

Ambient and Indoor Sampling for Public Health Evaluations for areas near WTC  
DRAFT ATSDR/DHAC Version 4, October 2, 2001

**I. Introduction:**

The collapse of the World Trade Center (WTC) buildings resulted in a large number of residents being evacuated from their homes. Until DATE, residents were not allowed to re-enter their homes in south Battery Park City (from West Thames Street and south, west of Broadway) or north of Chambers Street up through Canal Street, west of Broadway. Currently areas south of Chambers Street and north of West Thames Street, west of Broadway remain restricted; however, it is anticipated that residents will soon be allowed to move back into their homes. To date, non-rescue, recovery, and removal environmental sampling efforts have focused on commercial buildings to ensure the safety of worker occupants. It is now appropriate and necessary to ensure that residential areas are not adversely impacted by WTC collapse-related materials. In addition, additional environmental sampling is needed to ensure that ongoing WTC removal activities do not result in off-site migration of site-related material at levels of potential public health concern.

Surface dust and debris containing <1-4% asbestos has been found in lower Manhattan. Asbestos has been detected in personal air samples of "hot-zone" workers. In addition, low levels of asbestos have been detected in air samples collected on the "hot-zone" perimeter. Crystalline silica quartz has been detected in some of the 30 settled dust samples collected by NIOSH. Although most samples contained less than 5%, some samples contained from 15-20% crystalline silica quartz. Non-detectable levels of crystalline silica have been found in the few personal air samples analyzed to date. Dust, bulk, and air samples ("hot-zone"), as well as surface runoff water, river sediment, and river water have been analyzed for other contaminants, including metals, PAHs, dioxins and PCBs. The low levels of these contaminants found do not indicate an immediate need to conduct widespread environmental testing for them.

Materials surface dust that may be of more immediate health concern—especially to residents who are returning to lower Manhattan—are those that may cause eye, nose, and throat irritation. Materials that can be inhaled or respired from airborne dust may cause respiratory irritation and may cause exacerbation of pre-existing problems such as asthma, emphysema, and cardiopulmonary disease. Analysis of residential surface and airborne dust, both indoors and outdoors, is necessary to determine 1) if residents are being exposed to materials that may be of public health concern; and 2) the best methods of cleaning up the dust both inside and outside residences.

Information from a local south Battery Park resident supports the need to assess indoor and outdoor environmental health issues. Burning throats are a common problems in the recently re-occupied residential areas. Residents in south Battery Park, who left windows open prior to the WTC collapse, have settled dust in their homes. Some have disposed of furniture, stereo equipment, etc., because they were covered with "ash and dust." Homes in the Tribeca zone (Chambers Street to Murray Street, west of Broadway) are not yet occupied, but were reported to have roofs covered with hand-sized chunks of insulation-like material that contain small pieces

of mica-like material. In addition, the mica-like material has clogged roof drains and resulted in standing pools of water on residential roof tops. Finally, streets are periodically swept (HEPA vacuum trucks) and wetted (water trucks). However, the resident and others have reported constantly swirling dust throughout the area.

## **II. Sampling Objective:**

The overall objective of this sampling is to provide results that will begin to characterize the ambient and indoor airborne and potentially airborne particles (surface dust) that remain in residential areas of lower Manhattan from the collapse of the World Trade Center that will allow a public health interpretation of the data.

Specific Objectives, in order of priority are:

1. Characterize the make-up and size distribution of both settled and airborne breathing zone dust in residential areas—both indoors and outside—closest to the WTC. This information will be used to determine if materials are present at levels of public health concern; the best methods for cleaning/removing the materials; and the best methods to prevent/minimize future material track-in into residential areas.
2. Characterize the make-up and size distribution of both settled and airborne breathing zone dust in other residential areas—both indoors and outside—located further from the WTC, but still impacted by debris and dust from the collapse. For example, modeling the debris/dust impact areas may indicate residential areas more than ten blocks away were affected, as debris and dust from the collapse were forced along street arteries [EPA's ERT is attempting to determine if this modeling is possible]. Impact areas further from the site of collapse may have dust/debris with a different composition than what settled closer to the WTC. This information will be used to determine if materials are present at levels of public health concern; the best methods for cleaning/removing the materials; and the best methods to prevent future material track-in into residential areas.
3. Re-characterize a selected number of areas throughout the WTC cleanup to ensure that removal operations are not impacting area residents, cleaning methods remain effective, and exterior material track-in is not occurring.

## **III. Data and Quality Assurance:**

## **IV. Sampling Parameters:**

| Parameter                                                                                          | Environmental Media | Indoor/Outdoor | Rationale for Selection                                                                                                                                               |
|----------------------------------------------------------------------------------------------------|---------------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Asbestos                                                                                           | air, dust           | I/O            | known use in building construction, evidence of presence in early air sampling and in settled dust, known inhalation carcinogen                                       |
| Total Suspended particulates                                                                       | air                 | O              | Characterize amount of airborne dust that is inhalable $\leq 100 \mu\text{m}$ aerodynamic diameter                                                                    |
| PM10 and PM2.5                                                                                     | air                 | O              | Characterize the amount of airborne dust that is respirable                                                                                                           |
| Inhalable ( $<100\mu\text{m}$ )<br>thoracic ( $<10\mu\text{m}$ )<br>respirable ( $<4\mu\text{m}$ ) | air                 | I/O            | To determine relative amounts of each that are, present, and to have each fraction analyzed for silica, gypsum, asbestos to qualitatively determine potential hazards |
| Respirable crystalline silica                                                                      | air                 | I/O            | Known component of concrete, evidence of Presence in some settled dust samples, known inhalation carcinogen                                                           |
| pH                                                                                                 | dust                | I/O            | Concrete has a high pH, if dust has a high pH, it may be contributing to reported symptoms of ENT irritation                                                          |
| gypsum, mica, dust<br>calcite                                                                      |                     | I/O            | Associated with building materials (concrete, drywall) and known to be irritating to ENT                                                                              |
| magnesium                                                                                          | dust                | I/O            | May act as a tracer for WTC-related dust, levels found in metals analysis of settled dust from 16,000-29,000 ppm                                                      |



## **V. Residence Selection/Sampling Rationale**

The selection of priority residential areas should be decided upon by NYC DOH or the agency of their choosing, or by someone else on the scene with the concurrence of NYC DOH. Selection needs to be based on worst-case scenario(s) first, which will likely involve a visual determination (e.g., visible dust in lobby area, broken windows, dust along roadways and sidewalks).

Worst-case residential areas would include:

- A. Occupied and unoccupied residential areas closest to the WTC with visible exterior dust/fallout material
- B. Residential areas further from the WTC, where debris fallout may be tracked indoors
- C. Residential areas where Search/Rescue/Removal vehicles have spread dust that may be tracked indoors

Once residences are selected, then sampling can be pursued. If results of sampling in worst-case locations indicate no contaminants or respirable particle of present at levels of health concern, then residential sampling should be considered on a case-by-case basis (e.g., citizen complaint followed by a visual inspection).

If results in worst-case locations show indoor contamination/materials present at levels of concern, a thorough cleaning (these instructions need to be developed) should follow and the locations should be re-sampled. If the post-cleaning round of sampling indicates successful cleaning, then prior to sampling any additional residential locations (e.g., residential areas that also meet "worst case" or those on the tier below "worst case") a thorough cleaning should be conducted prior to any sampling. If post-sampling confirms that contaminants are below levels of health concern, then as other residential areas are cleaned, post-cleaning sampling should occur periodically as a quality assurance check of cleaning effectiveness.

It should be noted that contaminant/materials of concern may vary as the distance of the residence increases from the WTC. Therefore, an effective cleaning regime at one location may need to be modified for another location.

If results in worst-case locations show outdoor contamination/materials present at levels of concern, efforts should be made to reduce these levels and take steps that eliminate transporting them indoors (e.g., reduce contaminant track in by removing or changing shoes prior to entering residence, use HEPA filters on HVAC systems, inspect/change HVAC filters frequently).

## **VI. Sampling Approach:**

### **1. Interior**

Air and dust sampling should focus on common/high traffic areas of the building (e.g., lobbies, front entryways) and in a selected number of apartment units where visible dust is and is not reported. These first 2 areas should also be representative of worst case conditions for contaminant/material track-in from outdoors and of fallout deposition. Selecting apartments in the same building should provide information the ranges found in indoor living spaces.

If the building is unoccupied, aggressive (leaf blower, high-power fan) indoor air sampling should be conducted. If the building is occupied, air sampling should be conducted with the building HVAC system in continuous operation. After sampling is completed, filters for the HVAC system, if applicable, should be inspected. If dust is present, recommend filter replacement.

Indoor air sampling will be conducted for: asbestos (NIOSH 7400 and, if an action level is exceeded, NIOSH 7402), PCMe), respirable crystalline silica (NIOSH 7500), and inhalable, thoracic, and respirable airborne particulate matter for fraction analyses of silica, gypsum, mica, etc. (IOM sampler).

Indoor floor dust sampling will be conducted for asbestos (via TEM as the detection limit for PLM is 1%); for silica, gypsum, mica (XRD); and for magnesium (EPA Method#). Floor dust sampling will be conducted using EPA's Environmental Response Team (ERT) SOP for household dust collection. Any deviations from the SOP in actual field collection will be documented by the sampling team.

## 2. Exterior

Air and settled dust sampling should occur in a grid pattern in residential areas.

Ambient air sampling will be conducted at breathing height for: asbestos (NIOSH 7400 and, if an action level is exceeded, NIOSH 7402), PCMe ), respirable silica (NIOSH 7500), and inhalable, thoracic, and respirable airborne particulate matter for fraction analyses of silica, gypsum, mica, etc. (IOM sampler). In addition, 24-hour real-time TSP, PM10 and PM 2.5 sampling will be conducted—again at breathing zone height.

Settled dust samples will be collected and analyzed for asbestos (via TEM as the detection limit for PLM is 1%); for silica, gypsum, and mica (XRD); and for magnesium (EPA Method #).



Sample/Analytical Methods

| <u>Parameter</u>                                            | <u>Environmental Media</u> | <u>Indoor/Outdoor</u> | <u>Sampling/Analytical Method</u>                                                                                  |
|-------------------------------------------------------------|----------------------------|-----------------------|--------------------------------------------------------------------------------------------------------------------|
| Asbestos                                                    | air                        | I/O                   | NIOSH 7400, NIOSH 7402<br>Breathing zone sample height                                                             |
| Total Suspended Particulates                                | air                        | O                     | EPA Method # (continuous realtime)<br>Breathing zone sample height                                                 |
| PM10 and PM2.5                                              | air                        | O                     | EPA Method # (continuous real-time)<br>Breathing zone sample height                                                |
| Inhalable (<100µm)<br>thoracic (<10µm)<br>respirable (<4µm) | air                        | I/O                   | IOM personal sampler. Analyze each fraction for asbestos, (TEM), and for crystalline silica, gypsum (other?) (XRD) |
| Respirable crystalline silica                               | air                        | I/O                   | NIOSH 7500                                                                                                         |
| pH                                                          | dust                       | I/O                   | Method? ASTM?                                                                                                      |
| gypsum, mica, dust<br>calcite                               |                            | I/O                   | XRD                                                                                                                |
| magnesium                                                   | dust                       | I/O                   | EPA Method ##                                                                                                      |

8

4-2 person teams \$25 PLC  
\$60 TEM EMSL \$2500-\$3600

1 hi vol =

IOM = SKC, Inc.

personal

cyclone

bulk sample

**VII. Action Levels:**

Action levels will be developed for silica and PM in air; and for asbestos in vacuum dust and outdoor surface dust samples.

**VIII. Using Mg as a tracer:**

In an attempt to determine if dust is related to the WTC, it is proposed that magnesium be analyzed in the indoor and outdoor dust samples. Outdoor dust samples analyzed for metals by EPA have shown magnesium levels from 16,000-29,000 ppm. NIOSH has reported similar results.

Magnesium has not been found in ambient or occupational air samples collected to date. Therefore, surface dust sampling analysis for magnesium may assist in whether the areas sampled have been impacted with dust deposited by the WTC event. Evaluating trends between distance and direction from the WTC and dust levels of magnesium, along with crystalline silica and other analytes, may assist making the determining that an area has NOT been impacted.

**IX. Interference from existing bldg materials:**

It is anticipated that some of the contaminants/materials found in residential sampling will be un-related to the WTC event. Attempts will be made during sample collection to note other possible sources of contaminants.

**X. Sample Description Needs:**

In order to interpret results, the following information should accompany each area sampled:

1. Reason for selection of site for sampling (e.g., apartment had windows open during WTC event; visible dust present in ambient air adjacent to apartment building)
2. Description of sample location
  - Physical address
  - Apartment/floor number
  - Side of building (N, S, E, W)
  - Main entryway
3. For indoor sample locations, provide the following:
  - Has area been cleaned since WTC event?
  - If so, description of cleaning
    - wet mopping
    - dusting
    - sweeping (Broom, vacuum, HEPA vacuum)
    - carpets washed
  - Is visible dust present?
  - If so, describe
4. For entryway sampling locations (e.g., lobbies)
  - Is there evidence of dust track-in from outdoors
  - Same questions as #3
5. For outdoor sampling, provide the following:
  - Location of samples relative to main entryways of residential buildings
  - Side of building (N, S, E, W)
  - Location of samples relative to roadways
  - Is visible dust present (air, surfaces)
  - If so, describe
6. Description of HVAC system
  - Single or multi-unit system (if multi-unit, how many?)
  - Location of HVAC air handling unit (e.g., in each unit, on roof-top)
  - Description of conditions around HVAC air handling unit (e.g., heavy dust, no apparent dust)
  - Filter type (e.g., electrostatic)
  - Filter condition (visible dust present?)
  - Has it been in use since the WTC event?
    - If so, is it recirculating air or drawing from the outside?

ATSDR\_DHAC\_wtc residential sampling outline.wpd rec'd 9/25/01 from

>>> "Wilder, Lynn" <lxw2@cdc.gov> 09/25/01 02:28PM >>>

The attached are ATSDR/DHAC concepts on how to approach investigation the indoor contaminant issue from the WTC incident. We look forward to working with you on developing this plan and resolving this public health issue.

Lynn Wilder

<<wtc residential sampling outline.wpd>>

Recommendations for Sampling Buildings with Residential Use--CONCEPTS for use near WTC  
DRAFT ATSDR/DHAC Version 1, Sept 25, 2001

#### I. Focus/Priorities of sampling

The selection of priority residential areas should be decided upon by NYC DOH, or by someone else on the scene with the concurrence of NYCDOH. Selection needs to be based on worst-case scenario(s) first, which will likely involve a visual determination (e.g., visible dust in lobby area, broken windows, dust along roadways and sidewalks). Likely worst-case residential areas would seem to be:

- A. Residential areas closest (adjacent) to the WTC
- B. Residential areas where contaminant track-in from debris fallout or from Search/Rescue/Removal vehicles have spread dust

Once a few worst-case areas have been selected, then the suggested sampling approach (see II) can be pursued. If results of sampling in worst-case locations indicate no contaminants present at levels of health concern, then residential sampling should be considered only on a case-by-case basis (e.g., citizen complaint followed by a visual inspection).

If results in worst-case locations show contaminants at levels of concern, a thorough cleaning (these instructions need to be developed) should follow and the locations should be re-sampled. If the post-cleaning round of sampling indicates successful remediation, then prior to sampling any additional residential locations (e.g., residential areas that also meet "worst case" or those on the tier below "worst case") a thorough cleaning should be conducted. If post-sampling confirms that contaminants are below levels of health concern, then as other residential areas are cleaned, post-cleaning sampling should only occur periodically as a quality assurance check of cleaning effectiveness.

#### II. Sampling Approach

ATSDR suggests that sampling should focus on asbestos (PCM and PCMe), respirable silica, and inhalable and respirable airborne particulate matter (TSP, PM10, and PM2.5). Sampling should focus on common/high traffic areas of the building (e.g., lobbies, front entryways). These areas should also be representative of worst case conditions for contaminant track-in.

If the building is unoccupied, aggressive indoor air sampling should be conducted. If the building is occupied, air sampling should be conducted with the building HVAC system in continuous operation.

Floor dust sampling should be conducted using EPA's Environmental Response Team (ERT) SOP (HEPA vacuum). Location of sample and area sampled are required information to be collected. Samples should be analyzed for asbestos (via TEM as the detection limit for PLM is 1%); and respirable silica.

#### III. Action Levels

Action levels will be developed for silica, PM, and vacuum dust samples. A format similar to the "ATSDR/CDC Asbestos Air Action Levels for World Trade Center Response" is anticipated.