THE AQUAETERIAN

RELINQUO NON VESTIGIUM – (I) LEAVE NO TRACE

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THE PRESIDENT'S CORNER

AquAeTer began our 19th year in August and we are enjoying one of the most demanding and most rewarding years of technical challenges since forming the company.

Paul Marotta and the Brentwood staff have been working on several permitting and remediation projects including a successful application of in-situ biostimulation to reduce organic contaminants in groundwater. Chris Green is working on new commercial sites. Miriam led her team on a river and use attainability analysis. Paul and Pam are doing air emissions testing and permitting, and Mandy continues to complete Phase Is for telecommunication and commercial projects. Chrisie Brown and Richard Rogers have supported litigation with preparation of expert reports and testimony. Misty Huddleston, Ph.D., has successfully defended her dissertation, "Riparian Ecosystem Response to Hemlock Woolly Adelgid Induced Eastern Hemlock Mortality in the Great Smoky Mountains National Park, USA" from the Forestry, Wildlife and Fisheries Department, University of Tennessee recently joined the Brentwood office. Misty has been active in stream restoration for fisheries and mussels in Tennessee and North Carolina. Chris Bolin and the Centennial staff have been assisting the Greenfield Multistate Trust with regulatory compliance at the former Tronox wood treating sites. His group continues to provide environmental monitoring for Waste Management Subtitle D landfills in Colorado. Chris and Steve Smith have now published three peer-reviewed Life-Cycle Assessments of Treated Wood Products.

Mike & Cindy on Mt. Collins on the AT
See AT blog on AquAeTer.com/News

Steve Wampler expects to lead a design/build team to assist a Nevada client with relocation of support facilities at a RCRA Subtitle C landfill. Steve and his team have previously assisted this client with the design, permitting and construction of waste disposal trenches and covers at this landfill. John Michael Corn is managing a design/build project for a new diffuser for a new client that has a chemical facility on the Delaware River near Philadelphia.

We continue to value the working relationships we have established with our many clients and we look forward to continuing work on the many interesting projects that you send our way.

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What is Life Cycle Assessment?

What are the Elements Needed for a Defensible Life Cycle Assessment?

Christopher A. Bolin

With many commercial and industrial products claiming to be "green" or "sustainable", how do you know who is telling the full story and who is using those terms inappropriately or solely as marketing propaganda? Does the use of "toxic chemicals" in the manufacture of a product make it environmentally undesirable? These questions can be answered through the proper implementation of Life Cycle Assessment (LCA) practices. LCA is a tool for evaluating the environmental impacts of a product or process over a defined life-cycle period using set principles and guidance that are common amongst products. The use of LCA provides the practitioner an ability to assess the environmental aspects of a product or process and allows for comparison of the environmental attributes of alternative products. The principles and guidance for performing an LCA are defined by the International Organization for Standardization (ISO) in its 14000 series of standards.

The four basic stages of conducting an LCA include: 1) goal and scope definition; 2) inventory analysis (or model of the product's inflows and outflows); 3) impact assessment (an evaluation of the environmental relevance of the inflows and outflows); and 4) interpretation. The major stages in the life cycle of a product or process are material acquisition, materials manufacture, production, use/reuse/maintenance, and waste management. The system boundaries, assumptions, and conventions to be addressed in each stage all are necessary to understand any limitations on the use of the final LCA product. ISO 14040 states that LCA is an iterative technique, and as data and information are collected, it may be necessary for various aspects of the scope to be modified in order to meet the goal of the study.

The goal and scope of an LCA should be carefully developed prior to beginning the inventory of inflows and outflows. In general, the goal and scope should establish the reason for executing the LCA and outline the questions which need to be answered. Because small variations in products or processes under evaluation can result in major differences in LCA accounting, a precise definition of the life cycle and the function the product or process fulfills should be included in the goal and scope. Similarly, the functional unit, or basis for assessment, should be defined and a description of the inventory boundaries provided. While scoping an LCA, the practitioner should decide on the level of data quality that the project will require, as well as the assumptions and limitations that achieving that level of quality will put on the product of the effort.

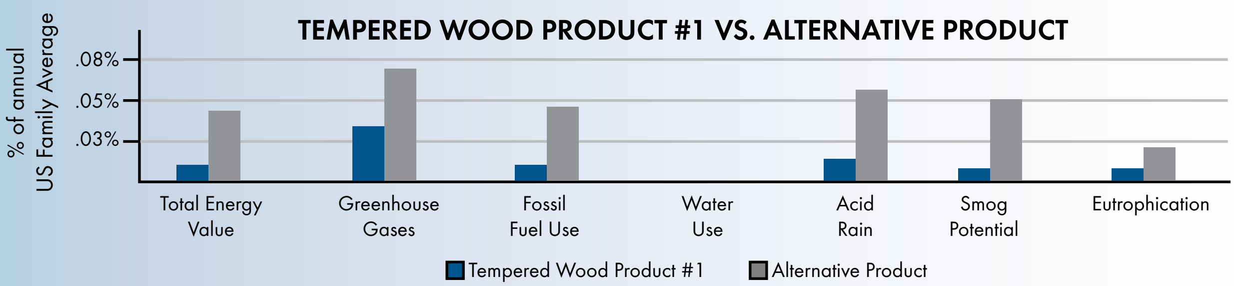
The LCA inventory is a process of quantifying energy and raw material requirements, atmospheric emissions, waterborne discharges, solid wastes, and other releases over the life cycle of the manufactured product. The first step in the life-cycle inventory is development of a process flow diagram illustrating the inputs and outputs (both material and energy) required for the life cycle of the product or process being evaluated. The second step in the life cycle inventory is development of a data collection plan. The data collection plan should include data quality goals, identification of data sources and types, and identification of any data gaps. The significance of data gaps must be determined and additional information may be required including: new data developed; valid assumptions developed; and determination of how the gaps will affect the usability of the final LCA product. The third step in the life cycle inventory is collection of data. The fourth and final step in the life cycle inventory is the evaluation and documentation of the results, ensuring that the data quality objectives have been met.

The LCA impact assessment uses the inventory results to calculate impact categories. The selection and definition of impact categories allows the practitioner to first classify or to assign life-cycle inventory results to the impact categories and then to characterize or model life-cycle inventory impacts within impact categories using science-based conversion factors so that the data can be used for interpretation. Once classified and characterized, these data can be normalized, grouped, and weighted. Normalization is the process of expressing potential impacts in ways that allow comparison of alternative products on an equal basis. Grouping is the process of sorting or ranking the indicators, and weighting emphasizes the most important potential impacts. ISO 14044 specifies that weighting, as a possibly subjective step, is not permitted in LCAs that include comparative assertions.

The interpretation component of the LCA should identify, quantify, check, and evaluate information derived from the assessment. The objective of the interpretation, as defined by ISO, is to analyze results, reach conclusions, explain limitations, and provide recommendations based on the findings of the inventory and assessment phases of the LCA. The results of the interpretation must be reported in a transparent manner and provide a readily understandable, complete, and consistent presentation of the results of the LCA study, in accordance with the goal and scope of the study. The key steps in interpreting the results of the LCA include: 1) identification of significant issues for the product or process being analyzed, which are based on the life cycle inventory and life cycle assessment; 2) evaluation, which considers completeness, sensitivity, and consistency checks; and 3) reporting, which includes providing conclusions and recommendations.

In order to give merit to the LCA, it should be reviewed by qualified independent persons, or peer-reviewers, to validate the LCA product and reduce the concern that the LCA product might be viewed as being biased. It is important to have both other professionals practicing in the product field being analyzed to be peer reviewers, as well as, other independent reviewers with knowledge of LCA analysis, but not professionals in the product field. LCAs intended for use in comparative analyses require third party review and comments associated with such reviews must be included with documentation of the LCA. The peer-review panel would be expected to scrutinize the methodology, data collection, and analysis done in the LCA in accordance with ISO 14044.

AquAeTer has completed six LCAs and have had three published in journals outside the realm of the product being analyzed. No product is 100% environmentally pure, but many products have very small footprints. If you are the party having an LCA performed on a product or process, there are several key elements that should be met to fulfill the definition of "good LCA practice". Contact us for further information.



Christopher A. Bolin is the operations manager for the Centennial, Colorado office and a technical director for AquAeTer's sustainability and Life Cycle Assessment projects. He has a B.S. in Environmental Geology from Southern Methodist University and a M.S.E. in Environmental Engineering from the Colorado School of Mines with 15 years of experience in environmental consulting.

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AQUAETER NEWS

Christopher S. Green, P.G. (TN), a Project Manager and Hydrogeologist with **AquAeTer**, Inc. was recently elected President of the Society of American Military Engineers (SAME) Campbell Post at Fort Campbell, Kentucky for the 2012 year. Mr. Green has been active in SAME for 4 years and most recently was Vice President for 2011 at the Campbell Post. Mr. Green has been involved with both the SAME Nashville Post and as the Campbell Post Representative for the Emergency Preparedness and Homeland Security Committee. He has been with **AquAeTer** for over 7 years.

Misty Huddleston, Ph.D. and Amanda Alvis, **AquAeTer** biologists, recently attended a Wetlands Restoration Workshop instructed by Thomas R. Biebighauser from the Center for Wetlands and Stream Restoration, U.S. Forest Service. They participated in hands-on instruction in practical wetland restoration techniques. They also learned to identify drained wetlands, select sites for building wetlands, and how to restore them. Give them a call at 615-373-8532 if you need wetlands assistance or email mhuddleston@aquaeter.com or aalvis@aquaeter.com.

EPA Renovation, Repair, and Painting (RRP) Rule – What It Means To You

Christopher S. Green, P.G. (TN) & Joe G. Lewis, III

During common renovation activities at commercial, industrial or residential facilities, hazardous conditions can be created from activities such as, sanding, cutting, and demolition. These activities can create hazardous lead dust and chips by disturbing lead-based paint. This can lead to potentially harmful or increased health risks to both adults and children.

In order to protect against this risk, USEPA issued on April 22, 2008 the Lead Renovation, Repair, and Painting Program (RRP). This rule requires that firms performing renovation, repair, and painting projects that disturb lead-based paint in pre-1978 homes, child care facilities and schools be certified by USEPA and that they use certified renovators who are trained by USEPA-approved training providers to follow lead safe-work practices.

AquAeTer has been assisting contractors in meeting these new regulations for establishing safe-work practices including identifying lead-containing areas including painted surfaces, windows and fixtures. This assistance has allowed contractors to perform renovation, repair and painting projects that potentially could disturb lead-based paint on child-occupied facilities (homes, residence halls, apartments, etc.) constructed prior to 1978.

A lead paint inspection is a surface by surface investigation to identify the presence of lead in paint and other potentially contaminated painted building components. A lead inspection tests lead contents in both intact and deteriorating surfaces. Because of the considerably greater number of surfaces to be analyzed during a lead inspection, the certified (licensed) inspector may consider using an X-Ray Fluorescence (XRF) Analyzer.

Certified and trained inspectors can use X-Ray fluorescence machines commonly called "XRF" or can send off paint chips to be analyzed. Portable XRF lead-based paint analyzers are the most common analytical method for inspections because of their demonstrated abilities to determine if lead-based paint is present. Using the XRF, destructive sampling or paint removal is not necessary and the XRF allows high speed sampling at a low cost per sample. XRF instruments expose building components to X-Rays, which causes lead to emit X-Rays with a characteristic frequency or energy. The intensity of this radiation is then measured by the instrument. This measurement is compared with the threshold range specified by the XRF's Performance Characteristic Sheet (PCS). At locations where XRF analysis cannot be conducted, such as, on non-flat or irregular surfaces, the inspector must collect a representative paint chip sample from the surface for analysis by a certified laboratory.

A risk assessment determines the presence or absence of lead-based paint hazards. Risk assessments go beyond simply assessing the condition of lead-based paints. They also identify other potential sources of lead hazards, such as dust and soil. By considering all hazards and examining resident and owner practices, a risk assessor determines appropriate ways to control hazards and to modify management practices so that the chances of hazards recurring is reduced.

AquAeTer can offer full-service lead inspections, risk assessments, abatement consulting for lead removal options, and re-inspection for full compliance with lead laws. **AquAeTer**'s inspectors are trained, state-certified and fully insured and use advanced XRF lead-detection technology, as well as, collecting samples for laboratory analysis as required. XRF technology is the most accurate lead detection technology available. It's safe, non-invasive and results can be provided within a short time.

Joe G. Lewis, III has more than 7 years of environmental project experience and is based in our Brentwood, TN office. He has experience in Phase I and Phase II Environmental Site Assessments, UST removals, landfill monitoring, environmental remediation, groundwater monitoring, water-quality studies, and soil studies throughout the United States. Mr. Lewis has been a certified asbestos inspector and management planner since 2008. He is also a federally certified Lead-Based Paint Inspector and Lead-Based Paint Risk Assessor.

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Christopher S. Green is a Hydrogeologist with over 10 years experience in environmental consulting. He holds a B.S. in Geology from Austin Peay State University and a M.S. in Hydrogeology from Illinois State University. He has experience conducting Phase I/Phase II Environmental Site Assessments, UST removals, and remedial designs. Mr. Green has been involved with environmental issues surrounding real estate transactions for the past eight years.

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