

ALAN ENVIRONMENTAL, LLC

John A. Baker

President

EDUCATION

- M.S., Environmental Engineering, University of Illinois, Urbana, 1973
- B.S., Biology/Chemistry, University of Illinois, Urbana, 1971

PROFESSIONAL SUMMARY

Mr. Baker provides over 33 years experience in studying environmental impacts of landfills and remedial sites. He previously worked 23 years for Waste Management, Inc. most recently as the Director of New Technology. In this role, Mr. Baker was responsible for developing innovative methods for environmental assessment, remediation, and proactive management and design of active and closed landfills. He developed and managed over 20 bioreactor landfill demonstrations and helped in the permitting and conceptual design of the Outer Loop Landfill bioreactor in Louisville working with the State of Kentucky and USEPA on a cooperative research basis. At this facility, alternate covers of clay and compost (biocover) was demonstrated to attenuate methane gas, VOCs, and odors. Mr. Baker implemented innovative remedial technologies for leachate, surface water, soil and groundwater for both regional and specific Superfund sites, hazardous waste landfills, and solid waste sites for groundwater, landfill gas, and vapor control. He also developed innovative monitoring and assessment techniques for fingerprinting sources of contamination and is an expert in demonstration landfill gas to groundwater contamination for solid waste sites. New statistical techniques were developed for evaluating monitoring data for hazardous and solid waste facilities and participated in petitioning for the regulatory rule change for the RCRA groundwater regulations for statistical analyses of data. He has demonstrated alternate technologies for waste management and also for leachate treatment, such as vertical wetlands, to manage leachate and contaminated groundwater. He also has evaluated alternate waste management technologies for energy production including pyrolysis, gasification, plasma arc, and other treatment/conversion methods.

Mr. Baker is a recognized expert in bioreactor landfills, alternate caps, landfill gas, groundwater quality, hydrogeology, surface water quality management, landfill operational efficiencies, and alternative waste management technologies... He has lead numerous State and Federal workshops for groundwater monitoring and assessment techniques, bioreactors, and innovative technologies for groundwater remediation.

PROFESSIONAL EXPERIENCE

Landfill

- **Hydrogeological Investigation / Hazardous, solid waste, low-level rad-waste, and superfund landfills / North America.** Directed and performed numerous hydrogeologic investigation and subsurface exploration of over 200 existing and proposed landfill sites in North America. These projects involved interpretation of

complex hydrogeological environments involving multiple aquifers, preparation of permit applications, coordination of project team in field and office, and negotiation with regulatory agencies. Projects ranged from green field sites to groundwater assessments at sites identified to be impacting the environment. Sites have been located in a wide variety of geologic and hydrogeologic environments across the continent. Methods were developed combining hydrogeologic data with geochemical, geomorphology, and environmental isotopes to confirm hydrogeologic gradients, interconnection of aquifers, and flow paths

- **Feasibility and Siting Studies / Hazardous and Solid Waste Sites.** Siting studies and regulatory reviews for numerous proposed hazardous and solid waste disposal sites, including international, North America, and local searches, published data reviews, and preliminary subsurface investigations. Several locations were successfully permitted as “Greenfield” landfills.
- **Peer review of hazardous and solid waste landfill design and operating plans.** Involved as expert to evaluate landfill design and operations for siting review by public agencies as well as peer review for double lined sites that have leaked into the environment. A hazardous waste landfill, although was triple lined, found flaws in leachate collection systems. Several solid waste sites, double lined, also had leakage due to gravity leachate collection systems and liner pipe penetrations.
- **Conceptual Design and Performance Monitoring of Innovative Gas Collection Systems.** Provided conceptual design and field monitoring to demonstrate effectiveness of innovative vertical and horizontal gas collection systems that can function in wet (or bioreactor) landfills. Systems were proven to be equal to or more effective than conventional gas collection systems and can withstand substantial settlement and moisture conditions in the landfill.
- **Groundwater Monitoring / North America, Australia, New Zealand, Europe, and South America** Prepared corporate guidelines for groundwater monitoring plans for over 200 RCRA Subtitle C and D sites and 200 closed/Superfund sites. Developed corporate standards for groundwater monitoring well design, construction and installation, sampling, analyses, and reporting.
- **Database Management and Statistical Evaluation of Data** –Assisted in development of WM’s groundwater analytical electronic data base, one of the largest environmental databases in the world. The statistical evaluation of groundwater monitoring data was automated and provided remotely to numerous sites in North America. Petitioned USEPA to change statistical regulations for RCRA C and D to accept use of intra-well comparisons as well as prediction limits reducing the false positive rates of failure.
- **Alternate Landfill Caps/Covers-** Demonstrated that installation of low permeability cap for Superfund and closed sites with groundwater contamination diverting moisture from bacteria. Sites have seen clean-up to standards over last 10 years and plumes have retreated. Supported USEPA’s ACAP program at 2 landfills where alternate ET caps have been constructed and monitored for flux through cap. Selected as contractor to assist Fluor-Hanford DOE site in conceptual design of ET caps and to negotiate regulator approval. Subtitle D (RCRA) caps were compared and showed ET caps are equivalent. Three sites permitted based on demonstration. Supported other alternate cap programs using models that demonstrated the suitability of ET caps. Assisted in 2 poplar tree cap acceptance at one closed site and one Superfund site instead of RCRA cap.

- **Demonstration of Fugitive Emissions Through Interim and Alternate Cover-** Through monitoring of flux on the soil and compost covers at 3 landfills (one was Outer Loop Bioreactor, KY) demonstrated that methane gas and VOCs are oxidized in the landfill cover. Methanotrophic bacteria are responsible for these conditions. Helps with odor emissions as well.
- **Evaluation of RCRA Cap Affects on Groundwater Quality from Landfill Gas-** Developed field and geochemical and isotopic techniques to demonstrate that VOCs in landfill gas can affect groundwater quality. Provided remedies to extract gas from vadose zone and perimeter of landfill to eliminate the problem. Showed geochemical affects as well due to creation of anaerobic conditions and dissolution of CO₂ from landfill gas. This problem was assessed at over 60 landfills that had Subtitle D liners over old unlined sites and installation of RCRA caps on partially lined and unlined landfills. Problems with VOC impacts to groundwater occurred within months of capping.
- **Participated in 20 Bioreactor Landfill Demonstrations-** Helped permit and develop conceptual design, operation, and monitoring of 19 bioreactor landfills, most notably in Louisville, Kentucky. Demonstrations are to provide data to USEPA to justify regulatory changes to encourage this technology. Showed that bioreactors generate more gas and control more gas during the operation compared to post-closure, improve leachate quality by in-situ treatment within the landfill, increase airspace by accelerating settlement, show that a RCRA cap is not necessary after closure, and post-closure care should be reduced to 10 years or less. The following are a list of bioreactor and significant leachate recirculation sites:
 - **Evergreen Landfill, OH-** first leachate recirculation demonstration using horizontal permeable blanket and one injection pipe. 2 acre area injected 500,000 gallons/year for 7 years without any seeps or problems. Degraded waste sampled to depth of just above liner
 - **Live Oak Landfill, GA-** Researched and funded 3 acre pilot aerobic landfill bioreactor. Degraded waste in 9 months to compost like quality, acceptable to States compost standards for off-site use. Scaled up later to 10 acre site.
 - **L&D Superfund Landfill-** Funded and conceptually designed experimental bench scale and full scale method of aerobically treating groundwater plume by injecting back into aerobic landfill
 - **Spruce Ridge Landfill-MN-** Funded and provided technical oversight of leachate recirculation project that had control cell. Comprehensive data on gas quality and quantity, leachate quantity and quality, settlement, cover dynamics, geophysics, and waste analyses with depth collected over 5 year period.
 - **Mid-Peninsula Landfill, VA- Funded** and monitored leachate quality, quantity, gas production, and alternate recirculation methods. Data collection on density and settlement of landfill
 - **Atlantic Landfill, VA-** Funded and monitored leachate quality, quantity, gas production, alternate recirculation methods, settlement, density, and affects of sludge addition.

- **High Acres Landfill, NY-** Funded and technical oversight of design, operation, and data collection on leachate quantity, quality, gas production and settlement. Next step is liquids addition pending RD&D rule promulgation.
- **DSWA Sandtown LF, DE-** Funded and directed study on summarizing 20 years historical data for leachate quality, quantity, water balance, settlement, density, gas production at the only site known to have this much historical data. Also funded study on 2 small test cells measuring same parameters comparing bioreactor to control.
- **Northern Oaks, LF-** Funded geotechnical instruments to measure in-situ settlement, density, stability, strain, and stress of waste. Served as technical advisor to MSU who collected data on leachate quality, quantity, gas quality and quantity, and degradation. Conceptual design and operation of facility.
- **Metro Landfill, WI-** Funded project, participated in conceptual design, assisted in permitting, operational review, and data collection for settlement, density, gas production, leachate quantity and quality. Helped gain acceptance for liquid biosolids as research project with EPA Reg. V.
- **Outer Loop Landfill, KY-** Funded initial project, assisted in EPA and KY acceptance and CRDA, technical advisor on conceptual design and operation.
- **Burlington County Landfill, NJ-** Funded project, technical advisor to county on design, operation, data collection for waste characterization, gas production, leachate quality and quantity, settlement and density.
- **GROWS Landfill, NJ-** Funded project collaborated with Geosynthetic Research Institute for monitoring of liner and within waste for temperature, leachate and gas quality. Leachate quantity and density measured.
- **Central Disposal, IA-** Funded and involved in conceptual design of bioreactor, innovative gas collection, leachate quality, quantity, gas quantity, quality, density and settlement.
- **McGill Landfill, MI-** Funded and involved in conceptual design of innovative method of leachate injection using horizontal blankets of 3 different materials-tire chips, glass cullet, and geonet. Results show more efficient and cheaper than horizontal trenches. Settlement and gas production being measured.
- **City of Dallas, TX-** Selected as Consultant to City of Dallas McCombs Landfill to assist in planning, design, and permitting as bioreactor landfill to increase gas generation, airspace, leachate recirculation, and alternate cap. Developed outline for evaluating geotechnical model for bioreactor slope stability and peer reviewed the geotechnical report.
- **City of Denton, TX-** Selected as consultant to City of Denton's landfill to assist in design, operation, and permitting of a bioreactor landfill for airspace, gas/energy generation, POTW biosolids management, and alternate cap.
- **Orchard Hills Landfill, IL-** Prepared initial evaluation of existing infrastructure, gas and leachate management systems for RDD application for IEPA. Provided sources of commercial/industrial liquid wastes that would be compatible with bioreactor operations in a 100 mile radius from the landfill.

- **Confidential Landfill:** Evaluate settlement, density, waste composition (15-20% biosolids by weight) leachate quality and quantity, and gas production data. Project objective was to determine if leachate recirculation practices resulted in characteristics of landfill acting as a bioreactor.
- **Advisor to :** Florida Solid and Hazardous Waste Research Center-advised New River aerobic bioreactor committee, Yolo County Bioreactor demonstration project, Swana Bioreactor committee (leader of maintaining bioreactor list of projects), Swana Research committee, Minnesota landfill operators group.
- **Peer Review Bioreactor Permit Application- Countryside LF, IL**
- **Prepare RD&D Permit Applications for 5 Illinois Landfills-** River Bend Prairie LF, Livingston LF, and Lee County LF, Countryside, and SIRL.
- **Develop Comments to Illinois Pollution Control Board to Assist IEPA in Promulgation of RD&D Regulations-** On behalf of Onyx Waste Services, provided substantial comments to the Pollution Control Board to streamline permit process for obtaining a Research, Development & Demonstration permit. IPCB responded favorably to all comments and recommended changes.
- **Demonstrate Innovative Leachate Treatment with Wetlands and Phytocaps-Assisted** with demonstration of suitability of constructed wetlands to treat leachate. Evaluation of new vertical wetlands for cost-savings and reduction of surface area requirements compared to standard wetlands. Vertical wetlands being demonstrated at several landfills, including for treatment of contaminated groundwater at remedial and superfund sites. Also demonstrating treating leachate from closed landfill by spray irrigating and injecting in planned phytocap. Plant species are being evaluated for uptake rates, etc.
- **Developed Geochemical Techniques for Determining Leachate Impacts to Groundwater-** Demonstrated and implemented the use of major cations and anions for evaluating Stiff plots and Piper diagrams for comparing leachate chemistry with groundwater quality. Conducted these analyses for over 200 landfills to determine if assessment monitoring is necessary.
- **Developed Organic Fingerprinting for Evaluating Landfill Impacts-** Demonstrated usefulness of organic “fingerprinting” for tracing VOC impacts from leachate at numerous solid, hazardous, and Superfund landfills. Technique was also used to determine location of source if on-site or determine if source is from off-site location.
- **Research on Leachate Quality Changes After Landfill Closure-** Evaluate leachate quality and quantity over time from 60 landfills in different climatic regimes to demonstrate degradation cycle of landfill. Grant from Environmental Industry Association research foundation obtained and results shared with USEPA. Data will help determine post-closure care periods.
- **Develop Guidance on Determining End of Post Closure Care for Subtitle D Landfills-** Through another research grant, developed conceptual model of determining when there is no longer a risk to the environment or human health for the four major components of post-closure care. The four components are leachate management, groundwater monitoring, gas monitoring, and cap maintenance. Data

are showing that risk-based approach is useful and that many landfills are safe well before 30 years of mandatory post-closure care.

- **Demonstration for Ending Post Closure Care for Pre-Subtitle D Landfills and Superfund Site-** Long term monitoring data for leachate, gas, settlement, waste analyses, groundwater, and gas probe monitoring for 2 landfills, (one is a Superfund site) are no longer a risk to the environment . Degradation cycles followed a first-order bio-decay process. Report submitted to States and EPA (for delisting of Superfund status) based on modeling potential impacts to groundwater and surface water. Decisions pending. Assisted with two other pre-subtitle D landfills where post-closure care was approved to be reduced by 90%.
- **Developed Data to Support Monitored Natural Attenuation Instead of Pump and Treatment of Contaminated Groundwater-** Several Superfund sites were shown to have naturally degraded the organics in the previous plume. Through isotopes and geochemical analyses, demonstrated that in-situ degradation was occurring and plume was shrinking. One site was allowed to eliminate existing pump and treatment system.
- **Manage Consortium of Hydrogeologic Consultants for Major Utility Company-** Responsible for the technical direction and peer review of major hydrogeologic, groundwater quality assessment, and corrective action that may lead to potential litigation for a major Midwest utility.
- **Used Innovative Groundwater Treatment Remedies-** Used 0 valent iron filings in lab and field to show de-halogenation of VOCs. Demonstration using glucose and yeast to change geochemistry and enhance natural biodegradation of VOCs at hazardous waste remedial site. Superfund landfill feasibility study and initial design approved for utilizing landfill as bioreactor to clean up groundwater plume. Contaminated groundwater will be injected back into the landfill and aerobically or anaerobically degrade VOCs by operating closed landfill as a bioreactor.

Conversion Technologies

- **Evaluation and Review of Conversion Technologies for Solid and Hazardous Waste.** Many states and public agencies desire alternative methods of disposing, treating, and converting waste to energy without incineration. Over 100 vendors of pyrolysis, gasification, plasma arc, and other treatment technologies have been evaluated for private and public concerns over the last 10 years. Some have been commercialized and found viable but 90 % of the vendors have not achieved commercialization. AE recently provided a detailed review of all vendors for a confidential client.
- **Technical Oversight and Permitting for New Gasification Technology-** AE is involved in consulting for a new company that is demonstrating an innovative gasification technology for unprocessed solid waste. A pilot plant was sited and test runs were evaluated.
- **Permitting and Pilot Testing of Plasma Arc Incinerator-** Assisted in permitting a pilot plasma arc system and evaluated test results at a hazardous waste site in New York.

Mr. Baker has conducted numerous workshops with 35 States and USEPA providing Training for Subtitle D groundwater monitoring programs, bioreactor landfill programs, and groundwater fingerprinting assessments.

Mr. Baker is an invited speaker for numerous environmental conferences for SWANA, Waste Tech, USEPA, International Phytoremediation, Association of Environmental Engineers, ASCE, and other national and international associations. Recently he was invited speaker for the National RCRA conference discussing post-closure care leachate characterization. Phytocaps were advocated at this conference by public solid waste agencies in agreement with his recommendations.

PROFESSIONAL ACTIVITIES

- National Ground Water Association
- Interstate Technology Research Cooperative- Initiated Alternate Landfill Technology Team to develop guidance document on alternate landfill caps, Bioreactor Guidance, Termination Post-Closure Care
- SWANA bioreactor committee and applied research foundation.
- EIA advisory board
- Governor's Groundwater Advisory Board-Illinois
- Advisor to Drinking Water Program-Florida
- Advisor to Hawaii DOH-Solid Waste Landfill Monitoring and groundwater protection
- Advisor to Florida Hazardous and Solid Waste Consortium
- Contributing Editor -Environmental Geology