# PROJECT XL PROPOSAL
# BIOREACTOR PILOT PROJECT

# ANNE ARUNDEL COUNTY, MARYLAND
# MILLERSVILLE LANDFILL AND RESOURCE RECOVERY FACILITY

Prepared by:

**ANNE ARUNDEL DEPARTMENT OF PUBLIC WORKS**
**Waste Management Services**
389 Burns Crossing Road
Severn, MD 21144-3411

&

**SCS ENGINEERS**
11260 Roger Bacon Drive
Reston, Virginia 20190
(703) 471-6150

March 15, 2000
File No. 0297054.03

# EXECUTIVE SUMMARY

Anne Arundel County wishes to test the bioreactor landfill concept at its Millersville Landfill and Resource Recovery Facility in Severn, Maryland. In order to test this concept, it is requesting Project XL flexibility from the United States Environmental Protection Agency (EPA) requirement that restricts liquid waste placement in landfills unless the landfills are designed with a prescribed composite liner system. If the EPA does not grant this flexibility, the County's pilot project will not be allowed to proceed.

Bioreactor landfills are an emerging approach to more efficient and effective solid waste management. The goals of the bioreactor landfill are to deliver superior environmental and economic benefits to the community. Bioreactors deliver environmental benefits by reducing the amount of leachate that is discharged to publicly owned treatment works and the avoidance of new landfill construction. They deliver economic benefits by accelerating waste decomposition (and resulting landfill settlement) which extends the life of a landfill at lower cost than new construction to ratepayers, operation and maintenance costs such as leachate treatment costs are also reduced.

The County's pilot project will involve injecting liquid (leachate and/or stormwater) through injection devices into a small portion of Cell 8 over a four to seven-year period (depending on effectiveness), and monitoring the settlement that results. Settlement will be monitored by installing settlement plates. If the pilot project is successful, the County would like to expand the bioreactor technology to other areas on Cell 8 (and future Cell 9) in the Millersville Landfill.

The County has developed a detailed stakeholder participation plan that will ensure full involvement of federal, state and local groups in the pilot project. The County plans to monitor the project's success and will publish updates on its website and in a local newsletter. The County has also committed the staff and budget to ensure that this pilot project can move forward, should it receive regulatory flexibility through the Project XL Program. Finally, the County believes that this project, if successful, will be transferable to a number other landfills in the Mid-Atlantic United States with similar climates.

# I. INTRODUCTION

## I.A. DESCRIPTION OF FACILITY, COMMUNITY AND GEOGRAPHIC AREA

The Millersville Landfill and Resource Recovery Facility (Facility) is located on a 565-acre portion of land in Severn, Maryland, 10 miles south of Baltimore. The Facility is owned and operated by Anne Arundel County (County) and is the only active municipal solid waste (MSW) landfill in the County. The Facility handles about 390 tons per day (tpd) of MSW, of which 1/3 of the amount (about 130 tpd) is recovered for reuse and recycling and the remaining amount (about 260 tpd) is landfilled. The Facility serves about 660 customers (residents and businesses combined) per day, 7 days per week.

The landfill consists of nine cells (refer to Attachment I). Cell 1-East, Cell 2, Cell 4, and Cell 567 are separate mounds that are filled, closed, and capped. Cells 3 and 1-West were excavated and relocated into Cell 8 in 1994 and 1996, respectively. Cell 8 is currently accepting waste, and Cell 9 is scheduled to be constructed in the future, when Cell 8 is filled. Cell 8 has eight subcells. Subcells 8-1 through 8-6 have been constructed and are all partially or nearly filled. The next subcell planned for construction is Cell 8-8, occurring in 2006. The landfill permit states that Cells 8 is approved for 5.6 million cubic yards (MMcy) of waste and Cell 9 for 8.7 MMcy. The final elevation of Cell 8 will be 243 feet above mean sea level (MSL).

Cell 8 alternate liner and leachate collection system (double-liner system) has been proven to exceed state and federal requirements and has been approved by the United States Environmental Protection Agency (EPA) Region III and the Maryland Department of the Environment (MDE). The EPA Region III approval letter is included in Attachment II. Details of the liner and leachate collection system are included in Section II.B.1 of this proposal.

The Landfill generates approximately 8,000 gallons of leachate per day. Leachate from Cell 8 is collected from subcell sumps (one sump per subcell) and piped to a wetwell. From the wetwell it is pumped to a 305,000 gallon influent tank. The leachate then flows to the pretreatment plant where the treatment process occurs in controlled batches.

Unconsolidated sediments underlie the landfill consisting of stratified layers of sand, gravel, silt, and clay overlying consolidated crystalline basement rocks. Four water-bearing zones, Zone 1 through Zone 4, have been identified in the upper 300 ft of the unconsolidated sediments at the site. In the uppermost zone (Zone 1), ground water is unconfined in primarily fluvial sands and perched on the upper confining layer. The extent of Zone 1 is restricted to the southern and southwestern boundaries of the site, north of Discus Mill Road, and along Burns Crossing Road, respectively. The second water bearing zone (Zone 2) occurs in a series of disconnected shallow sand zones within the upper confining layer. In the southern portion of the site, Zone 2 may be either unconfined or confined, and is recharged directly from the overlying perched aquifer (i.e., Zone 1). The third water-bearing zone (Zone 3) is a deep sand zone within the upper

confining layer that may be either semi-confined or confined across the site. Zone 3 is used as a residential water supply by some of the homes within 0.5 miles of the site. The zone is recharged by leakage form the overlying zones (i.e., Zones 1 and 2). The fourth water-bearing zone (Zone 4) is the major ground water aquifer in the vicinity of the Landfill. This aquifer is confined at the site by a basal clay unit in the upper confining layer.

The base of Cell 8 is underlain by at least 5 feet of unsaturated clay and sand. Beneath the unsaturated materials is 15 feet of saturated sand which comprises the Zone 2 aquifer.

Forty-three groundwater and 29 LFG monitoring wells are installed at the site. The groundwater monitoring wells are installed within each water-bearing zone in the subsurface beneath the Landfill. The groundwater wells are sampled semiannually, and the LFG monitoring wells are monitored quarterly.

The Facility operates under an enterprise fund that is paid for by an annual flat rate fee from residential customers that are provided curbside collection service and use the Facility and tipping fees from commercial customers funding is not through property taxes. Capital projects are funded with County bonds that are also repaid from the enterprise fund.

There are about 5,800 residents within a 1-mile radius of the landfill; about 2,750 within a 0.5-mile radius; and about 900 within a 0.25-mile radius (refer to Attachment III). The County has developed a stakeholder participation plan (see Section III.C. below) to engage these nearby residents in the proposed project.

During 1995 the County adopted a comprehensive Solid Waste Management Strategy, the main objective of which is to preserve the life of the landfill as long as possible. As the County implements the various elements of the plan, we create an integrated system involving waste reduction, recycling, reuse and innovative technologies that provides for a multi-faceted approach for meeting the County's future solid waste management needs. When the Millersville Landfill opened in 1975 the facility had a projected life of 25 years, or until the year 2000. When the 1994 Solid Waste Management Plan was adopted the projected completion of Cell 8 was in 1997 and the entire facility by 2008.

As of December 1995 the new projected closure date for Cell 8 was 2002 and the entire landfill, would be to capacity in 2019. We continue to evaluate numerous strategies and implement them as appropriate. They include:

- redirect 350 tons/day to regional transfer station for out-of-state disposal.
- evaluate municipal solid waste composting
- evaluate waste-to-energy facility diversion
- implement yard waste collection program for composting off-site
- educate curbside customers about recycling - increase recycling above 30%
- educate landfill and convenience center customers about source separation and recycling

- implement yard waste composting of self-hauled materials at the MLFRRF
- implement bioreactor project

This strategy has reduced the waste entering the MLFRRF from 800 tons/day in 1994 to 260 tons/day in 2000. The life of Cell 8 is now projected to be until 2017 and the life of Cell 9 until 2073. To date the County has been successful in implementing all feasible facets of the Strategy except the bioreactor concept.

## I.B. CONTACT INFORMATION

Robert A. DeMarco, Manager
Anne Arundel County, Maryland
Waste Management Services
389 Burns Crossing Road
Severn, MD 21144
Telephone: (410) 222-6108
Fax: (410) 222-6105
Email: bob_demarco@hotmail.com
Internet Site: www.aadpw.org

# II. PROJECT DESCRIPTION

## II.A. SUMMARY AND OVERVIEW OF PROJECT

Anne Arundel County proposes to operate a small-scale, controlled, fully monitored, and evaluated bioreactor pilot project at the Millersville Landfill's Cell 8. The County has enlisted the assistance of Johns Hopkins School of Engineering for this project and SCS Engineers will serve as the engineering consulting firm.

To implement the bioreactor pilot project, Anne Arundel County requests that the U.S. Environmental Protection Agency (EPA) grant regulatory flexibility from the Resource Conservation Recovery Act's (RCRA) requirements in 40CFR 258.28(a) and (a)(2). 40CFR 258.28(a) restricts liquid waste introduction into landfills unless the waste is either household waste other than septic waste or leachate or gas condensate derived from the landfill. Since this project will require introduction of liquids into a small portion of Cell 8, the County proposes to recirculate their leachate. However, if the available leachate quantities are incapable of supplying the project needs, the County proposes to supplement it with onsite stormwater runoff.

40CFR 258.28(a)(2) indicates that leachate or gas condensate recirculation is allowed if the composite liner and leachate collection system is designed as prescribed in 40CFR 258.40 (a)(2). Since Cell 8 has been constructed with an alternate composite liner and collection system, 40CFR 258.20(a)(2) prohibits leachate recirculation, although as mentioned before, the alternative system has been proven to exceed 40CFR 258.40 (a)(2) requirements.

The Maryland Department of the Environment (MDE) is aware of the objectives, potential merits, and technical issues associated with this proposal. MDE has also received a copy of this proposal. MDE has indicated support for and acceptance of the bioreactor concept provided EPA grants flexibility in regard to the regulatory constraints (40 CFR 258.20(a)(2)) and MDE has stakeholder involvement. The County will seek MDE concurrence with flexibility provided for all federal requirements.

Anne Arundel County is aware that EPA's Project XL is currently considering another landfill bioreactor proposal for Yolo County, California. Anne Arundel County believes that this proposal is distinct from the Yolo County Project XL proposal in several aspects. Some important aspects include:

- Geography/climate – The climate at the Millersville Landfill is much different from that at the Yolo County site. The primary difference is the amount of rainfall that the sites receive. The Yolo County site receives an average of 17 inches annually while the Millersville Landfill receives an average of 41 inches. This greatly impacts landfill gas generation and leachate formation as well as landfill settlement.

- Regulatory flexibility requested – The Yolo County proposal requested flexibility in implementing regulations prohibiting the addition of liquids to landfills, cover material requirements, and landfill height and closure requirements. The County is only asking for regulatory flexibility from the RCRA liquid restrictions and liner system requirements.

- Site specific information – The Millersville Project will provide valuable site-specific information, including design, operational, and maintenance. A major objective of this project is to determine the best method of injecting liquid that would lead to optimum effectiveness.

- Transferability – The information gained from the Millersville Project will be of better use (than Yolo County data) to future bioreactor projects in mid-Atlantic United States.

- Unique waste stream – The Millersville Landfill receives a unique, moderate organic waste stream since a large percentage of curbside collected household waste is diverted to a regional transfer station.

### II.A.1 Background on Bioreactor Landfills

A bioreactor landfill is a sanitary landfill that uses enhanced microbiological processes to transform and stabilize the decomposable organic waste within 5 to 10 years of implementation (compared to 30 to 100 years for "dry" Subtitle D landfills). Engineered bioreactor landfills can provide a more controlled means by which society can reduce the environmental impacts of landfills on the surrounding local environment. The bioreactor technology is gaining popularity in North America and Europe, and has been demonstrated at various landfills, particularly in areas where landfill closure is costly and/or where landfill siting is difficult. Engineered bioreactor landfills provide accelerated waste biodegradation, a means for recovery of capacity (air space), a means to enhance landfill gas generation rates, leachate quality enhancement and a means to minimize long-term liability, among others.

## II.B PROJECT COMPONENTS

The County's bioreactor pilot project will involve injecting a controlled amount of liquids through injection devices into a small portion of an individual subcell over a four to seven-year period (depending on effectiveness), and monitoring the settlement that results.

The objectives of the project are as follows:

1. Design and construct a bioreactor test area in an active subcell of the Landfill;

2. Perform liquid injection in a controlled manner using different injection methods;

3. Monitor surface settlement, injection rates and related parameters (Section III.G.) over a period of time; and

4. Evaluate results and ultimately select the method that will most effectively increase the Landfill's waste capacity.

The following subsections provide information on the proposed pilot design, simultaneously addressing apparent concerns. Attachments IV and V includes the drawings of the test area location, proposed system layout, and details.

### II.B.1 Test Area Location

The proposed test area measures 160 feet by 200 feet and is located within the southern end of Subcell 8-4, with a portion overlapping into adjacent Subcell 8-6 (refer to Attachment IV). The waste volume in this area is about 95,500 cubic yards (waste top elevation is approximately 218 feet and bottom elevation is between 135 and 140 feet) and the depth is about 80 to 85 feet. The test area is a plateau with a 2 percent slope toward the landfill's side slope. The test area is adjacent to an existing haul road which makes it accessible to tank trucks for easier liquid injection. Anne Arundel County evaluated other areas of the Millersville Landfill, but this test area proved to have the best conditions for the bioreactor pilot project.

Subcell 8-4 began accepting municipal solid waste (MSW) in October 1992; Subcell 8-6 accepted waste beginning in September 1997. The site has accepted only small quantities of curbside MSW since 1997; it now accepts primarily construction debris. Thus the lowermost portion of the waste in Subcell 8-4 contains typical MSW, while the uppermost portion contains waste that is higher in construction debris and lower in decomposable organic materials. The County recently completed (summer 1999) a waste composition study to provide more detailed waste stream information. A March 1995 waste sort report will also be consulted.

The County used soil as a daily cover at the site until March 1993. Since then, the County has primarily used removable tarpaulins (tarps) throughout Cell 8 as the cover (about 97 percent of the time, depending on weather conditions). Use of tarps for a bioreactor study is ideal, as there is less potential for the creation of barriers (e.g., compacted soil cover) to limit vertical penetration of liquid into the waste mass.

The base liner for each constructed Subcell in Cell 8 is a double synthetic system consisting of the following, from top to bottom (refer to Attachment VI):

1. 2-foot protective soil cover over geotextile filter;

2. Leachate collection geonet drainage layer;

3. 60-mil high density polyethylene (HDPE) geomembrane top liner;

4. Leakage detection geonet drainage layer;

5. 60-mil HDPE geomembrane bottom liner; and

6. 1.5-foot low permeability ($1x10^{-7}$ CM/S, demonstrated by construction QA/QC) soil subbase.

As mentioned, this liner system exceeds the requirements of the MDE and EPA for MSW landfills. It incorporates two geomembranes and provides for leak detection, features associated with hazardous waste landfill designs. Note that RCRA Subtitle D liner systems consist of a single geomembrane over a 2-foot layer of compacted soil with a hydraulic conductivity of no more than $1x10^{-7}$ cm/s.

The drainage portion of the liner system includes a 2-foot protective soil cover over geotextile filter over a geonet layer. This top 2-foot protective soil cover is a relatively high permeability soil with a saturated hydraulic conductivity of not less than $5x10^{-3}$ cm/s. The combination of high permeable protective soil over geotextile filter that is installed throughout the landfill minimizes potential clogging caused by particulates in the leachate, biological growth, and biochemical reactions.

The leachate collection system in Cell 8 consists of one layer of geonet (part of the liner system described above) that covers the entire bottom of each landfill subcell and a system of perforated HDPE pipes placed in gravel blankets that overlay the geonet. Leachate is conveyed by the geonet and/or pipes to a sump, from which leachate is pumped and conveyed to an on-site leachate pretreatment facility. The leachate collection system at the landfill is designed specifically to keep a very small liquid depth on the top liner (i.e., less than 5 mm, which is the thickness of the leachate collection geonet) at all locations within a subcell, except at the sump where liquid is collected for pumping. (Note that in RCRA Subtitle D systems, the leachate collection system can be designed and constructed to maintain no more than a 30-cm depth of leachate over the liner.) In the sump areas of the landfill, the liner system is enhanced by the addition of layers of geosynthetic clay liner (GCL) below both top and bottom geomembranes. The GCLs have saturated hydraulic conductivities of less than $1x10^{-9}$ cm/s. The GCLs together with the other liner components result in a "double-composite" liner system beneath the landfill sumps.

To monitor the integrity of top liner, the quantity of liquid removed from each subcell sump above the bottom liner (detection zone) is monitored on a daily basis. The accumulation of some liquid due to condensation in this area is normal. The number calculated and established as a "not to exceed guideline" is 100 gallons per acre of subcell floor per day. Daily monitoring of the liquid above the bottom liner will continue throughout the life of Cell 8.

To protect the drainage and liner system the initial eight-foot lift of waste is "soft trash". Soft trash is solid waste that is collected from residential curbside trash pickups. No curbside waste may exceed four feet in length. Curbside household waste in general is softer than waste streams from commercial facilities or sources from homeowners self-hauling materials from their home or yard. This initial eight-foot lift of waste was compacted to six feet in thickness.

## II.B.2. Liquid Injection

To improve the evaluation of different infiltration systems, the test area will include two vertical injection wells and two horizontal injection trenches. These are the two most commonly used and effective injection devices. The trenches will be excavated so that they slope away from the landfill sideslopes at a 2 percent grade, to minimize excavation depths, promote gravity drainage, and eliminate possible (landfill) side-slope seepage. Design spacing for the wells and trenches minimize overlapping areas of influence. This spacing will reduce uncertainties that may be introduced by overlapping influences. Similar to proven methods used in the groundwater industry, the information gathered from individual injection devices may be used to design a comprehensive system.

Design details of the proposed vertical wells and horizontal trenches are in Attachment V. These devices are designed to maximize the amount of liquid that can be injected; however, actual injection rates will be a function of infiltration and resulting settlement. The vertical wells consist of slotted or perforated 6-inch diameter pipe centered in a 3-foot diameter borehole and backfilled with high permeability stone. The well depths will be selected to penetrate between one-third and one-half the overall waste depth. The horizontal trenches will consist of 6-inch diameter perforated or slotted pipe centered in a 2 x 1.5-foot trench, backfilled with high permeability stone or gravel. Proprietary leachate pipe products that are relatively new to the waste industry may also be considered.

Each injection device will be fed by a 6,500 gallon tank truck through a centrally located single hose connection. A flow meter will be installed to allow measurement of liquid flow to each injection device. Four control valves will be installed to allow independent flow regulation to each of the injection ports. A central feed location will be used to ease system operations and reduce truck traffic that may affect settlement rates. Finally, precipitation will be recorded via a rain gauge to allow for adjustments to the injection rate.

## II.B.3 Settlement Plates

Settlement plates will be strategically located around wells and trenches to measure surface movements during the study (refer to the Layout in Attachment V). Plates will consist of 4-6 inch diameter concrete or wooden posts embedded at least 2 feet into the upper surface of the waste. If necessary, they will be grouted in place. The top elevation of each plate will be surveyed prior to liquid injection. The frequency of readings are anticipated to be at least monthly, but will occur more frequently if information suggests that settlement is occurring at a rapid rate. At least one plate will be located in a control area that is adjacent to the test area and outside the zone of influence for the liquid injection system. This control area will measure normal settlement rates as a comparison. Additionally, a stable elevation benchmark will be established to ensure that all readings are based on the same baseline elevation.

### II.B.4 Landfill Gas Considerations

Liquid injection promotes more rapid landfill gas generation, and may lead to localized odors in the test area. As a contingency to control landfill gas (LFG) emissions, the horizontal trenches will be designed with a flanged connection at the end opposite from the injection point. This connection will allow the County to install a passive flare to combust the collected LFG. The need to flare the gas will be evaluated as the project progresses, based on LFG pressure, methane concentration measurements, and observations of surface emissions and odors.

Fires in landfills are usually caused by poorly designed or operated active LFG collection systems allowing air or oxygen into the waste. On this project, a passive collection system is proposed to handle the gas generated; thus the potential for landfill fires is minimized. The potential for landfill fires is also minimized on this project since it is based on the anaerobic bioreactor concept. Note that landfill fires are of much greater concern in aerobic bioreactor landfills that are designed to introduce air or oxygen into the waste.

# III. PROJECT XL CRITERIA

## III.A. SUPERIOR ENVIRONMENTAL PERFORMANCE

The main goal of this project is to deliver superior environmental performance (SEP) by capturing the additional airspace gained by accelerated decomposition of the waste. This benefits the County and its citizens by prolonging the life of the landfill and thereby postponing the siting of new solid waste management facilities, with their attendant social impacts, environmental impacts, and economic costs.

Environmental benefits of this project include:

- Reduced need for construction of new landfills and corresponding reduction (or elimination) of the land, air, and water impacts associated with landfill construction;
- Decreased concentration of most leachate constituents as cycling of leachate removes or reduces contaminants;
- Reduction in the amount of leachate requiring pretreatment;
- Reduction in the amount of leachate that the facility discharges to the local wastewater treatment plant, and subsequent discharge of effluent to the Patuxent River; and
- Reduction in post-closure care, maintenance and risk (bioreactor landfills minimize long-term environmental risk and liability due to the controlled settlement of the solid waste during landfill operation, low potential for leachate migration into the subsurface environment, and the recovery of LFG during operation.)

### III.A.1 Tier 1: Is the Project Equivalent?

To adequately measure the environmental and other benefits of the proposed bioreactor pilot project, the County will set a "baseline" that records the environmental impacts of the Millersville Landfill without the proposed bioreactor project. Without the project, Subcells 8-4 and 8-6 will be filled until they reach their capacity, and then covered. The rest of the Subcells in Cell 8 will also be filled until the Millersville site reaches its capacity. After that time, Cell 8 will be closed and the County will have to develop Cell 9. It will also continue to generate the same levels of leachate for disposal to the local POTW.

Table 1 below outlines a comparison of the baseline project to a full-scale bioreactor project.

**Table 1. Comparison of Baseline Project to Bioreactor Project.**

| Superior Environmental Performance Criteria | Baseline Project (without bioreactor) | Proposed Bioreactor Project |
|---|---|---|
| Fugitive Emissions of Landfill Gas ($CH_4$ and VOCs) | 25%+ | <25% due to greater LFG generation during life of LFG collection system |
| Extension of Landfill Life | 0 years | Approx. 5 years |
| Leachate Strength ("Contamination Potential") | Medium to high over long term | Lower organics and metals over short term |
| Waste Stabilization[1] | 25-70 years | 5-10 years |
| Landfill Settlement (net) | Unknown | 20%+ increase expected |

### III.A.2 Tier 2: Superior Environmental Performance

With the bioreactor pilot project, the Millersville Landfill is expected to gain additional airspace, and additional years of landfill life. If the pilot project in Subcells 8-4 and 8-6 is successful, the County expects to expand the bioreactor technology to other subcells in Cell 8 and Cell 9 at the Millersville site, thus further extending the landfill's useful life.

### III.A.3 Measuring Superior Environmental Performance

SEP will be measured in the following areas: amount and concentration of leachate disposed to the local POTW and amount of landfill settlement. Due to the anticipated increase in LFG generation, NOx and CO emissions from the candlestick flare will increase (if installed); this disadvantage, however, will be more than offset by the reduction in VOC emissions.

## III.B. FLEXIBILITY AND OTHER BENEFITS

In addition to the environmental benefits described above, this project will produce a number of economic and societal benefits. These include:

- Overall reduction in landfill cost – by successive re-uses of the same bioreactor cell, there are overall savings arising from avoiding the siting of new landfills every 15-20 years. Proper operation of a bioreactor cell will reduce landfill monitoring activities and post-closure care costs.

- Current airspace at the Millersville Landfill is valued at $88.26 per cubic yard. The current projection for the life of the Millersville Landfill is 2073. The air space saved now will extend the life past 2073. The value of airspace in 2073 is inestimable but extremely valuable.

[1] Data obtained from Yolo County Project XL Proposal, Dated 9/14/99.

- Other benefits of this project include the possibility for replication among other counties and private landfill owners in the Mid-Atlantic with similar climate conditions.

## III.C. STAKEHOLDER INVOLVEMENT

Public outreach and education are essential functions of any significant project at the Millersville Landfill and Resource Recovery Facility. Anne Arundel County has included all relevant sectors as stakeholders in this project. Those entities the County feels may desire notification, but will not participate, will be provided information on the project. We welcome any comments received from any stakeholder or commentor.

### III.C.1 Stakeholder Identification

Anne Arundel County has a history of involving the appropriate stakeholders in projects at any of our solid waste acceptance or disposal facilities. This philosophy has proved to be beneficial to all involved parties. Anne Arundel County plans to continue this philosophy for this project.

We have divided the stakeholders into three groups. The groups are identified as primary stakeholders, potential interested parties, and members of the general public.

#### III.C.1.i. Primary Stakeholders

- U.S. Environmental Protection Agency (EPA)
- Maryland Department of the Environment, Solid Waste Program
- Anne Arundel County Health Department, Environmental Health Bureau
- Anne Arundel County, Planning and Code Enforcement
- Anne Arundel County, Soil Conservation District
- Others as may be identified

The primary stakeholders are the regulatory agencies involved with solid waste disposal facilities or other activities at the disposal site. These primary stakeholders will have active participation in the project proposal and project development.

#### III.C.1.ii. Potentially Interested Partners

- John Hopkins University, Department of Environmental Engineers
- Solid Waste Association of North America
- Geosyntec Consultants
- Heery International
- Carroll County, Maryland
- Private Sector, Waste Disposal Company
- Others as may be identified

The potentially interested partners may express interest in the project and have some involvement in the project. It is not anticipated that all partners will play an active and

ongoing role in project development. If they do not actively participate in the project, they will be kept informed at appropriate points. Their input will be welcomed in verbal or written form.

### III.C.1.iii. General Public

Our facility neighbors will be advised of the project in our routine Community Update Newsletter. As in the past their comments will be solicited; however, we do not anticipate community participation. The general public at large will be provided information on the Final Project Agreement (FPA) through the local media (Capital newspaper). We do not anticipate involvement from the general public.

Anne Arundel County will actively solicit comments from the primary stakeholders and potentially interested partners. We envision 4 – 5 meetings at appropriate times:

- After initial EPA/MDE proposal review and comment
- Upon release of the draft FPA
- Upon implementation
- Update during year 2
- Final meeting at the end of project

Anne Arundel County remains open to new participants that may be identified as the project progresses. The county will continue to provide stakeholders and members of the general public with updated information on the project via its internet website and publication of notices in local publications so that they may have an opportunity to monitor the project's progress towards meeting its goal of superior environmental performance. The County may develop and publish fact sheets and other informative outreach documents to further educate the landfill neighbors about this innovative project.

## III.D. INNOVATION/POLLUTION PREVENTION

The key innovation delivered by the Millersville Landfill Bioreactor pilot project is the increase in landfill waste settlement. If the pilot project is successful in demonstrating that accelerated waste settlement can be achieved in a cost-effective manner, the County will be able to implement other bioreactor projects on a wider scale. This leads to a significant pollution prevention benefit in the avoidance of new landfill siting and construction in the County. Another significant pollution prevention benefit is the leachate which becomes more dilute with each recirculation. Should there ever become a liner failure the leachate released would be of a dilute nature resulting in reduced or eliminated environmental and/or public health impact.

## III.E. TRANSFERABILITY

If the pilot project successfully achieves low-cost landfill settlement, it will have a high degree of transferability, as it requires a relatively simple technology and a small amount of regulatory flexibility. This project will also provide critical public information about

the viability of bioreactors in the Mid-Atlantic United States. Further, because the siting of new landfills requires a significant public investment of time and resources, other jurisdictions in Maryland and on the east coast will be able to use the County's results to help them implement similar bioreactor projects. The County's publication of its positive and negative results will also provide valuable data on the performance of different types of injection devices for enhanced degradation of waste.

### III.F. FEASIBILITY

The bioreactor concept has already been tested at the Yolo County project, and at other sites in North America and Europe, and has shown that the technology can feasibly create additional airspace at a landfill. The County has already consulted with the MDE about the proposed project, and MDE supports this proposal. Further, the County has set aside the necessary budget for this project.

### III.G. EVALUATION, MONITORING AND ACCOUNTABILITY

The County plans to develop a tracking methodology that involves collecting the following data:

- Amount of liquid injected via horizontal trenches and vertical wells
- The amount of treated leachate that is discharged to the local POTW (to determine if there is a decrease)
- Concentration of leachate constituents and general chemistry parameters (e.g., BOD, COD, pH, conductivity, and TDS).
- Amount of landfill settlement achieved
- Cost of project

Leachate samples were collected from each subcell sump in March 1998, June 1998, October 1998 and October 1999. These samples were analyzed for a full array of parameters including volatile organic compounds, total metals and general chemistry parameters (refer to Attachment VII). This establishes a baseline for leachate quality.

The project's status will be monitored and reported on a semi-annual basis to the EPA, MDE, and other stakeholders. Updates to the County's website will also be done at a minimum of semi-annually. This outreach will be designed to enable stakeholders to assess the project's success in delivering SEP.

#### III.G.1 Accountability

As mentioned previously, the County has included bioreactor landfilling as one part of its County-wide Solid Waste Management Strategy, and the project, therefore, already has the required County approvals to move forward. The County has a Solid Waste

Enterprise Fund that has provided the necessary funding to support the pilot project. Funding is dedicated at $122,000 for the design and construction portions of this project. The operation of the project will come from our regular landfill operating funds. The County is also willing to set out commitments in the Final Project Agreement whereby it agrees to expand the bioreactor technology to other cells in the Millersville Landfill if the pilot project demonstrates that it can achieve specific levels of settlement in a cost-effective manner.

## III.H. SHIFTING OF RISK BURDEN

This project does not entail a shifting of environmental risk to low-income or disadvantaged communities. Instead, it reduces that risk. The expected result of the project is the eventual delay or avoidance of new landfill construction.

## IV. REQUESTED FLEXIBILITY

The County is requesting that the U.S. Environmental Protection Agency (EPA) grant regulatory flexibility from the Resource Conservation Recovery Act's (RCRA) requirements in 40CFR 258.28(a) and (a)(2). 40CFR 258.28(a) restricts liquid waste introduction into landfills unless the waste is either household waste other than septic waste or leachate or gas condensate derived from the landfill. . Since this project will require introduction of liquids into a small portion of Cell 8, the County proposes to recirculate their leachate. However, if the available leachate quantities are incapable of supplying the project needs, the County proposes to supplement it with onsite stormwater runoff.

40CFR 258.28(a)(2) indicates that leachate or gas condensate recirculation is allowed if the composite liner and leachate collection system is designed as prescribed in 40CFR 258.40 (a)(2). Since Cell 8 has been constructed with an alternate composite liner and collection system, 40CFR 258.20(a)(2) prohibits leachate recirculation although (as mentioned before) the alternative system has been proven to exceed 40CFR 258.40 (a)(2) requirements.

Discussions with MDE suggest that they are supportive of the bioreactor concept, but as they are constrained by the mentioned EPA regulations, they cannot approve the project until EPA's regulatory flexibility is obtained. The County will seek MDE concurrence with flexibility provided for all federal requirements.

Without regulatory flexibility, the County would not be able to test the economic and environmental viability of the bioreactor technology.

# V. COMPLIANCE AND ENFORCEMENT PROFILE

The County has evaluated the Millersville Landfill to determine whether there are any outstanding environmental violations or requirements. The County also examined whether there are any ongoing compliance issues or enforcement actions associated with the site. Finally, the County investigated whether the site was involved in any lawsuits or judicial proceedings with the EPA. No legal, regulatory or other violations or proceedings were discovered.

## V.A. AIR REGULATIONS

### V.A.1. New Source Performance Standards

The purpose of the New Source Performance Standards (NSPS) for municipal solid waste landfills is to control LFG emissions. The target pollutants are non-methane organic compounds (NMOCs) and methane. The Rule seeks to limit LFG emissions by adopting NMOC emissions guidelines and performance standards, and requiring LFG emission control at landfills which exceed these guidelines and standards. By controlling NMOC emissions, methane emissions also are controlled.

The Landfill is currently in compliance with all NSPS requirements, including operations, monitoring, recordkeeping, and reporting.

### V.A.2. Title V Operating Permit

In 1990, the U.S. EPA established an Operating Permit Program under Title V (40 CFR Part 70) of the Federal Clean Air Act (CAA). Title V is an operating permit program, enforced through federal and state rules, requiring compilation of an air emissions inventory, identification of applicable regulations, and certifications of compliance.

> The County has submitted their Title V permit application to MDE and approval is pending.

### V.A.3. MACT Standard

The U.S. EPA is currently working on a maximum achievable control technology standard (MACT) for landfills. MACT requirements for landfills likely will pertain to required emission reductions for hazardous air pollutants (HAPs) in LFG. Any source that emits more than 10 tons per year of any single HAP or 25 tons per year in aggregate is classified as a major source and, therefore, will be subject to MACT requirements.

A proposed MACT standard for landfills is slated for adoption in the year 2000. Once the MACT is promulgated, the County plans to comply with its requirements.

## VI. SCHEDULE

The pilot project is expected to have a duration of four to seven years, depending on effectiveness. The project schedule follows:

1. Obtain EPA and MDE approval.

2. Construct pilot test facilities. Three months are estimated for this construction phase.

3. Perform controlled liquid injection while monitoring surface settlement and recirculation rates over a four-year period, minimum. During this period, semiannual progress reports will be submitted.

4. Evaluate results and ultimately select the method that will most effectively increase the Landfill's waste capacity. It is estimated that this evaluation will be completed within two months after test completion.

5. Submit final report.

**ATTACHMENT I**

**Vicinity Map**
**and**
**Capital Investment Map**

**ATTACHMENT II**

**U.S. EPA Approval Letter for Alternate Liner System**

**ATTACHMENT III**

**Resident Population around Landfill**

**ATTACHMENT IV**

**Test Area Location**

# ATTACHMENT V

## System Layout and Details

**ATTACHMENT VI**

**Liner Detail**

# ATTACHMENT VII

## Leachate Analytical Results