United States Department of the Interior
U.S. Fish and Wildlife Service
2321 West Royal Palm Road, Suite 103
Phoenix, Arizona 85021
Telephone: (602) 242-0210 FAX: (602) 242-2513

AESO/EC December 24, 2003

Mr. Steve Pawlowski
Arizona Department of Environmental Quality
Mailcode: 5415A-1
1110 West Washington Street
Phoenix, Arizona 85007

Dear Mr. Pawlowski:

Thank you for providing the United States Fish and Wildlife Service (FWS) the opportunity to review and comment on the Arizona Department of Environmental Quality's (ADEQ) December 15, 2003, Narrative Toxics Implementation Procedure Flow Chart and Factors to Consider. The FWS supports the adoption of implementation procedure that protect human health and the public welfare, enhance the quality of water, and achieve a level of water quality that provides for the protection of fish, shellfish, and wildlife, for recreation in and on the water, for fish and wildlife consumption, and for the restoration and maintenance of the chemical, physical, and biological integrity of the surface waters and aquatic habitats of Arizona. We offer the following comments as technical assistance under Section 316 (a) of the Federal Water Pollution Control Act (Clean Water Act) (33 United States Code 1251 - 1376, as amended) and the Fish and Wildlife Coordination Act (16 United States Code 661 *et seq*.).

Ephemeral and intermittent waters are not well-suited for the disposal or isolation of toxic or radioactive materials. The behavior of water contaminants in ephemeral waters is driven by abiotic and biotic processes that determine the fate and effects of pollutants. Ephemeral streams are more likely to transfer runoff downstream than infiltrate based on their the lack of vegetation in the watershed and arid conditions (Smith et al. 1993). Diffuse sources of contaminants such as runoff from urban, industrial, and agricultural sites can be delivered by wet weather events and change their physical integrity. When contaminants are introduced into these ephemeral environments, ecosystem processes begin to influence the distribution and transport of the disposed chemicals. By their nature surface waters in arid lands have so little water that they are easy to over-pollute as they have little ability for dilution capacity; and biota that are adapted to arid conditions are attracted to it. To restore and maintain the biological integrity of Arizona's waters, aquatic life should be protected in all types of waters, wherever and whenever they are found.

Naturally temporal waters do select against species typical of perennial waters, but are not poor habitat for species adapted to the unique physical, chemical, and biological qualities of these waters. The scarcity of aquatic life, however, is not necessarily due to poor habitat, but rather that few species have the selective adaptations to take advantage of the abundance of high quality detrital foods and lack of competitors or predators found in temporary waters (Feminella 1996).

For example, despite their lack of an ability to fly, some crustaceans are well adapted for persisting in or colonizing ephemeral waters, including tadpole shrimp, clam shrimp, fairy shrimp, seed shrimp, waterfleas, and copepods (Belk 1978, Cole et al. 1996). Crustacean eggs can lay dormant in the bottom of ephemeral waters for years until they sense favorable conditions for hatching, a useful trait for repopulating ponds that periodically go dry. Repopulation of waters is also rapid. Studies have found over 60 animal species in ephemeral playas within 2 weeks of precipitation (Moorehead 1998, Smith et al.1993, Sublette and Sublette 1967). Amphibian species also can quickly emerge to mate, breed, and lay eggs in temporally available water. The eggs take only 2 days to hatch and the tadpoles can metamorph into juvenile toads in less than 2 weeks (Degenhardt et al. 1996; Newman 1989). Rapid development by native amphibian species maximizes the probability of completing development before a water dries. For example, studies in New Mexico show that amphibians have become more widely dispersed than fish because adults are terrestrial, and have replaced fish as top predators in temporary waters (Cole et al. 1996).

We encourage and support ADEQ's efforts to protect aquatic life and wildlife through the development of implementation procedures protective water of quality standards for a variety of Arizona's surface waters. Numeric aquatic life criteria were largely developed using the early life stages of fish that are not common in ephemeral and intermittent waters of Arizona. Pollution sensitivity is often ascribed to the early life stages of fish. This feature is not a unique characteristic of fish *per se*, but rather that researchers are able to test their sensitive early life stages so easily (Birge et al. 2000). The developing tadpole stages of amphibian species are just as sensitive, or more so, than are fish species; but they have been omitted from evaluation because they lack easy-to-apply and standardized test protocols (Sparling et al. 2000). It would be just as appropriate to include the early life stages of amphibians in the development of protective aquatic life criteria for ephemeral and intermittent streams. In a review paper comparing amphibian and fish sensitivity in metal and organic toxicity tests, Birge et al. (2000) generally found that amphibians are more sensitive than fish. For example, amphibians had lower LC_{50} values than fishes in 64% of all the tests.

While species found in Arizona are adapted to cope with many environmental changes, such as intermittent flow, high turbidity, fluctuating temperature, dissolved oxygen content, and salinity - these adaptations do not necessarily translate into an advantage during pollutant exposure. Such pollution tolerance should be demonstrated empirically in a realistic setting before allowing contaminants into the environment. Without laboratory and field data, the causes of amphibian and other freshwater species declines related to the toxic effects of chemicals cannot

be eliminated or prevented. Therefore, ADEQ's conservative approach in implementing the 113(E) rule and developing the Toxics Implementation Procedure is appropriate.

Specific Comments

Intermittent Discharge of ≥7 Days or More

We support the chronic WET test requirement for intermittent discharges over 7 days or more. The 7-day threshold is an appropriate conservative threshold because the chronic WET tests for fathead minnows and daphnia run for 7 days and native Couch's spadefoot toads (Scaphiopus couchii) complete their pre-metamorphic development in as little as 10 days (Tinsley and Tocque 1995, Mayhew 1965). Using a conservative number such as 7 days is appropriate in arid environments like Arizona because organisms begin to breed as soon as the water appears (Kingsley 1985). Invertebrates have developed a life strategy in arid environments to cope with cycles of drying and wetting - diapause (= an arrested development stage in which invertebrates wait until enough water is available to complete its development) (Simovich and Hathway 1997, Colburn 1984, Shmoller 1970). Due to its wide variety of habitats and fluctuating environmental conditions, Arizona has the greatest diversity of fairy shrimps in North America (Belk 1978).

Recurrence Interval of Less than 30 Days

We recommend that you use hydrological data to support your conclusion that a 1 million gallon per day discharge or greater requires 30 days for the streambed to dry. At our December 15, 2003 meeting, ADEQ stated that it had no empirical evidence to support this determination. After a quick literature search online, we were able to find the following citation, "Report on Quality of Watershed and Plot Data from the Southwest Rangeland Watershed Research Center" by K.G. Renard (1982). Perhaps data from studies like this will help you qualify the 30-day criteria.

Recurrence Interval of Less than 14 Days

We recommend using some hydrological data similar to that described above to support your decision for a recurrence interval of 14 days. We support the creation of conservative criteria to help determine whether chronic WET testing is necessary in effluent-dependent waters.

Thank you for the opportunity to comment on ADEQ's draft Toxics Implementation Procedures Flow Chart and Factors to Consider to Arizona's Water Quality Standards for Surface Waters. If

we can be of further service or answer questions, please contact Carrie Marr at (602) 242-0210, extension 214, or at the letterhead address.

Sincerely,

/s/ Steven L. Spangle
Field Supervisor

cc: John Kennedy, Habitat Branch, Arizona Game and Fish Department, Phoenix, AZ
Program Manager, United States Environmental Protection Agency, Water Division, Region 9, San Francisco, CA (Attn: D. Eberhardt)

W:\Carrie Marr\acutevchronicIP.wpd:cgg

References Cited

Belk, D. 1978. Zoogeography of the Arizona fairy shrimps (Crustacea: Anostraca). Journal of the Arizona Academy of Science 12(2):70-78.

Birge, W. J., A. G. Westerman, and J. A. Spromberg. 2000. Chapter 14a, pages 727-791 in D.W. Sparling, G. Linder, and C. A. Bishop (editors), Ecotoxicology of Amphibians and Reptiles. Society of Environmental Toxicology and Chemistry (SETAC) Press, Pensacola, FL.

Colburn, E.A. 1984. Diapause in a salt-tolerant desert caddisfly: The life cycle of Limnephilus assimilis (Trichoptera) in Death Valley. American Midland Naturalist 111(2):280-287.

Cole, R. A., M. R. Hatch, and P. R. Turner. 1996. Diversity of aquatic animals in New Mexico. New Mexico Journal of Science 36:79-100.

Degenhardt, W. G., C. W. Painter, and A. H. Price. 1996. Amphibians and Reptiles of New Mexico. University of New Mexico, Albuquerque, NM.

Feminella, J.W. 1996. Comparison of benthic macroinvertebrate assemblages in small streamsalong a gradient of flow permanence. Journal of the North American Benthological Society 15:651-669.

Kingsley, K.J. 1985. Eretes sticticus (L.) (Coleoptera: Dytiscidae): Life history observations and an account of a remarkable event of synchronous emigration from a temporary desert pond. Coleopterists Bulletin 39(1):7-10.

Mayhew, W. W. 1965. Adaptations of the amphibian, Scaphiopus couchii to desert conditions. American Midland Naturalist 74:95-109.

Moorehead, D. L., D. L. Hall, and M. R. Willig. 1998. Succession of macroinvertebrates in playas of the Southern High Plains, USA. Journal of the North American Benthological Society 17(4): 430-442.

Newman, R. A. 1989. Developmental Plasticity of Scaphiopus Couchii Tadpoles in an Unpredictable Environment. Ecology 70(6): 1775-1787.

Renard, K.G. 1982. Report on Quality of Watershed and Plot Data from the Southwest Rangeland Watershed Research Center. Johnson, C.W. , Farrell, D.A., and Blaisdell, F.W., *eds*. The Quality of Agricultural Research Service Watershed and Plot Data, Agricultural Research Service Agricultural Reviews and Manuals ARM-W-31, Oakland, California.

Shmoller, R.R. 1970. Terrestrial Desert Arthropods: Fauna and Ecology. The Biologist 52(3):77-98.

Simovich, M.A. and S.A. Hathaway. 1997. Diversified bet-hedging as a reproductive strategy of some ephemeral pool Anostracans (Branchiopoda). Journal of Crustacean Biology 17(1):38-44.

Smith, M A., J. L. Dodd, Q. D. Skinner, and J. D. Rodgers. 1993. Dynamics of vegetation along and adjacent to an ephemeral channel. Journal of Range Management 46:56-64.

Sparling, D. W., C. A. Bishop, and G. Linder. 2000. The current status of amphibian and reptile ecotoxicological research. Chapter 1, pages 1-13 in D.W. Sparling, G. Linder, and C. A. Bishop (editors), Ecotoxicology of Amphibians and Reptiles. SETAC Press, Pensacola, FL.

Sublette, J. E., and M. S. Sublette. 1967. The limnology of playa lakes on the Llano Estacado, New Mexico and Texas. The Southwestern Naturalist 12(4): 369-406.

Tinsley, R.C. and K. Tocque. 1995. The population dynamics of a desert anuran, Scaphiopus couchii. Australian Journal of Ecology 20(3):376-384.