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yet shown that the Subchapter II provisions will achieve their objectives.

V. DEVELOPMENTS IN MUNICIPAL SLUDGE

DISPOSAL..... KAY HEIDBREDER

A. Introduction

Sludge, the odorous residue from sewage treatment processes, poses a serious threat to the public health environment because of the large quantities of pollutants found in the residue. In addition, experts predict that American wastewater treatment facilities will greatly increase sludge production in future years.⁴⁵² Municipalities, therefore, face an ever expanding need for safe and efficient sludge disposal techniques. Congress, recognizing the possibility of adverse effects, enacted legislation requiring that disposal techniques not be environmentally dangerous.⁴⁵³

Sewage consists of the organic wastes and wastewater used by residential, industrial and other users. Wastewater treatment facilities subject sewage to a number of processes that remove or modify the organic wastes present in the wastewater, and then return the cleansed water to the water stream,⁴⁵⁴ disposing of the residual sludge. Treatment facilities employ one or a combination of the following three treatment processes:⁴⁵⁵ (1) *primary treatment*, a physical process whereby the solids are filtered from the wastewater;⁴⁵⁶

452. In 1972, sewage treatment facilities produced 10,000 dry tons of sludge per day. By 1985, approximately 17,000 dry tons per day are expected to be produced. LEAGUE OF WOMEN VOTERS, *MUNICIPAL SLUDGE: WHAT SHALL WE DO WITH IT?* 1 (1976).

453. See, e.g., Federal Water Pollution Control Act (FWPCA), 33 U.S.C. § 1251, § 1345(a) (1976 & Supp. III 1979) (The Act prohibits, subject to exceptions, the disposal of any sludge into navigable waters if such disposal would cause pollutants to enter the water.); Resource Conservation and Recovery Act of 1976 (RCRA), 42 U.S.C. §§ 6901, 6944 (1976) (Sanitary landfill disposal cannot have an adverse impact on the environment).

454. The Clean Water Act, 33 U.S.C. § 1251 (1976 & Supp. 1979) regulates the treatment level waste water must receive before being returned to the water stream. *Id.* § 1311.

455. Each treatment process refers to a specific phase of treatment. Not all treatment plants utilize each of the three major categories of treatment phases. D. BAUMANN & D. DWORIN, *WATER RESOURCES FOR OUR CITIES* 27 (1978). [hereinafter cited as *WATER RESOURCES*].

456. Primary treatment is a physical process. Often, primary treatment involves allowing the sewage to collect in a basin. Solid materials settle to the bottom for

(2) *secondary wastewater treatment*, a process which biologically reduces the oxygen demand in the treated sewage;⁴⁵⁷ and (3) *tertiary treatment process*, a chemical process which disinfects the sewage.⁴⁵⁸

Sludge, as the by-product of any wastewater treatment process, is a semi-liquid mass, containing approximately 95% water. Sludge consists of the solids from the original wastewater, any organisms growing in the wastewater, and any chemical or other additives used in the wastewater treatment processes.⁴⁵⁹

Until the 1960s, municipalities had few problems with sludge. Most treatment facilities subjected the wastewater to only primary treatment.⁴⁶⁰ Therefore, treatment plants produced only small quantities of sludge⁴⁶¹ which were easily disposed of by dumping, burying or burning.⁴⁶²

In an effort to eliminate the discharge of pollutants into navigable waters by municipal and other users, Congress enacted the Federal Water Pollution Control Act of 1972 (FWPCA).⁴⁶³ After amendments in 1977, the Act's popular name became the "Clean Water Act."⁴⁶⁴ To effectuate the FWPCA's water quality objectives, Congress declared as one of the Act's major goals the total elimination of

removal. The process also involves skimming floating material off of the top. Primary treatment removes approximately 40% to 60% of the solids in sewage. WATER RESOURCES, *supra* note 4, at 28. See also Passman, *Composting Municipal Sludge: Public Health and Legal Implications*, 3 HARV. ENV'T'L L. REV. 381 (1979).

457. Secondary treatment involves biological breakdown of sewage. Bacteria, introduced into the process, degrade the organic matter and reduce the biochemical oxygen demand of the treated wastes. WATER RESOURCES, *supra* note 455, at 28.

458. Tertiary treatment is a chemical process. The chemicals added to the sewage produce flocculation of suspended solids. The solids then are removed. Passman, *supra* note 456, at 381.

459. For a discussion of the composition of sludge see WATER RESOURCES, *supra* note 455, at 28.

460. See J. GOLDSTEIN, *SENSIBLE SLUDGE, A NEW LOOK AT A WASTED NATURAL RESOURCE* 149 (1977) [hereinafter cited as *SENSIBLE SLUDGE*].

461. Primary treatment can reduce organic matter by 60 to 80 percent, although the current reduction rate is only 25 to 30 percent. Municipalities have adopted more sophisticated treatment methods. By the mid 1970s about 80 percent of the nation's treatment facilities utilized secondary treatment, and about five percent adopted the tertiary process. *Id.*

462. *Id.* at 9.

463. 33 U.S.C. § 1251 (1976).

464. 33 U.S.C. § 1251 (Supp. III 1979). The amendments basically allowed extensions on the requirements of the 1972 act.

pollutant discharges into navigable waters by 1985.⁴⁶⁵ In the interim, the Act required municipal wastewater treatment facilities to achieve effluent standards⁴⁶⁶ based on secondary treatment capabilities by July 1, 1977.⁴⁶⁷ Furthermore, by 1983, municipal wastewater treatment systems must utilize "the best practicable waste treatment technology" consistent with the goals of the FWPCA.⁴⁶⁸ In view of this requirement, municipalities will seek more sophisticated treatment methods than provided by secondary wastewater treatment. The level of pollutants remaining in the wastewater stream after secondary treatment will probably fail to meet the 1973 requirement and 1985 goal.

To achieve the FWPCA's objectives, Congress outlawed, subject to exceptions, the discharge of any pollutant into navigable waters.⁴⁶⁹ The Act created the National Pollutant Discharge Elimination System (NPDES) which authorizes EPA to issue permits allowing municipal pollutant discharges from "point sources."⁴⁷⁰ Municipalities may not discharge wastewater failing to meet the effluent limitations without a permit.⁴⁷¹ The permit includes a curtailment schedule aimed at bringing the municipal wastewater treatment facility into compliance with the effluent limitations.⁴⁷²

As municipalities employ more technologically advanced wastewater treatment facilities, wastewater returned to the water stream

465. 33 U.S.C. § 1251(a)(1) (1976).

466. The Act defines an "effluent limitation" as "any restriction established by a State or the Administrator on quantities, rates, and concentrations of chemical, physical, biological, and other constituents which are discharged from point sources into navigable waters, the waters of the contiguous zone, or the ocean, including schedules of compliance." *Id.* § 1362(11).

467. Massive municipal non-compliance occurred. Therefore, Congress authorized the EPA to grant time extensions until July 1, 1983. *Id.* § 1311(i)(1). The EPA has the responsibility of devising regulations that define how clean the treatment facility must make the effluent before it can be discharged. *Id.* § 1314(b).

468. *Id.* § 1281(g)(2)(A).

469. *Id.* § 1311(a).

470. *Id.* § 1342(a)(1). Approved state agencies may issue permits in lieu of the EPA. *Id.* § 1342(b). The act defines "point source" as: "any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged." This term does not include return flows from irrigated agriculture. 33 U.S.C. § 1362(14).

471. 33 U.S.C. §§ 1311(a), 1342, 1344 (1976 & Supp. III 1979).

472. *Id.* at § 1342(a)(1) (Supp. III 1979).

will be cleaner. The treatment processes, however, will result in increased quantities of sludge. Municipalities then must face the problem of discarding this residue. Consistent with the purposes of the FWPCA, Congress prohibited the disposal of sludge into navigable waters.⁴⁷³ Therefore, municipalities must develop an alternative method of disposal. The following section describes disposal techniques currently in use or which could be put into use.

B. *Alternative Disposal Methods*

1. Incineration

Incineration is not an ultimate disposal technique, but a volume reduction method.⁴⁷⁴ Municipalities possessing little available land for landfill disposal often employ this technique. The incinerator reduces the sludge to a sterile ash,⁴⁷⁵ weighing between ten and thirty percent of the original dry matter.⁴⁷⁶ The remaining ash is either dry or in scrubber water, depending on the extent of the incineration process.⁴⁷⁷ Municipalities must then dispose of the ash.

In accordance with the Air Pollution Prevention and Control Act ("Clean Air Act")⁴⁷⁸ requirements, incinerators must meet the same air quality standards as other facilities expelling pollutants into the

473. *Id.* § 1345(a). If the sludge meets the effluent limitations criteria, municipalities can discharge it into navigable waters. The EPA may authorize sludge disposal by municipal treatment facilities under the National Pollutant Discharge Elimination System permits. *Id.* § 1342.

474. *See generally* R. COREY, PRINCIPLES AND PRACTICES OF INCINERATION (1969).

475. *Id.*

476. ENVIRONMENTAL PROTECTION AGENCY, MUNICIPAL SLUDGE MANAGEMENT: EPA CONSTRUCTION GRANTS PROGRAM 7 (1976).

477. Most incinerators are multiple hearth. These incinerators can decompose certain pesticides and control heavy metals. Another common incinerator is the fluidized bed reactor. The incinerator oxidizes the sludge which produces a self-sustaining combustion. This method is more fuel efficient than the multiple hearth incinerators.

478. 42 U.S.C. § 7401-7642. (Supp. III 1979) (Originally enacted as act of July 14, 1955, c. 360, 69 stat. 322). For a discussion of the original act see Hines, *A Decade of Nondegradation Policy in Congress and the Courts: The Erratic Pursuit of Clear Air And Clean Water*, 62 IOWA L. REV. 643 (1977). For a discussion of the 1977 amendments see Pendley & Morgan, *The Clean Air Act Amendments of 1977: A Selective Legislative Analysis*, 13 LAND & WATER L. REV. 747 (1978).

atmosphere.⁴⁷⁹ Incineration presents a greater problem because treatment plants frequently process industrial wastewaters. These wastes often contain such elements as mercury, persistent organics, and radioactive material.⁴⁸⁰ During the incineration process, these elements become vaporized and are expelled into the environment.⁴⁸¹ Treatment plants should attempt to remove the elements before incinerating the sludge.⁴⁸² The "Clean Air Act" and regulations promulgated thereunder, encourage removal of these elements before incineration by setting permissible emission levels on many of these materials.⁴⁸³

Incinerators expend large amounts of energy in reducing the sludge to ash. Because of the rising energy costs, the process has become quite expensive.⁴⁸⁴ Incineration, however, involves definite economics of scale. Municipalities treating large amounts of sludge often find incineration the least expensive alternative. Large cities may incinerate their sludge at essentially the same cost as incurred when sludge is hauled to distant landfills.⁴⁸⁵ Because of these factors, the EPA only encourages larger facilities to consider incineration. Future technological advances will hopefully reduce both costs and

479. 42 U.S.C. § 7411(a)(3) (Supp. III 1979). For the emissions limitations see *id.* §§ 7470-79 (Supp. III 1979).

480. *See generally* R. COREY, PRINCIPLES AND PRACTICES OF INCINERATION 163-209 (1978).

481. *Id.*

482. Treatment plant procedures minimize the presence of hazardous chemicals and substances in incinerated sludge. *See, e.g.*, R. CULP, G. WESNER, & G. CULP, HANDBOOK OF ADVANCED WASTEWATER TREATMENT, 428 (1978) (finding no environmental problems with incineration project in Cleveland); K. IMHOFF, W. MULLER & D. THISTLETHWAYTE, DISPOSAL OF SEWAGE AND OTHER WATER-BORNE WASTES, 294 (1971) (setting out the standard technique of incinerating municipal sludge); INCINERATION, *supra* note 474, at 10, 12 (presenting a break down of the chemical components of sludge cakes prior to incineration).

483. The air quality regulations apply to any incineration method. The EPA has set primary and secondary limits on discharge levels. 40 C.F.R. 350. Permissible discharge levels for particular materials are in 40 C.F.R. §§ 60-61. *See also* ENVIRONMENTAL PROTECTION AGENCY, A GUIDE TO REGULATIONS AND GUIDANCE FOR THE UTILIZATION AND DISPOSAL OF MUNICIPAL SLUDGE 12-13 (1980) [hereinafter cited as EPA GUIDE TO REGULATIONS].

484. The incineration process costs from \$80-\$240 per dry ton. EPA GUIDE TO REGULATIONS, *supra* note 483, at 3.

485. Land filling, including transportation expenses, costs from \$73-\$226 per dry ton. *Id.*

energy requirements.⁴⁸⁶

2. Ocean Dumping and Discharge

Discharging and dumping⁴⁸⁷ of wastes into the ocean is not a new sludge disposal alternative.⁴⁸⁸ Man has employed this method for centuries to rid him of unwanted wastes.⁴⁸⁹ Not only is this an ancient practice, but it is also the least costly alternative available to date.⁴⁹⁰ Although both the east and west coasts utilize the ocean for dumping, each coast implements different methods of waste disposal. Boats and barges dump the eastern coastal cities' wastes into "sites."⁴⁹¹ The largest of these dumping sites is the New York Bight, located off the southeast coast of New York City.⁴⁹² Unlike the eastern cities, many Pacific coastal cities directly discharge their wastes into the ocean⁴⁹³ from land-based facilities. Sludge is piped from municipal treatment centers to outfalls located off the coast through

486. Some new methods of thermal reduction exist, but are not widely practical. Coincineration involves incinerating the sludge with refuse, refuse derived fuel, or coal. This will reduce auxiliary gas and oil fuel needs. Pyrolysis is a starved air combustion process that emits a low grade fuel. The fuel can then be used to operate the incinerators, heat the building, etc. The heat drying method produces ash that can be used as a fertilizer. *See* EPA GUIDE TO REGULATIONS, *supra* note 483, at 11. St. Louis City, in their Coldwater Creek facility, subjects its sludge to a pyrolysis and produces methane gas. The facility then uses the gas to heat the buildings. Interview with Bernie Raines, St. Louis Metropolitan Sewer District, in St. Louis, Mo. (September 24, 1980).

487. Even though ocean discharging and dumping are two different methods of waste disposal (*see* notes 492, 494, 501-24 and accompanying text *infra*), the ultimate outcome of the two are the same. Hence, these terms may be used interchangeably when discussing ocean dumping in general.

488. *See* notes 489, 492-94 *infra*.

489. Comment, *Ocean Dumping Regulation: An Overview*, 5 *ECOLOGY L. Q.* 753, 753 (1976) [hereinafter cited as *Ocean Dumping Regulation*].

490. Sludge disposal through ocean dumping costs only \$30—\$50 per dry ton. Ocean discharge systems cost approximately \$20 per day ton. EPA GUIDE TO REGULATIONS *supra* note 483, at 3). *See Ocean Dumping: Hearings before the Subcommittee on Oceanography and the Subcommittee on Fisheries and Wildlife Conservation and the Environment of the House Committee on Merchant Marine and Fisheries*, 96th Cong., 108 (1980) [hereinafter cited as *Ocean Dumping Hearings*] (Statement of Rep. Hayes).

491. Rogers, *Ocean Dumping*, 7 *ENV'T L.* 1 (1976).

492. *Id.* at 3 n.11. The area extends from the tip of Long Island to about Cape May, New Jersey and out to the edge of the continental shelf. *Id.*

493. *See id.* at 6. Florida also practices ocean discharge. *Id.*

point sources.⁴⁹⁴ Both ocean dumping and outfall discharges pose serious hazards.⁴⁹⁵ If used correctly, though, the ocean has the ability to assimilate wastes⁴⁹⁶ and thus become a viable method of waste disposal.

In the early 1970's, Congress recognized that unregulated dumping of sludge was creating a significant problem.⁴⁹⁷ As a result, Congress passed legislation which regulated the dumping and discharging of wastes into the ocean.⁴⁹⁸ Two major acts arising from this congressional concern are the Federal Water Pollution Control Act (FWPCA)⁴⁹⁹ and the Marine Protection, Research, and Sanctuaries Act of 1977 (MPRSA).⁵⁰⁰ The FWPCA regulates municipal sewage discharges⁵⁰¹ while the MPRSA regulates ocean dumping activities.⁵⁰²

The FWPCA does not permit any discharging of sludge into the ocean unless its statutory guidelines are met.⁵⁰³ To insure compliance with these guidelines, the act provides for a permit program known as National Pollution Discharge Elimination System (NPDES).⁵⁰⁴ This program is regulated by the Environmental Protection Agency (EPA).⁵⁰⁵ No NPDES permit may be issued which allows discharge of pollutants that unreasonably degrade the marine

494. See Note, *The Ocean Dumping Dilemma*, 10 LAW AM. 868, 876-77 nn. 37-38 (1978) [hereinafter cited as *Ocean Dumping Dilemma*].

495. See notes 538-41 and accompanying text *infra*.

496. Knauss, *Ocean Pollution: Status and Prognostication*, in LAW OF THE SEA: THE EMERGING REGIME OF THE OCEANS 313, 322 (J. Gamble, Jr. ed. 1973).

497. See N. Padelford & J. Cook, NEW DIMENSIONS OF THE U.S. MARINE POLICY 41-42 (1971).

498. The 1970 Council on Environmental Policy's report on ocean dumping was a major factor which pushed Congress into action in promulgating ocean dumping regulation. Prior to 1972, no comprehensive ocean dumping regulation existed. 10 ENV'T'L L. REP. (ELI) 10177, 10178 n.7 (1980). Several other federal agencies had powers to regulate dumping but they proved to be ineffective because they had no powers to regulate dumping in the ocean past the three-mile limit. *Ocean Dumping Regulation*, *supra* note 489, at 758.

499. 33 U.S.C. § 1251-1376 (1976 & Supp. III 1979).

500. 33 U.S.C. § 1401-44 (1976 & Supp. III 1979). The pertinent part of the act is Title I, The Ocean Dumping Act, 33 U.S.C. § 1411-1421 (1976 and Supp. III 1979).

501. 33 U.S.C. § 1343 (1976).

502. 33 U.S.C. § 1401 (1976).

503. 33 U.S.C. § 1343 (1976).

504. 33 U.S.C. § 1342 (1976).

505. *Id.* See also 33 U.S.C. § 1251(d) (1976).

environment.⁵⁰⁶ Such unreasonable degradation is measured by EPA criteria⁵⁰⁷ promulgated in compliance with FWPCA guidelines.⁵⁰⁸ NPDES ocean discharge permits must also meet FWPCA's effluent limitations.⁵⁰⁹ These limitations call for a progression toward the national goal of eliminating the discharge of all pollutants into either coastal or inland waters.⁵¹⁰ To effect this goal, each NPDES permit issued must submit a discharge reduction schedule which will comply or eventually comply with FWPCA effluent limitations.⁵¹¹ Municipal permit holders must comply with effluent limitations no later than July 1, 1983.⁵¹²

The MRPSA prohibits unregulated dumping of any material into the territorial seas or the contiguous sea zones of the United States.⁵¹³ Like the FWPCA, the MRPSA authorizes the EPA to regulate ocean dumping through a permit system.⁵¹⁴ To dump any material into the ocean, a prospective dumper must obtain an EPA permit issued pursuant to MPRSA standards⁵¹⁵ as well as established EPA criteria.⁵¹⁶ Although the MPRSA only specifically addresses general permits, it allows the EPA to establish and issue other various categories of per-

506. 45 Fed. Reg. 65942. *See also* 40 C.F.R. § 125.123(b) (1980).

507. 40 C.F.R. at § 125.122.

508. EPA's ocean discharge criteria (40 C.F.R. §§ 125.120-124 (1980)) is authorized by 33 U.S.C. § 1251(e) (1976). The FWPCA guidelines, which EPA must consider in determining degradation, is set out in 33 U.S.C. § 1343(c) (1976).

509. 33 U.S.C. at 1342 states that before a NPDES permit may be issued, 33 U.S.C. § 1311 (1976 & Supp. III 1979) requirements must be met. These requirements comprise the effluent limitation system. The effluent limitation system is a program to eventually produce effluents that meet acceptable environmental criteria as set out in the FWPCA. *Id.*

510. 33 U.S.C. § 1311(b) (1976 Supp. III 1979) sets up a timetable to carry out one of the objectives of this act: to achieve the national goal of eliminating the discharge of pollutants into waters. 33 U.S.C. § 1251(a)(1)-(6) (1976).

511. 33 U.S.C. § 1311(i) (Supp. III 1979). *See also* Recent Developments, *Highlights of the Clean Water Act of 1977*, 8 ENV'T'L L. 869, 870 (1978).

512. 33 U.S.C. at § 1311(i). *See also* Recent Developments, *supra* note 511, at 873. For non-municipal permit holders' date for compliance see 33 U.S.C. §§ 1311(b)(2) (1976 & Supp. III 1979) and Recent Developments, *supra* note 511, at 874-78.

513. 33 U.S.C. § 1411 (1976).

514. 33 U.S.C. at §§ 1411-12.

515. 33 U.S.C. at § 1412(a).

516. 40 C.F.R. §§ 227.1-.32 (1981).

mits.⁵¹⁷ General and interim permits are two such categories established by EPA guidelines.⁵¹⁸ EPA issues general permits only if dumped materials do not pose an unreasonable danger of degrading the environment or human life.⁵¹⁹ Current wastewater treatment technology has not advanced to the point that the by-product sludge meets this general permit standard.⁵²⁰

The EPA can no longer issue interim permits as of April, 1978.⁵²¹ These permits usually were issued for those materials that did not satisfy EPA established criteria but for which a need to dump was established. Municipal sludge is a major waste dumped under this permit.⁵²² Holders of interim permits were allowed to continue dumping only if they had begun to implement a schedule to end ocean dumping by December 31, 1981.⁵²³ After this date, no permits could be reissued⁵²⁴ and so consequently no sludge dumping may take place.

A problem arose when it became apparent that a few eastern coastal cities, utilizing interim permits, would not be able to meet the statutory December deadline.⁵²⁵ Congress and EPA stood firm in refusing to extend the deadline.⁵²⁶ This forced New York City, a large producer of sewage sludge, to implement an alternative method of disposal.⁵²⁷ This amounted to virtually stockpiling the sludge on

517. 33 U.S.C. at 1412(b). For a general discussion of the permit system see *Ocean Dumping Dilemma*, *supra* note 494, at 904-08.

518. See 40 C.F.R. at §§ 220.3(a)-(d). Other permits established by the EPA guidelines include special, emergency, and research permits. See *id.* §§ 220.3(b), (c), (e).

519. 40 C.F.R. at § 220.3(a).

520. EPA GUIDE TO REGULATIONS, *supra* note 483, at 35.

521. 40 C.F.R. at § 220.3(d).

522. *Ocean Dumping Regulations*, *supra* note 489, at 775.

523. 40 C.F.R. at §§ 220.3(d) 227.23.

524. 33 U.S.C. § 1412(a) (Supp. III 1979).

525. *Ocean Dumping Hearings*, *supra* note 490, at 26. The EPA has predicted that New York City, the largest dumper of sludge (*see* note 527, *infra*), will not meet the 1981 deadline. Interview with Robert Buston, Environmental Protection Agency, in Washington, D.C. (Oct. 7, 1980).

526. *Ocean Dumping Hearings*, *supra* note 490, at 261 (statement of Harry L. Longest, III).

527. New York City's long-term sludge disposal plan is pyrolysis. *Reauthorization of the Toxic Substance Control Act, Safe Drinking Water Act, and the Marine Protection, Research, and Sanctuaries Act, Hearing Before the Subcommittee on Environmental Pollution of the Senate Committee on Environment and Public Works*, 96th Cong.,

landfills and parks until New York City's permanent alternative disposal program is completed.⁵²⁸ Due to the large volume of sludge which New York City produces yearly,⁵²⁹ this stockpiling could pose serious environmental and health hazards.⁵³⁰

When faced with this argument, EPA rigidly maintained its position to end ocean dumping by 1982, regardless of the environmental consequences of a land-based alternative.⁵³¹ This argument between New York City and EPA culminated in the case of *City of New York v. Costel*⁵³² in 1981. The United States district court of New York found that Congress intended EPA to evaluate and balance all relative statutory factors in issuing permits.⁵³³ Since the court found that only dumping of *unreasonably* dangerous material was prohibited by the EPA guidelines, the court ordered EPA to consider and analyze the environmental impact of land-based alternatives against ocean

1st Sess. 111 (1979) [hereinafter cited as *Environmental and Public Works Hearing*]. This process partially decomposes the sludge to an ash and a gas. EPA, OCEAN DUMPING IN THE UNITED STATES, SIXTH ANNUAL REPORT OF THE ENVIRONMENTAL PROTECTION AGENCY ON ADMINISTRATION OF TITLE I, 47 (1977).

New York City's long-term disposal plan will not be ready until the late 1980's. *Environmental and Public Works Hearing, supra*. Composting is the city's interim plan, but the city could not implement this plan on time, either. New York City estimates that it will have to stockpile the sludge for about fourteen months. *Ocean Dumping Hearings, supra* note 490, at 272 (statement of Francis X. McArdle).

528. See note 527 *supra*.

529. New York City produces around 2,480,000 tons of sludge each year. See *Ocean Dumping Hearings, supra* note 490 at 121 (Attachment I).

530. One serious hazard is possible leaking of toxic poisons into the groundwater. Once the groundwater is polluted, it will remain so for hundreds of years. It is hard to cleanse. It cannot cleanse itself as do rivers and oceans through cycling. U.S. Council on Environmental Quality, 10 ENVIRONMENTAL QUALITY ANNUAL REPORT 110 (1979). Groundwater is a major source of drinking water for many people. *Reauthorization of the Resource Conservation and Recovery Act, Hearings before the Subcommittee on Resource Protection of the Senate Committee on Environmental and Public Works, 96th Cong., 1st Sess.* 147.

531. This quote best summarizes the EPA's position:

It is our position that EPA will not initiate any legislation to extend the 1981 deadline. We feel this deadline is reasonable and has provided adequate time for compliance efforts. We are, however, making use of every tool available to us at this point, and we believe that any lack of compliance with the law should be handled through the normal administrative and judicial procedures.

Ocean Dumping Hearings, supra note 490, at 261 (statement of Henry L. Longest III).

532. *City of New York v. Costel*, No. 80 Civ. 1677 (S.D. N.Y. April 19, 1981) as amended, *City of New York v. Costel*, No. 80 Civ. 1677 (S.D. N.Y. Aug. 27, 1981).

533. *Id.*

dumping.⁵³⁴ The court further held the 1981 deadline in effect.⁵³⁵ The *Costel* opinion, though, states that if the EPA found the land-based alternatives to be more damaging to the environment and human health than dumping, then Congress could not conceivably have intended to forbid EPA from granting dumping permits.⁵³⁶ This language strongly suggests that if land-based alternatives are found to be more hazardous than ocean dumping, the deadline should be extended. The District Court in *Coastal* reasoned wisely. Ocean dumping is a dangerous and abused practice.⁵³⁷ But it is equally dangerous to arbitrarily and summarily dismiss it as a method of disposal; the inevitable shift of waste disposal from water to land clearly will exacerbate existing land and air pollution.

Environmental damage *does* result from sludge dumping. Three major adverse effects of dumping may cause damage to marine as well as human life. First, toxic poisons released by ocean-dumped wastes can poison not only the marine environment, but it can also pass rapidly up the food chain and poison man.⁵³⁸ Second, oxygen essential for aquatic life can be depleted when large amounts of wastes are dumped into one area.⁵³⁹ Last, biostimulation may occur which also may lead to toxic conditions.⁵⁴⁰ The strongest argument to end ocean dumping, though, is that once the ocean becomes polluted, it is virtually impossible to correct given the size of the sea and its slow moving cleansing cycles.⁵⁴¹

Although continued *unregulated* dumping will be disastrous for all of ocean life, man should not entirely eliminate the ocean as a reposi-

534. *Id.*

535. *Id.*

536. *Id.*

537. See notes 538-41 and accompanying text *infra*. Man has abused the ocean as a method of disposal by dumping an abundance of pollutants into it, thereby straining its ability to assimilate wastes. See *Ocean Dumping Regulation*, *supra* note 489 at 753.

538. See *Ocean Dumping Dilemma*, *supra* note 494, at 886 n.92; *Ocean Dumping Regulation*, *supra* note 489, at 755-57.

539. See *Ocean Dumping Dilemma*, *supra* note 494, at 886 n.93; *Ocean Dumping Regulation*, *supra* note 489, at 757.

540. See *Ocean Dumping Dilemma*, *supra* note 494, at 886 n.94. Biostimulation is the process of accelerated fertilization of plant life caused by excessive nutrients found in sludge. For a more detailed discussion on the effects of ocean dumping, see IMPINGEMENT OF MAN ON THE OCEANS 445 (D. Hood ed. 1971).

541. D. Hood, *Introduction: Man and the Ocean Environment*, in IMPINGEMENT OF MAN ON THE OCEANS 1, 5 (D. Hood ed. 1971).

tory for waste disposal. Though the ocean is in danger of becoming polluted, experts have stated that the ocean's condition has not reached a state of emergency.⁵⁴² Studies of the New York Bight area support this statement.⁵⁴³ Sludge dumping in this area is not so detrimental that a cessation of it would effect a drastic improvement.⁵⁴⁴ Many materials normally considered dangerous may be safely disposed of at sea.⁵⁴⁵ Man can accomplish this through a working knowledge of toxicity tolerance levels among indigenous organisms, along with a utilization of the ocean's huge water volume and its cycles.⁵⁴⁶ The ocean has a tremendous ability to assimilate wastes.⁵⁴⁷ If dangerous pollutants can be taken out of sludge, then the ocean may then be able to work for man. Used efficiently and effectively, through strict regulation of dumping and discharging, the ocean could become a plausible medium of disposal.

3. Landfills

Municipalities must turn to disposal techniques other than ocean and navigable water dumping because statutory time limits on such

542. *Id.* No measurable impacts to the open ocean will appear during the next twenty years. COUNCIL ON ENVIRONMENTAL QUALITY, U.S. DEP'T OF STATE, GLOBAL FUTURE: TIME TO ACT 159 (1981).

543. In a detailed investigation it was found that mud deposits of the New York Bight does not contain any more organic carbon than found on the continental shelf muds from other areas. Freeland, Swift & Young, *Mud Deposits Near the New York Bight Dumpsight: Origin and Behavior*, in OCEAN DUMPING AND MARINE POLLUTION 76 (1979). Contamination of the mud needs chemical techniques to detect. There are no physical detectable signs. The sewage sludge front that was feared to be advancing toward the beaches were only mud patches. Inferences from this study were that the sludge is rapidly diluted by natural sediment, and the more stable components are widely dispersed through the natural mud deposits. *Id.* at 73.

544. *Ocean Dumping Authorization, Hearings before the Subcommittee on the Environment and the Atmosphere of the House Committee on Science and Technology*, 95th Cong., 2nd Sess. 13 (1978). The reason for this is that the Hudson and Raritan rivers contribute significantly to the contamination of the Bight. They contribute far more to the pollution in the area than does the dumping of sludge and dredged spoils. The particles of grease, tar, and trash that contaminate the beaches come from the rivers. *Id.* at 12.

545. Hood, *Introduction: Man and the Ocean Environment*, in IMPINGEMENT OF MAN ON THE OCEANS 1, 3 (D. Hood ed. 1971).

546. *Id.* Disposal of wastes at sea may become safer if wastes are spread over a large area of water. This avoids most of the problems of biostimulation and oxygen depletion.

547. See note 496 and accompanying text *supra*.

dumping will soon expire.⁵⁴⁸ Landfilling constitutes a major alternate disposal technique. A substantial percentage of municipal sludge and ash from incineration is deposited in landfills.⁵⁴⁹ Often cities mix the sludge with other solid refuse before dumping. Landfilling tends to be a cost efficient disposal method if a municipality can locate adequate sites near its wastewater treatment facility.⁵⁵⁰

Both the Resource Conservation and Recovery Act (RCRA)⁵⁵¹ and the FWPCA⁵⁵² authorize the EPA to issue regulations that will effectuate environmentally sound sludge disposal. The EPA, in accordance with statutory requirements, promulgated regulations for the safe disposal of solid wastes in landfills. Regulations also apply to disposal of sludge in landfills.⁵⁵³ All municipal landfills must meet the EPA requirements by January, 1986.⁵⁵⁴

The major problem created by a landfill is the possibility of resulting groundwater pollution.⁵⁵⁵ Many communities use groundwater as a source of their drinking water.⁵⁵⁶ Pollutants and bacteria contained in sludge may enter water supplies from landfills through runoff of leachate, accidental spills or drifts of sludge sprays.⁵⁵⁷ Therefore, EPA regulations prohibit the use of a sanitary landfill that leads to groundwater contamination beyond the facility's bound-

548. In 1978, 11% of all sewer sludge ended up in lagoons. EPA GUIDE TO REGULATIONS, *supra* note 483, at 27. Thirty-three percent was deposited in landfills (*id.* at 29) for a total of 44%.

549. All municipal ocean dumping must end by December 1981. Marine Protection Research and Sanctuaries Act of 1977 (MPRSA), 33 U.S.C. §§ 1401, 1412(a) (Supp. III 1979). The FWPCA, 33 U.S.C. § 1251 (1976 & Supp. III 1979), prohibits dumping unless the sludge meets effluent guidelines. *Id.* at § 1345. Currently no municipal sludge can meet these guidelines.

550. See NATIONAL CENTER FOR RESOURCE RECOVERY, SANITARY LANDFILL: A STATE-OF-THE ART STUDY (1974).

551. 42 U.S.C. §§ 6901, 6944 (1976).

552. 33 U.S.C. § 1345(d) (1976).

553. EPA Criteria for Classification of Solid Waste Disposal Facilities and Practices, 40 C.F.R. 257 (1981).

554. Facilities must immediately comply with the criteria. If they do not, the state may issue a discharge permit to the facility that lasts up to five years. The permit outlines a schedule whereby the operation will eventually comply with the criteria. All facilities must comply by January 1986. See EPA GUIDE TO REGULATIONS, *supra* note 483, at 30; 40 C.F.R. § 257.3-4 (1981).

555. *Id.*

556. *Id.*

557. *Id.*

ary.⁵⁵⁸ To meet this requirement, the facility needs some type of a liner. Clay provides an effective natural base for landfills.⁵⁵⁹ Municipalities can also install plastic lining before the landfill becomes operational.⁵⁶⁰

Other problems exist with landfills. Persons residing near the site of a proposed landfill frequently oppose the siting. Residents fear the landfill will emit odors and expose them to safety hazards.⁵⁶¹ To make the area safer, municipalities should erect barriers that prevent children from playing near the landfill.⁵⁶² Furthermore, good sites are becoming scarce. As existing facilities become filled with sludge, municipalities may be forced to locate new landfills far from the waste treatment facility. This increases the municipality's disposal cost because of the expense in hauling sludge greater distances.

4. Sludge as Soil Conditioner or Fertilizer

Before municipalities developed water carrying systems for human waste removal, farmers used such waste products as a natural fertilizer. Scavengers emptied the cities' cesspools and privy vaults at night. They would haul the wastes to farmers near the town.⁵⁶³ The Chinese continue to use untreated human wastes as fertilizer.⁵⁶⁴ Many municipalities today are turning their sludge into either soil conditioner or fertilizer.⁵⁶⁵

The EPA promulgated regulations under the statutory authority of

558. Under the regulations, the state has the authority to set another boundary. Many States have their own requirements for landfills. RCRA does not preempt these statutes, provided they are at least as stringent as those authorized under federal law. 42 U.S.C. § 6929 (1976).

559. See R. SANKS, J. LA PLANTE, & E. GLOYNE, *SURVEY: SUITABILITY OF CLAY BEDS FOR STORAGE OF INDUSTRIAL SOLID WASTES* (1975).

560. The criteria also regulate other problem areas landfills pose. Of special importance are the regulations dealing with possible disease transmittals. 40 C.F.R. 257.3-6 (1981).

561. See NATIONAL CENTER FOR RESOURCE RECOVERY, *SANITARY LANDFILL: A STATE-OF-THE ART STUDY* (1974).

562. *Id.*

563. Often these waste products would be called "night-soil." *SENSIBLE SLUDGE*, *supra* note 460, at 15-20.

564. *Id.* at 16.

565. For a discussion of the process by which a municipality converts sludge into fertilizer, see *DESIGN OF MUNICIPAL SLUDGE COMPOST FACILITIES* (1978). For an economic and social evaluation of the merits of sludge-fertilizer, see *SLUDGE DISPOSAL BY LANDSPREADING TECHNIQUES* (1979).

FWPCA⁵⁶⁶ and the RCRA⁵⁶⁷ dealing with the application of sludge as a soil conditioner or fertilizer. Specific regulations control the landspreading facility's use of sludge in order to protect surface water⁵⁶⁸ and groundwater from contamination. These regulations also attempt to prevent pathogenic organisms or toxic substances from reaching the food chain.⁵⁶⁹

The use of sludge as a fertilizer presents the danger that humans may contract diseases from pathogens in the sludge. In order to eliminate this problem, EPA regulations require sludge pretreatment by a process that will significantly reduce pathogens.⁵⁷⁰ Landspreading facilities must also limit public access to areas applied with sludge for twelve months as well as grazing by animals whose products humans eat for one month.⁵⁷¹ If the sludge will be used to fertilize land used for crop production, further sludge stabilization must be undertaken.⁵⁷²

Once municipalities transform their sludge into fertilizer or soil conditioner, they must find a market for their product. Municipalities have employed various marketing techniques. Milwaukee packages and sells their sludge under the trade-name Milorganite. Chicago adopted the product designation Nu-Earth and provides the sludge-fertilizer free of charge to persons desiring the product.⁵⁷³ The EPA plans to issue regulations governing the marketing and dis-

566. 33 U.S.C. § 1345(b) (1976).

567. 42 U.S.C. §§ 1345(b)(3), 6944(a) (1976).

568. EPA: Criteria for Classification of Solid Waste Disposal Facilities, 44 Fed. Reg. 53443 (1979) (to be codified in 40 C.F.R. 257.3-3).

569. *Id.* 53449 (to be codified in 40 C.F.R. § 257.3-5). Many sludges contain high concentrations of metals that could be toxic to plants. Municipalities should either screen out these pollutants or dispose of these sludges in an alternate manner. *See generally* EPA, MUNICIPAL SLUDGE MANAGEMENT: ENVIRONMENTAL FACTORS 12-14 (1977).

570. 44 Fed. Reg. 53455 (1979) (to be codified in 40 C.F.R. § 257.3-6).

571. *Id.*

572. *Id.* If a municipality turns their sludge into fertilizer, a major problem of responsibility arises. If pathogens enter the food chain and humans become sick from consuming the food, someone must be responsible. The question is whether the wastewater treatment plant, the farmer, the store selling the food products, or some other party should bear responsibility. For a discussion of this problem see Passman, *supra* note 456, at 392-398.

573. *See* SENSIBLE SLUDGE, *supra* note 460, at 83-92 (presenting a description of marketing techniques of sludge-fertilizer).

tribution of these products in the near future.⁵⁷⁴

C. *The Future of Sludge Disposal*

The ever increasing concern for environmental safety has moved municipalities to continue their efforts toward developing new sludge disposal techniques.⁵⁷⁵ Federal financing exists to help defray the costs of developing new facilities. RCRA provides research and development financing to states or regional agencies.⁵⁷⁶ Also, under the FWPCA, municipalities may receive up to 85% of the construction cost for innovative disposal techniques.⁵⁷⁷ The Federal Non-nuclear Energy Research and Development Act of 1974⁵⁷⁸ authorizes federal contributions to offset municipal costs in the creation of facilities that convert sludge into a usable energy source.⁵⁷⁹

Federal laws and EPA regulations are forward looking measures that attempt to deal with the sludge problem. They contemplate eventual sludge management that will result in environmentally safe disposal. During the development of new techniques, sludge will continue to cause damage. Federal law has not addressed the problem of reclaiming sludge damaged areas, or of compensating individuals injured by inadequate sludge disposal.

In 1979, Congressman Drinan introduced a bill entitled the "Sludge Management Act of 1979" that would provide a total assault on sludge.⁵⁸⁰ The bill specifically authorizes funding for research into possible health and environmental threats posed by current sludge management policies.⁵⁸¹ Furthermore, it provides federal assistance for cleaning up damage caused by sludge to the public waters.⁵⁸² This bill would be a necessary start in dealing with the sludge

574. EPA GUIDE TO REGULATIONS, *supra* note 483, at 46.

575. See EPA: INNOVATIVE TECHNOLOGY: MEETING THE CHALLENGE OF THE 80's. (Describes pilot projects across the country that utilize sludge in innovative fashions).

576. 42 U.S.C. § 6912(a) (1976).

577. 33 U.S.C. § 1282(a)(2) (Supp. III 1979).

578. 42 U.S.C. § 5901 (1976).

579. ENVIRONMENTAL AND NATURAL RESOURCES POLICY DIVISION OF THE LIBRARY OF CONGRESS FOR THE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS, ENVIRONMENTAL PROTECTION AFFAIRS OF THE NINETY-FIFTH CONGRESS, 96th Cong., 1st Sess. 122-25 (1979).

580. H.R. 290, 96th Cong., 1st Sess. (1979).

581. *Id.* § (5)(a).

582. *Id.* § (6)(b). No congressional action has been taken on this bill.

problem. The problem of sludge related damage would need additional legislative attention, however, since this bill does not provide redress for damage sludge may be causing to the air or land.

D. *Conclusion*

The sludge disposal problem has increased in magnitude since the enactment of the FWPCA. Municipalities increasingly have to find new methods for disposing of their sludge. Current methods, for the most part, fail to utilize sludge as a resource, but instead treat it as a waste that needs to be discarded. Slowly, municipalities are beginning to rethink the sludge problem and devise productive uses for the material, such as turning it into fertilizer.

