

US EPA ARCHIVE DOCUMENT

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USEPA PROJECT XL
FINAL PROJECT AGREEMENT

BIOREACTOR PILOT PROJECT

Anne Arundel County
Department of Public Works
Waste Management Services
Millersville Landfill and Resource
Recovery Facility

Severn, Maryland

September 15, 2000

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I. Introduction to the Agreement

A. Description of the Project and Its Purpose

This document contains the details of the Final Project Agreement (“FPA,” or “Agreement”) between Anne Arundel County (“County”), the United States Environmental Protection Agency (EPA, and the Maryland Department of the Environment (“MDE”)) (collectively, the Parties) documenting the Parties’ plans to allow the County to implement certain bioreactor operations (involving the additions and/or recirculation of bulk liquids, including landfill leachate), at the County’s Millersville Landfill and Resource Recovery Facility (“Facility”) located in Severn, Maryland. The general location of the facility is shown on Figure 1. This document summarizes the Parties’ plans for the project, and its expected benefits.

In the past, the design goal of a “traditional” landfill was to minimize the quantity of water introduced into the landfill, thus minimizing leachate generation. The disadvantage to this approach is that the lack of liquid causes the biodegradation process to occur very slowly, thus leaving waste in a relatively undecomposed state for a long period. In this case, the liner system is potentially exposed to leachate for a relatively long period of time, and waste continues to be a potential source of groundwater contamination throughout the post -closure period.

Bioreactor landfills are an emerging approach to more efficient and effective solid waste management. Bioreactor -techniques are expected to deliver superior environmental and economic benefits to the community. Bioreactor techniques deliver environmental benefits by reducing the amount of leachate that is discharged to publicly owned treatment works; postponing or avoiding new landfill construction; and reducing the need for long-term maintenance during the post-closure care period. These same attributes also deliver economic benefits: reduction of leachate treatment costs; the postponement or avoidance of the costs of new landfill construction; and the reduction in post-closure operations and maintenance costs.

As part of the project the County is requesting that EPA grant it regulatory relief from certain requirements of the Resource Conservation and Recovery Act (RCRA) that restrict application of bulk liquids in municipal solid waste landfills constructed with particular liner designs, as set forth in Title 40 of the Code of Federal Regulations (40 CFR) Section 258.28.

The landfill cells at the Facility were constructed with a geomembrane composite double-liner system, with primary leachate collection and leak detection (secondary collection) layers. Details of the liner and leachate collection system are set forth in Attachment V and VI of this FPA. This composite double liner system provides a high level of protection to the environment against potential impacts caused by leakage of leachate. While the liner design does not meet the specified liner design requirements under RCRA (40 C.F.R. § 258.40(a)(2) and (b)) which a landfill presently is required to have in place for bulk liquids to be added (40C.F.R. § 258.28(a)(2)); the Facility’s liner system does meet or exceed the performance requirements for municipal solid waste landfills and has been shown to be equivalent to the specified liner requirements. For this reason, the project sponsors believe that this landfill are excellent candidates for the bioreactor techniques that would be tested under this FPA.

The County's pilot project will involve injecting liquid (leachate and/or stormwater) through injection devices into a 3/4 acre portion of the Facility's SubCell 8-4 for a period up to seven years (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 Facility. (Such expansion would require further regulatory change outside the scope of this XL Project).

The County has developed a detailed stakeholder participation plan that will promote 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 other landfills in the Mid-Atlantic United States with similar wastes and climates.

B. Description of the Facility and Facility Operations/Community/Geographic Area

The Facility is located on a 565-acre portion of land in Severn, Maryland, approximately 15 miles south of Baltimore. The Facility is owned and operated by the County and is the only active municipal solid waste (MSW) landfill in the County. The Facility accepts approximately 390 tons per day (tpd) of MSW (FY00), of which 1/3 of the amount (approximately 130 tpd) is recovered for reuse and recycling and the remaining amount (approximately 260 tpd) is landfilled at the Facility. The Facility serves on average 660 customers (residents and businesses combined) per day, 7 days per week.

The Facility currently consists of six 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 lined 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 to design grades. 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. Cell 8 is designed to ultimately receive 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).

The Facility was constructed with a geomembrane composite double-liner system, with primary leachate collection and leak detection (secondary collection) layers. Details of the liner and leachate collection system are set forth in Attachments V and VI of this FPA. The base of Cell 8 is underlain by at least 5 feet of unsaturated clay and sand. The Cell 8 alternate liner and leachate collection system (double-liner system) has been approved by EPA and the Maryland Department of the Environment (MDE). The EPA Region III approval letter is included in Attachment II.

The Facility presently 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 a pretreatment plant in which it is treated in controlled batches. From there it is discharged into a 305,000 gallon effluent tank and ultimately discharged to the sanitary sewer via a force main on site.

Unconsolidated sediments underlie the Facility 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 from 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 Facility. 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 landfill gas (LFG) monitoring wells are installed at the perimeter of the Facility. The groundwater monitoring wells are installed within each water-bearing zone in the subsurface beneath the Facility. The groundwater wells are sampled semiannually, and the LFG monitoring wells are monitored quarterly.

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

There are approximately 5,800 residents within a 1-mile radius of the Facility; approximately 2,750 within a 0.5-mile radius; and approximately 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 extend the life of the Facility as long as possible. The plan comprises 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 Facility 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 expected projected closure date for Cell 8 was 2002 and the entire landfill was expected to reach capacity by 2019.

Since 1995 the County has continued to evaluate numerous strategies -to further extend the Landfill's life, and is implementing them as appropriate. They include:

- the redirection of 350 tons/day to a regional transfer station for out-of-state disposal.
- evaluation of municipal solid waste composting
- evaluation of waste-to-energy facility diversion
- implementation of a yard waste collection program for composting off-site
- encouragement of curbside customers to recycle -more, and to increase recycling above 30%
- encouragement of landfill and convenience center customers to source separate and recycle more
- implementation of yard waste composting of self-hauled materials at the Facility
- implement bioreactor project
- evaluate emerging technologies

Thus far, this strategy has reduced the waste entering the Facility from 800 tons/day in 1994 to 260 tons/day in 2000. As a result of the -County's efforts to implement this strategy, Cell 8 is now projected to be able to accept waste until 2017 and Cell 9 until 2063. To date the County has been successful in implementing all feasible components of the Current Strategy except the bioreactor concept.

C. Purpose of the Agreement

This Final Project Agreement is a joint statement of the plans, intentions, and commitments of the EPA, the MDE and the County to carry out this project at the County's Facility. This Project will be part of EPA's Project XL program to develop innovative approaches to environmental protection.

The Agreement does not create legal rights or obligations and is not an enforceable contract or a regulatory action such as a permit or a rule. This applies to both the substantive and the procedural provisions of this Agreement. While the parties to the Agreement fully intend to follow these procedures, they are not legally obligated to do so. For more detail, please refer to Section VI (Legal Basis for the Project Agreement).

Federal and State flexibility and enforceable commitments described in this Agreement will be implemented and become effective through one or more legal implementing mechanisms, such as a site specific rule -and/or a permit -or other regulatory amendment issued by the MDE.

All parties to this Agreement will strive for a high level of cooperation, communication, and coordination to assure successful, effective, and efficient implementation of the Agreement and the Project.

D. List of the Parties that Will Sign the Agreement

The Parties to this Final Project XL Agreement are the United States Environmental Protection Agency, Maryland Department of the Environment, and Anne Arundel County Department of Public Works.

E. List of the Project Contacts

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

U. S. Environmental Protection Agency, Region 3
1650 Arch Street (mailcode 3OR00)
Philadelphia, Pennsylvania 19103
Contact: Charles B. Howland
(215) 814-2645
howland.charles@epa.gov

State of Maryland
Department of the Environment
2500 Broening Highway
Baltimore, Maryland 21224
Contact: Edward M. Dexter
(410) 631-3318

II. Detailed Description of the Project

A. Summary of the Project

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 -accelerate- waste biodegradation, -which is expected to: result in the recovery of capacity (air space)-; accelerate landfill gas generation rates-; improve leachate quality-; and shorten and lower the cost of long-term post-closure measures, potentially resulting in an earlier reuse of the land for other purposes.

The County proposes to operate a small-scale, controlled, fully monitored, and evaluated bioreactor pilot project at the Facility'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, the County requests that EPA grant regulatory flexibility from RCRA's requirement in 40 CFR 258.28(a) and (a)(2). 40 CFR 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. Under this FPA, the County proposes to recirculate leachate into a small portion of Cell 8. If the available leachate quantities are incapable of supplying the project needs, the County may supplement it with onsite stormwater runoff.

40 CFR 258.28(a)(2) -provides 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-. (As mentioned before, the alternative system has been proven to exceed the performance requirements set forth at 40CFR 258.40 (a)(2)-).

The County is aware that EPA's Project XL is being used to test bioreactor techniques at several other landfills across the country. The County believes that this project is different from the-se other projects, and will offer unique benefits, for several reasons-, including:

- Geography/climate – The climate at the Facility is different from that at the -other facilities, particularly with respect to the amount of rainfall that the sites receive. While the other landfills receive as little as 17 inches of rain annually, the Facility receives an average of 41 inches. This fact greatly impacts landfill gas generation and leachate formation as well as landfill settlement, and should affect how much liquids are necessary to achieve optimum biodegradation.
- Regulatory flexibility requested – Some of the -other proposals 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.

- Unique waste stream – The Facility receives a unique, moderately organic waste stream since a large percentage of curbside collected household waste is diverted to a regional transfer station. Thus this 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.

B. Specific project elements

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 for up to a seven-year period (depending on effectiveness), and monitoring the settlement and LFG that results.

The objectives of the project are as follows:

1. Design and construct a bioreactor test area in an active subcell of the Facility;
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 Facility's waste capacity.
5. Evaluate cost effectiveness as a method of capacity creation.

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

1. Test Area Location

The proposed test area measures 160 feet by 200 feet and is located within the southwestern portion of Subcell 8-4 (refer to Attachment IV). The waste volume in this area is approximately 95,500 cubic yards waste top elevation is approximately 218 feet and bottom elevation is between 135 and 140 feet) and the depth is approximately 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. The County -determined that this -area -ha-d 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 proportionately 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 and reusable tarpaulins (tarps) throughout Cell 8 as the cover (approximately 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 while data is being collected.

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 (1×10^{-7} , cm/s, demonstrated by construction QA/QC) soil subbase.

(As mentioned, this liner system exceeds the performance requirements of the MDE and EPA for MSW landfills-, and incorporates two geomembranes providing for leak detection, features associated with hazardous waste landfill designs.)

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 5×10^{-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, and which is significantly less than the maximum 30 mm required under RCRA Subtitle D) at all locations within a subcell, except at the sump where liquid is collected for pumping.- In the sump areas of the landfill subcells, 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 1×10^{-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.

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. At no time will more than 30 cm of leachate be permitted to collect over the liner.

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.

4. Landfill Gas Considerations

Cell 8 currently operates under an Alternate Operating Scenario (AOS) approved by the State of Maryland. The alternate operating scenario consists of actively collecting LFG from leachate collection system components, rather than from typical LFG extraction wells and/or trenches. Note that the alternate scenario is implemented in Cell 8 only. All other Cells of the Facility are closed, capped, and operate normally (i.e., the LFG collection system consists of typical extraction wells and/or trenches).

Since liquid addition is known to enhance LFG generation, the system will be designed to collect and control LFG in accordance with 40 CFR Part 60 Subpart WWW. To support this level of LFG collection and control, each horizontal trench pipe will have a flanged connection at the end opposite from the injection point. This connection will allow the County to install either a passive or an active system to combust the collected LFG. The need to collect and control LFG will be evaluated as the project progresses, based on methane surface emission monitoring, and observations of odors. Collection and control will occur if methane surface emissions exceed 500 ppm or odors from the test area are observed. Exceedances will be handled in accordance with the protocol outlined in 40 CFR Part 60 WWW.

The potential for surface emissions is greatest just over the test area. Recognizing, however, that LFG generated from the test area could potentially migrate beyond the test area, the County will monitor surface emissions over the entire plateau area that encompasses the test area. This plateau area measures 180 feet by 300 feet and is essentially centered on the test area and borders the landfill sideslope (see Attachment IV). Note that the landfill sideslope is covered with a clayey intermediate cap (hydraulic conductivity of about 10^{-4} to 10^{-5} cm/s), reducing the potential for sideslope surface emissions. Note also that the integrity of the sideslope cap is maintained with vegetative growth.

Surface monitoring in the above-mentioned plateau area will be in accordance with the New Source Performance Standards (NSPS), 40CFR Subpart WWW (refer to Table 3).

5. Protection Against Landfill fires

Fires in landfills are usually caused by poorly designed or operated active LFG collection systems that allow air or oxygen into the waste. For this project, a passive collection system is proposed to handle excess gas generated; thus the potential for landfill fires will be minimized. The potential for landfill fires will also be minimized for 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 intentionally designed to introduce air or oxygen into the waste.

6. Liquids Monitoring

The quantity of leachate, and supplemental water (if required), added back to the landfill will be measured throughout the life of the project. The County expects to measure recirculation quantities- using flow meters installed on the leachate receptacle just prior to the distribution system piping and valves. The goal of the system design will be to quantify the amount of leachate recirculated to each horizontal trench or well individually.

As discussed previously, the leachate collection/drainage layer constructed in each subcell consists of two feet of high permeability sand over a geonet drainage layer. Due to the internal subcell slopes and high permeability of the drainage layer, the County expects that there will be very little head buildup on the liner notwithstanding the increased levels of liquids. Leachate recirculation will be suspended in any subcells where there appears to be head build up, and in any event the head will not be allowed to exceed 30 MM.

Table 1- Instrumentation Type and Location for the Bioreactor Project

Type of Instrumentation	Location	Description
Gas Composition, Gas Pressure, and Flow Meter	Connections will be located at each passive flare.	Gas meter connection ports at each flare will allow connection of a hand held portable gas meter to collect data each week.
Leachate Flow Measurement	Outflow from each cell is measured at each sump. Inflow is measured at the injection manifold.	The volumes of liquids removed from each subcell are monitored from via hour meters wired to each subcell pump. The quantity of leachate added to the bioreactor plumbing is measured at a flow meter at the head of the distribution system.

Studies of bioreactor techniques have documented the improvement in leachate quality -that results from liquids addition. See Attachment VII for Leachate Analytical Results. This is an important environmental benefit of the project, both because it would indicate that the waste mass is stabilizing, and because of the lessened requirements for treatment. Since leachate is pumped from each subcell individually, the County intends to sample the leachate from each subcell semi-annually for parameters that will be able to establish whether or not leachate quality is indeed improving.

Prior to system startup, the County will install monuments to monitor settlement caused by the degradation of the waste. These monuments will be checked semi-annually to track settlement.

Annual aerial topographic surveys will also be performed to aid in the evaluation of settlement and the effectiveness of the leachate recirculation/gas recovery system.

III. How the Project Will Meet the XL Criteria

A. Superior Environmental Performance

The main goal of this project is to test whether the use of bioreactor techniques could 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 -and 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.)

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 Facility 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 remainder of the Subcells in Cell 8 will also be filled until the Facility reaches its capacity. After that time, Cell 8 will be closed and the County will develop Cell 9. It will also continue to generate the same levels of leachate for disposal to the local Publicly Owned Treatment Works (POTW).

Table 2 below outlines a comparison of the baseline project to a full-scale bioreactor project.

This particular XL project will provide environmental performance at least equivalent to Tier 1 in all areas.

Table 2. 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 (<i>I</i>)	25-70 years	5-10 years
Landfill Settlement (net)	Unknown	20%+ increase expected

(1) Data obtained from Yolo County Project XL Proposal, dated 9/14/99.

2. Tier 2: Superior Environmental Performance

Landfill gas contains roughly 50% methane, a potent greenhouse gas. In terms of climate effects methane, is second in importance only to carbon dioxide. Landfill gas also contains volatile organic compounds (VOC's) that are local hazardous air pollutants. At closure, landfill gas capture is maximized by a surface permeable gas collection layer overlain by a cover of soil with embedded membrane. Gas is withdrawn to maintain this permeable layer beneath surface containment at slight vacuum. It is anticipated that the capture of methane is further facilitated and eased by a shortened generation interval, from 30 to 50 years to between 5 to 10 years through enhanced decomposition afforded by leachate recirculation. The County is proposing to install vertical gas wells and horizontal collection trenches in areas that have already received significant waste to collect gas throughout the active life of the pilot project. site. With this gas capture approach, it is expected that fugitive landfill gas emissions will be reduced for reasons that include:

- Reduction in emissions through installation and operation of gas collection system before the final fill height is reached, and before it would be required by the AOS.
- Collection efficiency from the proposed horizontal trenches.
- Reduction in long-term emissions, from landfill gas generation occurring slowly beyond 30 years of post-closure, which are not easily controlled.

Other bioreactor demonstration projects in the United States have already shown close to a tenfold increase in methane recovery rates, which suggest a tenfold reduction in interval of methane generation. Available indications as well as basic physical principles suggest that capture effectiveness approaches 100%, so long as the flares remain operational, cover integrity is maintained and the collection system is designed and maintained to collect the maximum amount of LFG generated at the site.

With the bioreactor pilot project, the Facility is expected to gain additional airspace, and additional years of landfill life. If the pilot project in Subcells 8-4 is successful, the County

expects to expand the bioreactor technology to other subcells in Cell 8 and Cell 9 at the Facility site, thus further extending the landfill's useful life.

Leachate recirculation also promises more rapid leachate stabilization in terms of pollutant load, reduced leachate environmental impact, and elimination of need for most discharges to treatment facilities. The biological processes, which are enhanced by the recirculation of leachate, have been shown in studies at many scales to reduce the content of many leachate pollutants. These include organic acids and other soluble organic pollutants. Since a biologically active landfill operation brings pH to near-neutral conditions, metals of concern are largely precipitated and sequestered/ immobilized in waste. Thus free liquid concentrations and mobility of metals are reduced compared to "conventional" landfill practices, where more contaminated lower-pH leachate is often observed to be generated slowly for years.

The need for off-site leachate treatment should be reduced as long as waste landfilling continues concurrently with leachate recirculation/gas recovery operations. Additional leachate that would have to be treated at a wastewater treatment facility could be avoided. Because this type of operation sometimes requires extra liquid for optimum performance, and leachate and condensate re-introduction are permissible under specified circumstances (40 CFR 258.28), continuing liquids recirculation allows generated leachate and condensate to be reintroduced so long as new dry waste continues to flow into the landfill.

Improvements in leachate quality are expected to consist of organic compound reduction through increased biological activity and inorganic reductions by adsorption to the waste mass and soil, and by chemical reactions, such as metals precipitation.

3. How We Will Measure the Superior Environmental Performance

Superior Environmental Performance (SEP) will be measured using the baseline (Tier 1, without Project XL) against the actual results of the project (Tier 2, proposed Project XL). To determine specific bioreactor performance attributes, monitoring parameters are listed in Tables 2 and 3.

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, NO_x and CO emissions from the candlestick flare will increase; this disadvantage, however, will be more than offset by the reduction in VOC emissions.

The design capacity of the Facility's Subtitle D landfill exceeds the NSPS thresholds and thus the facility -must comply with 40 CFR Subpart WWW. As noted above, MDE, Air and Radiation Management Administration has approved an Alternate Operating System (AOS) for all of Cell 8 which permits an alternative form of LFG collection, and which postpones quarterly monitoring. Therefore, any gas collection while the AOS is effective will prevent degradation of air quality. On July 18, 2000, the County submitted Addendum #1 to the AOS to MDE which would require the use of passive flares for this project. Tests will be conducted to compare emission performance of the bioreactors to the conventional landfilling. NSPS emission guideline method (section 60.755 (c) 3) will be used to measure surface emission. Monitoring of system performance will include quarterly surface methane emissions testing to track and

confirm the collection effectiveness of the system. Because bioreactors generate more landfill gas earlier in the lifespan of the facility compared to standard MSW landfills, it will be necessary for gas collection and monitoring to be required prior to the time frame set out in subpart WWW, which does not contemplate bioreactor scenarios. Monitoring will continue for the duration of the project.

It is well documented in the literature and from operating leachate recirculation/gas recovery landfills that accelerated gas generation will occur in these types of landfills. The passive flare or gas recovery system for the project will be designed to account for this expected condition.

Measurement of additional waste disposal airspace through settlement will be based on annual aerial topographical surveys. Total volume loss occurring within this time interval will be calculated.

The County will measure leachate quality over time to examine changes and trends in leachate quality. The County will compare its results with similar, non-recirculating subcells (8.1, 8.2, 8.3, 8.5, and 8.6).

B. 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 Facility is valued at \$88.26 per cubic yard based on current gate rate for commercial customers and 5 year average waste in place density. The current projection for the life of the Millersville Landfill is 2063. The air space saved now will extend the life past 2063. The value of airspace in 2063 will likely be significantly greater based on future economic factors.
- Other benefits of this project include the possibility for replication among other counties and private landfill owners in the Mid-Atlantic and other areas with similar climate conditions.

C. Stakeholder Involvement and Support

Public outreach and education are essential functions of any significant project at the Facility. The 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.

Stakeholder Identification

The 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. The 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.

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.

Potentially Interested Partners

- John Hopkins University, Department of Environmental Engineers
- Solid Waste Association of North America (SWANA)
- 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 of the project's progress at appropriate milestones. Their input will be welcomed in verbal or written form.

General Public

Our facility neighbors will be advised of the project through routine Community Update Newsletter. As in the past, their comments will be solicited; however, we do not anticipate structured 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 any further involvement from the general public.

Anne Arundel County will actively solicit comments from the primary stakeholders and potentially interested partners. We envision 4 – 6 meetings at appropriate times:

- Upon release of the draft FPA
- One year after project field initiation.
- Update after completion of each year of project
- Final meeting at the end of project

The County remains open to new interested stakeholders 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 Department of Public Works website and newsletters 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, if beneficial.

D. Innovative Approaches and Multi-media 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 continued recirculation. Should there ever become a liner future failure, the leachate released would be of a dilute nature resulting in reduced or minimal environmental and/or public health impact.

E. Transferability of the Approach to Other Entities or Sectors

The County believes that 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 elsewhere 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 controlled degradation of waste.

Following an evaluation of this XL Project by EPA, and assuming its overall success, the leachate recirculation/gas recovery landfill technology used could be transferable to landfills where conditions are favorable for actively managing the decomposition process while ensuring groundwater protection and gas control.

F. Feasibility of the Project

The bioreactor concept has already been tested at the Yolo County project, and at other sites in North America and Europe. It has been 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 budgeted funds to implement this project.

The project sponsor, primary stakeholders, and regulatory agencies as designated in the Final Project Agreement, agree to support the project, subject to any review procedures necessary to implement the legal mechanism for this project. Further, the XL participant has the financial capability, personnel and senior management commitment necessary to implement the elements of this XL Project.

G. Monitoring, Reporting, Accountability, and Evaluation of Methods to be Used

The enforceable requirement to initiate NSPS compliant gas collection and monitoring prior to liquid addition will be implemented via a Federally Enforceable State Operating Permit (FESOP) provision. This FPA contains both enforceable and aspirational requirements and will establish certain limits and goals for the County's performance. The County will ensure compliance with legal requirements and ensure implementation of processes seeking to meet aspirational goals. The County will establish a record keeping system to ensure compliance, as well as accurate reporting of monitoring data from Table 3. The County will make any such reports available publicly and will specifically discuss our performance with interested stakeholder groups.

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)
- Characteristics of LFG (e.g., CH₄, CO₂, O₂, and N₂)
- 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 DPW's website will also be done at least semi-annually. This outreach will be designed to enable stakeholders to assess the project's success in achieving SEP.

Accountability

As mentioned previously, the County has included bioreactor landfilling as one part of its County-wide Solid Waste Management Strategy, and the project 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 initially dedicated at \$122,000 for the design and construction portions of this project. Operation of the project is estimated at \$25,000/year. The County is also willing to set out commitments in the Agreement whereby it agrees to expand the bioreactor technology to other cells at the Facility if the pilot project demonstrates that it can achieve desirable levels of settlement cost effectively.

The parties intend to implement as enforceable commitments, federal and state regulatory flexibility, monitoring, record-keeping, and reporting provisions of this FPA through a site-specific rule and a Federally Enforceable State Operating Permit (FESOP). Table 3 identifies the Monitoring Parameters and Frequency for Monitoring for this project.

The legal mechanisms that would apply to this project include a Federally Enforceable State Operating Permit for gas collection and monitoring, and a site-specific rule for liquid additions. The FESOP would contain enforceable parameters and requirements with respect to NSPS-compliant gas collection and monitoring prior to liquid additions and/or leachate recirculation, whichever occurs first. It would require a public notice and comment period. In addition, EPA will be issuing a proposed rule for liquid additions at the Facility. It would also require a public comment period. Either the FESOP or the site-specific rule (as appropriate) would contain the enforceable project monitoring requirements listed in Table 3, and would require that the County provide semi-annual reporting of the monitoring to project stakeholders and regulators in order to facilitate project evaluation.

EPA, the State, and other appropriate regulatory agencies will assess the project annually based on all information submitted. EPA will post the County's project data on its Project XL web page semi-annually.

Table 3- Monitoring Parameters and Frequency for the Bioreactor Project

Monitoring Parameter	Frequency	Description
Leachate:		Leachate samples will be collected from each subcell sump and tested.
pH	Semi-annually	
Conductivity	Semi-annually	
Dissolved Oxygen	Semi-annually	
Dissolved Solids	Semi-annually	
Biochemical Oxygen Demand	Semi-annually	
Chemical Oxygen Demand	Semi-annually	
Organic Carbon	Semi-annually	
Nutrients(Ammonia Nitrogen,	Semi-annually	
Total Nitrogen, and Total	Semi-annually	
Phosphorus)	Semi-annually	
Nitrate	Semi-annually	
Nitrite	Semi-Annually	
Total Alkalinity	Semi-Annually	
Ortho Phosphate	Semi-Annually	
Total Suspended Solids	Semi-Annually	
Cyanide	Semi-Annually	
Chloride	Semi-Annually	

Total Dissolved Solids Heavy Metals Organic Priority Pollutants	Semi-Annually Semi-Annually Semi-Annually	
Landfill Gas: CH ₄ , CO ₂ , O ₂ , and N ₂ NMOCs N ₂ O Surface Methane Emissions Well Head Gas Temperatures	Weekly Semi-annually Semi-annually Quarterly Monthly	Landfill gas will be tested routinely from the anaerobic cell. Semi-annually other gas emissions will be measured by using NSPS approved methods. Surface emissions will be monitored for compliance with the 500 ppm CH ₄ limit in Subpart WWW.
Solid Waste Stabilization and decomposition: Volume of Gas Generation Topographic survey	Weekly (if active system) Annually ■	

Additionally, the County voluntarily commits to providing the following information to project stakeholders and regulators in order to facilitate a comprehensive project evaluation:

- Quantities of leachate recirculated in sub cell 8.4, and the amount of supplementary liquids added to subcell 8.4.
- Semi-annual reports on changes in the quality of the leachate subsequent to recirculation in each cell.
- Semi-annual reporting on settlement as measured against monuments installed for this purpose.
- Annual reporting and assessment of the settlement in the test area based upon topographic surveys.
- Quarterly monitoring of surface methane emissions

Information submitted for both the mandatory and voluntary reporting elements for this project will be considered and assessed annually by EPA and the State.

H. Avoidance of Shifting of Risk Burden to Other Areas or Media

It is expected that there will be enforceable monitoring requirements in place which will ensure that no shifting of risk burden to other environmental media associated with this project. In the unlikely event that the alternate liner system not perform sufficiently under recirculation conditions, the underlying groundwater monitoring zone (i.e., the lined area beneath the sump areas and liner systems in each subcell) will be able to detect a release early, collect the release,

and form the basis for project suspension. The monitoring zone will serve to collect any release of contaminants before they reach the underlying groundwater regime. The County agrees to conduct periodic surface emissions monitoring conducted analytically in compliance with Subpart WWW to demonstrate compliance with NSPS as well as that no additional burden of air emissions has occurred from within the test area.

In addition, this project would 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. Description of the Requested Flexibility and Implementing Mechanisms

A. Requested Flexibility

This section is primarily intended to describe federal flexibility needed for this XL project. It also discusses State and local flexibility believed to be necessary to authorize this project. To the extent such action is necessary and appropriate, it will be provided as part of this project and subject to public notice and comment.

In general, the County proposes to be able to undertake a proposed bioreactor landfill project that falls within the limitations established in the XL agreement. The County is requesting specific flexibility under the current federal regulations requirements for liquid addition as described below.

The County is requesting that the 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 the leachate. However, if the available leachate quantities are incapable of supplying the project needs, the County may supplement it with onsite stormwater.

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 County will comply with all other applicable environmental requirements. No flexibility is being sought from the New Source Performance Standards (NSPS). The County will submit an application to MDE requesting a Federally Enforceable State Operating Permit (FESOP).

Discussions with MDE confirm that they are supportive of the bioreactor concept, but as they are constrained by the mentioned EPA regulations, they cannot fully concur with the project until EPA's regulatory flexibility is obtained.

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

B. Legal Implementing Mechanisms

To implement this Project, the parties intend to take the following steps:

1. EPA expects to propose for public comment and promulgate a site-specific rule amending 40 CFR 258.28 for Anne Arundel County's Millersville Landfill and Resource Recovery Facility. This site-specific rule will describe the project requirements and any other aspects of the rulemaking. It is expected that the site-specific rule will provide for Withdrawal or Termination and a Post-Project Compliance Period consistent with Section VII, and will address the Transfer procedures included in Section X. The standards and reporting requirements set forth in Section II (and any attachments to this FPA) will be implemented in this site-specific rulemaking.
2. The State of Maryland under its relevant authority expects to modify any permits necessary to implement this FPA. The monitoring, record keeping, and reporting requirements will be implemented in a Federally Enforceable State Operating Permit (FESOP). The FESOP will identify whether the County intends to install a passive or an active system to combust the collected landfill gas.
3. Except as provided in any rule(s), compliance order(s), permit provisions or other implementing mechanisms that may be adopted to implement the Project, the parties do not intend that this FPA will modify or otherwise alter the applicability of existing or future laws or regulations to the County's Facility
4. By signing this FPA, EPA, the County, and the MDE acknowledge and agree that they have the respective authorities and discretion to enter into this FPA and to implement the provisions of this project, to the extent appropriate.

V. Discussion of Intentions and Commitments for Implementing the Project

A. Anne Arundel County's Intentions and Commitments

1. Enforceable

The County will comply with all applicable environmental requirements during implementation of this Project.

The County will establish a record keeping system to ensure compliance, as well as accurate reporting of monitoring data from Table 3.

Anne Arundel County will submit an application to the MDE, Air and Radiation Management Administration (ARMA) State of Maryland requesting that the MDE issue, to the County, a

federally enforceable state operating permit (FESOP) which incorporates all of the landfill gas monitoring requirements specified in Table 3 of this agreement and contains adequate provisions to ensure that landfill gas is collected and controlled in accordance with the requirements of 40 CFR, part 60, Subpart WWW - Standards of Performance for Municipal Solid Waste Landfills. The County will work diligently with MDE to ensure that the FESOP is issued in a timely manner.

The County will monitor surface emissions over the entire plateau area (180 feet by 300 feet) that encompasses the bioreactor landfill test area (see Attachment IV). The County agrees to monitor for a minimum of 1 year after cessation of leachate recirculation (4-7 years plus 1 yr monitoring). The monitoring will be conducted within the 4-7 year project duration. Surface monitoring will be in accordance with the New Source Performance Standards (NSPS), 40CFR Subpart WWW (refer to Table 3).

2. Voluntary

The County proposes to operate Subcell 8-4 as a bioreactor landfill pilot to attain a number of superior environmental and cost savings benefits.

The County may request to expand the area in the future if the pilot project is successful.

The County is committed to working with federal, state, and local governments to demonstrate, with regulatory flexibility allowing recirculation over subcells constructed with alternative liners and the addition of supplemental water (if needed), how a leachate recirculation/gas collection landfill can demonstrate more desirable environmental results than a conventional landfill.

The County intends to provide accurate data for the proposed bioreactor landfill. This data should enable EPA and the State to develop or modify regulatory requirements for identified parameters, such as those identified in Table 3 of this FPA.

The County intends to continue to provide resources to maintain the schedules set forth in this FPA.

B. EPA's, the State of Maryland, and other local regulatory agency's Intentions and Commitments

EPA intends to propose and issue (subject to applicable procedures and review of public comments) a site-specific rule, amending 40 CFR Part 258.28 for the County to allow recirculation of leachate over cells constructed with an alternative liner and to allow the addition of supplemental storm water from the on-site ponds should leachate availability become limited, that applies specifically to the County's Facility. The site-specific rule will also provide for withdrawal or termination and a post-Project compliance period consistent with Section XII of this Agreement, and will address the transfer procedures included in Section IX. Monitoring, record keeping, and reporting requirements will be implemented in the site-specific rule. EPA

will work with other parties, stakeholders and the appropriate local, regional, state and federal agencies to facilitate the process.

EPA will propose a site-specific rule to facilitate the implementation of this pilot project by providing regulatory flexibility for liquid additions into existing cells.

EPA will review the Project to determine whether it results in superior environmental performance.

EPA and the other regulatory agencies will review and assess annual and periodic reports submitted by the County. Based on periodic review of the pilot project the parties, in consultation with the stakeholders, EPA will determine whether the pilot program is successfully exhibiting the superior environmental performance anticipated at this time and that no detrimental results (such as the alternative liner failing to perform as anticipated, or unsatisfactory performance of the gas collection or monitoring strategy) have been exhibited during the pilot project, then EPA may extend the regulatory flexibility described under this FPA to future subcells and cells at the County project site. EPA will also take into account any relevant amendments to the regulations in 40 CFR Part 258 that concern addition of liquids to MSWLFs or landfill gas collection/ monitoring requirements. EPA expects that such amendments would supercede the site-specific rule and would apply to future landfill subcells or cells at the Facility.

The State and other local governing regulatory agencies will assist the XL Project Team in understanding all applicable regulatory and/or permitting requirements for the Project, and evaluate any need for regulatory flexibility openly with the Team.

The MDE-ARMA under its relevant authority expects to modify any permits necessary to implement this FPA. The monitoring, record keeping, and reporting requirements will be implemented in the FESOP.

C. Project XL Performance Targets

The performance targets of this project will be to achieve the superior environmental performance described in Section III, G of this FPA in Table 3. It describes some of the measures that will be used. Others may be developed as part of the permitting processes and the associated stakeholder involvement.

D. Proposed Schedule and Milestones

This project will be developed and implemented over a time period necessary to complete its desired major objectives, beginning from the date that the final legal mechanism becomes effective, unless it is terminated earlier or extended by agreement of all Project Signatories. Assuming that a Final Project Agreement is executed by October, 2000, the County intends to begin final design of the system and have it complete November 2000. At that time, the final design will be submitted to MDE and to EPA for verification of consistency with the Final Project Agreement. It is expected that MDE concurrence can be accomplished within one month at which time construction of the leachate recirculation/gas recovery system will commence. It is expected that the system will be operational by the Spring of 2001.

The current estimated build_out schedule for Cell 8 of the Facility is provided below. The actual schedule will depend mainly on the amount of waste received each year, density and amount of cover utilized.

Fill Sequence	Expected Life
Subcell 8.6 to 210' in elevation	44 months
Subcell 8.6 haul road to 210' in elevation	5 months
Remainder of Subcells 8.5 and 8.6 and remainder of Subcells 8.1-8.4	47 months
Fill Bio Remediation Area	13 months
Subcell 8.8	31 months
Subcell 8.7	62 months

E. Project Tracking, Reporting and Evaluation

The project tracking, reporting and evaluation will be accomplished for the project sponsors including EPA, in accordance with EPA requests. The County may provide periodic updates of project performance at nationally recognized solid waste symposiums, subject to acceptance by those symposia.

The County will prepare semi-annual reports which will include all monitoring data commencing with the execution of the Final Project Agreement and deliver them to EPA and the primary stakeholders. An annual meeting will be held to review the project progress and results to date for as long as the County continues to recirculate leachate at its site under the provisions of the site specific rule(s) promulgated to implement this XL project.

F. Periodic Review by the Parties to the Agreement

The Parties will hold periodic performance review conferences to assess their progress in implementing this Project. Unless they agree otherwise, the date for those conferences will be concurrent with annual Stakeholder Meetings. No later than thirty (30) days following a periodic performance review conference, the County will provide a summary of the minutes of that conference to all Primary Stakeholders. Any additional comments from other interested partners or other parties will be provided to EPA.

G. Duration of the Project

If the pilot project, the boundaries of which are shown in Attachment IV, is deemed successful when evaluated against the expected superior results after four years from the date of the Final Project Agreement, the County may request that they be able to expand the system to future subcells or cells under similar terms. This assumes that the current regulations for which the County is seeking flexibility are not changed in the meantime to allow the activities requested herein. In the event that EPA and Maryland promulgate changes to the generally applicable

requirements for leachate recirculation or landfill gas collection/ monitoring at municipal solid waste landfills like the Facility and the stakeholders involved in this XL Project agree that no reason exists to have the project continue to be in effect, then this FPA may be terminated according to the procedures set forth within this document. The implementing mechanism(s) will contain “sunset” provisions ending authorization for this Project 25 years after the effective date of the implementing mechanism(s). They will also address withdrawal or termination conditions and procedures (as described in Section XI). This Project will not extend past the agreed upon date, and the County will comply with all applicable requirements following this date (as described in Section XII), unless all parties agree to an amendment to the Project term (as provided in Section VIII).

The County proposes to conduct the bioreactor pilot project for no more than 7 years. If successful this pilot project will be requested to be extended to other areas or cell 8. During that period, the County will conduct specified monitoring at designated intervals during the life of the project. The data from the project monitoring will benefit EPA, State and local regulatory agencies, and will also be available to all other stakeholders who are interested in the environment, and safety at the site and in the project vicinity. The implementation of the pilot will be permissible through the promulgation of a site-specific rule. The County recognizes that the State permit will be valid for a period of five years. Prior to the permit expiration, the County will perform an evaluation to ensure that there have been no significant instances of non-compliance, and to determine whether or not revisions need to be made to the permit prior to renewal. EPA evaluation would occur either during this period of evaluation, or during the annual assessment for the project under the XL program.

If, during the 25 year period, EPA develops a new rule or rule modification addressing recirculation of leachate, the County and/or EPA could make the determination to cancel or terminate the pilot project and continue the recirculation consistent with the new regulations. At any point during the pilot project, if the County or EPA chooses to terminate the project, they may do so. However, it is expected that the implementation and operation of the bioreactor landfill site at the Facility will provide useful data for the evaluation of EPA rules as initiated by the April 6, 2000 Federal Register Notice (65FR, 18014).

VI. Legal Basis for the Project

A. Authority to Enter into the Agreement

By signing this Agreement, all signatories acknowledge and agree that they have the respective authorities, discretion, and resources to enter into this Agreement and to implement all applicable provisions of this Project, as described in this Agreement.

B. Legal Effect of the Agreement

This Agreement states the intentions of the Parties with respect to the County’s XL Project. The Parties have stated their intentions seriously and in good faith, and expect to carry out their stated intentions. This Agreement in itself does not create or modify legal rights or obligations, is not a contract or a regulatory action, such as a permit or a rule, and is not legally binding or enforceable against any Party. Rather, it expresses the plans and intentions of the Parties without making those plans and intentions binding requirements. This applies to the provisions of this Agreement that concern procedural as well as substantive matters. Thus, for example, the Agreement establishes procedures that the parties intend to follow with respect to dispute

resolution and termination (see Sections X and XI). However, while the parties fully intend to adhere to these procedures, they are not legally obligated to do so.

EPA intends to propose for public comment a site-specific rule needed to implement this Project. Any rules, permit modifications or legal mechanisms that implement this Project will be effective and enforceable as provided under applicable law.

This Agreement is not a "final agency action" by EPA, because it does not create or modify legal rights or obligations and is not legally enforceable. This Agreement itself is not subject to judicial review or enforcement. Nothing any Party does or does not do that deviates from a provision of this Agreement, or that is alleged to deviate from a provision of this Agreement, can serve as the sole basis for any claim for damages, compensation or other relief against any Party.

C. Other Laws or Regulations That May Apply

Except as provided in the legal implementing mechanisms for this Project, the parties do not intend that this Final Project Agreement will modify the applicability of any other existing or future laws or regulations.

D. Retention of Rights to Other Legal Remedies

Except as expressly provided in the legal implementing mechanisms described in Section IV, nothing in this Agreement affects or limits the County's, EPA's, the State of Maryland's, or any other signatory's legal rights. These rights include legal, equitable, civil, criminal or administrative claims or other relief regarding the enforcement of present or future applicable federal and state laws, rules, regulations or permits with respect to the facility.

Although the County does not intend to challenge agency actions implementing the Project (including any rule amendments or adoptions, permit actions, or other action) that are consistent with this Agreement, the County reserves any right it may have to appeal or otherwise challenge any EPA, State of Maryland, or local agency action to implement the Project. With regard to the legal implementing mechanisms, nothing in this Agreement is intended to limit the County's right to administrative or judicial appeal or review of those legal mechanisms, in accordance with the applicable procedures for such review.

VII. Unavoidable Delay During Project Implementation

"Unavoidable delay" (for purposes of this Agreement) means any event beyond the control of any Party that causes delays or prevents the implementation of the Project described in this Agreement, despite the Parties' best efforts to put their intentions into effect. An unavoidable delay can be caused by, for example, a fire or acts of war, or permitting delays at the State level.

When any event occurs that may delay or prevent the implementation of this Project, whether or not it is avoidable, the Party to this Agreement who knows about it will immediately provide notice to the remaining Parties. Within ten (10) days after that initial notice, the Party should confirm the event in writing. The confirming notice should include: 1) the reason for the delay; 2) the anticipated duration; 3) all actions taken to prevent or minimize the delay; and 4) why the delay was considered unavoidable, accompanied by appropriate documentation.

If the Parties, agree that the delay is unavoidable, relevant parts of the Project schedule (see Section V.) will be extended to cover the time period lost due to the delay. If they agree, they will also document their agreement in a written amendment to this Agreement. If the Parties do not agree, then they will follow the provisions for Dispute Resolution outlined below.

This section applies only to provisions of this Agreement that are not implemented by legal implementing mechanisms. Legal mechanisms, such as permit provisions or rules, will be subject to modification or enforcement as provided under applicable law.

VIII. Amendments or Modifications to the Agreement

This Project is a research project designed to test new approaches to environmental protection and there is a degree of uncertainty regarding the environmental benefits and costs associated with activities to be undertaken in this Project. Therefore, it may be appropriate to amend this Agreement at some point during its duration.

This Final Project Agreement may be amended by mutual agreement of all parties at any time during the duration of the Project. The parties recognize that amendments to this Agreement may also necessitate modification of legal implementation mechanisms or may require development of new implementation mechanisms. If the Agreement is amended, EPA and the County expect to work together with other regulatory bodies and stakeholders to identify and pursue any necessary modifications or additions to the implementation mechanisms in accordance with applicable procedures (including public notice and comment). If the parties agree to make a substantial amendment to this Agreement, the general public will receive notice of the amendment and be given an opportunity to participate in the process, as appropriate. In determining whether to amend the Agreement, the parties will evaluate whether the proposed amendment meets Project XL acceptance criteria and any other relevant considerations agreed on by the parties. All parties to the Agreement will meet within ninety (90) days following submission of any amendment proposal (or within a shorter or longer period if all parties agree) to discuss evaluation of the proposed amendment. If all parties support the proposed amendment, the parties will (after appropriate stakeholder involvement) amend the Agreement.

IX. Transfer of Project Benefits and Responsibilities to a New Owner

The parties expect that the implementing mechanisms will allow for a transfer of the County's benefits and responsibilities under the Project to any future owner or operator upon request of County and the new owner or operator, provided that the following conditions are met:

A. The County will provide written notice of any such proposed transfer to the EPA, the State of Maryland, and all applicable local agencies at least ninety (90) days before the effective date of the transfer. The notice is expected to include identification of the proposed new owner or operator, a description of its financial and technical capability to assume the obligations associated with the Project, and a statement of the new owner or operator's intention to take over the responsibilities in the XL Project of the existing owner or operator.

B. Within forty-five (45) days of receipt of the written notice, the parties expect that EPA, the State of Maryland, and all applicable local agencies in consultation with all stakeholders, will determine whether: (1) the new owner or operator has demonstrated adequate capability to meet EPA's requirements for carrying out the XL Project; (2) is willing to take over the responsibilities in the XL Project of the existing owner or operator; and, (3) is otherwise an appropriate Project XL partner. Other relevant factors, including the new owner or operator's

record of compliance with Federal, State and local environmental requirements, may be considered as well. It is expected that the implementation mechanism will provide that, so long as the demonstration has been made to the satisfaction and unreviewable discretion of EPA, the State of Maryland, and all applicable local agencies and upon consideration of other relevant factors, the FPA will be modified to allow the proposed transferee to assume the rights and obligations of the County. In the event that the transfer is disapproved by any agency, withdrawal or termination may be initiated, as provided in Section XI.

It will be necessary to modify the Agreement to reflect the new owner and it may also be necessary for EPA, the State of Maryland, and all applicable local agencies to amend appropriate rules, permits, or other implementing mechanisms (subject to applicable public notice and comment) to transfer the legal rights and obligations of the County under this Project to the proposed new owner or operator. The rights and obligations of this Project remain with the County prior to their final, legal transfer to the proposed transferee.

X. Process for Resolving Disputes

Any dispute that arises under or with respect to this Agreement will be subject to informal negotiations between the parties to the Agreement. The period of informal negotiations will not exceed twenty (20) calendar days from the time the dispute is first documented, unless that period is extended by a written agreement of the parties to the dispute. The dispute will be considered documented when one party sends a written Notice of Dispute to the other parties.

If the parties cannot resolve a dispute through informal negotiations, the parties may invoke non-binding mediation by describing the dispute with a proposal for resolution in a letter to the Regional Administrator for EPA Region 3, with a copy to all parties. The Regional Administrator will serve as the non-binding mediator and may request an informal mediation meeting to attempt to resolve the dispute. He or she will then issue a written opinion that will be non-binding and does not constitute a final EPA action. If this effort is not successful, the parties still have the option to terminate or withdraw from the Agreement, as set forth in Section XI below.

XI. Withdrawal From or Termination of the Agreement

A. Expectations

Although this Agreement is not legally binding and any party may withdraw from the Agreement at any time, it is the desire of the parties that it should remain in effect through the expected duration of the project, or until changes in generally applicable regulations make the requested flexibility unnecessary, or until the Subtitle D landfill portion of the Facility reaches capacity. The agreement will be implemented as fully as possible, unless one of the conditions below occurs:

1. Failure by any party to: (a) comply with the provisions of the enforceable implementing mechanisms for this Project, or (b) act in accordance with the provisions of this Agreement. The assessment of the failure will take its nature and duration into account.
2. Failure of any party to disclose material facts during development of the Agreement.
3. Failure of the Project to provide superior environmental performance consistent with the provisions of this Agreement.

4. Enactment or promulgation of any environmental, health or safety law or regulation after execution of the Agreement, which renders the Project legally, technically or economically impracticable.
5. Decision by an agency to reject the transfer of the Project to a new owner or operator of the facility.

The County will be given notice and a reasonable opportunity to remedy any substantial failure before EPA's withdrawal. If there is a disagreement between the parties over whether a substantial failure exists, the parties will use the dispute resolution mechanism identified in Section X of this Agreement. EPA, the State of Maryland, and all applicable local agencies retain their discretion to use existing enforcement authorities, including withdrawal or termination of this Project, as appropriate. The County retains any existing rights or abilities to defend itself against any enforcement actions, in accordance with applicable procedures.

B. Procedures

The parties agree that the following procedures will be used to withdraw from or terminate the Project before expiration of the Project term. They also agree that the implementing mechanism(s) will provide for withdrawal or termination consistent with these procedures.

1. Any party that wants to terminate or withdraw from the Project is expected to provide written notice to the other parties at least sixty (60) days before the withdrawal or termination.
2. If requested by any party during the sixty-(60) day period noted above, the dispute resolution proceedings described in this Agreement may be initiated to resolve any dispute relating to the intended withdrawal or termination. If, following any dispute resolution or informal discussion, a party still desires to withdraw or terminate, that party will provide written notice of final withdrawal or termination to the other parties.

If any agency withdraws or terminates its participation in the Agreement, the remaining agencies will consult with the County to determine whether the Agreement should be continued in a modified form, consistent with applicable federal or State law, or whether it should be terminated.

3. The procedures described in this Section apply only to the decision to withdraw or terminate participation in this Agreement. Procedures to be used in modifying or rescinding any legal implementing mechanisms will be governed by the terms of those legal mechanisms and applicable law. It may be necessary to invoke the implementing mechanism's provisions that end authorization for the Project (called "sunset provisions") in the event of withdrawal or termination.

XII. Compliance After the Project is Over

The parties intend that there be an orderly return to compliance upon completion, withdrawal from, or termination of the Project, as follows:

A. Orderly Return to Compliance with Otherwise Applicable Regulations, if the Project Term is Completed

The County is expected to anticipate and plan for all activities to return to compliance sufficiently in advance of the end of the Project term. The County will request a meeting with EPA, the State of Maryland, and all applicable local agencies to discuss the timing and nature of any actions that they will be required to take. The parties agree to meet within thirty days of receipt of the County's written request for such a discussion. At and following such a meeting, the parties should discuss in reasonable, good faith, which of the requirements deferred under this Project will apply after termination of the Project.

B. Orderly Return to Compliance with Otherwise Applicable Regulations in the Event of Early Withdrawal or Termination

In the event of a withdrawal or termination not based on the end of the Project term and where the County has made efforts in good faith, the parties to the Agreement will determine an interim compliance period to provide sufficient time for the County to return to compliance with any regulations deferred under the Project. The interim compliance period will extend from the date on which EPA, the State of Maryland, and all applicable local agencies provide written notice of final withdrawal or termination of the Project, in accordance with Section XI of this Project Agreement. By the end of the interim compliance period, the County will comply with the applicable deferred standards set forth in 40 CFR Part 258.28 and 40 CFR 258.60(f). During the interim compliance period, EPA, the State of Maryland, and any applicable local agency may issue an order, permit, or other legally enforceable mechanism establishing a schedule for the County to return to compliance with otherwise applicable regulations as soon as practicable. This schedule cannot extend beyond 6 months from the date of withdrawal or termination. The County intends to be in compliance with all applicable Federal, State, and local requirements as soon as is practicable, as will be set forth in the new schedule.

XIII. Signatories and Effective Date

Thomas Voltaggio

Deputy Regional Administrator, EPA, Region 3

Date

Jerome Klasmeier,

Cheif Administrative Officer

Anne Arundel County

Date

Edward Dexter

Maryland Department of the Environment

Date