Effluent Toxicity Identification Evaluation Services

When standard toxicity testing identifies a sample as being "toxic", the first question is often "**What is causing this toxicity?**" A toxicity identification evaluation (TIE) is an organized progression through a number of published methods, to isolate and identify the toxicity-causing agent.

Once the toxicity-causing agent is identified, toxicity reduction evaluation (TRE) addresses the "**How can we resolve this toxicity?**" question. TRE employs another set of recognized methods to determine the most efficient and effective method for reducing or neutralizing the toxic effect.

The three phases of a typical TIE/TRE program, developed by the U.S. EPA are:

Phase 1) Toxicant Characterization - Completion of toxicity test manipulations that can categorize the toxicants as cationic metals, non-polar organics, oxidants, substances whose toxicity is pH dependent, etc. as well as development of physical/chemical characteristics of the toxicant such as filterability, degradability, volatility and solubility.

Phase 2) Toxicant Identification - The major objective of this phase is to identify the suspected toxicants by isolating the non-toxic compounds from those associated with toxicity.

Phase 3) Toxicant Confirmation Procedures – These procedures are generic to all toxicants. When the results are collectively considered they provide a "weight of evidence" that the toxicant has been identified.

It has been our experience that, though the EPA has developed specific protocols for TIE/TRE investigations, most users of these protocols utilize them as a guide for evaluating toxicity problems. We approach the problem of effluent toxicity similar to how one would evaluate and solve any problem: through the review, assessment, and implementation of common sense investigative techniques.

Pollutech's experts are well experienced in the TIE/TRE process, having completed numerous investigations for a wide variety of effluents from municipal and industry sources including petrochemical, organic, inorganic, thermal electric, mining, food processing, and textile sources to name a few.

At typical Phase I TIE investigative study design is provided in the following figure:

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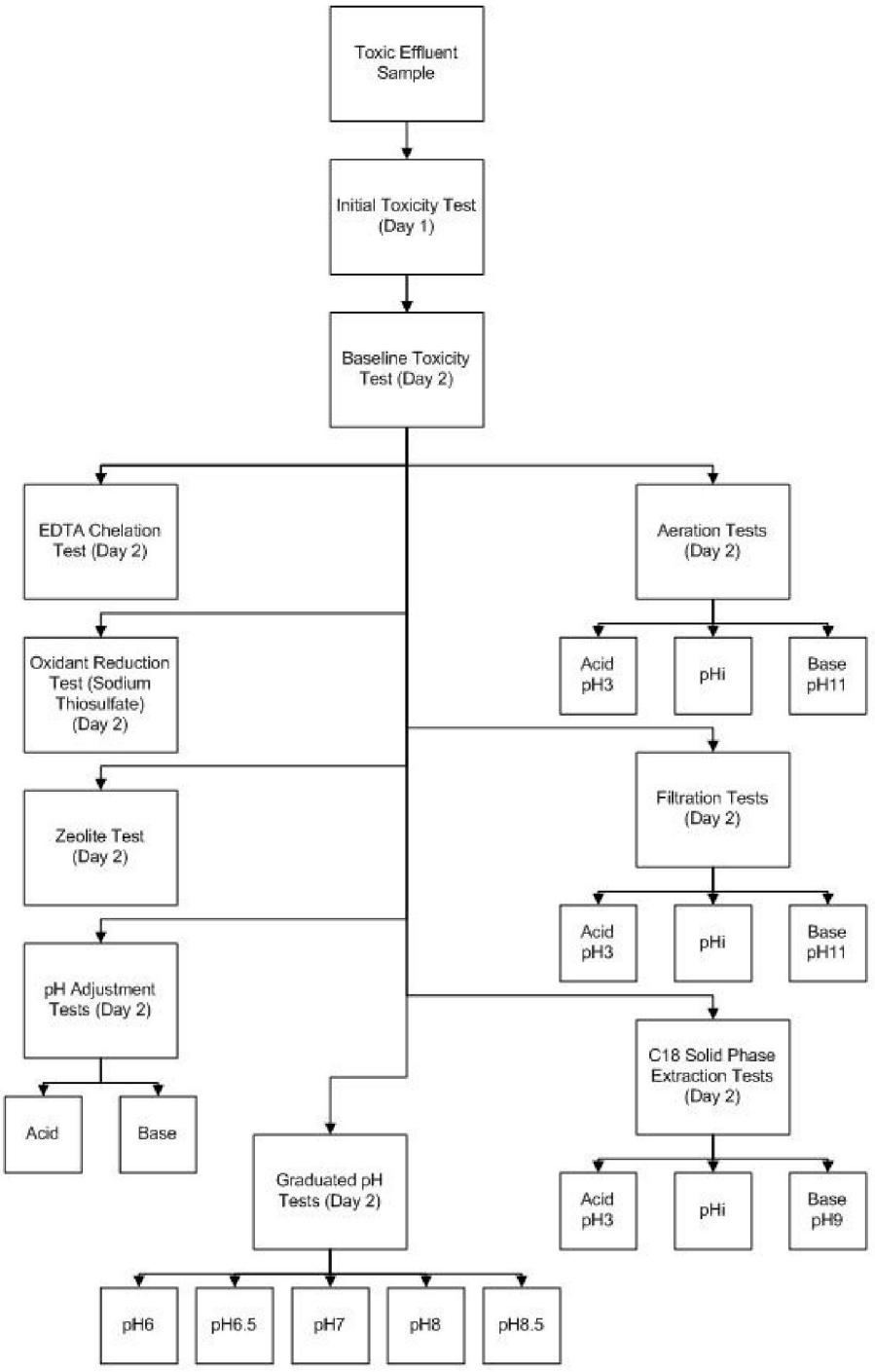
TIE Phase 1 Study Approach (Modified from "Methods for Aquatic Toxicity Identification Evaluations Phase 1 Toxicity Characterization Procedures" Second Edition, EPA/600/6-91/003 February 1991, Norberg-King et al)



Pollutech's ecotoxicity laboratory TIE/TRE skills along with our wastewater process engineering group are well suited and experienced to tackle any effluent toxicity issue from identification and source evaluation through to technical assessment of existing wastewater treatment facilities to achieve compliance. Each TIE/TRE evaluation is unique, and each expands our ability to effectively help our clients to solve their effluent toxicity compliance issue.

Examples of TIE/TRE investigative work completed by Pollutech are summarized as follows:

Industry Type	**Endpoint Response**	**Test Species**	**Toxicity-Causing Agent**
Gold Mine	Acute	*Ceriodaphnia*	Copper/Aluminium
Thermal Power	Acute	*Daphnia magna*	Dissolved metal and seasonal changes
Refinery	Acute	Rainbow Trout	Zinc
Organic Chemical	Acute	*Daphnia magna*	Very soft water low level metal toxicity
Hazardous Landfill Leachate	Acute	Rainbow Trout and *Daphnia magna*	pH sensitive Organic
Contaminated Sediment	Acute	Fathead Minnow & *Ceriodaphnia* on Pore water	Various Amine Compounds
Organic Chemical	Acute	*Daphnia magna*	Organic Metal Complex
Refinery	Acute	Rainbow Trout	Waste water polymer
Organic Chemical	Acute	Rainbow Trout	Surfactant
Textile	Acute	Rainbow Trout	Detergent
Textile	Acute/sublethal	Rainbow Trout	Organic Solvent
Refinery	Sublethal	Fathead Minnow	Nonyl Phenol
Textile	Acute	Rainbow Trout and *Daphnia magna*	High TDS for DM and organic compound for RT

Industry Type	Endpoint Response	Test Species	Toxicity-Causing Agent
CO_2 Production Facility	Acute	Rainbow Trout and *Daphnia magna*	Chlorine, Copper and Zinc
Gold Mine	Acute	Rainbow Trout and *Daphnia magna*	Copper
Organic Chemical	Acute	*Daphnia magna*	Low level chlorine
Refinery	Acute	Rainbow Trout	Toxicity non- reoccurring
Inorganic Chemical	Acute	Rainbow Trout and *Daphnia magna*	Cationic Metals and TRC
Refinery	Acute	Rainbow Trout	Zinc
Organic Chemical	Acute	*Daphnia magna*	Complex amine compound(s)
Organic Chemical	Acute	*Daphnia magna*	Metal
Organic Chemical	Acute	Rainbow Trout	Ammonia
Aquatic Sediments	Acute/Chronic	*Ceriodaphnia dubia*	Sediment pore water containing complex amine compounds
Polyethylene Pail Liners	Acute	Rainbow Trout	Sample collection bags leached an unknown contaminate into clients environmental samples
Organic Chemical	Acute	Rainbow Trout	Ammonia
Mining	Acute	Rainbow Trout	Third Party Review of Results and provision of study design
Refinery	Acute	Rainbow Trout	Hydrocarbon
Food Processor	Acute	Rainbow Trout and *Daphnia magna*	Oxidative compound – Chlorine/Bromine

Industry Type	Endpoint Response	Test Species	Toxicity-Causing Agent
Gas Separation Facility	Acute	*Daphnia magna*	Isocyanate compound
CO2 Facility	Acute	*Daphnia magna*	Oxidant
Hydroelectric	Acute	*Daphnia magna*	Metal
Hydroelectric	Acute	*Daphnia magna*	Metal/Organic complex
CO2 Facility	Acute/Chronic	*Ceriodaphnia dubia*	Oragnic amine and oxidant
Petrochemical	Acute	Rainbow Trout	Heavy hydrocarbon and/or potentially octyl/nonyl phenol complex
Petrochemical	Acute	Rainbow Trout	Organic acid complex
Municipal	Acute	Rainbow Trout	Ammonia and oxidant combination
Organic Chemical	Acute	*Daphnia magna*	Organic compound (?)
Petrochemical	Acute	Rainbow Trout	Overdose of Water Treatment Chemical
Hydroelectric	Acute	*Daphnia magna*	Inconclusive - Ongoing

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