

Supporting material for

**A Review of Passive Sampling Systems for Ambient Air Mercury  
Measurements**

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## **FLUENT Simulation**

FLUENT was used to simulate the concentrations profile with species transport model in 2-D around a box sampler designed by Lyman et al. (2010) with a bucket to protect the sampler from precipitation and wind speed influence. The bulk concentration was  $4.23 \times 10^{-14}$  g-Hg/g-air (50 pg  $\text{m}^{-3}$ ) and the coverage was set to  $1 \times 10^{-6}$ . Detail information is listed below.

### **Species**

Diffusivity:  $9 \times 10^{-6} \text{ m}^2 \text{ s}^{-1}$  ( $\text{Hg}^0$ )

Species Mass Fraction:  $4.23 \times 10^{-14}$  (GOM)

### **Velocity Inlet**

Temperature [K]: 300

Velocity Magnitude [ $\text{m s}^{-1}$ ]: 1, 3, 5

Turbulence Intensity [%]: 2

### **Outlet Vent**

Gauge Pressure [Pa]: 0

Backflow Total Temperature [K]: 300

Backflow Turbulence Intensity [%]: 0.01

### **Viscous Model Settings**

Viscous Model: SST k- $\omega$  with default constants (2D)

Model Options: Shear flow corrections

Table SI 1 – brief information of the handling processes before the samples deployment and analytical methods after samples collection

	Handling processes	Analytical methods	References
Gold stock solution	Fill with 10 or 20 mL reagent Resin sampler exterior with dilute acid, DI water, and methanol Store in double zip bags until sampling	Cold-vapor atomic absorption spectrophotometry Inductively couple plasma-mass spectrometry (ICP-MS)	<sup>1</sup>
Gold and silver surfaces	Blank the surfaces before use	Samples were thermally desorbed and analyzed by cold vapor atomic fluorescence spectroscopy	<sup>2-7</sup>
Cation-exchange membranes	None	Samples were soaked in DI water, digested with BrCl, and analyzed followed by EPA Method 1631E	<sup>3, 7-11</sup>
Water and acidified water	None	Samples were digested with BrCl and analyzed followed by EPA Method 1631E	<sup>3, 4, 12-14</sup>
Sulfur-impegnated carbon	None	Samples were analyzed by the Direct Mercury Analyzer (DMA-80)	<sup>15</sup>

Table SI 1 – Meteorological data (mean (standard deviation)) for case study during sampling period (4/14/2009 – 5/24/2009)

Date ending	Temp (°C)	SR (kWh/m <sup>2</sup> )*	RH (%)*	precip (mm)*	WD (SD) (°)	WS (m/s)	Sigma Theta
04/22/2009	10.5 (5.0)	8.3 (0.3)	31.7 (10.1)	0.0	334.9 (68.5)	2.3 (0.9)	27.0 (6.3)
04/29/2009	7.6 (3.9)	6.3 (2.1)	47.6 (18.0)	8.9	307.6 (49.1)	4.2 (1.4)	18.2 (6.1)
05/06/2009	13.4 (2.9)	5.7 (2.0)	55.0 (12.5)	21.5	38.9 (49.1)	4.4 (1.8)	19.4 (5.5)
05/13/2009	12.3 (2.4)	8.8 (0.3)	31.4 (7.0)	4.8	296.8 (26.4)	3.5 (1.4)	24.5 (4.5)
05/20/2009	18.3 (3.7)	8.5 (1.0)	27.0 (10.8)	0.0	355.2 (46.5)	3.8 (1.9)	22.8 (8.9)
05/27/2009	17.4 (1.4)	7.9 (1.2)	30.4 (9.9)	4.3	349.1 (13.8)	2.5 (0.5)	26.6 (2.1)

\*data collected from Morey Creek

Temp- temperature

SR- solar radiation

RH- relative humidity

precip- precipitation

WD- wind direction

SD- standard deviation

WS- wind speed

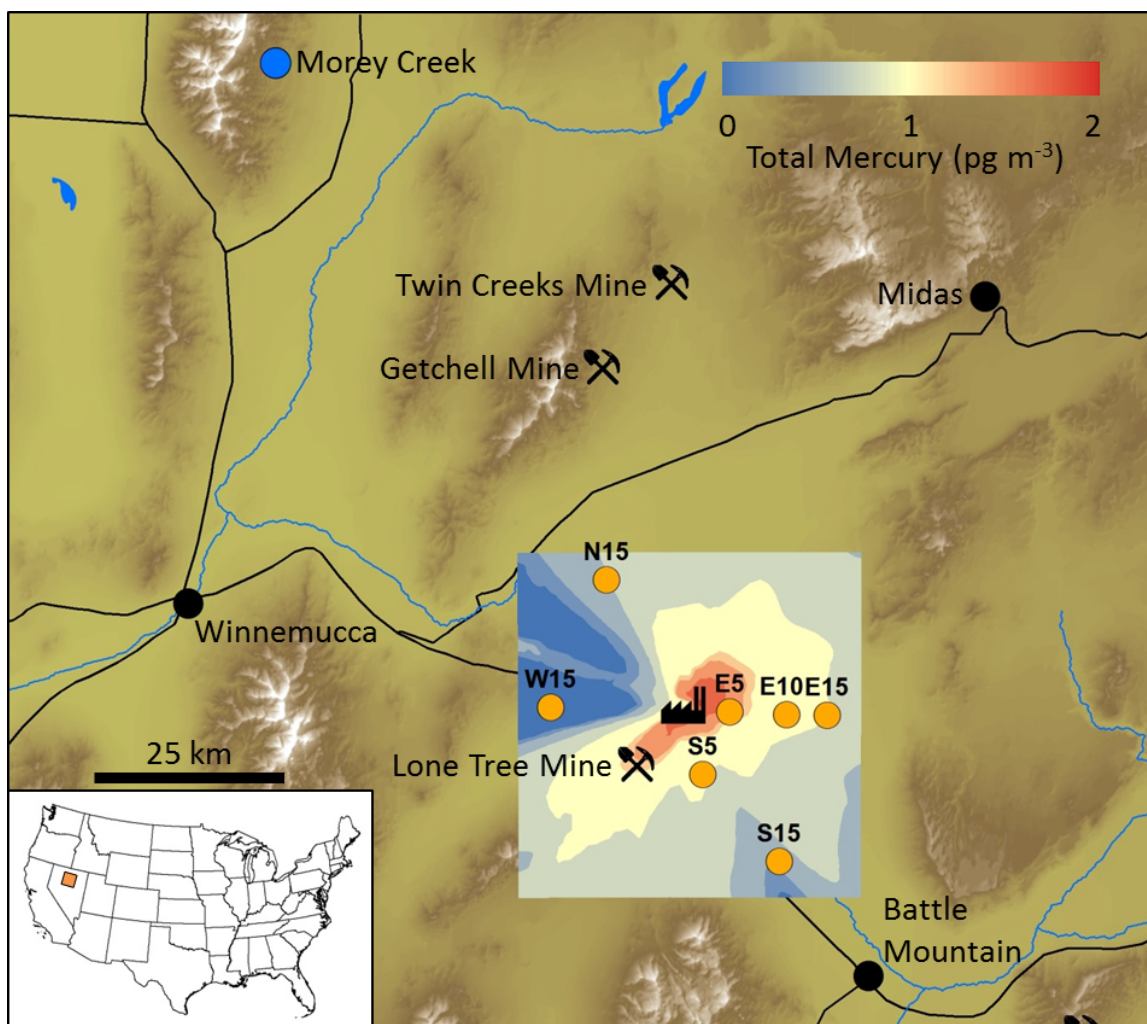


Figure SI 1 – Site map for case study, the coal-fired power plant was the building located in the center of the map, and orange dots represent the site locations. Results of AERMOD based on the meteorological data (4/14/2009 – 5/24/2009) and emission profiles.



Figure SI 2 – Deployment of three Hg passive samplers.

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