concerning the planning process may be obtained from:

Bureau of State and County Planning
Division of Solid Waste Management
Department of Environmental Protection and Energy
CN 414
Trenton, New Jersey 08625
(609) 530-8203

3. Wastewater Discharge Permits/Approvals/Requirements

To determine which of the following permits/approvals are required, consult the flow chart attached as Appendix A and then contact the appropriate Bureau in the Department's Wastewater Facilities Regulation Program. In making either written or telephone requests regarding the required permits/approvals, be specific as to what types of permits/approvals are the subject of inquiry.

a. Industrial Treatment Works Approval (#1-See Appendix A)

This permit is related to construction approval of the actual regulated medical waste treatment facility and should be obtained prior to initiation of construction. Prior to submission of an application, any applicable final NJPDES-SIU, DSW, DGW permit or sewer ban exemption shall have been issued.

Contact: Wastewater Facilities Regulation Program
Division of Environmental Regulation
CN 029 Trenton, NJ 08625
(609) 292-4860

b. Treatment Works Approval for Sanitary Sewer Extension (#2-See Appendix A)

This permit is related to the actual construction of a sewer main and would be required if existing sewer line capacity is inadequate or a new sewer main is required as part of the project.

Contact: Bureau of Construction and Connection Permits
Wastewater Facilities Regulation Program
Division of Environmental Regulation
CN 029 Trenton, NJ 08625
(609) 984-4429

c. Sewer Ban Exemption (#3-See Appendix A)

This approval involves obtaining an exemption from DEPE where the sewerage authority treatment facility or collection system has been prohibited from constructing new sewer mains or allowing new connections due to hydraulic or organic overloading. In order to determine whether a sewer ban is in effect or to obtain an application for exemption, contact the following bureau.

Contact: Bureau of Construction and Connection Permits
Wastewater Facilities Regulation Program
Division of Environmental Regulation
CN 029 Trenton, NJ 08625
(609) 984-4429

d. New Jersey Pollutant Discharge Elimination System-Significant Indirect User Permit (NJPDES-SIU)
(#4-See Appendix A)

This permit may be required for discharges to sanitary sewers where the sewage treatment authority has not been designated by DEPE to administer the federal pretreatment program in its service area. The need for this permit is

made on a case by case basis.

Contact: Same as 3a above.

e. New Jersey Pollutant Discharge Elimination System-Discharge to Surface Water (NJPDES-DSW)
(#5-See Appendix A)

This permit is required for any direct wastewater discharge to streams, lakes or into storm sewers or other conveyances leading to surface waters.

Contact: Same as 3a above.

f. New Jersey Pollutant Discharge Elimination System-Discharge to Groundwater (NJPDES-DGW)
(#6-See Appendix A)

This permit is for wastewater discharges onto or into the ground, such as facility on-site septic systems, leach fields, spray irrigation or other facilities which discharge into the soil.

Contact: Same as 3a above.

g. Licensed Operator (#7-See Appendix A)

This requirement is applicable to facilities which receive Treatment Works Approvals for a Regulated Medical Waste Facility and also hold a NJPDES-SIU, DSW or DGW permit. Upon receipt of a Treatment Works Approval for the Regulated Medical Waste Facility, application must be made to sit for an exam for the specified license grade indicated on the Treatment Works Approval. Upon passing the exam, the operator is responsible for the proper operation and maintenance of the facility and is involved in proper reporting of malfunctions and discharge data in accordance with the applicable NJPDES permit.

Contact: Bureau of Revenue
Division of Financial Management, Planning
and General Services
CN 402
Trenton, NJ 08625
(609) 777-1006

4. DOH Operating Protocol

Information concerning the treatment capabilities of the RMW treatment/destruction system is required to be submitted to BMWRP as part of the CPL registration application package to be reviewed

and then forwarded to the DOH. These informational documents must give a detailed description of the operation of the equipment, the efficacy of the treatment process, the nature and amount of the RMW to be treated, the manufacturer's specifications concerning the treatment/destruction capabilities of the equipment and such other data DOH may need to evaluate the equipment and issue an operating protocol. The DOH will also request additional data and information as necessary from the vendor and the using facility to determine the efficacy of the equipment in treating RMW specifically at that facility in order to establish testing and operating protocols for ongoing monitoring of the system's operation at the facility.

Contact: Public Health Sanitation and Safety Program
Regulated Medical Waste Project
New Jersey Department of Health
CN 369
Trenton, NJ 08625-0369

The contact person for information concerning DOH operating protocols for RMW facility operations is Dr. Rana A. Kazmi, who may be contacted at (609) 588-3124.

5. Air Pollution Control Permits

Any facility that plans to install a device to treat and/or destroy RMW must determine whether the device will have any air pollution discharges subject to regulatory control. The facility may have to apply for and obtain an "Air Pollution Control Permit to Construct, Install or Alter Control Apparatus or Equipment and Certificate to Operate Control Apparatus or Equipment."

- a. For information concerning applications for air pollution control permits for RMW incinerators contact:

Iclal Atay, Ph.D, Chief
Bureau of Air Quality Engineering
Air Quality Regulation Program
CN 027
Trenton, NJ 08625-0027
(609) 984-3023

- b. For information concerning applications for air pollution control permits for alternate processes to treat and destroy RMW contact:

Louis Mikolajczyk, Chief
Bureau of New Source Review
Air Quality Regulation Program
CN 027
Trenton, NJ 08625-0027
(609) 292-6716

6. Environmental Radiation

Any facility that plans to install a treatment/destruction device that discharges radioactive materials or generates ionizing or nonionizing radiation is subject to the regulatory requirements of the Radiation Protection Code; namely N.J.A.C. 7:28. This requirement applies to microwave units, gamma irradiators and similar devices.

Contact: Radiation Protection Programs
Division of Environmental Safety,
Health and Analytical Programs
CN 415
Trenton, NJ 08625-0415
(609) 987-6389

7. Business Licensing: Commercial Facilities

Any facility operating as a commercial RMW disposal facility, utilizing any recognized disposal system or methodology, must undergo a background investigation per N.J.A.C. 7:26-16, referred to as "A-901", to operate in New Jersey. New commercial facilities were prohibited by the Comprehensive Act until after the department submits its statewide regulated medical waste management plan to the Governor and Legislature (see N.J.S.A. 13:1E-48.1). An "A-901" license must be obtained prior to the commencement of operations. A commercial disposal facility is in the business of disposing of wastes from other generators for profit. Information concerning this process may be obtained from:

Bureau of Disclosure Review
Division of Solid Waste Management
Department of Environmental Protection and Energy
CN 414
840 Bear Tavern Road
Trenton, New Jersey 08625-0414
(609) 530-8210

8. Business Licensing: Noncommercial Facilities

Regulated medical waste noncommercial disposal facilities are defined in N.J.A.C. 7:26-3A.5, as facilities which accept RMW for disposal for charges not exceeding the costs of disposal. The noncommercial facilities may operate without the N.J.A.C. 7:26-16 background investigation, as provided by the Comprehensive Act at N.J.S.A. 13:1E-48.1 et seq. An example of a noncommercial facility would be a hospital which accepts RMW from a nearby doctor for disposal in its incinerator or grinding/disinfection machine, for a cost-based fee not in excess of the hospital's cost to process and dispose of the waste.

9. Generator and Transporter Registration

Any facility that generates or transports RMW, must also register separately with the DEPE for each of those activities, per N.J.A.C. 7:26-3A. Information concerning the requirements for generators or transporters may be obtained from the Bureau of Medical Waste & Residuals Planning at (609) 530-8599. For example, a hospital would naturally be a generator of RMW, which would require registration as a generator.

10. Facility Fees: Commercial Facilities

A facility operating as a commercial RMW disposal facility may be subject to regulations setting the facility's fees. Information concerning this issue may be obtained from:

Bureau of Rates and Tariffs
Division of Solid Waste Management
Department of Environmental Protection and Energy
CN 414
840 Bear Tavern Road
Trenton, NJ 08625-0414
(609) 530-8225

11. Other Permits

All facilities must also comply with all applicable local, state and federal requirements.

SECTION II. INCINERATORS:

1. General Requirements for Incinerators

a. Incinerators which destroy RMW are solid waste facilities which must be authorized to operate in accordance with N.J.A.C. 7:26-3A.37, or permitted by the Division in accordance with N.J.A.C. 7:26-2 and 2B. These incinerators must be included in the appropriate county solid waste management plan or obtain inclusion as described under section I.2 above. If a proposed incinerator is replacing a previous incinerator and is the same capacity, the applicant must notify the county but may not be required to obtain an amendment to the county solid waste management plan. There will be a case-by-case review when replacement capacity is being proposed. Commercial facilities must also undergo a background investigation per N.J.A.C. 7:26-16. In addition, incinerators which destroy regulated medical waste must register with the DSWM as regulated medical waste destination facilities in accordance with N.J.A.C. 7:26-3A.8(c). (Refer to section I.1, 7 and 8 above.) Small scale incinerators must be permitted by the Bureau of Resource Recovery Engineering.

b. Regulations at N.J.A.C. 7:26-3A.37 require all RMW incinerators to hold a certificate to operate control apparatus or equipment (air pollution control device permits) per N.J.A.C. 7:27-

8 issued by the DEPE's Air Quality Regulation Program, Bureau of Air Quality Engineering. Information may be obtained from:

Bureau of Air Quality Engineering
Air Quality Regulation Program
Department of Environmental Protection and Energy
CN 027
401 East State Street
Trenton, NJ 08625-0027

The contact person for information concerning this permit and equipment operating standards is Iclal Atay, Ph.D., Chief, Bureau of Air Quality Engineering who may be contacted at (609) 984-3023.

c. Permits may also be required to discharge scrubber solutions from the site. (Refer to section I.3 above for information concerning the specific permitting requirements for liquid effluent discharges).

2. Incinerators Operating As of March 6, 1989:

a. The Comprehensive Act automatically included incinerators in the DSWMP where the incinerator is located, if the incinerator was accepting RMW before March 6, 1989. To determine which incinerators are affected by this provision, the DSWM is requiring each existing RMW incinerator owner or operator to file an affidavit with the DSWM certifying that the incinerator was operating as of March 6, 1989. A copy of a sample affidavit which must be completed for this purpose is attached as Appendix B.

b. These regulations, N.J.A.C. 7:26-3A.37(b)5, further require a RMW incinerator operating as of March 6, 1989, to obtain a permit from the Division to operate a solid waste disposal facility before the expiration of the facility's air pollution control device permit. A copy of a permit application form CP1 is available for this purpose. You may contact Mr. Sukhdev Bhalla, Bureau of Resource Recovery Engineering at (609) 530-8005, for obtaining assistance in completing this form.

c. Facilities operating commercially prior to March 6, 1989 must hold a certificate of public convenience and necessity from the New Jersey Board of Public Utilities (NJBPUB) whose function was transferred to the DEPE as of August 19, 1991. Authority to set rates for the disposal of regulated medical waste was granted by the Comprehensive Act. Information concerning the certification process may be obtained from:

Bureau of Registration
Division of Solid Waste Management
Department of Environmental Protection and Energy
CN 414
Trenton, NJ 08625-0414

The contact person for information about the certification process is Mr. Michael DeTalvo, who may be contact at (609) 530-4004. Information about rates setting may be obtained from:

Bureau of Rates and Tariffs
Division of Solid Waste Management
Department of Environmental Protection and Energy
CN 414
Trenton, NJ 08625-0414
(609) 530-8225

3. New Incinerators:

a. The Comprehensive Act imposed a moratorium on the construction of commercial RWM disposal facilities, including incinerators, until the DEPE and the DOH complete a statewide RMW management plan. The Comprehensive Act specifically prohibits the Department, other State departments, divisions, commissions, authorities, councils, agencies, boards, or any county or municipality from considering the application for, or granting any approval, certificate, license, consent, permit or other authorization for a proposed new commercial RMW disposal facility until the plan is submitted (N.J.S.A. 13:1E-48.14). When the moratorium has ended, new incinerators must be properly permitted and adopted into the respective county solid waste management plan. (Refer to section I.2 for instructions on complying with the county planning process).

b. If the incinerator facility intends to operate on a noncommercial basis, applications for incinerator permits may be submitted for review by the DSWM during the moratorium period using the CPL form available from the address listed in section I.1. The Comprehensive Act defines "noncommercial facility" as one that accepts RMW from other generators for on-site disposal for a cost based fee not in excess of the costs actually incurred by the facility for such disposal (N.J.S.A. 13:1E-48.1). (Refer to section I.2 for instructions on complying with the county planning process.)

SECTION III. GRINDING/DISINFECTING MACHINES;

1. A device which treats and destroys RMW by means of both grinding and disinfecting the waste, is regulated as a solid waste disposal facility and a RMW destination facility pursuant to N.J.A.C. 7:26-3A.8 and must register with the DEPE. (Refer to the section heading in this letter, "General Requirements", I.1, for instructions for registration and obtaining these permits). An applicant in regard to the operation of such a device must be included in the appropriate county solid waste management plan or obtain inclusion as described under section I.2 above. If a proposed device is replacing a previously operated device of the same capacity, the applicant must notify the county but may not be

required to obtain an amendment to the county solid waste management plan. There will be a case-by-case review when replacement capacity is being proposed.

2. Pursuant to N.J.A.C. 7:27, a permit to construct, install or alter control apparatus or equipment and certificate to operate control apparatus or equipment must be obtained for the vents from these machines. Permit applications are available at:

Bureau of New Source Review
Division of Environmental Quality
Department of Environmental Protection and Energy
CN 027
401 East State Street
Trenton, NJ 08625-0027

The contact person for information concerning this permit and equipment standards is Mr. Max Friedman, who may be contacted at (609) 633-8230.

3. A Treatment Works Approval and other permits may be required from the DEPE's Wastewater Facilities Regulation Program. A Treatment Works Approval Permit must be obtained from the Bureau of Construction and Connection Permits pursuant to N.J.A.C. 7:14A-12, to permit these machines to discharge to municipal sewer systems. (Refer to Section I.3 of the letter for information and Department contacts for obtaining these permits.)

4. Approval of the disinfecting agent applied to RMW must be obtained from the United States Environmental Protection Agency (USEPA) FIFRA Program. A facility that is seeking approval of a chemical disinfection method should contact the Registration Division - USEPA at (703) 305-7964.

SECTION IV. OTHER DEVICES:

At this point in time, new medical waste management disposal devices are evolving technologically and are also under rapid marketing development. These devices also require county plan inclusion, registration and permitting by the DEPE. The Division of Solid Waste Management is presently preparing a comprehensive statewide RMW management plan as required by the Comprehensive Act. This plan will include both an evaluation of the operating conditions for these new treatment, destruction and disposal technologies, and an assessment of the requirements of existing State statutes and Department regulations for the devices' control and monitoring.

When the statewide plan is completed, the DEPE will bring any additional registration and permit requirements for these devices to the attention of the regulated community. In the meantime, these devices will be subject to registration, permitting and

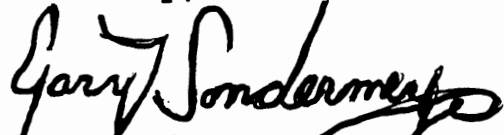
required approvals on a case-by-case basis following review procedures as described under "I. General Requirements" above.

SECTION V. PERMIT APPLICATION INFORMATION;

The above discussion attempts to clearly guide prospective applicants toward the appropriate DEPE people in order to obtain the necessary registrations and permits. However, the DEPE acknowledges the complexity and uncertainty which often surrounds the application and review process. With this in mind, DEPE representatives of the DEPE's solid waste, air pollution control, water resources and environmental radiation control programs, and the Department of Health at the agency offices listed in this document are available to assist applicants with understanding the regulations on the completion of application packages and the review process.

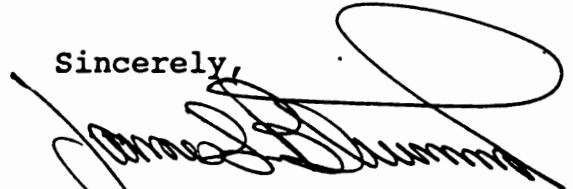
If you have any questions concerning the DEPE's registration or permitting requirements for your organization's RMW treatment and/or destruction facility, you should contact the Bureau of Medical Waste & Residual Planning at (609) 530-8599, for assistance.

Sincerely,



Gary Sondermeyer P.P.
Assistant Director
Office of Recycling
and Planning
New Jersey Department
of Environmental
Protection and Energy

Sincerely,



James Blumenstock
Director
Consumer Health Services
New Jersey Department
of Health

RCM/tlg
E-91-910
Revised

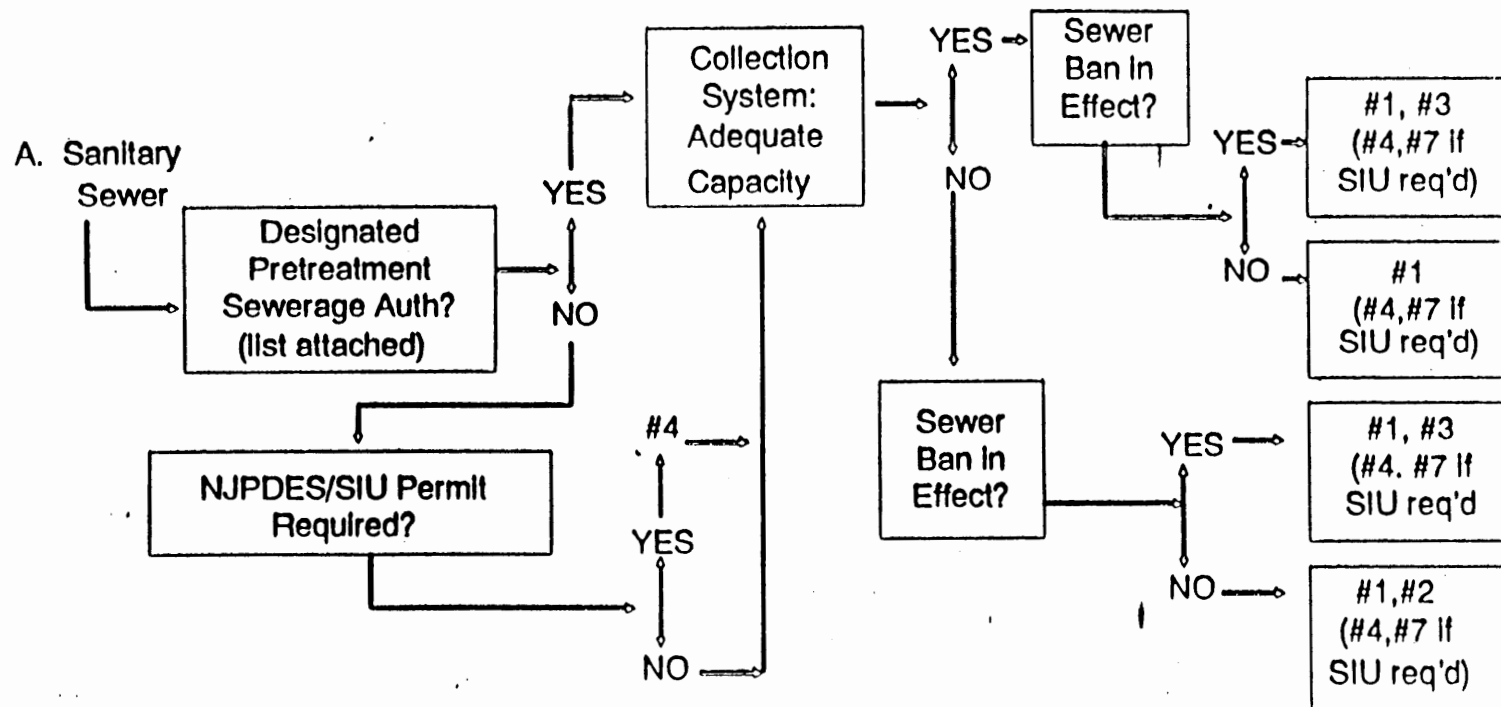
Regulated Medical Waste Disposal Facilities

DEPE Wastewater Permits/Approvals/Requirements

Method of
Discharge

Applicable
Conditions

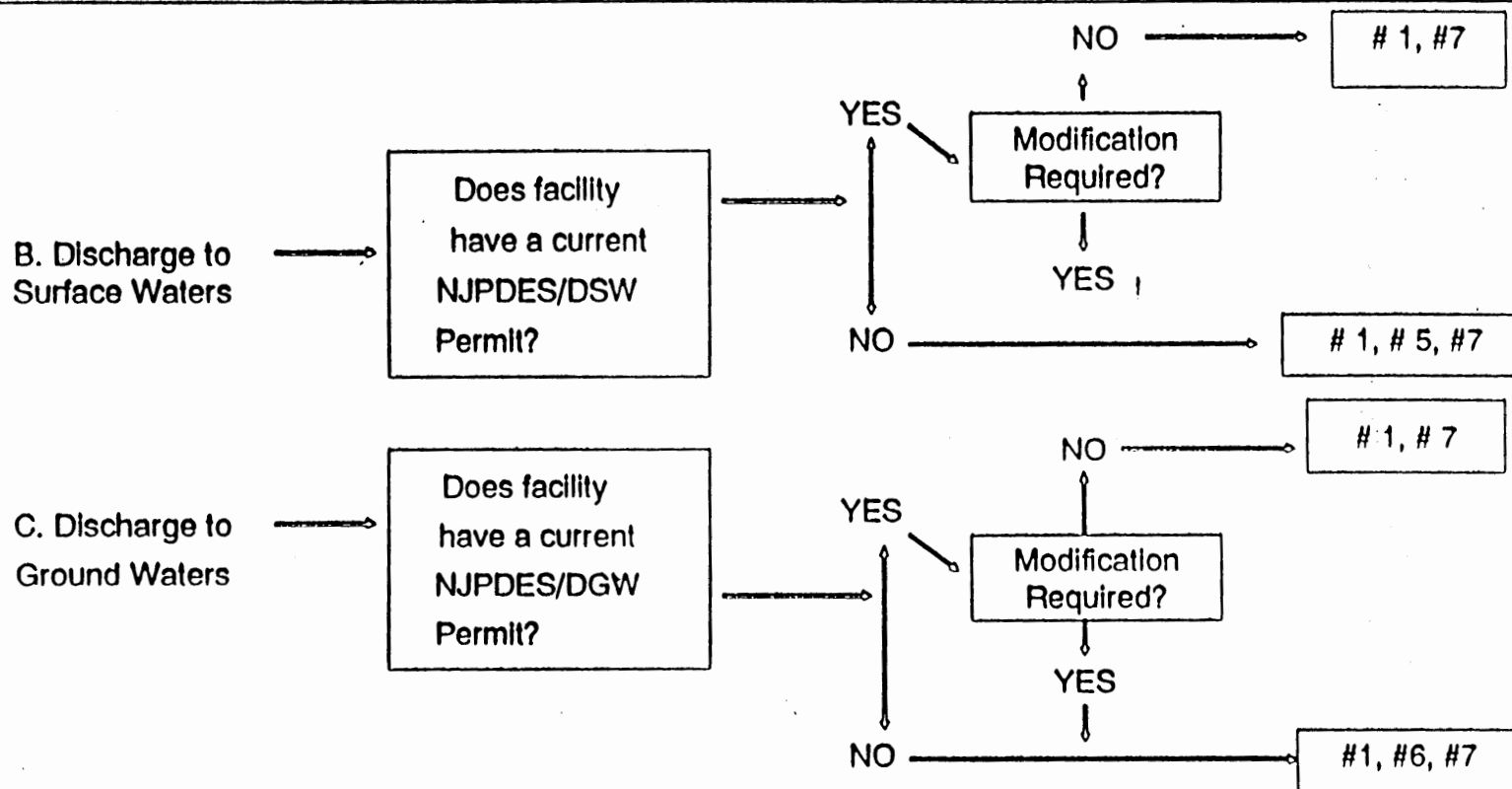
DEPE Permits, Approvals,
and Requirements



Method of Discharge

Applicable Conditions

DEPE Permits, Approvals, and Requirements



SAMPLE AFFIDAVIT FOR INCINERATORS OPERATING AS OF MARCH 6, 1989

(Refer to Section II-2.a)

STATE OF NEW JERSEY

AFFIDAVIT OF

COUNTY OF _____

(Full Name)

_____, of full age and duly sworn according to
(Name)

law, upon his oath deposes and says:

1. I am (List title, organization, location, responsibilities).
2. I have been employed at (organization) for (time period).
3. (State the complete history of the operating incineration facility).
4. The incinerator at (organization, location) is permitted by (list all operating and environmental permits and dates first recorded).
5. The incinerator at (organization, location) was operating to destroy medical waste at (organization) as of March 6, 1989
6. The above referenced incinerator operates solely on a non-commercial basis.

Sworn and subscribed before

me this _____ day

of (month), (year).

_____. Signature _____

(Return to Robert M. Confer, Chief, Bureau of Medical Waste and
Residuals Planning, Department of Environmental Protection and
Energy, 840 Bear Tavern Road, CN414, Trenton, New Jersey 08625)



State of New Jersey
Department of Environmental Protection and Energy
Division of Solid Waste Management

CN 414
Trenton, NJ 08625-0414
Tel. # 609-530-8591
Fax. # 609-530-8899

Scott A. Weiner
Commissioner

Steven Gabe
Director

APR 02 1993

Dear

This is in reference to your correspondence of describing your company's regulated medical waste (RMW) management system, for which you are requesting New Jersey Department of Environmental Protection and Energy (NJDEPE) authorization to operate in New Jersey. Please note that any New Jersey facility ultimately using this system must obtain all required authorizations and permits prior to installation and operation of the system. In assessing medical waste management technologies, the Division of Solid Waste Management (division) relies heavily on the submission of data from at least one actual, working facility or thorough testing of a prototype identical to units that will be manufactured for sale, supervised by an appropriately certified person. This data should be drawn from repeated applications of the process. The division requires at a minimum, the following information regarding the waste management system, required in the Technical Review Form (TRF) and the attachments described under TRF item No. 8, in order to evaluate the system and its RMW treatment technology:

- o TRF, enclosed, duly completed;
- o Thorough description of the method of operation of the system and the technology, specifying each step of the operational process and how the system prevents operator contact with untreated RMW at each phase of operation;
- o Actual operational performance data adequately characterizing the performance of the waste disposal system in a facility which handles medical waste treatment and/or destruction. If not available, numerical data adequately characterizing the performance of a prototype, from testing preferably supervised by an appropriately certified independent agent;

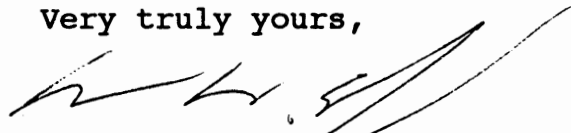
- o Results of efficacy reviews performed by other states;
- o Information on parametric monitoring and controls. List and describe both continuous and non-continuous parametric monitoring systems and controls. Description, in detail, how monitoring is performed and how controls operate (chart recorders, interlocks, actual parameter limits, etc.). Also, information on the feasibility of operators being able to modify the controls;
- o Actual data on cost of installation and operation of the waste disposal system in a facility which handles medical waste treatment and/or destruction. If not available, projected cost of installation and operation in a typical facility which generates medical waste;
- o Reports and/or assessments of the system's functioning and efficacy determination produced by an independent professional research or engineering firm, university, etc., not associated with the system's manufacturer;
- o Actual quantity of medical waste processed;
- o Assessment of how closely this waste resembles waste which would be generated in New Jersey, i.e., whether it includes the same and all types of wastes as defined in New Jersey regulations (a copy is enclosed for your use);
- o Capacity of the system, i.e., quantity of medical waste processed by the facility per unit time;
- o Description of training requirements and certification requirements for personnel to ensure safe operation of the system;
- o Characterization of process residuals, such as solid or hazardous waste, air emissions, liquid effluent or other by-products;
- o Results of tests on the reduction in infectious nature of RMW processed by the system. Vendors must include all raw data and the specific testing procedures, not merely summaries of testing. This information concerning the efficacy of the technology for treating medical wastes will be forwarded to the New Jersey Department of Health, Consumer Health Services for review, which may also request additional detailed information;
- o Costs to generator per unit weight of medical waste processed including itemization of energy costs per unit weight of medical waste processed that will be forwarded to NJDEPE Office of Energy for review, which may also request additional detailed information; and

- o Estimated costs to the generator to prepare, if necessary, medical waste for processing. This would include, but not be limited to, costs (including labor) that the generator might bear to receive any training from you or other sources, and to segregate, consolidate, package, store, handle and manifest medical waste according to your requirements/standards.

Systems to be operated in New Jersey for RMW treatment and/or destruction must be identical to the system described in this application for authorization to operate in New Jersey and for which operational data is presented in the TRF for NJDEPE review. The manufacturer or vendor must certify that the system or equipment being marketed is identical to the prototype. Any changes in the system or equipment after NJDEPE review and authorization to operate must be submitted in writing to NJDEPE. NJDEPE permitting or other authorization conditions granted to operate any system to treat and/or destroy RMW will be reviewed by the agency periodically to ensure specifically authorized technological systems meet current accepted standards for RMW management. The NJDEPE may modify system operational or performance requirements for systems that received prior authorizations to operate if warranted.

On reviewing the completed TRF and the required attachments, we may have additional questions regarding your company's medical/infectious waste disposal system. If you have any questions, please contact Ms. Sonya Rozansky of my staff at (609) 530-8599.

Very truly yours,



Robert M. Confer, Chief
Bureau of Medical Waste,
Residuals Management &
Statewide Planning

Enclosures
SR/jm
P/E-92-824

c: James Blumenstock, NJDOH

**NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION AND ENERGY
DIVISION OF SOLID WASTE MANAGEMENT**

**TECHNICAL REVIEW FORM FOR REGULATED MEDICAL WASTE DISPOSAL
SYSTEM/EQUIPMENT**

(Answer all questions in detail and attach additional pages or other information sources as necessary.)

1. COMPANY NAME _____

2. SYSTEM/EQUIPMENT NAME _____

3. CONDITIONS OF OPERATION - REQUIREMENTS

A. SPACE _____

B. PLUMBING _____

C. SEWER _____

D. ELECTRICAL _____

E. VENTING _____

F. STAFF TRAINING _____

G. CHEMICALS TO BE STOCKED _____

H. PERMITS/APPROVALS _____

I. SAFETY & OSHA _____

**NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION AND ENERGY
DIVISION OF SOLID WASTE MANAGEMENT**

J. OTHER _____

**4. CONSTRAINTS ON USE - DOES THE SYSTEM/EQUIPMENT HAVE ANY
LIMITATIONS IN TREATING/DESTROYING THE FOLLOWING CLASSES OF
REGULATED MEDICAL WASTE?**

CLASS 1. YES/NO - EXPLAIN _____

CLASS 2. YES/NO - EXPLAIN _____

CLASS 3. YES/NO - EXPLAIN _____

CLASS 4. YES/NO - EXPLAIN _____

CLASS 5. YES/NO - EXPLAIN _____

CLASS 6. YES/NO - EXPLAIN _____

CLASS 7. YES/NO - EXPLAIN _____

(SEE PAGE 6 FOR DESCRIPTION OF WASTE CLASSES)

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION AND ENERGY
DIVISION OF SOLID WASTE MANAGEMENT

5. TYPICAL OPERATION - WASTE TREATMENT/DESTRUCTION

A. CHARGE CAPACITY(lb/hr)_____

B. REDUCTION IN VOLUME(Ratio)_____

C. REDUCTION IN WEIGHT(Ratio)_____

D. REDUCTION IN RECOGNIZABILITY(Explain)_____

E. REDUCTION IN INFECTIOUS NATURE(Explain)_____

F. COMPOSITION AND SUGGESTED METHOD OF DISPOSAL OF

A. SOLID RESIDUES_____

B. LIQUID EFFLUENT_____

C. AIR/GASEOUS DISCHARGE_____

G. OTHER _____

**NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION AND ENERGY
DIVISION OF SOLID WASTE MANAGEMENT**

**6. TIME REQUIRED TO INSTALL IN NJ AND AVAILABILITY -
NJ/US DISTRIBUTORS?**

**7. LIST OF FACILITIES WITH SYSTEM/EQUIPMENT INSTALLED IN
NJ & VICINITY**

**8. THE INFORMATION LISTED BELOW IS CRITICAL TO THE DEPARTMENTS
CONDUCTING A THOROUGH REVIEW OF THE RMW DISPOSAL SYSTEM AND MUST
BE INCLUDED IN THE APPLICATION IN ORDER FOR IT TO BE COMPLETE.
INDICATE WHICH OF THE FOLLOWING ARE SUPPLIED:**

- ☐ A. Actual numerical data adequately characterizing the performance of the waste disposal system in a facility which handles medical waste treatment and/or destruction
- ☐ B. If above not available, numerical data adequately characterizing the performance of a prototype
- ☐ C. Description of continuous and non-continuous parametric and controls. Describe the methods for obtaining monitoring data and how controls operate. Include information on the feasibility of operators modifying monitoring systems.
- ☐ D. Reports and/or assessments of the system produced by an independent professional research or engineering firm, university, etc., not associated with you/your company.
- ☐ E. Attach all raw data concerning treatment efficacy testing.
- ☐ F. Actual data on cost of installation and operation of the waste disposal system in a facility which handles medical waste treatment and/or destruction
- ☐ G. If above not available, projected cost of installation and operation in a typical facility which generates medical waste.

**NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION AND ENERGY
DIVISION OF SOLID WASTE MANAGEMENT**

PERSON COMPLETING QUESTIONNAIRE

TITLE

DATE

TABSDOC/TG

**NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION AND ENERGY
DIVISION OF SOLID WASTE MANAGEMENT**

TABLE

**REGULATED MEDICAL WASTE
[N.J.A.C. 7:26-3A.6(a)]**

WASTE CLASS	DESCRIPTION
1. CULTURES AND STOCKS	Cultures and stocks of infectious agents and associated biologicals, including: cultures from medical and pathological laboratories; cultures and stocks of infectious agents from research and industrial laboratories; wastes from the production of biologicals; discarded live and attenuated vaccines; and culture dishes and devices used to transfer, inoculate, and mix cultures.
2. PATHOLOGICAL WASTES	Human pathological wastes, including tissues, organs and body parts and body fluids that are removed during surgery or autopsy, or other medical procedures, and specimens of body fluids and their containers.
3. HUMAN BLOOD AND BLOOD PRODUCTS	Liquid waste human blood; products of blood; items saturated and/or dripping with human blood or items that were saturated and/or dripping with human blood that are now caked with dried human blood; including serum, plasma, and other blood components, and their containers, which were used or intended for use in either patient care, testing and laboratory analysis or the development of pharmaceuticals. Intravenous bags are also included in this category.
4. SHARPS	Sharps that have been used in animal or human patient care or treatment or in medical, research, or industrial laboratories, including hypodermic needles, syringes (with or without the attached needle), pasteur pipettes, scalpel blades, blood vials, needles with attached tubing, and culture dishes (regardless of presence of infectious agents). Also included are other types of broken or unbroken glassware that were in contact with infectious agents, such as slides and cover slips.
5. ANIMAL WASTE	Contaminated animal carcasses, body parts, and bedding of animals that were known to have been exposed to infectious agents during research (including research in veterinary hospitals), production of biologicals, or testing of pharmaceuticals.
6. ISOLATION WASTES	Biological waste and discarded materials contaminated with blood, excretion, exudates, or secretions from humans who are isolated to protect others from certain highly communicable diseases, or isolated animals known to be infected with highly communicable diseases.
7. UNUSED SHARPS	The following unused, discarded sharps: hypodermic needles, suture needles, syringes, and scalpel blades.



**State of New Jersey
Department of Environmental Protection and Energy**

Division of Solid Waste Management

CN 414

Trenton, NJ 08625-0414

Tel. # 609-530-8591

Fax. # 609-530-8899

Scott A. Weiner
Commissioner

Steven Gabel
Director

Attachment C

MAR 11 1993

Dear

This correspondence is in reply to your letter of _____ 1993 as submitted to the New Jersey Department of Environmental Protection and Energy (department) Bureau of Medical Waste and Residuals Planning (BMWRP) regarding obtaining department authorization for a demonstration project for the treatment and destruction of regulated medical waste (RMW). _____ is planning to install equipment referred to as the _____ process for a _____ month trial period to be conducted at _____.

The basic demonstration project process operating conditions that you specify in your letter of _____ are acceptable to the department. [or] The following information concerning the demonstration project process must be submitted to this office _____.

In addition, the facility (_____) must demonstrate compliance with the following requirements for the demonstration project as well as any other specific department requirements specific to the process before authorization will be granted:

1. Obtain approval of the demonstration project from the county solid waste authorities;
2. Obtain an air pollution control permit if required by the Bureau of New Source Review (contact Mr. Max Friedman, (609) 633-8230);
3. Obtain authorization of the demonstration project from Consumer Health Services, N.J. Department of Health

(NJDOH) (contact Dr. Rana Kazmi, (609) 588-3124). This bureau will forward this letter and any further information concerning treatment/destruction efficacy to NJDOH;

4. If there is any discharge of water or other liquids to surface water, ground water or a sewage system, discharge permits may be required by the Wastewater Facilities Regulation Element, (609)292-4860; and
5. For systems using disinfectants, obtain FIFRA approval from USEPA for the disinfectant utilized with the _____. Contact Walter Francis, Office of Pesticide Programs, Registration Division, (703)305-7964.
6. Obtain authorization of the demonstration project from the Bureau of Medical Waste and Residuals Planning (BMWRP).

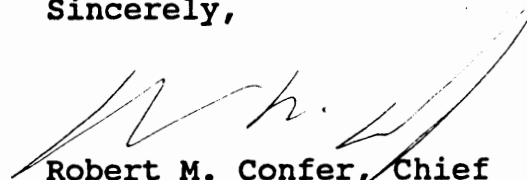
The authorization from the BMWRP is contingent on receipt of documentation that the other requirements listed above have been satisfied. A suitable statement of nonapplicability from an authorizing agency is required if one of the above agencies disclaims jurisdiction. Further, the facility is also responsible for determining that all local, state and federal regulations are complied with.

BMWRP must be supplied with a complete report on completion of the demonstration project. The report, at a minimum, must include a detailed description of the process, the amount of waste treated and destroyed, the timeframe for the treatment/destruction process, a description and quantification of the waste types processed and a summary of the results of the treatment/destruction process including analyses of the residues. More information may be requested by BMWRP and NJDOH as deemed necessary. This will include notice of any additional requirements when authorization is issued as stated above. The _____ system cannot be used after the completion of the demonstration project until all required permits and authorizations are obtained.

There are new regulations in the development stage concerning demonstrations and testing new technologies for solid waste management such as that described in your letter of _____. These will set up specific requirements for demonstration projects and will serve to simplify the process of arranging such projects in the future. We hope to propose and adopt these regulations within the next year.

Please call Ms. Sonya Rozansky of my staff at (609)530-8599 if you have any questions.

Sincerely,

A handwritten signature in dark ink, appearing to read 'R. Confer', is written over the typed name.

Robert M. Confer, Chief
Bureau of Medical Waste
Residuals Management &
Statewide Planning

SR/pt/dls
P/E-92-849

cc: Max Friedman
Ron Ulinsky

MAR 11 1993

N.J. Department of Health Conditions

Based on a generic technology assessment of the ABB Sanitec Microwave Disinfection System and a review of the specific application to install and operate such a system by [REDACTED] Hospital [REDACTED] County [REDACTED] on [REDACTED], 1990, please be advised that the New Jersey State Department of Health finds the subject proposal to be generally acceptable as a means to treat and destroy regulated medical waste as defined and prescribed in N.J.A.C. 7:26-3A.

It is strongly recommended that the following terms and conditions be placed on the permit (s) issued by your agency in this regard which are felt necessary for the proper and safe operation on the subject system:

1. Allowable Waste in Feedstock

Chemotherapy agents and radioactive materials are prohibited.

All seven classes of Regulated Medical Waste (RMW), with the following stipulations and exceptions, are permissible.

Class 1: Culture of any of the following organisms must be pretreated by sterilization:

- (i) Bacillus anthracis
- (ii) Blastomyces dermatitidis
- (iii) Brucella Species
- (iv) Coocidioides immitis, sporulating mold forms
- (v) Francisella tularensis
- (vi) Histoplasma capsulatum
- (vii) Mycobacterium bovis
- (viii) Mycobacterium tuberculosis
- (ix) Yersinia pestis

Class 2: For aesthetic and societal reasons, product of conception and gross anatomical pathological waste will not be allowed to be processed through this system. The department will continue to assess this matter.

Class 6: All wastes described at N.J.A.C. 7:26-3A.6(a)6 must be pretreated by sterilization.

2. Efficacy Testing

- a. Test organism(s): *Bacillus subtilis* (niger spore) is an acceptable organism for testing the efficacy of disinfection during routine operation of the Sanitec unit. A 95% or greater "kill" (e.g., of 40 spore samples, which are introduced into the waste stream below the shredder and traverse the system, 38 or more show no growth upon being cultured) will be considered an acceptable level of disinfection. Other organisms may be used in addition, if desired, however, substitution is acceptable only if substantiating evidence of their equivalency to *Bacillus subtilis* as a suitable indicator is submitted for review before implementation.
- b. Frequency of testing: The following schedule for efficacy testing is mandatory for the start up, shakedown, and routine stages of operation of the Sanitec unit during which the manufacturer's minimum specifications must be met.

Note: During the first three weeks, each week's testing schedule below may be followed only if the previous week's tested samples meet the minimum kill requirement. If it is not met, then the previous week's testing schedule must be repeated.

Week 1: Feedstock: Solid non-regulated medical waste only.

Test: 40 samples on each of three alternate days.

Week 2: Feedstock: Solid non-medical and/or solid non-regulated medical waste mixed, in hopper, with less than 20% regulated medical waste, preferably containing no sharps.

Test: 40 samples on each of five consecutive days.

The feedstock for the third and subsequent weeks may contain non-medical, non-RMW and RMW in any mix ratio including sharps.

Week 3: Test: 40 samples on each of three alternate days.

Week 7: Test: 40 samples on one day.

Week 15: Test: 40 samples on one day.

Week 28: Test: 40 Samples on one day.

Thereafter, at 13-week intervals: test 40 samples in one day.

In the event of a test failure, the following steps must be followed:

- Immediately notify the State Department of Health's Medical Waste Management Project at (609) 984-3947.
- Examine the unit to ensure that all of the required operating parameters are met and notify the manufacturer if assistance is necessary.
- Detain the waste processed during the failure cycle for either reprocessing or disposal in accordance with the established contingency plan.
- Retest during the two consecutive operational periods and detain waste processed until it is verified that the desired level of disinfection is achieved.

3. Recordkeeping

A log of the sampling schedule and associated microbiological laboratory results must be kept for a period of three years in an appropriate manner and form and be available for inspection on demand during that period.

4. Contingency Plans

The following protocols must be prepared in advance of startup of the Sanitec unit.

- a. A plan for the disposal of RMW during down-time for routine maintenance and emergency repair.
- b. A protocol for the removal of untreated RMW from the hopper when the system is shut down for troubleshooting and/or repair.

5. RMW Storage

RMW awaiting treatment and destruction must be protected from the elements and maintained in a nonputrescent state and stored in a limited access area and in a secure manner. Although not a condition of this permit, it is recommended that a special structure be erected that would protect the employees from the elements while operating the Sanitec unit.

6. Operator Training

6. A training program on the proper operation of the Sanitec unit and the correct handling of RMW before introduction into the unit must be established and implemented. Records of training

schedules including personnel involved must be maintained and be available for inspection for a three-year period.

It must be emphasized that this review primarily focused on treatment and destruction efficacy and not on related environmental and occupational health and safety issues. The State Department of Health defers to those state and federal agencies having expertise in and responsibility for these areas of potential concern.

Furthermore, since this is a new technological process, the department reserves the right to modify or amend its position as specified in this transmittal as additional knowledge and experience is acquired relative to the design, installation, operation and efficacy of the subject system.

Should you have any questions or require additional information feel free to contact [REDACTED] Project Manager, Regulated Medical Waste Management, at (609) [REDACTED].

588-3124

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