



Behind the Numbers

Direct access to the people and information you need.

Summer 2017

The newsletter of REI Consultants, Inc., your full service environmental laboratory

BECKLEY, WV • ROANOKE, VA • STAUNTON, VA • MORGANTOWN, WV | 800.999.0105 | reiclabs.com

The Art of bioassay testing

State-of-the-art capabilities at REIC...

By Dr. James L. Hern, President & CEO



Toxicity evaluations or “bioassays” are a unique diagnostic science that employs a combination of chemistry, biology, and aquatic science combined with precise environmental control to provide a practical measurement of toxicity in effluents or water sources. These tests are conducted on living organisms in an effort to determine the synergistic effects of various and multiple substances when present in an aquatic environment.

There are two basic types of toxicity tests: Acute and Chronic. Acute tests are short-term tests that are typically performed on a single grab or composite sample to determine test organism survivability after 24 to 48 hours. Chronic tests are typically performed on samples collected from multiple events: usually three 24-hour composites collected at designated intervals, such as every other day. Test concentrations are renewed daily, and test organisms are fed daily.

Measurements include survivability and/or measurements such as a reduction in growth or reproduction. The most common test organisms include fathead minnow *Pimephales promelas*, and 3 species of daphnia (tiny crustaceans), *Ceriodaphnia dubia*, *Daphnia pulex*, and *Daphnia magna*.

Federal and state guidelines require all fish and daphnia test organisms to be less than 24 hours old at evaluation initiation for chronic tests, as well as for daphnia in acute tests. An obvious requirement is that these organisms not be stressed from handling or shipping and are of the proper required age.

REIC scientists believe the only way to guarantee the rigid requirements of age and health of test organisms is to raise them in-house in precisely controlled environments. If there is no internal control over the rearing or handling stresses, it is highly



Eggs for fathead minnows being raised in-house.

questionable that evaluations resulting from such organisms can guarantee proper age, consistent health, and organism quality.

Use of organisms supplied by external long distance providers should raise serious questions relative to the precision and accuracy required to render regulatory compliant and defensible toxicity evaluations. Although the rearing of organisms is a highly complex 24/7 operation, REIC believes it is vital to insuring the quality required by both regulatory agencies and clients for all acute and chronic toxicity evaluations.

Along with a fully functional aquatic organism rearing facility, all of REIC’s toxicity tests are performed in modern walk-in environmental chambers, which precisely control the lighting intensity, photoperiod, and temperature throughout the evaluation process.

REIC also performs complex Toxicity Identification Evaluations (TIE) and Toxicity Reduction Evaluations (TRE) for situations



Adult fathead minnow brood stock

Continued on Back

Also in this issue...

Acid Base Accounting...

Tim Keeney Rocks...

“Rock Solid” on Acid Base Accounting



The environmental and geotechnical issues associated with pyritic soil and rock exposed during civil construction and mining operations pose significant challenges to these industries. The negative environmental effects associated with the oxidation of pyritic minerals pursuant to the excavation of soils and overburdens in terms of the production of acid mine drainage (AMD) has been a major issue for nearly six decades. Conversely, the physicochemical processes associated with the oxidation of pyritic minerals has become a significant issue in civil construction as it relates to pyrite-induced heave, degradation of concrete and steel, and accelerated weathering as it affects strength and stability of rock and soil.

REIC has been evaluating the aspects of geochemical and geophysical problems resulting from excavated soils and overburdens for over 25 years and employs various technics of Acid-Base Accounting (ABA) procedures as the basis for deter-

Bioassay *(from page 1)*

with problematic effluents requiring identification of specific toxic components of the effluent.

We welcome anyone to visit our dedicated Biological-Aquatic Toxicity Facility, operated by an exemplary professional staff with more than 150 years of combined aquatic toxicity experience. We recognize that to perform the various toxicity evaluations in a scientifically responsible and regulatory compliant manner, many exhaustive and precise processes must be incorporated operationally.

So, when choosing your toxicity testing provider, don't hesitate to ask about these critical questions. Be assured REIC has the right answers.



The REIConnect™ web portal allows clients secure and efficient electronic access to their project data, final reports, invoices and chain of custody records. . Many REIC clients elect to go “paperless” and receive all reports electronically.

mining the presence of problematic levels of pyritic minerals. Fundamentally, ABA Methods accounts for projecting Potential Acidity resulting from the oxidation of Total %Sulfur and/or %Pyritic Sulfur against the Neutralization Potential of a geo-material to arrive at a Net Deficiency or Excess of Calcium Carbonate Equivalence.

Analyses by ABA have been expanded upon to include projected soil fertility for use of Geologic strata as topsoil substitutes for plant growth medium. Parameters typically include plant available Ca, Mg, P, and K, as well as pH, lime requirement, and Soluble Salts. Such analyses have been used with resounding success to many applications of Direct Seeding to Coal Refuse in Southern West Virginia. Additional physical analyses may include Slake Durability Index, used to evaluate competence of lithologic units for selected uses

REIC maintains the certifications to service most of the Mid-Atlantic Region including West Virginia, Virginia, Kentucky, Pennsylvania, and Ohio. Projects have included extensive operations that involve excavation and placement of millions of cubic yards of geologic strata resulting from surface mining and major highway construction operations. . The collective data resulting from these studies are reported in “Comprehensive Spreadsheet” Excel and pdf formats easily used by clients and their engineers.

Contact REIC's Geological Department to gain more insight into the geochemical and geophysical issues revolving around both large and small excavation projects and the environmentally responsible options for handling of these materials.

Tim Keeney rocks...



Meet Timothy A. Keeney, REIC's Research Soil Scientist/Manager, with 40 years' experience in geotechnical application of soil and rock analyses, including materials handling, revegetation and post-mining land use. Tim has degrees in agriculture from Potomac State College and WVU, and an MS degree in soil science from WVU.

Tim states, “I first worked with acid-base accounting in 1977 under Dr. Richard Meriwether Smith, innovator of the ABA concept, starting with research in the Alabama coal fields.” That's a lot of rock and dirt, and a lot of geo-chemical characterizations, that's passed through these hands in those 40 years!

Contact us:

Corporate Headquarters: 800-999-0105 • info@reiclabs.com
Roanoke Service Center: 540-777-1276 • Roanoke, VA
Shenandoah Service Center: 540-248-0183 • Verona, VA
Morgantown Service Center: 304-241-5861 • Morgantown, WV