



INVESTIGATOR'S ANNUAL REPORT

United States Department of the Interior

National Park Service

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Reporting Year: 2012	Park: Bandelier NM	Select the type of permit this report addresses: Scientific Study	
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Study Title (maximum 300 characters): PCBs Found in Precipitation near Los Alamos National Laboratory			
Park-assigned Study or Activity #: BAND-12997	Park-assigned Permit #: BAND-2012-SCI-0011	Permit Start Date: Jan 01, 2012	Permit Expiration Date: Dec 31, 2012
Scientific Study Starting Date: Jan 01, 2008		Estimated Scientific Study Ending Date: Dec 31, 2015	
For either a Scientific Study or a Science Education Activity, the status is: Continuing		For a Scientific Study that is completed, please check each of the following that applies: <input type="checkbox"/> A final report has been provided to the park or will be provided to the park within the next two years <input type="checkbox"/> Copies of field notes, data files, photos, or other study records, as agreed, have been provided to the park <input type="checkbox"/> All collected and retained specimens have been cataloged into the NPS catalog system and NPS has processed loan agreements as needed	
Activity Type: Monitoring			
Subject/Discipline: Air Quality			

Purpose of Scientific Study or Science Education Activity during the reporting year (maximum 4000 characters):

OBJECTIVES/HYPOTHESES TO BE TESTED

What are the ranges of concentrations of total PCB and PCB congeners found in precipitation in Northern New Mexico? Based on available literature, are these ranges higher or lower than those found elsewhere in the United States. The null hypothesis is that the levels of PCBs in precipitation in New Mexico are the same as those reported for other locations in the United States.

Abstract

PCBs are ubiquitous in the environment. With the advent of lower detection limits for PCBs it has become apparent that there is a widely distributed PCB signature in environmental media throughout the world. A significant and widespread problem with using EPA Method 1668, a high resolution gas chromatography/high resolution mass spectrometry (HRGC/HRMS) analytical method, is the presence of detectable background levels of PCBs in environmental samples.

Background PCBs are derived from the global reservoir of PCBs, transported atmospherically, and deposited in sediments and water bodies on a regional scale. Baseline PCBs can be attributed to local, non-LANL sources. Understanding background and baseline concentrations of PCBs is critical to isolating LANL's contribution to PCBs in storm water. This study will determine PCB concentrations in precipitation at a background location and will be compared to those found downwind from LANL and other locations world-wide.

OVERVIEW

PCB concentrations in precipitation vary widely and are often associated with local source terms that provide PCBs to the atmosphere through volatilization and suspension of PCBs adsorbed to particles. There is substantial uncertainty about the concentrations that may be present in rainfall in the area around LANL. Understanding the potential contributions from rainfall will be important to understanding background and baseline concentrations in storm water runoff. Therefore, precipitation as rainfall and snow will be sampled as part of this study.

Statement of issue

It is recognized that additional data are needed to determine the regional distribution of PCBs and to support mitigation and assessment of contaminated sites relative to the New Mexico Water quality Control Commission PCB water quality standards and the requirements of LANL's Individual Storm Water Permit. The objective of this study is to determine background and baseline concentrations of PCBs in precipitation. Background PCBs are derived from the global reservoir of PCBs and transported atmospherically as a gas, aerosol, or adsorbed to organic and inorganic particulates and deposited in terrestrial sediments and water bodies on a regional scale. Baseline PCBs can be attributed to local, non-LANL sources. Background and baseline concentrations are important to isolating and understanding LANL's contribution to PCBs in storm waters.

Scope of study

Data from the proposed precipitation sampling at Bandelier (upwind from LANL) will be used in conjunction with data collected at the Los Alamos County Airport to evaluate differences, if any, and to determine background concentrations of PCBs in area precipitation.

Intended use of results

The New Mexico Water Quality Control Commission (WQCC) standards for total PCBs in water are 0.64 ng/L (0.64 parts per trillion) for the Human Health Standard and 14 ng/L for the Wildlife Habitat Standard. The recently issued EPA NPDES Individual Permit for LANL requires monitoring for PCBs in storm water. Target Action Levels for the IP are 0.64 ng/L.

The total PCB and congener data collected at Bandelier will be used along with snowpack data to determine a range of concentrations expected in precipitation in Northern New Mexico. This range of PCB in precipitation may be used to help determine what portion of the PCBs found in storm water at LANL is due to background contributions and what LANL may ultimately be responsible for.

Findings and status of Scientific Study (including collections made and catalog status of retained specimens and retained material originating from such specimens) or accomplishments of Science Education Activity during the reporting year (maximum 4000 characters):

Two precipitation samples were collected in 2012 on August 20, 2012 and September 17, 2012. Total PCB (blank corrected) was found in the August 20 sample was 240 pg/L and in the September 17 sample was 130 pg/L.

A final report, "Polychlorinated Biphenyls in Precipitation and Storm Water in the Upper Rio grande Watershed" was published in May 2012 and the following is an excerpt from the report:

4.1 Precipitation and Snowpack

Precipitation delivers a diffuse source of PCBs to the landscape throughout northern New Mexico. As with radioactive fallout, PCBs are found globally in the atmosphere and periodically are rained out to the ground. A starting point in evaluating baseline PCB concentrations in northern New Mexico surface waters is quantifying PCB levels in precipitation.

PCBs in Precipitation and Stormwater within the Upper Rio Grande Watershed

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A total of 34 precipitation events were sampled at two stations near Los Alamos. Sampling stations were located near the fire-lookout tower above the visitor's center of the Bandelier National Monument and at the Los Alamos County Airport. In addition, 12 snowpack samples were collected from nine peaks located along mountain ranges bordering the Rio Grande corridor between Albuquerque and Taos, near the Colorado-New Mexico border (Figure 7).

4.1.1 Variation of Baseline PCB Concentrations in Precipitation and Snowpack

The concentrations of total PCBs in precipitation and snowpack samples are illustrated in Figure 8 in box plot form and are summarized in Table 2. The precipitation total PCB concentrations ranged from 0.0 ng/L to 0.60 ng/L (Bandelier median: 0.12 ng/L; Los Alamos County Airport median: 0.14 ng/L).

Concentrations in snowpack samples ranged from 0.003 ng/L to 0.65 ng/L (median: 0.14 ng/L). One PCB precipitation sample result (4.04 ng/L) was removed from the Bandelier data set because it was an extreme outlier based on the Dixon test ($p < 0.01$) when compared with other Bandelier precipitation results and with a paired result obtained at the Los Alamos County Airport for the same event. Detected

PCB concentrations in precipitation and snowpack samples that were slightly skewed appear to be derived either from a normal or gamma distribution (see probability plots in Appendix C). The results for the precipitation samples were nearly identical to those for the snowpack samples. Los Alamos-area precipitation PCB concentrations were statistically indistinguishable from those measured in snowpack samples collected from high elevation locations throughout northern New Mexico (WMW test, $p = 0.24$). Similarly, total PCB concentrations in Bandelier precipitation samples were indistinguishable from those measured at the Los Alamos County Airport (WMW test, $p = 0.493$). All but 1 of the 34 precipitation and snowpack samples were below the New Mexico human health WQC of 0.64 ng/L, and all were below the wildlife habitat WQC of 14 ng/L.

The results show the distribution of total PCB concentrations in precipitation and snowpack samples is relatively uniform throughout northern New Mexico. The consistency in results across the region indicates that local sources of atmospheric PCBs have limited regional impacts. The two largest PCB concentrations measured in snowpack were collected at Sandia Crest and probably demonstrate higher urban contributions from Albuquerque (population approximately 500,000). For the other snowpack sites, however, Figure 9 shows no clear relation between PCB concentrations and population sizes. For example, snowpack samples collected in the mountains above and predominantly upwind of Taos (population approximately 5700) contained larger average PCB concentrations than those collected above and upwind of Santa Fe (population approximately 75,000).

For Scientific Studies (not Science Education Activities), were any specimens collected and removed from the park but not destroyed during analysis?

No

Funding specifically used in this park this reporting year that was provided by NPS (enter dollar amount):
0

Funding specifically used in this park this reporting year that was provided by all other sources (enter dollar amount):
5000

List any other U.S. Government Agencies supporting this study or activity and the funding each provided this reporting year:

For Scientific Studies (not Science Education Activities), were any specimens collected and removed from the park but not destroyed during analysis?

No

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