

# Research, Development, and Demonstration Project (RDDP)

## Technical Summary

### Background

Conventional municipal solid waste (MSW) landfill design and construction practices result in the creation of “dry tomb” landfills that will remain a liability for generations. Recent bioreactor landfill technology development addresses this concern by optimizing the conditions for biological decomposition of MSW via

- moisture addition,
- chemistry regulation (e.g., pH-level),
- microbial seed addition, and

St. Clair County and its consultant, CTI and Associates, Inc. have pioneered a new bioreactor technology by using domestic septage to increase the rate of MSW decomposition and, consequently, produce larger amounts of methane. With a landfill gas-to-energy facility, the collected methane will be converted into renewable clean energy.



View of 7-acre full scale bioreactor showing green biogas extraction system. This bioreactor project produces enough landfill gas to power 800 homes or roughly half of the landfill’s overall potential.

### Site Description

Smiths Creek Landfill (SCL) is an MSW landfill located in St. Clair County, Michigan. The total active area, including the interim-covered areas is 74 acres. The site receives approximately 100,000 tons of MSW and 100,000 tons of construction and demolition (C&D) debris annually. The leachate generated on-site has been recirculated into several areas of the landfill.

Only MSW is placed in SCL’s 7-acre bioreactor cell and is separated from older waste by a separatory liner. SCL pre-processes its septage to reduce the solids content using screens and settlement tanks. The septage is then injected into the waste using buried, horizontal injection pipes inside the MSW. The sludge removed during pretreatment is also introduced to the MSW using infiltration pits.

### Technical Achievements

Residential septage is an on-going wastewater challenge for municipalities. Conventional methods of septage disposal – land application and waste water treatment plants – can result in surface water pollution, overloading treatment plants, and increased energy consumption. However, this innovative treatment technology improves the management of both septage and municipal solid waste (MSW) to avoid these problems. Solving water pollution issue made it possible for SCL received State Revolving Fund (SRF) and significant principle forgiveness (40 to 50%) due to the renewable energy recovery.

This technology provides accelerated renewable energy generation while extending the life of an operating landfill. Mixing septage with MSW can be a “win-win” combination – residential septage is safely treated and used to accelerate the waste decomposition and methane generation in a landfill. The County’s septage bioreactor landfill project was developed to demonstrate the feasibility of this concept. This project included the construction and operation of a full-scale, 7-acre demonstration septage bioreactor landfill cell. Landfill operations are conducted in an engineered and controlled manner that limits both groundwater pollution and air pollution.

After eight years of operation, the results show that septage addition has dramatically increased the methane generation rate in the septage bioreactor landfill, making it possible for the owning municipality to construct a landfill-gas-to-electricity facility. The electricity generated from this facility will be used to power on-site operations and sold to a local utility, generating revenue for the County. Also, the leachate collected from the bioreactor cell is comparable to conventional landfill leachate, demonstrating that this technology also reduces the cost to treat septage, saving residents’ money.



Unloading at septage receiving station. Septage bioreactor landfill reduces the cost to treat septage and eliminates septage pollution.