

Research Suggestions for the FY2021 Research Agenda

Hinkley Center for Solid and Hazardous Waste

BENEFICIAL USE/RECYCLING WASTE TO ENERGY ASH

There are test sections of public roadways constructed using MSW WTE residuals and other types of recycled materials in place now, and more that may be placed soon. The researcher would need to perform a review of completed and ongoing research in the US and worldwide. Any new research project should build upon the work previously funded by the Hinkley Center and should supplement, not duplicate, the many research projects that currently are underway nationwide. The Hinkley Center connection should facilitate a cooperative response from all the owners of the test sections. Research is needed to do the following:

1. Locate and catalog all roadway test sections in Florida and their source of material.
2. Catalog the design features of the test sections and any corresponding field/lab test data of the material.
3. Establish what the long-term engineering and environmental performance parameters should be for these and all future test sections. Also establish how these parameters will be measured.
4. Execute the performance tests on all existing test sections.
5. Define design features and test protocols for Florida Department of Environmental Protection (FDEP) approval to facilitate approval of future roadway sections – i.e., move beyond test sections to an established reuse protocol.

BIOSOLIDS

Biosolids are primarily organic materials produced as a necessary byproduct of treating wastewater and can be put to beneficial use. An example of such use is the land application of biosolids to soil to supply nutrients (N, P&K), micronutrients such as zinc and copper and replenish soil organic matter.

This research study would include a state-wide survey of the current treatment and disposal methods of biosolids, including ultimate disposal and recycling locations- whether land applied within the state or marketed as fertilizer pellets through public/private partnerships. The research team could use visuals and GIS applications to present research findings that are easy to understand for a non-technical reviewer (general public, elected officials).

This research should be coordinated with FDEP.

Research Suggestions for the FY2021 Research Agenda

Hinkley Center for Solid and Hazardous Waste

COAL COMBUSTION RESIDUE (CCR)

The Division of Waste Management is moving forward with rulemaking for the state permitting program for Coal Combustion Residuals (CCR) landfills and surface impoundments. The issue relates to liner requirements under EPA's CCR program as compared to state requirements. Florida's double liner systems for Class I landfills have primary and secondary containment. These liners are sufficient to contain leachate and they also provide opportunities for monitoring and management of breaches in the liner. As part of Florida's CCR permitting program, which will be incorporated into Chapter 62-701, liner systems should be studied and compared to illustrate equivalence to EPA's requirements. If this work can be performed and provided to EPA, it could lead to many benefits going forward.

COMPOSTING

There has been recent interest in managing algae and algal waste with composting (as opposed to disposal in a landfill). However, the potential toxicity of some algae is a concern. Algal wastes, such as blue green algae retrieved from canals, are toxic. How does the composting process affect the toxicity associated with the blue green algae? Can the toxicity be reduced or mitigated to allow for safe composting of the algal biomass? Are there disinfection methods? An optimum result would be a process that reliably reduces or eliminates toxins and permits safe composting of algae with minimal testing. Once composted, the resulting material would be suitable for use or mixing with other materials.

CONSTRUCTION AND DEMOLITION DEBRIS (C&D)

Mixed Construction & Demolition (C&D) processing facilities accept non-source separated demolition materials, including materials from mom and pop contractors or owner-builders whose projects may be exempt from conducting an asbestos survey. These generators generally do not remove unacceptable wastes that C&D facilities are prohibited from accepting. Certain wastes are difficult to spot and may not be readily distinguishable from acceptable materials – for instance ACM roof tiles. This research would review the comingled C&D received at the C&D processing facilities to determine if unacceptable and difficult to identify wastes are present in significant quantities. The results could be used to improve spotter training resulting in the safe disposition of these materials.

Research Suggestions for the FY2021 Research Agenda

Hinkley Center for Solid and Hazardous Waste

ENVIRONMENT

Polyfluoroalkyl substances (PFAS) exist in a wide variety of forms in MSW, sludges, and construction and demolition materials, which are disposed of in landfills, and thus have the potential to affect landfill leachate. Additionally, PFAS may be found in sludges used to produce compost. Continued work is needed to identify and characterize the amount and fate of PFAS in the waste stream. Work is also needed to address policies, techniques, instrumentation, processing equipment, and other tools solid waste managers, policy makers, and others can use to address the challenge of addressing PFAS.

More specifically, the Hinkley Center is more interested in the following:

- Research that focuses on leachability of PFAS from individual waste streams or materials into the leachate. This should include column studies to better assess the mobile fraction of the PFAS compounds for each material type. Examples of the expanded research should include carpet, building materials, paper products, and possibly cleaning products.
- Research that deciphers the fate and transport of the PFAS in municipal WWTP sludge/residuals disposed in MSW landfills and should include column studies regarding leachability of the PFAS into the leachate.
- Preliminary research suggests some long and short chain PFAS chemicals have the potential to be sequestered within the waste mass rather than solubilizing into the leachate. Further research is needed to understand the partitioning coefficients and attenuation factors that affect PFAS stabilization in landfills for future operations.

Prior research has demonstrated that elevated concentrations of iron, arsenic, and other constituents can be found in the ground water at many solid waste management facilities because of the reductive dissolution of soils (a/k/a the “shadowing effect”). The FDEP tentatively acknowledged this phenomenon in FDEP’s 2016 Guidance Document SW-13.11 (titled “Secondary Ground Water Standards at Solid Waste Facilities”). However, it appears that additional research could help the FDEP with the development of a uniform approach to dealing with this issue on a statewide basis. Research to compile existing information and evaluate results from across the state could add value in better understanding this phenomenon.

HEALTH & SAFETY

Waste industry pandemic response – This research would evaluate essential solid waste management services and determine potential pathways for virus transmission. It could also help answer the question- “Are solid waste employees more or less likely than average to be exposed to the COVID virus or other

Research Suggestions for the FY2021 Research Agenda

Hinkley Center for Solid and Hazardous Waste

harmful viruses during routine work?” With an anticipated increase in residential waste vs. commercial waste due to workers teleworking, are the potential exposure pathways in anyway increased or different? The research could be used to support best practices or operational changes during a pandemic event, or as a way of developing new best waste management practices for preventing solid waste management employees’ illnesses. The solid waste industry provides critical services and maintaining a healthy workforce and addressing employee concerns are beneficial to day-to-day operations.

What measures need to be taken to ensure the safety of solid waste management professionals who are involved in the collection, sorting, and/or disposal of discarded materials? What measures need to be deployed differently if there is shift in waste volumes from commercial to residential?

In addition, has the Pandemic increased the costs for Florida’s residential waste and recycling collection services and costs for the processing of recyclables at Material Recovery Facilities (MRFs)? The questions are (a) What are waste projections anticipated and relative cost impacts? Are the additional costs significant? (b) Should collection companies and companies that operate MRFs receive additional compensation for their increased costs and losses? (c) How should municipal governments, county governments and these companies prepare for a possible increase in the scope and severity of the impacts of the pandemic?, and (d) How should this pandemic, the possible increase of the severity of the current pandemic and future pandemics be addressed in current and future contracts?

LANDFILL CLOSURE

There are several slurry-wall landfills in the state of Florida, including the landfills in Brevard, Pinellas, and Seminole County. One of the major issues facing the Counties that have slurry wall landfills is the post closure period for such landfills. After the final closure, how long should the county continue pumping leachate and groundwater from inside of the slurry wall to maintain the inward gradient? What groundwater standards are going to be acceptable to FDEP to consider that a slurry wall landfill has met its post closure obligation? What if within 5-10 years of final closure, the ground water around and beneath the slurry wall has the same parameters as groundwater outside? When can the pumping stop?

LANDFILL DESIGN AND MANAGEMENT

Geophysical techniques are already known and used to evaluate the potential for sinkholes forming under proposed landfill sites in Florida. These techniques include borings, Ground Penetrating Radar, and other geophysical techniques. While they generate data, the method for using this data to properly evaluate a

Research Suggestions for the FY2021 Research Agenda

Hinkley Center for Solid and Hazardous Waste

proposed landfill area is often unclear. What is the best way to correlate geophysical results for evaluating sinkhole potential under proposed landfill sites with data like Standard Test Penetration borings, Cone Penetrometer Tests, site history, known sinkholes in the area, etc. Develop a guidance document that describes the approaches which are suitable for evaluating sinkhole potential beneath proposed landfill sites in Florida. This guidance should also include techniques for correlating the various data obtained so the costs of the subsurface evaluations can be optimized. It should also include a method for using this data to develop a reasonable estimate of the sinkhole risk potential for landfill sites. This can help with site evaluations and designs for new and lateral expansions of landfills.

LANDFILL LEACHATE

Florida Administrative Code (F.A.C.) 62-701.630 requires a landfill operator to provide assurance that there are sufficient funds for Closure and Long-Term Care of a disposal unit. Leachate management can be a significant component of the Long-Term care estimates based on the current models for leachate generation. Landfill closures are designed to greatly reduce the amount of infiltration into the waste mass. Leachate volumes should decrease over time. How rapidly and to what degree this occurs is unknown. Current models of leachate impingement likely overestimate the actual amounts of leachate production in post closure. Empirical data would be useful in understanding the actual leachate production and refine impingement rate models. Validating the leachate production estimates, especially for lined disposal units, will help landfill operators and regulators understand post closure leachate production to better and more effectively allocate funds for this element of Long-Term Care.

More facilities have been looking into or beginning to implement leachate evaporation using heat from the combustion of landfill gas and/or heat from the exhaust of landfill gas-to-energy generators. Some processes say they can reduce leachate in volume by 90 percent. Some of the residuals are dried and then returned to the landfill. How much of that material will it take to cause issues in future leachate, and what will that do for future leachate treatment and/or evaporation? Is there a point when the resulting liquid is too concentrated and causes adverse chemical impacts? An evaluation is needed of the benefits and limitations of leachate evaporation that results in a very concentrated product. What are the characteristics of the leachate concentrate /solid residuals? Does the introduction of leachate concentrate into landfills result in unintended consequences? Is there a true benefit to this process?

Research Suggestions for the FY2021 Research Agenda

Hinkley Center for Solid and Hazardous Waste

LANDFILL MINING

There has been increased interest recently in mining landfills. Much of the interest has been associated with ash monofills, but there is interest in other landfills, as well. For example, a former auto shredder fluff disposal site and a residuals facility are being mined to recover metals. How long after mining/removal is complete does it take for the site to recover to a pre-existing condition? Would mining of an unlined unit or ash unit show any particular long-term impact to groundwater? How long and what type of monitoring needs to occur? A distinct rebound may be observed when mining is complete. How does replacing the residual soils at the same time affect this post-mining use as opposed to hauling everything out and filling with clean fill material? Could the return to a pre-existing condition be modeled so that long term recovery of the mined site could be predicted? Other issues related to landfill mining could also be explored.

RECYCLING

As a community, we all want to recycle. However, many communities are placing their residential recycling programs on hold. Contamination rates continue to increase, participation decreases, and end uses for the recovered products are not readily available. To continue, we need to develop programs that encourage participation, are easy for residents to follow properly, and result in recovered materials that can be reused.

The researcher will need to identify failure mechanisms for recycling programs; and it is likely different across communities. Based on the failure mechanism(s), the researcher will need to develop a recycling program that can be successful. The research should focus on different methods of recycling (e.g. single stream versus dual stream) to compare data on cost, convenience, contamination rates, beneficial end use / market, education, and enforcement.

The research should consider the size of the community, the types of industry in the community, and community demographics. Different types of communities should be considered in this study.

Results of research should address participation rates, contamination rates, and costs. The results should include recommendations for an implementable recycling program.

Researchers should consider research conducted by NWRA, NRC, and others.

Research Suggestions for the FY2021 Research Agenda

Hinkley Center for Solid and Hazardous Waste

SPECIAL WASTE

Household Hazardous Waste (HHW) is a management and cost issue for local solid waste operations in Florida. A comprehensive review of the HHW waste stream, the quantity and quality of HHW collected by counties, and an assessment of HHW programs could lead to more effective programs. Some information is available on HHW programs, but it has not been compiled. Most counties in Florida collect HHW for alternate disposal to keep it out of landfills, waste-to-energy facilities, or other solid waste disposal facilities. Are some HHW programs more effective at collecting materials than others? More importantly, which program elements lead to the most collection activity, at the lowest cost, with the best environmental protection. A research project could gather the appropriate information, compile it, and share the results with solid waste programs to help improve their programs. Information is available from North American Hazardous Materials Association <https://nahmma.org/>

What is the appropriate amount of low strength sludge wastes that can safely be accepted at a Class I Landfill? MSW landfills often accept low strength sludge wastes such as biosolids, dredged materials, or lime sludges that are challenging to manage and may cause long-term geotechnical stability issues. This information is needed by counties and private companies who operate landfills, or who may be asked to accept larger quantities of this material. This is important because proposed changes to Chapter F.A.C. 62-640, Regulation of Biosolids, will reduce/impact the land application of approximately 450,000 wet tons of Class B biosolids. While some of this material will continue to be land applied, quantities managed by landfills may be increased as the practice and viability of land application of biosolids decreases. This research should answer the questions of how much of this material should be accepted at MSW facilities, and what are best practices for managing it?