

**THIS PROPOSAL IS BASED AND HAS CONSIDERED THE ITRC TRAINING PROGRAM POLICIES AND PROCEDURE APPROVED (to be approved October 2006)**

**ITRC MULTI-DAY TRAINING CLASSROOM PROJECT PROPOSAL: LEGACY MANAGEMENT THROUGH OPTIMIZATION OF POST CLOSURE CARE AT LANDFILLS MULTI-DAY CLASSROOM TRAINING DEVELOPMENT AND DELIVERY**

**TITLE OF ASSOCIATED ITRC TECHNICAL AND REGULATORY GUIDANCE(S) (TECH/REG):**

- ALT-,1, 2003; and ALT-2, 2003 on [Design, Installation and Monitoring of Alternative Final Covers](#);
- ALT-3, 2006, [Technical and Regulatory Guidance for Characterization, Design, Construction and Monitoring of Bioreactor Landfills](#);
- ALT-4, 2006, [Technical and Regulatory Guidance for Optimizing and Ending Post Closure Care at Landfills](#)

**PROPOSAL DATE: May 29<sup>th</sup>, 2007**

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**Problem Statement** (why is this project necessary?)

In 1991, the U.S. Environmental Protection Agency promulgated new criteria under Subtitle D of the Resource Conservation and Recovery Act that updated the requirements for municipal solid waste (MSW) landfills (40 CFR Part 258). A primary goal of Subtitle D was to minimize environmental impacts from MSW landfills during the closure and post-closure care (PCC) period. Subtitle D required facilities to provide for a minimum of 30 years of PCC after final closure and demonstrate financial assurance for such activities. Many older landfills shut down rather than incur the cost of complying with Subtitle D. However, many of these closed MSW landfills were required by states to provide PCC, although typically for shorter time periods. In addition, guidance and training were lacking regarding the ability to evaluate and optimize ongoing-post-closure care programs.

The federal criteria also allowed state regulators to extend or shorten the PCC time period as needed to provide for the protection of human health and the environment. However, guidance was not available to regulators or landfill owners and operators on how to demonstrate whether a shorter or longer PCC time period was necessary or when PCC could be ended. As a result, PCC time periods were and are being extended indefinitely at many landfills in several states. Most extensions are established or based on public concerns that all landfills pose a level of long-term risk due to the lack of a systematic structured approach to evaluate landfill performance and threat. A major problem with this approach is that the PCC term is not typically based upon a site-specific evaluation of threat using existing and site-specific environmental data. Another artifact is that extended PCC terms comes with a commensurate requirement for the owner/operator to provide PCC funding, which may or may not be needed to protect human health and the environment.

Regulatory agencies and landfill owners and operators need guidance and in-depth training to effectively determine when post closure care of a landfill can be adjusted or potentially ended without an impact to human health and the environment. Since 1988, more than 6,100 municipal solid waste (MSW) landfills have closed (see <http://www.epa.gov/epaoswer/non-hw/muncpl/pubs/msw05rpt.pdf>). Determining when the regulatory post-closure care (PCC) period can be optimized or ended for a permitted solid waste disposal facility is one of the greatest challenges facing the solid waste industry in recent times.

Through existing environmental regulatory programs, (e.g. solid, hazardous, mining, voluntary cleanup, Brownfield, CERCLA, energy, and legacy wastes), parties involved with waste management units have a variety of sites that have undergone or will undergo closure. The owners/operators, including municipalities, the Department of Energy, Department of Defense, and industry, of a land disposal unit must retain a financial assurance mechanism on a Waste Management Unit (WMU) until the regulatory agency releases them from liability.

Currently regulatory agencies have no guidance to tell them when or under what condition (including administrative management tools) a waste management unit or site no longer needs to manage a potential threat associated at a WMU, and is still protective of human health and the environment. There is little understanding of what stability of waste material in a landfill implies, which leads the industry to continue to consider waste management units temporary storage for dangerous waste, which can accidentally be released to the environment at any future time. This perpetuates permanent and expensive care and limits future land reuse. Many of these sites, regardless of the regulatory oversight authority, do not achieve their true and most beneficial potential as unrestricted or managed reuse properties.

Even though these waste management sites stabilize during post-closure care and can reach a point where active management is not required, they still need some form of monitoring, care or legacy management. There is no detailed guidance or tool for evaluating the effectiveness and efficiency of the post closure care monitoring, care, or management of a WMU and no process for controlling the site following the end of Post Closure care.

It is imperative that ITRC develop a curriculum to train the waste management practitioners how to document the effectiveness of the Post Closure Care programs. This includes definition of the actual threat of the managed areas and closed sites considering potential land reuse scenarios and documenting land reuse restrictions in custodial care, or long term surveillance. The need for this proposed ITRC classroom-style training is demonstrated through a variety of feedback channels including:

- Landfill training ranked high overall when compared to other site topics needing ITRC classroom-style training; (Training Program Customer Survey, July 2006 based on over 1000 respondents)
- 2769 participants have received ITRC Internet-based Training on landfill related topics based on ITRC guidance documents. The initial offering of landfill related Internet-based training courses have been over 90% participant capacity with the collective participation of all landfill related courses at over 80% capacity over the last 3 years.
- State and local government participants account for 55% of the total audience which is 20% higher than for a typical ITRC course. This highlights the state need for training on landfill related topics.

- Over 50% of Internet-based Training participants providing feedback after taking a landfill related course indicated the development of a more detailed classroom-style training course by ITRC is warranted.

**Solution / Impact** (how will the project impact the environmental marketplace?)

A team of experts have developed a new and innovative approach toward evaluating long term care at landfills working with the Environmental Research and Education Foundation (EREF) and the Interstate Technology Regulatory Council (ITRC). The approach emphasizes the operation of landfills in a manner that reduces long term risk and the proactive collection of data to demonstrate whether landfills pose a threat to human health or the environment during post closure care (PCC). Two technical guidance documents designed to work in concert with each other and create a regulatory decision based process integrated with a structured technical landfill performance evaluation approach were released in 2006. On September 8, 2006, the document entitled "*Project Summary Report: Performance-Based System for Post-Closure Care at MSW Landfills: A Procedure for Providing Long-Term Stewardship under RCRA Subtitle D*" was released by GeoSyntec to EREF. On September 6, 2006 the ITRC Alternative Landfill Technologies (ALT) team released a technical guidance entitled "*Evaluating, Optimizing, and Ending Post-Closure Care at MSW Landfills Based Upon Site Specific Data Evaluations.*" These technical documents were developed based upon current regulations developed under Subtitle D and provide a structured systematic approach to evaluating threat with property end-use in mind. The proposed approach facilitates developing post-closure care plans that will generate the data required to evaluate landfill performance, assess its threat, and directly answer questions related the ability to optimize existing post-closure care programs, or the need to shorten or lengthen post-closure care.

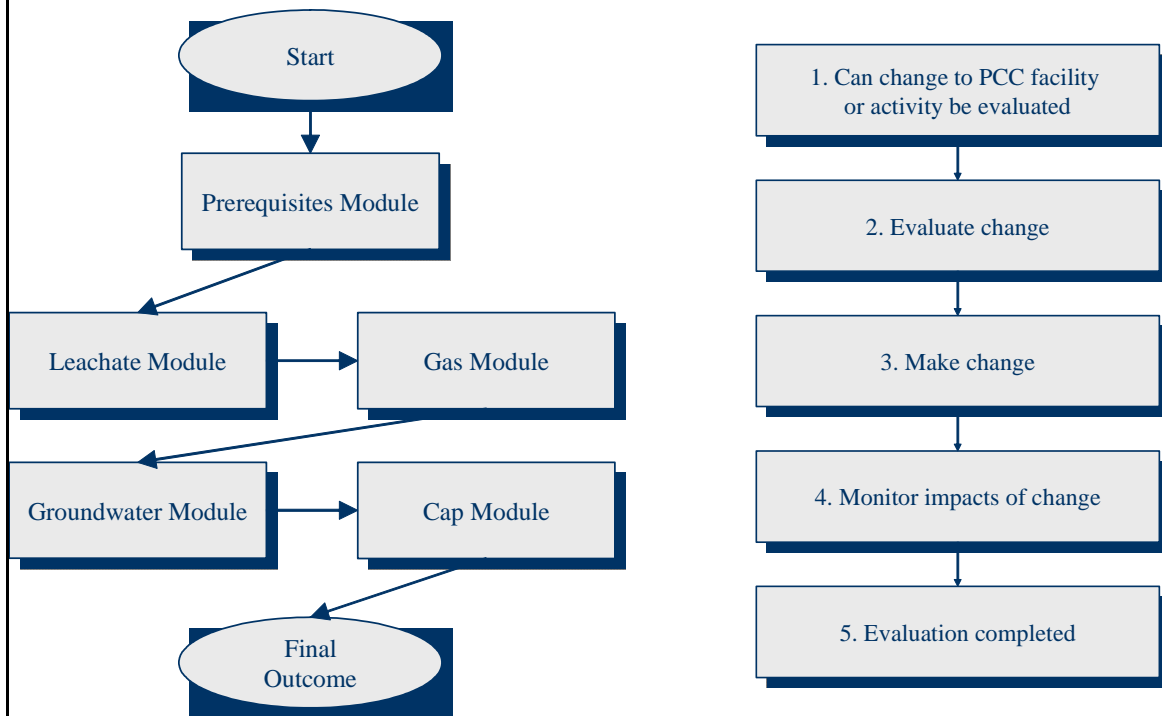
The goal of the research was to design a scientifically defensible, site-specific process to show that a landfill operational element (leachate and LFG) does not pose a threat to human health and the environment and the operational or monitoring element (leachate management, monitoring for LFG migration, groundwater monitoring, and maintaining the integrity of the final cover) can be discontinued. GeoSyntec worked directly with a team of experts familiar with landfill engineering, operational and monitoring controls, and source media (leachate and landfill gas) characterization to define the approach. The team of technical experts then worked closely with organizations such as SWANA, ASTSWMO, ITRC, and other stakeholders to develop consensus on the feasibility of the approach.

The EREF guidance describes: a) an approach to gather physical and chemical data to characterize the principal landfill components during PCC, and b) procedures to evaluate these data and show the effectiveness of the principal landfill components O&M to be protective of human health and the environment at the points of exposure. The approach can be considered as an innovated alternative to long-term care options, used to evaluate how, when and where to optimize a post-closure care management strategy, and when a closed landfill (or its principal components) has successfully completed post-closure care and is ready to transition into non-regulatory custodial care and potential beneficial use.

The ITRC guidance supports the decision process that is integrated with the performance based approach to evaluate a landfill during PCC. It further stresses optimization of costs during PCC and strategies to project property reuse. The ITRC guidance also provides a section that includes its 'key findings' and 'recommendations' with the intention of showing that ending PCC is possible, manageable, and approvable by a State's Executive Director.

Both the EREF and ITRC guidance documents advance the concept of long-term stewardship for landfills by providing clear guidelines for data gathering and sound technical approaches for determining whether there is a threat to human health or the environment in the area surrounding the landfill. The approach endorses proactive management of those components that may have more potential for threat to the environment during the active life of the facility. The approach also focuses on use of the property after site closure, assuring that future use of the land will be compatible with its surroundings while providing maximum community benefit and protection of human health and the environment.

The guidance is designed to provide an evaluation of threat on a modular basis. Specifically, the approach includes five modules, one Prerequisites Module (e.g. data requirements) and four PCC element Modules as described in Subtitle D. The approach allows PCC to be evaluated on a sequential basis (leachate, Landfill Gas, groundwater monitoring, and cap maintenance and monitoring). However, the modular evaluation can be conducted on an element by element basis during landfill operation and post-closure care to identify whether changes in operational practices can be optimized to reduce long-term threat potential of the landfill. Figure 1 provides a process flow diagram of the process.



**Figure 1. Component Modules of the Approach (left) and five-step performance-based evaluation philosophy for each module (right)**

The methodology refines the post-closure regulatory process to focus resources on the aspects of the facility that need attention. As components of post-closure care cease to be needed (e.g., landfill gas generation declines to rates that no longer require active collection), requirements for that component can either cease or be significantly reduced and more focus can be placed on components that remain active. The approach also provides a mechanism to evaluate environmental data to

facilitate post-closure care decisions including the optimization of various post-closure care components, including terminating a component. Accordingly, the process is focused on defining long-term threat potential including the cost-effective application of resources directly to components that require management consistent with long-term environmental stewardship.

The primary benefits of the EREF/ITRC approach include:

- Provides a defensible systematic approach that allows for regulatory PCC to end and implements a non-regulatory care program, termed Custodial Care, after the principal landfill components are demonstrated not to pose an unacceptable threat to human health and the environment at the points of exposure.
- Provides technical support to implement proactive operational practices (such as bioreactor or alternative final covers) to accelerate waste decomposition and stabilization processes and reduce the long-term threat potential of landfills.
- Provides justification for optimization of resources during closure and PCC periods.
- Provides a roadmap for environmental stewardship that ties community desire for the successful return of land to productive use while appropriately addressing community concerns that long-term threat to human health and the environment is appropriately evaluated.

Overall, the described approach is an industry milestone that encourages proactive operation of active and closed landfills to ensure protection of human health and the environment prior to and during post closure care and rewards such activities with potential costs savings for the owners and operators..

**Success Measures** (how you determine the project impact to the market place)

Listed below are potential success measure options to be considered pending budget availability

- Student evaluation of each classroom training course offering
- Student response following training participation (example 3 – 12 months) to evaluate the impact or change to the student’s organization and sites resulting from the training
- Document, through communication with POCs, students, and team members, any measurable increased use of the ITRC Team guidances. This includes the relative rate or total number of states who concur with the guidance before and after attending the class
- Documentation of how many states are using or referencing the ITRC guidance in their state guidance
- Evaluate whether post closure care in ITRC states been optimized or how many time the optimization evaluation has been made since attending the classroom training.
- Measure an increased awareness of the importance of Post Closure Care optimization evaluations in the states.

**Summary of Deliverables** (primary project outputs)

1. Incorporation of the classroom training strategy into the Implementation Strategy of the ALT project.
2. Strategic approach to deliver the class adequately throughout the US
3. A multi-day classroom training curriculum, objectives, course outline, training approach, and student oriented problem sets.
4. Student evaluation summary of classroom Training Dry Run
5. ITRC Training Program evaluation of Classroom Training Dry Run
6. Partnership and sponsorship agreement(s) as appropriate for this training
7. Host state agreements as appropriate to implement training strategy
8. Cumulative student statistic and evaluation summary by course
9. Continuing Education Credits (or related) on a course by course basis as available and required in the regional setting.
10. Identification of lessons learned and successes

### **Project Schedule**

#### **Year 1 Development**

- Preparation and testing (i.e., dry run) of the classroom curriculum based on Team products
- Preparation for public offering

Year 2, 3 and 4 **Delivery** (based on a total of 10 courses with maximum of 120 students per course)

- Classroom training delivery, evaluation, and updates
- Collection and summary of success according to success measures

#### **Year 5 Evaluation**

- Evaluation and modification as necessary of Tech Reg guidance and corresponding classroom training curriculum to stay up-to-date with current research and developments. (Depending on degree of modification that may be required, the team may be reconvened (see ITRC Project Life Cycle Guidance).

### **Target Audience**

#### **Primary Audience**

- Landfill owners and operator including DOE & DOD, DOA (Forest Service and BLM), State Regulators and Federal Regulators, Waste Management and Remediation Consultants

#### **Secondary Audience**

- Secondarily, local community stakeholders will become more aware of the actual risk without the exposure emotion and the sensitivities residents experience during investigations.

### **Training Personnel Required**

#### **States Interested in Supporting Project**

Charles Johnson, Colorado; Ed Wosika, California; Ken Beard, Pennsylvania; Eleanor Wehner, Texas; Nihar Mohanty, Massachusetts

#### **Instructors**

- States
  - Charles Johnson, Colorado DHEP, (Original Team leader)
  - Ed Wosika, California, Water Resource Board
- Federal agencies
  - (Kalpesh Patel), Team member AFCEE
- Industry
  - (Mike Houlihan), Team member and IBT Instructor, Geosyntec

- Academia
  - (TBD from Original Team)
- Others
  - Dave Smit (community stakeholder)
- ITRC Program Support
  - Technical Team Program Advisor during development and testing of the course and overall implementation evaluation.
  - Classroom Training Program Support for strategy development, quality assurance, course planning and delivery, and success evaluation.
  - Outreach Support maintains the ITRC website for course advertisement and internal training program website for course development needs, utilizes existing advertising opportunities, facilitates shipping and printing of documents to training venues and related programmatic support. (Note: Need clarification on this)
  - State Engagement provides quality assurance and testing (identify state students for Dry Run testing).
  - ITRC/ECOS management support provides classroom training venue coordination and contract implementation.

<b>Financial Resources</b>								
	<b>TRAVEL<sup>(1)</sup></b>			<b>CONTRACT SUPPORT<sup>(2)</sup></b>		<b>MATERIALS &amp; FACILITIES</b>		<b>TOTALS</b>
<b>Year</b>	<b>Instructor</b>	<b>Proctor</b>	<b>State Regulator Scholarship</b>	<b>Team PA (labor &amp; travel)</b>	<b>Training<sup>(3)</sup> Program (labor &amp; travel)</b>	<b>Materials<sup>(4)</sup>, Printing, Calls</b>	<b>Facilities &amp; Catering</b>	<b>PROJECT TOTALS</b>
<b>2008 Curriculum Development &amp; Testing</b>	\$25,200.00 <sup>(5)</sup>	\$0.00	\$11,000.00 <sup>(6)</sup>	\$68,000.00	\$46,000.00	\$9,000.00	\$2,000.00	\$161,200.00
<b>2009-2011 Public Course Delivery (10 courses)<sup>(7)</sup></b>	\$48,000.00 <sup>(8)</sup>	\$22,000.00 <sup>(9)</sup>	\$220,000.00 <sup>(10)</sup>	\$0.00	\$330,000.00	\$82,000.00	\$320,000.00 <sup>(11)</sup>	\$1,022,000.00
<b>2012 Evaluation &amp; Update Guidance and Classroom Training Curriculum</b>	\$23,100.00	\$0.00	\$0.00	\$25,000.00	\$10,000.00	\$15,000.00	\$0.00	\$73,100.00
<b>TOTALS</b>	<b>\$96,300.00</b>	<b>\$22,000.00</b>	<b>\$231,000.00</b>	<b>\$93,000.00</b>	<b>\$386,000.00</b>	<b>\$106,000.00</b>	<b>\$322,000.00</b>	<b>\$1,256,300.00</b>

<sup>(1)</sup> Based on ECOS/ITRC assumption of \$1200 average per trip

<sup>(2)</sup> Outreach Program support beyond what is already a part of their general outreach activities may not be included. Additional resources (if any) are to be determined.

<sup>(3)</sup> See ITRC Training Program Strategy (Aug. 2006) for Classroom Training Development and Delivery Functions

<sup>(4)</sup> Assumes associated ITRC guidance document and course booklet provided to each participant

<sup>(5)</sup> Based on 7 instructors to 3 meetings. 4 principle instructors and 3 alternates during development

<sup>(6)</sup> Based on 10 state regulator travel scholarships for dry run

- <sup>(7)</sup> Includes projection of 120 participants per course for 10 courses (2.5 days), an approximate per person cost of \$1050 for development and delivery.
- <sup>(8)</sup> Based on 4 instructors per public delivery
- <sup>(9)</sup> Based on 2 state regulator training proctors per public delivery
- <sup>(10)</sup> Based on 20 state regulator travel scholarships per public delivery
- <sup>(11)</sup> Includes continental breakfasts, lunch, breaks and one reception for attendees

<b>Related Work:</b>			
Documents developed by ITRC related to this topic:			
<ul style="list-style-type: none"> <li>○ ALT-,1, 2003; and ALT-2, 2003 on <a href="#">Design, Installation and Monitoring of Alternative Final Covers</a></li> <li>○ ALT-3, 2006, <a href="#">Technical and Regulatory Guidance for Characterization, Design, Construction and Monitoring of Bioreactor Landfills</a>;</li> <li>○ ALT-4, 2006, <a href="#">Technical and Regulatory Guidance for Optimizing and Ending Post Closure Care at Landfills</a>;</li> <li>○ ECO-2, 2006, <a href="#">Design of Ecological Land Reuse of Remediated Sites</a>;</li> <li>○ Phyto-2, 2001, <a href="#">Technical and Regulatory Guidance for Phytotechnologies</a></li> <li>○ Wetlands-1, 2003, <a href="#">Technical and Regulatory Guidance for Constructed Treatment Wetlands</a></li> <li>○ Wetland-2, 2005, <a href="#">Technical and Regulatory Guidance for Characterization, Design, and Monitoring of Mitigation Wetlands</a>;</li> <li>○ Rad-3, <a href="#">Issues of Long Term Stewardship, State Regulator's Perspective</a></li> <li>○ DSP-3, 2003, <a href="#">Technical and Regulatory Guidance for Using Polyethylene Diffusion Bag Samplers to Monitor Volatile Organic Compounds in Groundwater</a></li> <li>○ BRNFLD-2, 2006, <a href="#">Property Revitalization– Lessons Learned from BRAC and Brownfields</a></li> </ul>			
<b>Potential Funding Sources and Strategy</b> (list potential funding sources including organization)			
<b>Name</b>	<b>Organization</b>	<b>Telephone</b>	<b>E-mail</b>
Ed Repa	Environmental Research & Education foundation	(202)-364-3773	<a href="mailto:erepa@envasns.org">erepa@envasns.org</a>
Kalpesh Patel	NFESC	(202) 433-5321	<a href="mailto:kalpesh.patel@navy.mil">kalpesh.patel@navy.mil</a>
Lou Bull & Mike Caldwell	Waste Management, Inc	(713) 328-7462	<a href="mailto:Lbull1@wm.com">Lbull1@wm.com</a> , <a href="mailto:mcaldwell@wm.com">mcaldwell@wm.com</a>