

Evaluation of Off-site Soil Sampling Analytical Results for the  
EQ North Carolina Facility, Apex, NC

11/17/06

Initial sampling of off-site soils for areas potentially affected by environmental contaminants related to the fire at the EQ North Carolina facility in Apex, North Carolina was completed on Oct. 23, 2006. A total of 37 samples were collected by Division of Waste Management personnel.

Chemical analyses of the soil samples indicate the presence of a limited number of inorganic and organic compounds at concentrations that exceed their North Carolina Soil Screening Level (SSL), the United States Environmental Protection Agency (EPA) Region 9 Preliminary Remediation Goals for Residential Soil, or the EPA Region 4 Preliminary Remediation Goals for Residential Soil. These include:

- > Inorganics (Metals)
  - o Arsenic
  - o Cadmium
  - o Chromium
  - o Manganese
  - o Mercury
  - o Silver
- > Organics
  - o Tetrachloroethene (PCE)
  - o Bromodichloromethane
  - o Benzo(a)anthracene
  - o Benzo(a)pyrene
  - o Benzo(b)fluoranthacene
  - o Dibenzo[a,h]anthracene/Indeno(1,2,3,c,d)pyrene

North Carolina Soil Screening Levels are calculated to be protective of groundwater. They reflect the levels for each chemical at which the chemical would have the potential to migrate through the soil and contaminate groundwater. The Soil Screening Levels are calculated by multiplying the North Carolina groundwater standards by soil fate and transport factors. EPA Region 9 Residential Soil Preliminary Remediation Goals (PRGs) are levels in soil protective of human health based on typical homeowner exposure to soil. They are calculated for a residential exposure of 350 days/year for 30 years. The EPA Region 4 PRG for arsenic is based on a noncancer endpoint and is protective of childhood exposure scenarios.

Inorganics (Metals)

Arsenic

Arsenic was detected in all samples analyzed at concentrations ranging from 0.738 mg/Kg to 35.90 mg/Kg. All but one of these samples is below the EPA Region 4 residential soil PRG of 20 mg/Kg for childhood exposure to arsenic in

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soil. The mean concentration of arsenic for all samples is 4.3 mg/Kg. According to the North Carolina Geological Survey, background concentrations of arsenic for parent materials in the Apex area are on the order of 1 -2 mg/Kg. However, these values may be more indicative of deeper materials than the surface soils sampled for the current investigation. Published background arsenic data from the US EPA for soils nationwide give a range of 1 - 93.2 mg/Kg. All of the arsenic concentrations identified by this sampling event are within the stated EPA "naturally occurring" range.

Mapping of the arsenic concentrations indicates that arsenic is widely distributed across the entire area sampled. The overall distribution of arsenic does not suggest dispersal from a point source centered on the EQ facility. The one sample showing an exceedance of the Region 4 PRG was taken from soil next to a residential deck made of treated lumber, a known source of arsenic. The wide distribution of arsenic may also be related to past application of agricultural pesticides.

### Mercury

Mercury was detected in 36 of the 37 collected soil samples at concentrations exceeding the 0.015 mg/Kg SSL. None of the samples contained mercury at levels exceeding the 23.0 mg/Kg Region 9 PRG. Detected concentrations of mercury ranged from 0.016 mg/Kg to 0.107 mg/Kg with a mean value of 0.033mg/Kg. Published background mercury data from the US EPA for soils nationwide give a range of 0.02 - 1.5 mg/Kg. All of the mercury concentrations identified by this sampling event are within the stated EPA "naturally occurring" range.

Mapping of the mercury concentrations indicates that mercury is widely distributed across the entire area sampled. Several "hotspots" were identified, but the overall distribution of mercury does not suggest dispersal from a point source centered on the EQ facility. The highest concentration of mercury detected is associated with a sampling location at which auto maintenance/storage has occurred. Mercury is contained in many components of automobiles such as trunk, hood, and vanity lighting switches, anti-lock braking systems, high intensity headlamps, and dashboard displays. Changes or damage to these items, such as those that can occur in auto maintenance work, can result in releases of mercury. The wide distribution of mercury may also be related to regional air emissions, residuals from lighting or industrial components, or to past application of agricultural and residential fungicides.

### Manganese

Manganese was detected in 19 of the 37 soil samples at concentrations exceeding the 65.2 mg/Kg SSL. None of the samples contained manganese at levels exceeding the 1,800.0 mg/Kg Region 9 PRG. Detected concentrations of manganese ranged from 16.0 mg/Kg to 264.0 mg/Kg with a mean value of 103.4 mg/Kg. Published background manganese data from the US EPA for soils

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nationwide give a range of 20 - 3,000 mg/Kg. All of the manganese concentrations identified by this sampling event are within the stated EPA "naturally occurring" range.

Manganese appears to be widely distributed across the sampled area. The overall distribution does not suggest dispersal from a point source centered on the EQ facility. Manganese is a major weathering product from the chemical breakdown of rock-forming minerals. Manganese staining in the form of manganese hydroxide is common in rocks throughout the Piedmont of North Carolina. The widespread distribution of manganese in the collected soil samples suggests that the detected concentrations result from natural processes.

### Silver

Silver was detected in 36 of the 37 soil samples at concentrations exceeding the 0.217 mg/Kg SSL. None of the samples contained silver at levels exceeding the 390.0 mg/Kg Region 9 Residential PRG. Detected concentrations of silver ranged from 0.148 mg/Kg to 2.1 mg/Kg with a mean value of 0.363 mg/Kg.

Silver appears to be widely distributed across the sampled area. The overall distribution does not suggest dispersal from a point source centered on the EQ facility. The source of the silver detected may be related to industrial/manufacturing activities, metals reclamation operations, or possible meteorological experimentation.

### Other Metals

Chromium was also detected at concentrations exceeding the North Carolina SSL at three locations and cadmium was detected at concentrations exceeding the SSL at two separate locations. However, the distributions of these metals do not indicate their origin from a point source associated with the EQ facility.

### Organics

#### Volatile Organic Compounds (VOCs)

Tetrachloroethene (PERC) was detected at a concentration above the North Carolina SSL in one sampling location and bromodichloromethane was detected at a concentration exceeding the SSL at a separate location. Neither exceeded the EPA Region 9 Residential PRG. Other VOCs, generally associated with petroleum fuels or plasticizers, were also detected at levels below screening levels.

The overall distribution of VOCs does not suggest that they originated from a point source associated with the EQ facility.

#### Semi-volatile Organic Compounds (SVOCs)

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Semi-volatile organic compounds, primarily polynuclear aromatic hydrocarbons (PAHs), were detected at three sampling locations at concentrations exceeding their EPA Region 9 Residential PRG. These included:

- Benzo(a)pyrene -2 locations
- Benzo(b)fluoranthene -1 location
- Dibenzo[a,h]anthracene -3 location
- Indeno(1,2,3,c,d)pyrene -3 locations

Detected concentrations of PAHs also demonstrate exceedances of the North Carolina SSL at the same sampling locations for:

- Benzo(a)anthracene -2 locations
- Benzo(a)pyrene -3 locations
- Dibenzo(a,h)anthracene -3 locations

The distribution of PAHs is inconclusive with regard to source. PAHs are common components of fuel oils and lubricants, asphaltic surfacing and roofing compounds, and as products of incomplete combustion of these products. The samples demonstrating regulatory exceedances in soils are located in a general downwind direction from the EQ facility. However, there are other potential sources (i.e. automotive repair, landscape activities) for PAHs at each of the sampling sites. Additional sampling may be warranted to clarify the distribution and potential source(s) of these compounds.

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Summary

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Evaluation of the spatial distribution of the observed inorganic compounds (metals) does not appear to show a pattern consistent with deposition originating from a point source associated with the EQ North Carolina facility.

Evaluation of the spatial distribution of the observed volatile organic compounds (VOCs) does not appear to show a pattern consistent with deposition originating from a point source associated with the EQ North Carolina facility.

The distribution of semi-volatile organic compounds (SVOCs), primarily polynuclear aromatic hydrocarbons (PAHs), is inconclusive with regard to source. The samples demonstrating regulatory exceedances in soils are located in a general downwind direction from the EQ facility. However, there are other potential sources (i.e. automotive repair, landscape activities) for PAHs at each of the sampling sites. Additional sampling may be warranted to clarify the distribution and potential source(s) of these compounds.

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The area surrounding the facility is served by a public water supply (City of Apex). Some private wells may possibly be present within the study area.

It should also be noted that comparison of analytical results from the ash residues collected at the facility with the analytical results from off-site soil samples do not appear to indicate a strong correlation between residue compounds observed at the facility and those observed in the off-site soil samples.