

# **Report as of FY2006 for 2004AZ70G: "Pharmaceutically Active Compounds: Fate in Sludges and Biosolids Derived from Wastewater Treatment"**

## **Publications**

Project 2004AZ70G has resulted in no reported publications as of FY2006.

## **Report Follows**

## Progress Report

The two main objectives of this project are to (1) perform measurements of endocrine disrupting compounds (EDCs) and pharmaceutically active compounds (PhACs) in sludges/biosolids obtained at selected wastewater treatment plants using different sludge digestion processes and (2) examine the fate of biosolid-associated EDCs and PhACs in soils at land application sites receiving biosolids.

During the third year of the project, tasks performed to satisfy project objectives included the following:

1. Liquid and sludge/biosolid samples were obtained from four wastewater treatment plants in Arizona to compare EDC removal efficiencies by different treatment processes. Sampling points included influent, effluent, and digested sludges to support overall mass balance calculations at each treatment facility.
2. As part of the knowledge transfer objective of the project, PhD students from the environmental engineering program at the University of Arizona (UA) visited Edward Furlong's USGS laboratory to learn LC-MS and GC-MS analytical techniques for PhACs and EDCs. Two PhD students (Otakuye Conroy, Sondra Teske) visited in April 2006 for a one-week training session. During summer 2007, another PhD student (Bing Feng Dong) will receive similar training at the USGS lab and will assist with analysis of soil samples from a land application research field site near Tucson.
3. Leachate and soil samples obtained from three 1-m long stainless steel columns set up to simulate land application were sent to Dr. Furlong's laboratory for analysis of PhACs and EDCs. The analytical measurements at Dr. Furlong's laboratory were conducted in part by the graduate students from UA in April 2006. The analytical measurement work is ongoing.
4. A new focus was made on the emerging contaminant polybrominated diphenyl ether (PBDE). The fate of PBDEs has been examined during conventional wastewater treatment in trickling filter and activated sludge facilities, effluent polishing during soil aquifer treatment, and biosolid application onto agricultural land research sites in Arizona and Washington State.
5. A second comparison of sample extraction techniques (microwave assisted extraction, MAE; accelerated solvent extraction, ASE) is underway. A series of digested sludge samples were extracted using both procedures and are being analyzed for 21 PhACs and 61 wastewater compounds using liquid chromatography-mass spectroscopy (LC-MS) and gas chromatography-mass spectroscopy (GC-MS) at Edward Furlong's USGS laboratory in Denver, Colorado. In addition, parallel work is underway at UA to measure estrogenic activity on all extracts. A peer-reviewed Technical Note will be prepared summarizing results of the comparison.

**Planned Activities:**

During the final few months of the study, planned activities include:

1. Data analysis including mass balance calculations on contaminant flux rates at the Ina Rd wastewater treatment plant (activated sludge process).
2. Analysis of soil samples from a local land application site for a suite of organic wastewater contaminants. A UA graduate student will conduct this work during a visit this summer to the USGS analytical laboratory in Denver under the direction of Ed Furlong.
3. Compilation of analytical results to support conclusions on efficacy of wastewater treatment unit processes and land application practices for attenuation of solid-bound PhACs and EDCs.
4. Preparation of final project report.