"What Ever Happened to the RD&D Rule? A Look at Where Landfills Have Come From and Where They are Heading"

Robert B. Gardner, P.E., DEE
Senior Vice President
SCS ENGINEERS
6330 North Center Dr, Bldg 13, Suite 100
Norfolk, VA 23502
(757) 466-3361
rgardner@scsengineers.com

INTRODUCTION

Civilizations have always recycled, burned, buried or otherwise processed its solid waste. The techniques, sophistication, complexity, and regulatory requirements governing how we accomplish these tasks have varied from place to place and from time to time, generally increasing over the ages. However, even today, one can go to many countries (and even in the United States) and find open dumps, widespread indiscriminate disposal of residential, commercial, and industrial wastes, and blatant disregard for environmental regulations, or no regulatory controls at all.

The approaches communities take to solid waste management are governed in many ways by the fundamental understanding that the community has on how such practices will impact the quality of life of the community. Ten thousand years ago when humans were primarily nomadic, how solid waste was disposed was of much less importance because the types and quantities of waste that were generated and the consequences of disposing primarily food and animal waste products in close proximity to where they lived. However, as fixed communities began to form, the "how and where" of solid waste management became more important.

According to a recent publication from NSWMA, a connection was not made until the late 1800s between disease and environmental conditions.[1] Up until that time, the common practice was to either throw wastes into the streets, and allow scavengers or animals to take care of the waste, or maybe use a rudimentary collection system to take waste to open dumps or uncontrolled incinerators just outside of the city or town limits. Swamps, which we now call "wetlands", were not viewed as environmental assets to be protected, but rather as sources of mosquitoes that needed to be eliminated or land that needed to be reclaimed for other purposes. Solid waste and other waste products were viewed as a way of "reclaiming" these lands. Nearly every city in the United States that is adjacent to a river, stream, or bay has a landfill along its banks or shores, a marker to the historical practices and philosophy of solid waste management.

As the industrial revolution progressed in the 19th and 20th centuries, our ability to create new residential, commercial, and industrial waste products outpaced our ability or a least the sense of urgency of properly disposing of these waste products. In the late 1800's and early 1900's, some progress began to be made in larger cities toward "managing" the waste that were being generated. Rudimentary collection systems were developed, dumps opened, wetlands filled, or waste disposed directly into the sea, all in an attempt to separate the waste from the densely populated urban centers and negate some of the more obvious negative environmental consequences such as disease, odor, vector, and aesthetic problems. The 1930s saw the emergence of what might be considered the modern day landfill in California, where rudimentary cover practices were employed to control odors and vectors.

Our "beliefs" have shaped the way we have managed solid waste in the past. In the past:

- We viewed wetlands as "wasteland", so we filled them in with garbage and debris.
- We viewed the ocean as limitless, so we disposed of waste directly in the water and allowed the tides to purify the wastes or flush them from our area.
- We did not understand the complexity of geology, groundwater, and surface water interconnection, so we disposed of solid waste without considering the impact to each and the resulting impacts to humans, wildlife, and the environment in general.
- We thought the atmosphere as limitless, so we burned our waste without any controls.

[1] National Solid Waste Management Associations, "Modern Landfills: A Far Cry from the Past",

- We believed that if we did not see the waste, it was not a problem.
- We believed that solid waste should be buried and entombed to isolate the waste from the environment, this lead to the current requirements for bottom liner and relatively impermeable final covers.

In some places in the world, some of these "beliefs" are still held, ultimately affecting the way societies handle their solid waste.

However, in most modern societies, our "beliefs" have changed substantially. Changes accelerated in the United States beginning in the 1960's with the passage of the Solid Waste Disposal Act of 1965, creating a national office of solid waste and requiring states to develop solid waste management regulations. The U. S. Environmental Protection Agency (EPA) was established in 1970 and significantly expanded the federal role in waste management. The EPA initiated a series of studies in association with the states and industry to collect and evaluate fundamental data on waste generation, disposal, management practices, and risks to human health and the environment which culminated in the passage the Resource Conservation and Recovery Act (RCRA) on October 21, 1976. RCRA addressed hazardous (Subtitle C) and non-hazardous solid wastes (Subtitle D) management by directing the EPA to develop nationwide minimum design and operational standards for sanitary landfills, and upgrading or closing existing open dumps that did not meet the new RCRA standards. RCRA was subsequently amended in 1979, 1984, and 1991 to accomplish the following:

- Developed criteria for landfills including siting restrictions in floodplains, control of impacts to endangered species, surface waster controls, groundwater controls, vector controls, prohibition against open burning, safety issues such as fire, explosive gas, and bird controls, and periodic application of cover materials (1979).
- Required EPA to assess the adequacy of the sanitary landfill criteria and revise these criteria as appropriate (1984).
- Established, as a part of the Federal Hazardous and Solid Waste Amendments (HSWA), new location and operation standards, added design standards for certain components of the landfill (i.e., liners and leachate collection systems, final cover, etc.), expanded groundwater monitoring requirements and procedures for corrective action, provided minimum closure and post-closure care requirements, and required landfill owners/operators to demonstrate financial assurance for the operation and long-term care of closed landfills (1991).

We clearly understand that what we throw out and how we dispose of our solid waste can and will impact the quality of our drinking water, groundwater, and air resources. We understand that we can cause disease, death, and significant impairment of our communities if we fail to manage our solid waste carefully. Through the EPA's superfund program as well as various State and local community sponsored closed landfill investigation programs, we have a significant body of evidence demonstrating the negative consequences of our past "acceptable" solid waste practices. In response, we have developed sophisticated and complex regulatory programs to control every aspect of the generation, recycling, and disposal of solid waste.

The consequences of these new "beliefs" are substantial, and our "beliefs" are being challenged daily as well as being reformulated with the passage of each new regulation or court decision. The EPA realizes that several major revisions are still needed to RCRA to clarify certain issues relating to liquids addition, leachate recirculation on approved alternative liner systems, final cover requirements, and closure and post-closure care requirements. The EPA is developing changes to the Subtitle D regulations, and their reoccurring refrain is "we are almost ready to publish draft amendments to Subtitle D."

In addition, recently the solid waste industry, both private and public entities, have evaluated alternative design and operational approaches through various state and federal programs that challenge existing "beliefs" and evaluate solid waste management approaches that will increase revenues, reduce operational, closure, and post-closure care costs, and accelerate the stabilization of the landfill to reduce long-term negative impacts from leachate, landfill gas, and settlement.

RD&D RULE

As an interim step before the Subtitle D rules are amended, the Research, Development, and Demonstration (RD&D) permit rule for municipal solid waste landfills was published by the EPA in final form in the Federal Register on March 22, 2004. This rule sets the stage for RD&D permits to be issued that give landfill operators who want to conduct research more flexibility with respect to the requirements of Subtitle D. The rule is brief and is presented in Exhibit 1.

EPA originally proposed this rule in 2002. The final version of the rule is narrower in scope than their original proposal as a result of numerous comments on the proposed rule. The net effect of the new rule is to allow variances to some requirements of 40 CFR Part 258 so that research can be conducted in two specific areas – liquids addition for bioreactor landfills, and alternative final cover designs, such as phytocovers.

The liquids addition variance will allow recirculated leachate and other bulk liquids to be added to landfills with either the prescriptive Subtitle D composite liner system or an alternative liner system design currently allowed by an approved State program. To obtain the variance, the operator must demonstrate that groundwater protection requirements will still be met. The new rule does not alter any of the Subtitle D liner system design criteria, including the requirement for a leachate collection system that will maintain no more than a 30 centimeter (1 foot) head on the liner. EPA also noted that geotechnical stability of the waste mass with liquid addition is an area of concern that they would expect to be addressed in applications for this variance.

The alternative final cover variance will allow research into other means of keeping moisture from accumulating in closed landfills besides the currently prescribed low permeability cover systems. To obtain the variance, the operator must demonstrate that infiltration into the landfill will be controlled sufficiently so that there is no buildup of excess liquid and leakage of leachate from the landfill. The variance will encourage further research into phytocovers, which use plants to remove moisture from the soil cover of the landfill and to control seepage into the landfill.

Final promulgation of the federal RD&D rule did not enable immediate implementation by individual states. The rule is not self implementing. In other words, each state must adopt the Federal RD&D rule; however, States are not required to amend their solid waste permit programs, which have been determined adequate by the EPA under 40 CFR Part 239. Several states already have provisions in their regulations similar to that of the RD&D rule; however, specific reference to the federal rule or modification of their existing rule is required to be consistent with the Federal rule. Such revisions will not result in re-review of previously approved solid waste programs by the Federal Government. There is some confusion and disagreement at the state level on this issue, but EPA is emphatic that each state must amend its rules to address the Federal rule and get approval from the EPA if it intends on issuing RD&D permits for bioreactor landfills.

Unfortunately, individual state solid waste agencies have not had a good track record for speedy adoption of Subtitle D modifications. Indeed, Iowa, the last state to receive authorization for its Subtitle D program occurred 8 years after the original Subtitle D promulgation of 1991. In fact, most states took a minimum of 3 or 4 years to adopt the Subtitle D rules. A similar trend is occurring with the adoption of the RD&D rules at the state level. Exhibit 2 presents a summary of a survey I recently conducted on the status of the RD&D rule implementation at the state level. I received responses from nearly every state regarding the current status of the RD&D rule, although we are awaiting responses from some states. The following observations are provided from the review of the information in Exhibit 2:

- Eight states have confirmed approved RD&D permit programs (CA, IL, IN, KY, MI, MN, NE, WI). Of these eight states, four have been approved by the EPA (IN, IL, WI, MN
- Thirty-five states confirmed they have either not promulgated a RD&D program, submitted programs and are awaiting EPA approval, or in some cases have no plans to implement an RD&D program.
- Two states indicated its programs were consistent with the Federal rule and it did not plan on seeking separate Federal approval (TN and KS). Texas also held this view until recently and is reconsidering its stance.
- Several states currently have RD&D programs within their current solid waste regulations; however, in most cases these are not entirely consistent with the Federal Rules (e.g., NY and NJ).

The bottom line is this: Substantial effort will be needed at the state level for the RD&D program to become fully implemented nationwide. The delay in states RD&D permit programs is causing associated delays in the demonstration of bioreactor programs and other new technologies under these RD&D permits. Such delays may be negatively affect the advancement of beneficial technologies and the cost-effective use of resources. The EPA has confirmed that no "fast track" method for approving RD&D programs at individual sites will be allowed. Sites must apply to states, and be consistent with state RD&D rules.

BIOREACTOR LANDFILLS – THE WAVE OF THE FUTURE?

Landfill bioreactors are gaining increased attention as an alternative to the conventional Subtitle D landfill. Both public and private sector landfill operators, as well as regulatory agencies including the EPA are actively supporting the development of this new landfill technology.

A landfill bioreactor is a landfill designed and operated to accelerate the decomposition and stabilization of solid waste, usually under anaerobic conditions, but in some cases under aerobic conditions, or a combination thereof. Unlike Subtitle D landfills that are designed and operated to minimize contact between water and solid waste, the operation of a bioreactor relies on the addition of liquids to increase the moisture content of the solid waste to the optimum level for decomposition. The typical bioreactor will recirculate all of its leachate and may still require the addition of supplemental liquids for its operation. The potential benefits of a bioreactor landfill are as follows:

- **Increased Landfill Capacity –** One significant result of the more rapid and complete decomposition of solid waste in a bioreactor is additional disposal capacity that can be utilized during the active lifetime of the landfill. This additional capacity will generate additional revenue for the landfill operator and will help defer the need for developing additional landfill capacity.
- **Reduced Leachate Management Cost**s – Leachate recirculation in a bioreactor can substantially reduce leachate management costs and off-site treatment or disposal of leachate. The need for supplemental liquid addition may create opportunities for utilization of other liquid wastes such as sewage sludge.
- **Improved Landfill Gas Management –** Landfill gas (LFG) generation from a bioreactor is also accelerated. This means a higher peak LFG generation rate, which increase the potential for beneficial use of the gas, and a shorter LFG generation period, which reduces the requirement for long term LFG management.
- **Reduced Long Term Liabilities –** The more rapid and complete decomposition of solid waste in a bioreactor will potentially reduce the period during which long term care and environmental monitoring must occur after closure. The more completely stabilized waste mass of the closed bioreactor is less likely than a conventional closed landfill to create environmental liabilities in the future.

Bioreactor landfills typically must address several unique design, operational, and regulatory issues:

- **Leachate Recirculation** – A bioreactor requires a large amount of leachate and supplemental liquid to be distributed evenly throughout the waste mass. The design and operation of leachate recirculation systems requires careful attention so that the system can meet this operational requirement without disrupting landfill operations or causing other leachate management problems.
- **Landfill Gas Management** – The increased LFG generation over a reduced time period that comes with a bioreactor presents both opportunities and challenges. Design, installation, and operation of an active LFG collection system will be an essential component of any bioreactor operation. Successful operation of an LFG collection system under wet landfill conditions is difficult, particularly with the potential odor and Clean Air Act compliance issues at stake.
- **Geotechnical Stability** – The addition of large amounts of liquid in a landfill bioreactor changes the geotechnical characteristics of the waste mass and requires special attention. Virtually every documented landfill stability problem has had wet conditions of the waste as one of the factors that contributed to the failure.
- **Regulatory Approval** – While regulatory agencies are generally supportive of the landfill bioreactor concept due to its many benefits, existing landfill regulations do not always accommodate all the features required for a bioreactor. Regulatory waivers or approval of alternate procedures may need to be pursued as part of the permitting of a landfill bioreactor.
- **Economic Feasibility** – There are both additional costs and additional revenues associated with landfill bioreactors. Whether or not the additional revenues exceed the additional costs is dependent on a number of design and operational factors that must be carefully evaluated.

If you have attended a landfill or solid waste conference over the last couple of years, the subject of bioreactor landfills has been dominant. However, the development of full-scale bioreactor landfills has been somewhat limited, partially due to the delay in the implementation of the RD&D rule first at the Federal level, and recently at the State level. There also is reluctance on the part of some landfill operators to develop full scale bioreactors due to the operational difficulties and increased costs that can result. There also is concern that the application of the RD&D rule will not be uniform across the States, despite the simplicity of the Federal rule. The simplicity of the Federal rule, which has several broad, sweeping statements regarding protecting human, health, and the environment,

is seen by some as an open book for regulatory activism, in which State or Federal regulators block approval of RD&D permits unless certain accommodations are made to incorporate certain technologies. The hope is that regulators will not thwart the intent of the rule by such actions, making the cost to research new approaches prohibitive or the monitoring requirements overly strict or cumbersome.

This past year the RD&D rule has stood up to the first court challenge in the State of California, which is encouraging. The EPA scored a victory in the United States Court of Appeals for the District of Columbia Circuit. The case filed by GrassRoots Recycling Network's (GRRN) challenging the EPA's Research, Development and Demonstration Rule was dismissed. allowing approved state landfill permitting programs to The dismissal was based on a determination that GRRN did not have standing to seek a review of the rule.

The survey presented herein of the state regulatory agencies identified less than a dozen "official" bioreactor projects that are either operating through Project XL, CRADA and a state program, have applications pending, or are expecting to submit an RD&D permit application in the near future. In contrast, the bioreactor landfill database that the SWANA Landfill Division, Bioreactor Committee maintains suggest there are close to 70 aerobic, aerobic/anaerobic, semi-aerobic, and facultative bioreactor projects in operations throughout the United States (See Exhibit 3). The SWANA database is an informal, self-reporting database that lists landfills that claim to be operating as bioreactor landfills. The SWANA list suggests that number of bioreactor landfills is much larger than acknowledged or known by various state agencies. The discrepancy may be in the definition of a bioreactor landfill as used by participants in the SWANA list. Many of the landfills in the SWANA list most likely are merely landfills that recirculate leachate and view themselves as bioreactor landfills, although they do not meet the current official definition of a bioreactor landfill, and in many cases have not applied through an RD&D program to allow for the introduction of other liquids into the landfill.

CONCLUSIONS

What is the future of landfilling? Will bioreactors become standard technology five or ten years from now? Will research, development, and demonstration of these technologies provide the data needed by EPA to formulate permanent changes to the RCRA Subtitle D rules? Will we look back then and say regarding our current landfilling approaches "how could we have been so foolish?" Will we continue to entomb landfills with impermeable covers, or will we allow alternative final cover and liquids management approaches that facilitate the accelerated decomposition and stabilization of the waste mass? Progress is being made. Some companies and public entities have taken bold steps to investigate alternative approaches to current convention. The new RD&D rule should facilitate additional research and data gathering that will support the "landfill of the future."

EXHBIT 1. FEDERAL RD&D RULE

PART 258 - CRITERIA FOR MUNICIPAL SOLID WASTE LANDFILLS

1. The authority citation for part 258 is revised to read as follows: Authority: 33 U.S.C.1345(d) and (e); 42 U.S.C. 6902(a), 6907, 6912(a), 6944, 6945(c) and 6949a(c), 6981(a).

Subpart A - [Amended]

2. Amend subpart A to add §258.4 as follows:

§ 258.4 Research, development, and demonstration permits.

(a) Except as provided in paragraph (f) of this section, the Director of an approved State may issue a research, development, and demonstration permit for a new MSWLF unit, existing MSWLF unit, or lateral expansion, for which the owner or operator proposes to utilize innovative and new methods which vary from either or both of the following criteria provided that the MSWLF unit has a leachate collection system designed and constructed to maintain less than a 30-cm depth of leachate on the liner:
(1) The run-on control systems in § 258.26(a)(1); and
(2) The liquids restrictions in § 258.28(a).

(b) The Director of an approved State may issue a research, development, and demonstration permit for a new MSWLF unit, existing MSWLF unit, or lateral expansion, for which the owner or operator proposes to utilize innovative and new methods which vary from the final cover criteria of §258.60(a)(1), (a)(2) and (b)(1), provided the MSWLF unit owner/operator demonstrates that the infiltration of liquid through the alternative cover system will not cause contamination of groundwater or surface water, or cause leachate depth on the liner to exceed 30-cm.

(c) Any permit issued under this section must include such terms and conditions at least as protective as the criteria for municipal solid waste landfills to assure protection of human health and the environment. Such permits shall:
(1) Provide for the construction and operation of such facilities as necessary, for not longer than three years, unless renewed as provided in paragraph (e) of this section;
(2) Provide that the MSWLF unit must receive only those types and quantities of municipal solid waste and non-hazardous wastes which the State Director deems appropriate for the purposes of determining the efficacy and performance capabilities of the technology or process;
(3) Include such requirements as necessary to protect human health and the environment, including such requirements as necessary for testing and providing information to the State Director with respect to the operation of the facility;
(4) Require the owner or operator of a MSWLF unit permitted under this section to submit an annual report to the State Director showing whether and to what extent the site is progressing in attaining project goals. The report will also include a summary of all monitoring and testing results, as well as any other operating information specified by the State Director in the permit; and
(5) Require compliance with all criteria in this part, except as permitted under this section.

(d) The Director of an approved State may order an immediate termination of all operations at the facility allowed under this section or other corrective measures at any time the State Director determines that the overall goals of the project are not being attained, including protection of human health or the environment.

(e) Any permit issued under this section shall not exceed three years and each renewal of a permit may not exceed three years.
(1) The total term for a permit for a project including renewals may not exceed twelve years; and
(2) During permit renewal, the applicant shall provide a detailed assessment of the project showing the status with respect to achieving project goals, a list of problems and status with respect to problem resolutions, and other any other requirements that the Director determines necessary for permit renewal.

(f) Small MSWLF units.
(1) An owner or operator of a MSWLF unit operating under an exemption set forth in §258.1(f)(1) is not eligible for any variance from §§ 258.26(a)(1) and 258.28(a) of the operating criteria in subpart C of this part.
(2) An owner or operator of a MSWLF unit that disposes of 20 tons of municipal solid waste per day or less, based on an annual average, is not eligible for a variance from §258.60 (b)(1), except in accordance with §258.60(b)(3).

EXHIBIT 2. STATE SURVEY OF STATUS OF RD&D RULE

State	Adopted [1]	RD&D Status
Alabama	N	Alabama has not adopted the rule and doesn't plan to anytime soon.
Alaska	N	Expect to be submitting applications for the RD&D program approval. No final applications and no landfills are currently operating under an RD&D rule permit. (see Roberson email)
Arizona	N	Arizona will not adopt the RD&D Rule
Arkansas	?	Arkansas: Issued bioreactor permit to City of Ft. Smith in 2005.Still awaiting confirmation of rule status.
California	Y	California regulations to implement the Subtitle D RD&D Rule were approved at the State level in October 2005. The regulations were formerly transmitted to USEPA Region 9 in March 2006 for approval as an update to California's Subtitle D Program. The regulations and supporting information can be downloaded from: http://www.ciwmb.ca.gov/RuleArchive/2005/LandfillDemo/default.htm Anticipate the first permit application for the Kettleman Hills LF, WMI to be considered within the next several months. Operation to add liquids would not occur until USEPA approves the Program. Note that California has an ongoing bioreactor landfill project at the Yolo County Central Landfill. That project was approved under USEPA's Project XL Program which is no longer in effect. The State anticipates a separate RD&D Permit application later this year to continue such operations at Yolo County beyond the Project XL timeframe. Contact Scott Walker at (916) 341-6319 for further information.
Colorado	N	The State of Colorado does not have authorization and has not submitted its application for the RD&D rule as it pertains to RCRA subpart D (Solid waste landfills). The unit leader for the Solid Waste Unit is Charles Johnson, 303-692-3348. Colorado has a Research Development & Demonstration permit rule under its Hazardous Waste permit rules, 6 CCR 1007-3 Part 100, section 100.25. See http://www.cdphe.state.co.us/op/regs/hazwaste/10073100hazwastepermits.pdf. However this rule has been on the books for a while. Further information can be obtained from Customer Technical Assistance Hazardous Materials & Waste Management Division Colorado Department of Public Health & Environment phone: 303.692.3320 toll-free phone: 888.569.1831 x3320 fax: 303.759.5355 email: comments.hmwmd@state.co.us website: www.cdphe.state.co.us/hm/
Connecticut	?	
Delaware	?	
Florida	N	Florida has not developed or approved an RD&D rule consistent with the Federal rule yet. However, Section 403.7221, FS contains statutory language on RD&D permits. The Florida Department of Environmental Protection is trying during the current legislative session to get the permit lengths in our statutes consistent with

EXHIBIT 2. STATE SURVEY OF STATUS OF RD&D RULE

State	Adopted [1]	RD&D Status
		the new EPA rule language. Section 403.7221, FS states the following: 403.7221 Research, development, and demonstration permits.- (1) The department may issue a research, development, and demonstration permit to the owner or operator of any solid waste management facility who proposes to utilize an innovative and experimental solid waste treatment technology or process for which permit standards have not been promulgated. Permits shall: (a) Provide for construction and operation of the facility for not longer than 1 year, renewable no more than 3 times. (b) Provide for the receipt and treatment by the facility of only those types and quantities of solid waste which the department deems necessary for purposes of determining the performance capabilities of the technology or process and the effects of such technology or process on human health and the environment. (c) Include requirements the department deems necessary which may include monitoring, operation, testing, financial responsibility, closure, and remedial action. (2) The department may apply the criteria set forth in this section in establishing the conditions of each permit without separate establishment of rules implementing such criteria. (3) For the purpose of expediting review and issuance of permits under this section, the department may, consistent with the protection of human health and the environment, modify or waive permit application and permit issuance requirements, except that there shall be no modification or waiver of regulations regarding financial responsibility or of procedures established regarding public participation. (4) The department may order an immediate termination of all operations at the facility at any time upon a determination that termination is necessary to protect human health and the environment. History.-s. 35, ch. 86-186; s. 80, ch. 88-130. Florida has not had any RD&D applications submitted in Florida under the new EPA rules.
Georgia	N	Georgia has not promulgated any RD&D rules or done anything to incorporate the Federal R&D rule, nor do they have anything proposed. Therefore, they also have not received any RD&D applications or issued any RD&D permits.
Hawaii	?	
Idaho	N	Idaho has not requested to be part of this program and will not be issuing any RD&D permits under the program.
Illinois	Y	State RD&D rule was finalized on January 25, 2006.
Indiana	Y	Notice of the final rule was published in November 2005.
Iowa	N	Iowa currently is in the process of rewriting its municipal solid waste rules (567 Iowa Administrative Code Chapter 113). The State has been presenting the changes to its stakeholders in parts. The link designated as draft 1 below contains the proposed RD&D language. The only other foreseeable implemention of this portion of the rule, aside from bioreactors, is approvals for alternative caps. The State anticipates receiving requests to install strictly earthen caps on final closure of cells with composite liners. However, the proposed rule revisions are not expected to be promulgated until late summer or early fall of 2007. http://www.iowadnr.com/waste/policy/files/113draft1.pdf

EXHIBIT 2. STATE SURVEY OF STATUS OF RD&D RULE

State	Adopted [1]	RD&D Status
		http://www.iowadnr.com/waste/policy/files/113draft2.pdf http://www.iowadnr.com/waste/policy/files/113draft3.pdf Nina M. Koger Environmental Engineer Senior Energy & Waste Management Bureau 515/281-8986 Phone 515/281-8895 Fax
Kansas	?	No Bioreators approved. Have not received confrmation of status of RD&D rule in State.
Kentucky	Y	Kentucky has an RD&D rule for solid waste facilities, which can be found in rule 401 KAR 47:150, Section 3. For special waste facilities (coal ash, sewage sludge), rule is 401 KAR 45:135, Section 2. For hazardous waste facilities, the rule is 401 KAR 38:060, Section 6. A copy of these rules can be found at http://www.lrc.ky.gov/kar/TITLE401.HTM Kentucky is managing two bioreactor cell and leachate recirculation projects: Hardin Co. Landfill, permit # 047-00040, Outer Loop Landfill, permit # 056-00028, synopses (fact sheets) on file. Contact Person at the State is; Bob Bickner, Supervisor RPBR Section Solid Waste Branch 502/564-2225, ext. 627 bob.bickner@ky.gov
Maine	?	Contactt: Randy McMullin Environmental Specialist Maine Department of Environmental Protection 312 Canco Road Portland, Maine 04103 (207) 822-6343 Fax (207) 822-6303
Louisiana	N	Louisiana has not pursued the RD&D permit delegation yet. It is in the process of revising the Solid Waste Regulations. The current plan is to incorporate the Federal rule into the state specific requirements. The proposed rule and status of the proposed rule change can be found at http://www.deq.louisiana.gov/portal/Default.aspx?tabid=1672.
Maryland	N	Maryland contends that EPA's adoption of the rule with certain characteristics made it impossible for it to implement it. Unlike the rest of 40 CFR 258, which just sets standards that facilities must meet and does not bind the approving states to a particular permit process and in fact makes no reference to a permit as such at all, the RD&D rule requires issuance of a permit with a specified 3 year life span. Unfortunately, Maryland's statute specifies that refuse disposal permits have a 5-year span, no more and no less. The State contends it cannot adopt the Federal rule as written, and has not proceeded with rule development to adopt the Federal rule, although it is looking into alternative approaches to solve this perceived impasse. The State had followed the regulation development as written that limited

EXHIBIT 2. STATE SURVEY OF STATUS OF RD&D RULE

State	Adopted [1]	RD&D Status
		recirculation of leachate to landfill areas incorporating the "design standard" liner, so those few landfills interested in leachate recirculation had already changed their liner designs to include the design standard liner in at least their lowest liner element, and few sites have thus far been interested in recirculating leachate, so it has not been a major impediment, although it is an inconvenience as it prevents a landfill or two from continuing recirculation on an older cell with an approved alternative liner. Maryland would have preferred that EPA actually fix their regulation by allowing recirculation on alternative liners, rather than the way it was handled in the RD&D rule. The State hopes that EPA will do so in the future. Some of the State's permittees have expressed interest in moving toward a bioreactor design to some extent. However, permittees and the State are proceeding cautiously, if at all, because of potential concerns regarding the additional operational and material requirements needed to operate a bioreactor so it does not cause nuisances or other impacts to the environment or the public health, safety, or comfort. Contact person is: Edward M. Dexter, P.G., Administrator Solid Waste Program Maryland Department of the Environment 1800 Washington Blvd., Suite 605 Baltimore MD 21230-1719 Phone (410) 537-3318 Facsimile (410) 537-3842 edexter@mde.state.md.us
Massachusetts	N	Massachusetts DEP (MassDEP) has had a Demonstration Project permit in its Solid Waste Regulations, 310 CMR 19.000, since the regulations were rewritten in 1990. There are no plans at present to amend the regulations to adopt the federal rule or to modify our rule. The rule is not restricted to demonstrations at landfills. The Massachusetts Solid Waste Regulations can be found on the MassDEP website at http://www.mass.gov/dep/service/regulations/310cmr19.pdf Since 1990, MassDEP has approved numerous applications under its Demonstration Project rule. MassDEP does not have any summary of those permits, nor are those permits available online. Permits have been issued for such things as alternative daily cover and final capping material demonstrations, alternative solid waste technologies.
Michigan	Y	Michigan modified its laws late last year to allow for RD&D permits. The language can be found primarily in Section 324.11511b, which is available on the Internet at: http://www.legislature.mi.gov/documents/mcl/pdf/mcl-451-1994-ii-3-115.pdf The State has not had any applications yet, although it anticipates one soon for a bioreactor demonstration project for new cells at an existing landfill in St. Clair County. Contact person: Steven R. Sliver, Chief

EXHIBIT 2. STATE SURVEY OF STATUS OF RD&D RULE

State	Adopted [1]	RD&D Status
		Storage Tank and Solid Waste Section Waste and Hazardous Materials Division Department of Environmental Quality P.O. Box 30241 Lansing, Michigan 48909-7741
Minnesota	Y	State RD&D rule was adopted February 15, 2005 and approved by the EPA. The State has received one bioreactor proposal from the Spruce Ridge Landfill, which is a Waste Management, Inc. site, located west of the Twin Cities in Glenco, MN.
Mississippi	?	
Missouri	N	Missouri has not adopted the RD&D rule nor does it plan to so; however, the current State rules provide the flexibility to allow design variations for MSW landfills and can implement the rule upon approval by EPA. Submitted RD&D rules change to EPA Region 7 this week. Expect to receive approval in May '07 MDNR believes that its current rules allow approval of RD&D type projects and they granted the City of Columbia a bioreactor permit under "old rules". No landfills have formally applied as yet.
Montana	?	
Nebraska	Y	Nebraska adopted the federal rule into the State regulations practically verbatim. Go to www.deq.state.ne.us and click on "Rules and Regulations" then click on "Title 132" then click on "Chapter 2" and scroll down until you come to Section 14 of Chapter 2. The State has not received any RD&D applications, but one landfill is talking about a bioreactor landfill. Contact Person William C. Gidley Waste Management Section Supervisor Nebraska Dept. of Environmental Quality 402.471.4210
Nevada	N	Nevada does not intend to seek authority to issue RD&D permits for bioreactor landfills unless a good case is made for their safe operation in Nevada.
New Hampshire	?	
New Jersey	N	New Jersey has an existing RD&D rule found in NJAC 7:26-17(f). It is not entirely consistent with the Federal RD&D rule The rule is broader in scope in that it does not limit itself to the specific areas identified in the Federal Rule (run-on, liquids addition, and final covers). The State rule also has a one year term, although longer periods can be applied for, and limits demonstration projects to 100 ton per day, unless otherwise approved.
New Mexico	N	New Mexico has yet to adopt the Federal RD&D rule. It is in the process of revising the New Mexico Solid Waste Management Regulations to incorporate the Federal RD&D language (the language will be very similar, but with minor edits). The State expects this new language to be effective by September 2006. Is a copy of the rule available online , see Section 310 in: http://www.nmenv.state.nm.us/swb/doc/SWMR%20Draft%204-3-06%20Formatted.doc

EXHIBIT 2. STATE SURVEY OF STATUS OF RD&D RULE

State	Adopted [1]	RD&D Status
New York	N	New York has a Solid Waste Management Research, Development and Demonstration (RDD) permit rule which is found in 6 NYCRR 360-1.13. The rule is more generic than the Federal rule, which addresses specific areas that the RD&D rule applies to. The New York Department of Environmental Conservation (NYDEC) may issue a research, development and demonstration permit for any solid waste management facility proposing to utilize an innovative and experimental solid waste management technology or process, including a beneficial use demonstration project. The application for such permit must clearly demonstrate adequate protection of public health and the environment and be consistent with federal and State laws and regulations and this Part. A permit issued under this section must not be for an activity of a continuing nature. The NYDEC may, at its discretion, waive or modify some or all of the application requirements for permits issued under this section. Also, permits issued under the state rule may be renewed not more than three times, unless the permittee demonstrates to the satisfaction of the NYDEC that a longer time period is required to adequately assess the long-term environmental effects of the technology or process being studied under authority of the permit. Each renewal period will not exceed one year and will be conditioned upon compliance with this section. The Federal rule has an initial permit period of 3 years, with a possibility of three, 3-year renewal periods for a maximum period of 12 years.
North Carolina	N	North Carolina has not adopted an RD&D rule, and currently has no plans to change state rules to adopt one. Therefore no landfills have applied under this rule and no applications have been reviewed or approved. According to Ed Mussler (NC mail.net), the State is not anticipating any applications since it does not a rule or a mechanism to approve a project.
North Dakota	N	North Dakota has not implemented rule changes to adopt the Federal RD&D.
Ohio	N	Ohio has not implemented rule changes to adopt the Federal RD&D.
Oklahoma	N	Oklahoma has not implemented rule changes to adopt the Federal RD&D rule. A link to the State's solid waste rules: http://www.deq.state.ok.us/rules/515.pdf
Oregon	N	Oregon has developed guidelines not a rule. The state has statutory authority to allow liquids in landfills so that it can permit bioreactor landfills under state statutory authority. Under state authority and guidelines (prior to EPA adoption of the RD&D rules) the state received one application and has issued one permit addendum. The 3-year permitted activity will expire this year unless renewed.
Rhode Island	?	
South Carolina	N	The South Carolina Department of Health and Environmental Control (SCDHEC) is currently in the process of revising all of its solid waste landfill regulations, including the municipal solid waste landfill regulation. The comprehensive landfill regulation that is being drafted includes the Federal RD&D language. The regulation should be ready for legislative review by the SC General Assembly during its 2007 Session. The Department currently has a State RD&D regulation that is not specific to landfills but has been used to permit RD&D projects at the following MSW landfills: Aiken County Landfill #5, Langley Site Landfill Aerobic System - air and leachate injected into landfill Permit issued July 1998, expired November 1999 Results were inconclusive

EXHIBIT 2. STATE SURVEY OF STATUS OF RD&D RULE

State	Adopted [1]	RD&D Status
		Three River Solid Waste Authority Landfill Aerobic System - air and leachate injected into landfill Permit issued July 2002, expired August 2004 Results were inconclusive, numerous operational problems The current RD&D Regulation, 61-107.10, can be viewed at www.scdhec.gov/lwm/html/regs.html Information provided by braswead@dhec.sc.gov. . Other contact: Art Braswell, Director Division of Mining and Solid Waste Management Bureau of Land and Waste Management SCDHEC
South Dakota	N	South Dakota has not adopted the Federal regulations or implemented its own RD&D rules. There are no on-going RD&D project issues in SD at this time.
Tennessee	N	Tennessee's Solid Waste Processing and Disposal regulations, http://www.state.tn.us/environment/swm/swmregs/ , allow for the rules to be waived by the Commissioner if the operator can demonstrate to the satisfaction of the Commissioner, that the standard is inapplicable, inappropriate, or unnecessary to his facility, or that it is equaled in effect by alternative standards or requirements (1200-1-7-.01(5)). This approach has been in place in Tennessee's regulations for many years and the State believes it is consistent with current EPA RD & D regulations and initiatives. However, program has not been approved by the EPA. There are no variance or wavier requests pending in Tennessee at the present time. Contact person: Greg Luke DSWM 615 532-0874
Texas	N	Texas is still sorting out what to do with the RD&D rule. TCEQ thought was that they didn't need to do anything because existing state rules were in place for such activities as bioreactors and leachate recirculation over alternative liners. After a public hearing held by the TCEQ in March 2006, where opponents to the States approach expressed concern, the TCEQ is in process of revising regulations to address bioreactor operations.
Utah	?	No response from State to inquiry of RD&D status.
Vermont	?	No response from State to inquiry of RD&D status.
Virginia	N	Virginia is in the process of developing Amendment 5 to the SW regulations. It has an "experimental permit" that has tentatively been adapted to be the RDD equivalent but keeping it as it is. Depending on comments received, the State may move closer to the Federal rule language. There is nothing to review as yet, but proposed regulations may be posted after May 22, when the Board meets. Current regulations are on the web:. http://www.deq.virginia.gov/waste/wastereg80.html
Washington	N	Washington expects to be submitting applications for the RD&D program approval. No final applications and no landfills are currently operating under an RD&D rule permit.
West Virginia	N	West Virginia does not have any permit application pending for RD&D. It does not

EXHIBIT 2. STATE SURVEY OF STATUS OF RD&D RULE

State	Adopted [1]	RD&D Status
		have any rule proposed or filed with the state legislature. However, one application to operate a bioreactor landfill is pending.
Wisconsin	Y	Wisconsin implemented its RD&D rule on March 31, 2006.
Wyoming	?	No response from State to inquiry of RD&D status.

Notes:
1. May be adopted at State level, but still pending approval of EPA.

EXHIBIT 3

SWANA BIOREACTOR LANDFILL COMMITTEE
SUMMARY OF LIST OF NORTH AMERICAN BIOREACTOR LANDFILL PROJECTS (March 2004)

SWANA - Bioreactor Landfill Committee

Summary List of North American Bioreactor Landfill Projects (as of March 2004)

NOTE: Database will be updated **QUARTERLY**. Please email revisions and new project additions to **Prentiss Shaw,** Database Committee Chair, EMCON/OWT, at **prentiss.shaw@shawgrp.com**

Project ID #	LMOP Landfill ID #	State-#	Landfill Name	Landfill City	Bioreactor Type	Owner Contact/Owner	Owner Phone	Owner email	Start Date	End Date	Wetting Method	Scale (acres)	Leachate Circulation	Other Liquids	Sludge Added	Air Injection	Vacuum Air	Active LFG System	Engineer Contact	Engineer Company	Engineer Co. Phone	Engineer E-mail
		AL-1	Onyx Cedar Hill Landfill	Ragland	Anaerobic	Bert Broome/Onyx	205-338-7821	bbroome@onyxws.com				Full	Yes	Yes				Yes	Nick Marrota	Onyx	352-351-8886	
		AL-2	Onyx Star Ridge Landfill	Moody	Anaerobic	Bert Broome/Onyx	205-640-1799	bbroome@onyxws.com				Full	Yes	Yes				Yes	Nick Marrota	Onyx	352-351-8886	
170802	2052	AR-1	Fort Smtih Landfill	City of Fort Smith	Anerobic	Daniel Reikes/City of Fort Smith	479-784-2431	dreikes@fsark.com	2004		Injection	Full		No		No	No	yes	Brian Edwards	Mickle Wagner Coleman and Genesis Environmetal Consulting	501-455-2199	bedwards@genesisenvironmental.net
		Bahamas-1	Onyx Pine Ridge Landfill	Freeport	Anaerobic	Lou Carroll/Onyx	242-351-4222	lcarroll@onyxws.com				Full	Yes	Yes				Yes	Nick Marrota	Onyx	352-351-8886	
409	349	CA-1	City of Santa Clara LF	Santa Clara	Aerobic	Closed	n/a		1969	1969	n/a	Demonstration	No	No	No	Yes	No	No	Bill Johnson	ArcadisGeraghty & Miller	770-431-8666	Bjohnson@arcadis-us.com
404	344	CA-2	Mountain View LF	Mountain View	Anaerobic	City of Mountain View			1982	1982	Injection	Demonstration	Yes	Yes	Yes	No	No	No	Don Augenstein	IEM	650-856-2850	iemdon@aol.com
180153	327	CA-3	Yolo County Central LF	Woodland	Anaerobic	Ramin Yazdani/Yolo County	530-666-8848	ryazdani@yolocounty.org	1994			Demonstration	Yes	Yes	No	No	No	No				
		CA-4	Yolo County Landfill	Woodland	Aerobic & Anaerobic	Ramin Yazdani/Yolo County	530-666-8848	ryazdani@yolocounty.org	2000			Full	Yes	No	No	No	Yes	Yes				
166403	1831	DE-1	DSWA Central SWM Center	Sandtown	Anaerobic	Logan Miller, Facility Manager/DSWA	302-284-8851	lvm@dswa.com	1985	ongoing	Gravity & Injection	Full	Yes	No	No	No	No	No	Chris Gabel	Camp, Dresser & McKee	703-642-5500	gabelcj@cdm.com
166404	1832	DE-2	DSWA Southern SWM Center	Jones Crossroads	Anaerobic	Jim Vescovi, Facility Manager/DSWA			1985	1994	Injection	Full	Yes	No	No	No	No	No	Chris Gabel	Camp, Dresser & McKee	703-642-5501	gabelcj@cdm.com
		FL-1	Baseline Landfill	Ocala	Anaerobic	Allen Ellision, Solid Waste Director/Marion County			1992		Horiz & Vert Inj	Full	Yes	No	No	No	No	Yes	Mark Hadlock	Jones Edmunds & Assoc	352-377-5821	mhadlock@jea.net
466	401	FL-2	Naples SLF Cell #6 Collier County	Naples	Aerobic	Collier County			1990	1992	Lysimeter	Lab	Yes	Yes	No	Yes	No	No	Robert J. Murphy	University of South Florida		
498	433	FL-3	New River Regional LF	Raiford	Aerobic & Anaerobic	Darrel O' Neal, Director/New River Reg. SWA	904-431-1000	donealnrri@yahoo.com	2002		Injection	Full	Yes	Yes	No	Yes	No	No	Tim Townsend	UF/Jones Edmonds & Assoc/Darabi & Assoc	352-392-0846	ttown@eng.ufl.edu
489	424	FL-4	North Central Landfill	Winter Haven	Anaerobic	Ana Wood, Solid Waste Director/Polk County		AnaWood@polk-county.net	2001		Horiz Leach. Inj	Full	No	No	No	No	No	No	Tim Townsend	UF/Jones Edmunds & Assoc	352-392-0846	ttown@eng.ufl.edu
		FL-5	Highlands Cty Solid Waste Mgnt Ctr	Sebring	Anaerobic	Jerome Leszkiewkz/Highlands County Board of Cnty Comm	863-655-6483	jjlesz@digital.net	2000		Horiz Leach. Inj	Full	yes	yes				yes	Jerry Murphy	Ghastain-Skillman	863 646 1402	

SWANA - Bioreactor Landfill Committee

Summary List of North American Bioreactor Landfill Projects (as of March 2004)

NOTE: Database will be updated **QUARTERLY**. Please email revisions and new project additions to **Prentiss Shaw,** Database Committee Chair, EMCON/OWT, at **prentiss.shaw@shawgrp.com**

Project ID #	LMOP Landfill ID #	State-#	Landfill Name	Landfill City	Bioreactor Type	Owner Contact/Owner	Owner Phone	Owner email	Start Date	End Date	Wetting Method	Scale (acres)	Leachate Circulation	Other Liquids	Sludge Added	Air Injection	Vacuum Air	Active LFG System	Engineer Contact	Engineer Company	Engineer Co. Phone	Engineer E-mail
		FL-6	Southwest Landfill	Gainesville	Anaerobic	Ron Bishop/Alachua County		rbishop@co.alachua.fl.us	1988	1993	Pond & Injection	Full	Yes	No	No	No	No	No	John Hurford	Jones Edmunds & Assoc	352-377-5821	jhurford@jea.net
		FL-7	Winfield Landfill	Lake City	Anaerobic	Bill Lycan, Solid Waste Director/		cclandfl@isgroup.net	1992			Full	Yes	No	No	No	No	No	Judy Devita	Jones Edmunds & Assoc/Darabi & Assoc	352-377-5821	jdevita@jea.net
		GA-1	Columbia County	Grovetown	Aerobic	Jim Leiper/Columbia Co.			1997	2000	Injection	Demonstration	Yes	No	No	Yes	No	No	Mark Hudgins	Environmental Control Systems	803-643-1755	markh@aerobiclandfill.com
		GA-2	LaGrange Sanitary Landfill	LaGrange	Anaerobic	David Brown, Director of Public Services/		dbrown@lagrange-ga.org	2003	2025	Pumped	50	Yes	Yes	Yes	No	No	Yes	Robbie Blanton	ArcadisGeraghty & Miller	770-431-8666	rblanton@arcadis-us.com
		GA-4	Superior Pecan Row MSW Landfill	Valdosta	Leachate Recirculation		912-241-8440				Injection	Full	Yes	No	No	No	No	No				
		GA-5	WMI-Live Oak Landfill	Conley	Aerobic	Matt Smith/WMI	706-542-8856		1997	1999		Full	Yes	Yes	No	Yes	No	No	William Johnson	Arcadis Geraghty & Miller	770-952-8861	bjohnson@arcadis-us.com
		IA-1	Central Disposal LF	Lake Mills	Anaerobic				2001		Injection		Yes	Yes	No	No	No	No	Jeff Harris	WMI	713-533-5006	jharris3@wm.com
701	631	IA-2	Bluestem Landfill Site #2	Marion	Anaerobic	Karmin Bradbury	319-398-1278	kbradbury@bluestem.org			Injection	Full	Yes	Yes	Yes	No	No	No	Francis Hallada		515-281-6807	
		IL-1	Onyx Orchard Hills Landfill	Davis Junction	Anaerobic	Chris Peters/Onyx	815-874-9000	ccpeters@onyxws.com	2003			Full	Yes	No				Yes	Randy Frank	Onyx	262-971-1391	
		IL-2	Onyx Zion Landfill	Zion	Anaerobic	Jim Lewis/Onyx	847-731-5110	jalewis@onyxws.com	2002			Full	Yes	Yes				Yes	Randy Frank	Onyx	262-971-1391	
		IL-3	Onyx Valley View Landfill	Decatur	Anaerobic	Chris Peters/Onyx	217-963-2976	ccpeters@onyxws.com	1998			Full	Yes	Yes				Yes	Randy Frank	Onyx	262-971-1391	
		IN-1	Onyx Blackfoot Landfill	Winslow	Anaerobic	Joe Sutton/Onyx	812-789-2647	jsutton@onyxws.com	1999			Full	Yes	Yes				Yes	Bill Binnie	Onyx	814-265-1744	
		KY-1	Outer Loop RDF	Louisville	facultative	Gary Hater, Bioreactor Program Dir./WMI	513-389-7370	ghater@wm.com	2002		injection		yes	Yes	No	No	No	Yes		WMI		
		KY-2	Outer Loop RDF	Louisville	facultative	Gary Hater, Bioreactor Program Dir./WMI	513-389-7370	ghater@wm.com	2002		injection		yes	Yes	no	no	no	Yes		WMI		
		KY-3	Outer Loop RDF	Louisville	facultative	Gary Hater, Bioreactor Program Dir./WMI	513-389-7370	ghater@wm.com	2002		Injection		yes	Yes	Yes	Yes	No	Yes		WMI		

SWANA - Bioreactor Landfill Committee

Summary List of North American Bioreactor Landfill Projects (as of March 2004)

NOTE: Database will be updated **QUARTERLY**. Please email revisions and new project additions to **Prentiss Shaw,** Database Committee Chair, EMCON/OWT, at **prentiss.shaw@shawgrp.com**

Project ID #	LMOP Landfill ID #	State-#	Landfill Name	Landfill City	Bioreactor Type	Owner Contact/Owner	Owner Phone	Owner email	Start Date	End Date	Wetting Method	Scale (acres)	Leachate Circulation	Other Liquids	Sludge Added	Air Injection	Vacuum Air	Active LFG System	Engineer Contact	Engineer Company	Engineer Co. Phone	Engineer E-mail
		KY-4	Outer Loop RDF	Louisville	Hybrid	Gary Hater, Bioreactor Program Dir./WMI	513-389-7370	ghater@wm.com	2002				Yes	No	No	No	No	No		WMI		
824	754	MD-1	Millerville SLF	Severn	Anaerobic	Robert DeMarco/	410-222-6108				Injection		Yes	Yes	No	No	No	No				
		MD-2	Worcester County Landfill	Worcester	Anaerobic	John Tustin/Worcester County			1990		Vert. Wells	Full	Yes	No	No	No	No	No	Ken Kilmer	EA Engineering Science & Technology	410-584-7000	kwk@eaest.com
		MI-1	Northern Oak Landfill		Anaerobic	WMI			2002		Injection		Yes	No	Yes	No	No	Yes	Jeff Harris	MSU/WMI	713-533-5006	jharris3@wm.com
		MI-2	Forest Lawn Landfill	Three Oaks	Anaerobic	Gary Brown	219-747-0446		1999	ongoing									D. Vladic	EMCON/OWT, Inc.	630-771-9232	dave.vladic@shawgrp.com
167078	1993	MN-1	Spruce Ridge LF	Glencoe	Anaerobic	WMI			1997	2003	Horiz. Dist		Yes	No	No	No	No	Yes	Jeff Harris	WMI	713-533-5006	jharris3@wm.com
		MN-2	Crow Wing County Landfill	Brainerd	Leachate Recirculation	Doug Morris, Solid Waste Coord/Crow Wing County	218-824-1290		1998	ongoing			Yes	No	No	No	No	No	Fred Doran	R. W. Beck	651-994-8415	fdoran@rwbeck.com
907	837	MO-1	Lemons SLF, Inc	Dexter	Anaerobic	Dan Rigazio / Lemons LF, LLC	573-624-5129	dan.rigazio@awin.com	1994		Vert Wells / Horiz Distrb	Full	Yes	No	No	No	No	Yes	Brad Zimmerman	Allied Waste	573-634-4276	brad.zimmerman@awin.com
		MO-2	Showme Regional LF LLC	Warrensburg	Anaerobic	Richard Swetman/Show-me Regional LF, LLC	660-747-7697	richard.swetman@awin.com	1997		Horiz dist	Full	Yes	No	No	No	No	yes	Darryl Basham	Allied Waste	913-287-5589	
		MO-3	Black Oak LF	Hartville	Anaerobic	Chris Landoll/Waste Corp of America	417-840-0647	clandoll@wcamerica.com	1995		Horiz. Dist	Full	Yes	No	No	No	No	No	Chris Landoll	Waste Corp of America	417-840-0647	clandoll@wcamerica.com
		MO-4	Onyx Oak Ridge Landfill	Ballwin	Anaerobic	Tony Witte/Onyx	636-225-7220	ajwitte@onyxws.com	1989			Full	Yes	Yes				Yes	Jay Warzinski	Onyx	262-971-1390	
		MO-5	Onyx Maple Hill Landfill	Macon	Anaerobic	Tony Witte/Onyx	660-773-5459	ajwitte@onyxws.com	2003			Full	Yes	Yes				Yes	Jay Warzinski	Onyx	262-971-1390	
167048	1966	MS-1	Plantation Oaks LF	Sibley	Hybrid	Doug Wilson, Site Manager/WMI							Yes	No	No	No	No	No	Jeff Harris	WMI	713-533-5006	jharris3@wm.com
		NC-1	Buncombe County LF	Alexander	Anaerobic	Bob Hunter/Buncombe County	828-250-5460	bob.hunter@buncombecounty.org	2003	2023	Gravity & Injection	Full	Yes	Yes	Yes	No	No	Yes	Chris Gabel	Camp, Dresser & McKee	703-642-5500	gabelci@cdm.com
1147	1074	NC-2	Coastal Regional SWM Authority Landfill	New Bern		Coastal Regional SWMA					Injection	Full	Yes	No	No	No	No	No				

SWANA - Bioreactor Landfill Committee

Summary List of North American Bioreactor Landfill Projects (as of March 2004)

NOTE: Database will be updated **QUARTERLY**. Please email revisions and new project additions to **Prentiss Shaw,** Database Committee Chair, EMCON/OWT, at **prentiss.shaw@shawgrp.com**

Project ID #	LMOP Landfill ID #	State-#	Landfill Name	Landfill City	Bioreactor Type	Owner Contact/Owner	Owner Phone	Owner email	Start Date	End Date	Wetting Method	Scale (acres)	Leachate Circulation	Other Liquids	Sludge Added	Air Injection	Vacuum Air	Active LFG System	Engineer Contact	Engineer Company	Engineer Co. Phone	Engineer E-mail
167112	2027	NH-1	Lower Mount Washington Valley LF	Conway					1992	1993	Spray	Full	Yes	No	No	No	No	No				
		NJ-1	Cape May County LF	Woodbine	Anaerobic	Manny Solheim/Cape May County	609-465-9026	solheimmc@cmcmua.com	2001	ongoing	Injection	Full	Yes	Yes					Amy Knight	EMCON/OWT	201 512-5700	amy.knight@shawgrp.com
		NJ-2	Burlington Co. LF	Columbia	Anaerobic				2002		injection		yes	yes	no	no	no	yes	Jeff Harris	Burlington Co/WMI	713-533-5006	jharris3@wm.com
1023	952	NJ-3	Pennsauken Sanitary LF	Pennsauken	Anaerobic	John Londres/PCFA of Camden Cty	856 663 2772	londres@pcfacc.com	2004/2005		injection	Full	yes	no	no	no	no	yes	Cay Smith	Cummize Smith	535 744 6556	
1013	942	NJ-4	Cumberland County Solid Waste Complex	Deerfield Township	Aerobic	Bernard D. Germanio/Cumberland County	856-825-3700	bgermanio@ccia-net.com	2003	2007	Vert Inj Wells	11	Yes	Yes	No	Yes	No	Yes	Mark Hudgins	ECS/ Gannett Fleming	803-643-1755	markh@aerobiclandfill.com
		NJ-5	Ocean County Landfill		Anaerobic	Ocean County			2000	ongoing	Cap system injection	Full	Yes	No					Ajay Chandwani	EMCON/OWT	201 512-5700	ajay.chandwani@shawgrp.com
		NJ-6	Salem County Landfill	Alloway Township	Anaerobic	Salem County			1999	2003	Trench	Full	Yes	No	No	No	No	yes	Amy Knight	EMCON/OWT	201 512-5761	amy.knight@shawgrp.com
		NY-1	Broome County Nanticoke SLF	Binghamton	Anaerobic	Ray Standish/Broome County			1995	1997	Trench	Demonstration	Yes	No	Yes	No	No	No	Ron Scrudato	NYSERDA		
1058	986	NY-2	Chemung County SLF	Elmira	Aerobic		607-737-2980		1992	1996	Spray	Full	Yes	No	No	Yes	No	No	Dennis Fagan	Fagan Engineers	607-734-2165	dennis.fagan@faganengineers.com
1057	985	NY-3	Greater Albany SLF	Albany	Aerobic	Joe Giebelhaus/City of Albany	518-869-3651	giebej@albany.ny.us	1989	1995	Spray	Full	Yes	Yes	No	Yes	No	No	David Hansen	Landfill Service Corp.	607-625-3050	dave@landfill.com
1060	988	NY-4	Colonie LF	Colonie	Anaerobic	Joseph Stockbridge/Town of Colonie	518-783-2827	stockbridgej@colonie.org	1998		Injection	Recirculation	yes	No	Yes	No	No	Yes	Dan Lowenstein	Malcolm Pirnie		
		NY-5	Mill Seat LF	Riga	Anaerobic	Edward Harding/Monore County			1995	1999	Injection	Demonstration	Yes	No	No	No	No	No		NYSERDA		
		NY-6	Ontario County SLF	Canandaigua	Aerobic				1998	1998	Spray	Full	Yes	Yes	No	Yes	No	No	Dennis Fagen	Fagan Engineers	607-734-2165	dennis.fagan@faganengineers.com
1067	995	NY-7	Sullivan County LF	Thompson	Semi-Aerobic	John Kelenbeck/Sullivan County	845-794-4466		2001	2001	Spray	Full	Yes	No	No	No	Yes	Yes	Prentiss Shaw	EMCON/OWT	201-512-5771	prentiss.shaw@shawgrp.com
		PA-1	Lycoming County LF	Williamsport	Anaerobic							Full	Yes	No	No	No	No	No				

SWANA - Bioreactor Landfill Committee

Summary List of North American Bioreactor Landfill Projects (as of March 2004)

NOTE: Database will be updated **QUARTERLY**. Please email revisions and new project additions to **Prentiss Shaw,** Database Committee Chair, EMCON/OWT, at **prentiss.shaw@shawgrp.com**

Project ID #	LMOP Landfill ID #	State-#	Landfill Name	Landfill City	Bioreactor Type	Owner Contact/Owner	Owner Phone	Owner email	Start Date	End Date	Wetting Method	Scale (acres)	Leachate Circulation	Other Liquids	Sludge Added	Air Injection	Vacuum Air	Active LFG System	Engineer Contact	Engineer Company	Engineer Co. Phone	Engineer E-mail
1341	1266	PA-2	Lanchester Landfill	Narvon	Anaerobic	Bob Watts-CCSWA		bwatts@chestercswa.org	2002	ongoing	Injection		Yes	No	No	No	Yes	Yes	Chris Campman	Gannett Fleming	610-650-8101	ccampman@gfnet.com
		PA-3	GROWS Landfill	Falls Township	Anaerobic	Tony Eith/WMI	215-269-2143		2000	ongoing			Yes	No	No	No	No	yes	Amy Knight	EMCON/OWT, Inc.	201-512-5761	amy.knight@shawgrp.com
		PA-4	Onyx Greentree Landfill	Kersey	Anaerobic	Don Henrichs/Onyx	814-265-1744	djhenrichs@onyxws.com	2000			Full	Yes	Yes				Yes	Bill Binnie	Onyx	814-265-1744	
		QUE-1	Ste Sophie Landfill	Ste Sophie, Quebec	Anaerobic	Hubert Bourque/WMI	514-334-3164		2002	ongoing	Injection	pilot/27	Yes	No	No	No	No	Yes		Intersan/WMI	450-438-5604	
166976	1920	SC-1	Aiken County Landfill	Langley	Aerobic	Alvin Bryan	803-642-1506		1998	1999	Injection	Demonstration	Yes	No	No	Yes	No	No	Mark Hudgins	Environmental Control Systems	803-643-1755	markh@aerobiclandfill.com
166977	1921	SC-2	Berkely County Landfill	Moncks Corner	Anaerobic	Steven Hively			permit rvw		Spr & Injection	Full	Yes	Yes	No	No	No	Yes	Chris Gabel	Camp, Dresser & McKee	703-642-5500	gabelcj@cdm.com
1419	1343	TN-1	Cedar Ridge LF	Lewisburg							Spray	Full	Yes	No	No	No	No	No				
1452	1376	TN-2	Hamilton County LF	Chattanooga	Aerobic				1999	2000	Injection	Full	Yes	Yes	No	Yes	No	No	Damon Riggs	Arcadis Geraghty & Miller	423-756-7193	driggs@arcadis-us.com
		TN-3	Williamson County LF	Franklin	Aerobic				2000		Injection	Separate Cell	Yes	No	No	Yes	No	No	Jo House	Civil & Environmental Consultants/ ECS	615-333-7797	jhouse@cecinc.com
		VA-1	Atlantic Waste LF	Waverly	Anaerobic	Mike Kearns/WMI	804-834-8300		1998		Injection		Yes	No	No	No	No	Yes		WMI		
		VA-2	King George County LF		Anaerobic	Jim Stenborg/WMI	540-775-3123				Injection		Yes	Yes	Yes	No	No	Yes		WMI		
		VA-3	Maplewood RWD Facility	Amilia County	Leachate Recirculation	Jim Stenborg/WMI	540-775-3123						No	No	No	No	No	Yes		WMI		
		VA-4	Middle Penninsula	Glenns	facultative	Jim Loveland/WMI	804-693-5109		2000		spray		Yes	No	No	No	No	Yes		WMI		
1741	1661	WI-1	Deer Track Park Incorporated LF	Watertown	Leachate Recirculation	Jay Schwoch/WMI					Spray		Yes	Yes	No	No	No	Yes	Gerald Hamblin		920-699-3475	
		WI-2	Lake Area Disposal LF	Sarona	Leachate Recirculation	Jim Palmer/BFI	715-469-3356		2001				Yes	Yes	No	No	No	Yes				

SWANA - Bioreactor Landfill Committee

Summary List of North American Bioreactor Landfill Projects (as of March 2004)

NOTE: Database will be updated **QUARTERLY**. Please email revisions and new project additions to **Prentiss Shaw,** Database Committee Chair, EMCON/OWT, at **prentiss.shaw@shawgrp.com**

Project ID #	LMOP Landfill ID #	State-#	Landfill Name	Landfill City	Bioreactor Type	Owner Contact/Owner	Owner Phone	Owner email	Start Date	End Date	Wetting Method	Scale (acres)	Leachate Circulation	Other Liquids	Sludge Added	Air Injection	Vacuum Air	Active LFG System	Engineer Contact	Engineer Company	Engineer Co. Phone	Engineer E-mail
1756	1676	WI-3	Mallard Ridge LF	Delavan	Leachate Recirculation	Scott Otterson/Republic	262-724-3257		1996	1998	Injection	Full	Yes	Yes	No	No	No	Yes				
		WI-4	Metro Recycling and Disposal LF	Franklin	Hybrid	Mike Heckney/WMI					Injection	Separate Cell	Yes	Yes	Yes	Yes	No	Yes	Ray Seegers	WMI	414-529-6180	
		WI-5	Superior 7-Mile Creek		Anaerobic	Mark Vinall/Superior	715-830-0284		1996		Injection	Full	Yes	No	No	No	No	Yes				
		WI-6	Superior Emerald Park LF	Muskego	Anaerobic	Gene Kramer/Superior	414-529-1360		1998		Injection	Full	Yes	Yes	No	No	No	Yes	Todd Watermolen	Onyx Waste Service, Inc.	414-479-7800	
		WI-7	Superior Glacier Ridge LF	Horicon	Leachate Recirculation	Don Smith/Superior			1999		Spray	Full	Yes	Yes	No	No	No	Yes	Andrea Lorenz		920-387-0987	
		WI-8	Timberline Trail Landfill		Leachate Recirculation	Scott O'Neill/WMI			2001				Yes	Yes	No	No	No	Yes	Dan LeClaire		608-837-9031	
1785	1705	WI-9	Valley Trail LF	Berlin	Leachate Recirculation	Todd Hartman/WMI			1999	2001	Spray	Full	Yes	Yes	No	No	No	Yes				