Damage Assessment
130 Liberty Street Property

Report Date: December 2003

WTC Dust Signature Report
Metals and Organics

Summary Report

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1.0 Summary

The World Trade Center destruction commencing on September 11, 2001 ("WTC Event") physically destroyed significant portions of the interior and exterior of the building located at 130 Liberty Street, New York, NY (the "Building"). A gash was created in the north side of the Building; the plaza in front of the Building was crushed which exposed the Level A and Level B Basement areas and the first floor; approximately 1,500 windows were broken; and the Building was exposed to the elements as well as being filled with a combination of soot, dust, dirt, debris, and contaminants. For a period of time following the WTC Event, the Building owner, Deutsche Bank Trust Company Americas (the "Bank"), was precluded by the City of New York from entering the Building. After the Bank gained access to the Building, the Bank retained the services of engineering firms to assess the physical damage. Additionally, an environmental firm was retained to conduct limited sampling for asbestos, heavy metals, and biological contaminants.

In April of 2002, RJ Lee Group was retained by the law firm of Pitney Hardin Kipp & Szuch LLP, on behalf of the Bank, to oversee and investigate the presence, type, amount, and extent of environmental contaminants in the Building and to recommend remediation strategies. The findings set forth in this report are based upon RJ Lee Group's review of the results of its own extensive set of analyses, its background, experience, and education in this area, as well as its study of recognized scientific literature.

1.1 Investigation

The collapse of a major building can produce significant quantities of dust and debris comprised of the construction materials and the contents of the building. Fires in commercial office buildings can produce combustion products including soot, partially combusted aerosolized particles and organic vapors. The amounts and portions of the various products of combustion will depend upon the source materials, the combustion temperatures, the availability of oxygen and other oxidants, the duration of the fires, and other factors. The WTC disaster uniquely combined several cataclysmic destructive processes in a single event. This report evaluates the features of the WTC Dust and WTC Hazardous Substances deposited in the Building as a result of the collapse, ground impact, fires, pressure forces, and other phenomena arising from the WTC Event.

As a result of this investigation, it was determined that WTC Dust contains various solid phases that include asbestos and minerals, metals and mercury, organic pollutants and particles of various sizes and different morphological characteristics. The distinctive composition, solid phases, and unique morphological features have allowed for the development of a "WTC Dust Signature": dust containing particles that, when occurring together, can be considered to act as identifying source tracers. The WTC Dust Signature can be compared with dusts of unknown provenance using conventional source apportionment methodologies, forensic tags derived from microscopic observations, or statistical analysis. These techniques are a scientifically recognized methodology used to determine source impact by comparing dust from an unknown source to reference source signatures. In this case, the dust of unknown origin can be compared to the WTC Dust Signature to determine what component or fraction of the material is the result of the WTC Event.

To evaluate the validity of the WTC Dust Signature as a unique identifier, dust samples were collected from a number of representative office buildings, "Background Buildings", in typical urban locations including Midtown Manhattan, New York City, NY, Washington, D.C., Pittsburgh and Philadelphia, PA, and Florham Park, NJ. See RJ Lee Group "Background Levels in Buildings" report. Additionally, dust samples collected from the New York City area collected and analyzed prior to 9/11/2001 were reevaluated. The pre-WTC Event samples, collected in the spring of 2000, included materials from both the interiors of the World Trade Center Towers as well as exterior samples, taken in close proximity to the Towers. The Background Building samples and the pre-WTC Event samples were compared to known WTC Dust for the forensic evaluation, using the source apportionment methodologies to determine the extent of the WTC Dust impact.

This WTC Dust evaluation represents the most extensive microscopic investigation related to WTC Dust ever performed. Over 400,000 particles were classified using SEM techniques with approximately 80,000 images collected.

Numerous Contamination Reports demonstrated that the Building is pervasively contaminated with WTC Dust. A more detailed analysis of WTC Dust in the Building, revealed the presence of WTC Dust Markers such as gypsum, mineral wool, chrysotile, iron spheres and vesicular carbonaceous particles, as well as, heavy metals including mercury, and organics. This report will focus on the metallic and organic contamination of the WTC Dust.

1.2 Testing Protocol

Samples were collected from the Building beginning June 08, 2002 using "TP-01: Protocol for the Monitoring of Non-Biological Indoor Environmental Contaminants at 130 Liberty Street" dated May 10, 2002. Samples were also collected from Background Buildings beginning February 04, 2003 using the general guidelines of Testing Protocol 01, Interior Spaces. Sampling kits were taken to each predetermined location for sampling. Sampling kits, each containing media for eight samples, were taken to each predetermined grid location for sampling. Each kit contained:

- Asbestos Wipe
- Silica Microvac
- Metals Wipe
- Mercury Wipe
- Dust Lift
- PNAs Wipe
- PCBs Wipe
- Dioxins/Furans Wipe

The sample location selection procedures involved and a summary of the statistical analysis are set forth in the Addenda. The test protocols set forth the complete methodology and a detailed discussion of sampling design, and statistical analysis are contained in the Insurance Claim Report dated May 2003, Volume III: Statistical Analysis.

- Samples were analyzed using industry standard analytical laboratory methods as follows:
- Samples were analyzed for asbestos using transmission electron microscopy (TEM) in accordance with ASTM D-5755.
- Samples were analyzed for metals in accordance with NIOSH 7300 method, using inductively coupled argon plasma (ICP) spectrometry.
- Samples were analyzed for mercury in accordance with EPA Method SW 846 7471A, using cold vapor atomic absorption (CVAA).
- Samples were analyzed for PCBs in accordance with EPA Method SW 846 8082 using gas chromatography with electron capture detectors (GC/ECD).
- Samples were analyzed for PNAs in accordance with EPA Method SW 846 8270C using gas chromatography with mass spectrometry (GC/MS).
- Samples were analyzed for dioxins/furans in accordance with EPA Method SW 846 8290 using gas chromatography with high-resolution mass spectrometry (GC/HRMS).

- Samples were analyzed for particle characteristics using scanning electron microscopy (SEM), coupled with energy dispersive spectroscopy (EDS) techniques.
- Samples were analyzed for silica using X-ray Diffraction (XRD) in accordance with NIOSH 7500 and NIOSH 0600 methods.

1.3 Findings

As stated in other reports, WTC Dust consists of a unique mixture of mineral wool, gypsum, cement dust, glass shards, asbestos, and high temperature combustion products. A WTC Dust Signature has been developed from the examination of samples of WTC Dust collected from the Building and other buildings in the vicinity of the WTC using a combination of microscopic and chemical analyses. The WTC Dust Signature is shown in **Figure 1**.

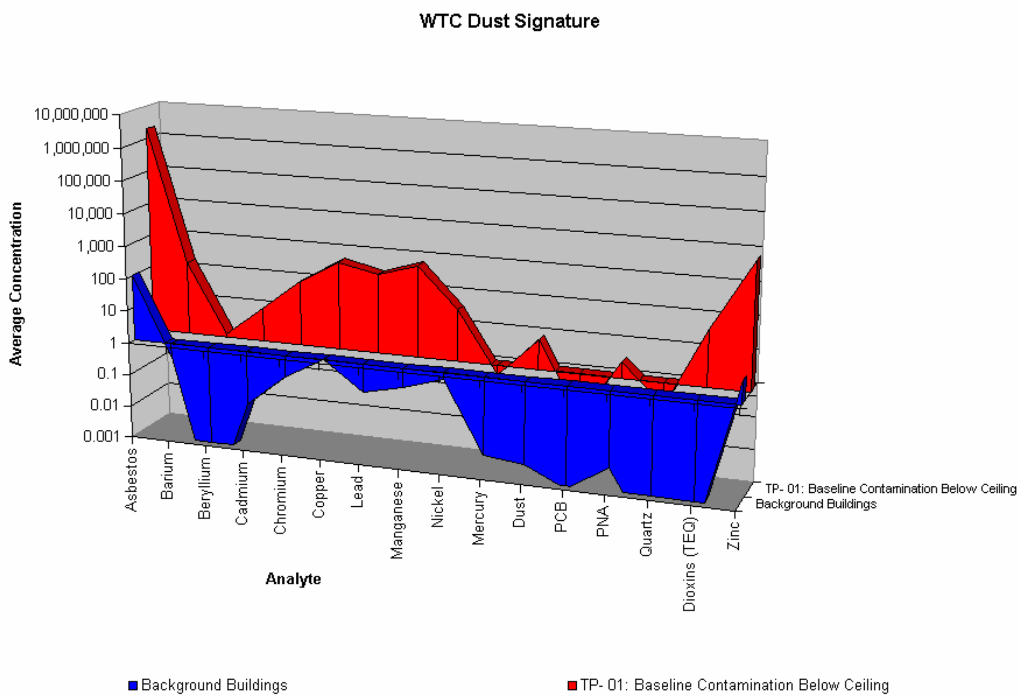

Figure 1. WTC Dust Signature (TP-01) compared to Background Buildings

Comparison of the composition from "Baseline" Interior Spaces (TP-01) with samples of dust collected from the Background Buildings revealed a composition pattern or "signature" that permits the reliable identification of WTC Dust. The signature is based on a pattern of the presence and concentrations of multiple components, not on a single component.

The overall conclusions reached in this report regarding the metal and organic contamination of WTC Dust of the Building are as follows:

- WTC Dust contained concentrations of metals and organics that were many times higher than corresponding concentrations in the Background Buildings.
- WTC Dust contains a set of metals and organics at concentrations that exhibited strong statistical correlations among themselves. This correlation pattern supports the contention that the WTC Event is the source of the contamination.
- WTC Dust can be identified using a combination of tracers to define a WTC source signature. Dust with this signature was observed throughout the Building.
- WTC Dust can be differentiated from normal building dust on the basis of its unique composition.
- The presence of WTC Dust in a sample of building dust can be established using conventional forensic and statistical methodology with a high degree of scientific certainty.

2.0 Levels and Distribution of Contaminated WTC Dust

2.1 Unique Features

Ten elements were selected for the evaluation of the Building. The relative amount of the various metals observed in WTC Dust, their toxicity, the degree to which the metals are characteristic of WTC Dust and their differences from normal building dust or natural atmospheric dust were considered in this evaluation.

Metals such as lead, cadmium, and mercury were present in concentrations much higher in the Building than the concentrations observed in the Background Buildings. Metals were vaporized at the WTC during the WTC Event and either deposited on WTC Dust or deposited directly onto surfaces in the Building.

The presence of organic compounds including PCB's and PNA's was also found to contribute to characteristic WTC Dust. These toxic compounds were detected in dust from the Building at levels many times higher than that in background buildings. The following can be stated with scientific certainty:

- Concentrations of metals and organic compounds are higher in WTC Dust than in dust evaluated from background buildings.
- Concentrations of metals and organic compounds are correlated at a statistically significant level in WTC Dust.
- Concentrations of metals and organic compounds are not randomly distributed in the Building.

The high level of correlation among the components of WTC Dust indicates that their presence is not due to incidental random occurrence. The analytical and statistical results confirm that the WTC Dust has a single source, the WTC Event.

Table 1 lists, by analyte, the average concentrations, maximum concentration, and number of samples for comparison of WTC Dust and Background Building dust and shows the results of an unpaired t-test assuming unequal variance. The concentrations of the analytes show a distinct difference between WTC Dust collected in the Building and dust from the Background Buildings. In all cases, the concentrations of the analytes are significantly higher in WTC Dust than in the Background Building samples.

Table 1. Average Concentrations of Analytes at the Building (below ceiling) and in Background Buildings.

	130 Liberty			Background Buildings			Statistical Difference
Analyte	Average	Maximum	Count	Average	Maximum	Count	Two-tailed p-value (by ave)
Barium (µg/ft^2)	231	12,000	1,627	0.356	3.10	32	<0.01
Beryllium (µg/ft^2)	1.2	56.7	1,627	0	0	32	<0.01
Cadmium (µg/ft^2)	25.8	8,530	1,627	0.022	0.383	32	<0.01
Chromium (µg/ft^2)	153	11,800	1,627	0.226	1.61	32	<0.01
Copper (µg/ft^2)	758	84,400	1,627	1.01	5.05	32	<0.01
Lead (µg/ft^2)	420	15,000	1,627	0.134	2.53	32	<0.01
Manganese (µg/ft^2)	705	38,400	1,627	0.253	2.73	32	<0.01
Mercury (µg/ft^2)	1.32	58.7	1,600	0.004	0.038	32	<0.01
Nickel (µg/ft^2)	47	4,110	1,627	0.22	3.45	32	<0.01
Zinc (µg/ft^2)	24,020	14,400,000	1,627	4.77	21	32	<0.01
PCB (ug/100 cm^2)	0.053	10.6	1,691	0.00085	0.015	32	<0.01
PNA (µg/100 cm^2)	3.1	248.9	1,703	0.00482	0.125	32	<0.01
TEQ (pg/100cm^2)	56.4	2,954	1,722	0.00007	0.0009	32	<0.01

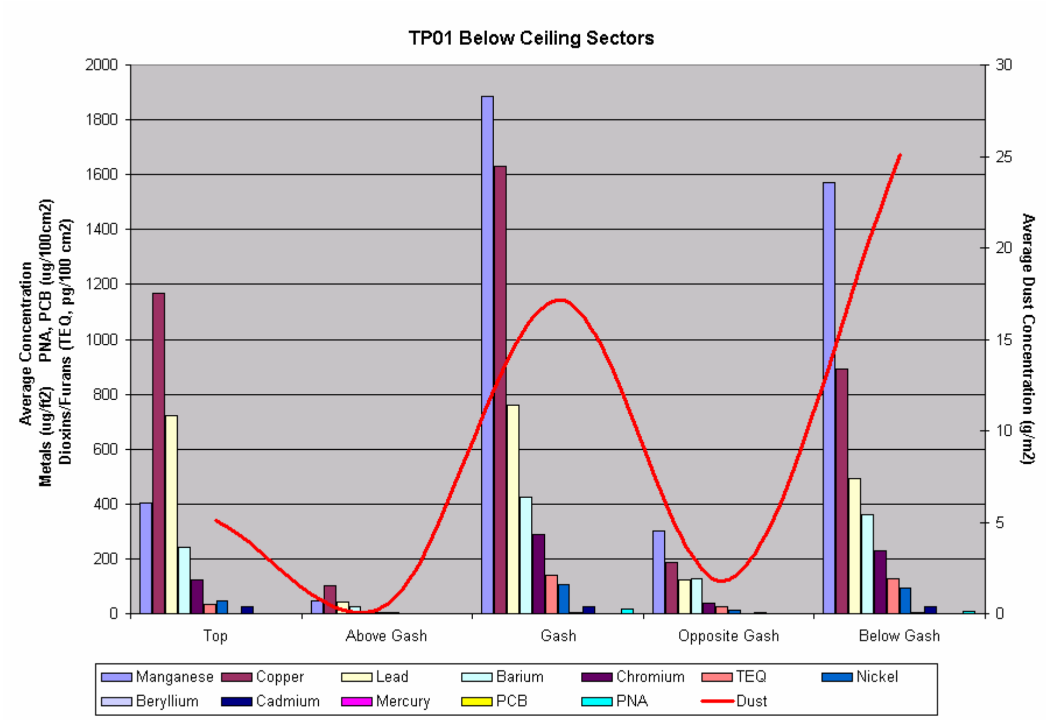

Figure 2. Metals, Dust, and Organic contaminant surface concentrations from the TP-01 below-ceiling wipe samples by Building sector

Figure 2 presents the average surface concentrations of metals and organic contaminants by sectors of the building for wipe samples that were obtained at below ceiling locations as sampled following the TP-01 interior spaces protocol. Dust loading concentrations (right axis) were overlayed with the metals and organic surface data. These data illustrate the positive relationship between the dust mass per unit area and surface contamination for the noted analytes.

Table 2 illustrates the correlations for comparisons between TP-01 (Below Ceiling) analytes, and **Table 3** reflects the same information between Background Buildings. These matrices illustrate the highly correlated nature of the contaminants in the Building and the absence of such correlations in the background buildings. The correlation coefficients are shown in the matrix. For ease of comparison, the contaminants, which are correlated at the greater than 95 % confidence level, are shown in green. Values approaching one indicate a higher degree of correlation. It is apparent that the data provided in these matrices indicate that the WTC Dust and dust in background buildings are composed of two distinctly different populations.

It is this strong correlation among the contaminants that makes the relative concentrations shown in **Figure 1** have predictive value.

Table 2. Correlation Coefficients for TP-01 (Below Ceiling) Analytes* in the Building.

	Asbestos	Barium	Beryllium	Cadmium	Chromium	Copper	Dust	Lead	Manganese	Mercury	Nickel	PCB	PNA	Quartz	TEQ
Asbestos	-														
Barium	0.6674	-													
Beryllium	0.6321	0.7519	-												
Cadmium	0.6911	0.8475	0.7514	-											
Chromium	0.7644	0.8388	0.9120	0.8616	-										
Copper	0.6982	0.8216	0.8334	0.8613	0.9367	-									
Dust	0.6962	0.6069	0.7359	0.5103	0.7517	0.6539	-								
Lead	0.5241	0.7858	0.7875	0.8872	0.8354	0.8853	0.4199	-							
Manganese	0.6623	0.7859	0.9918	0.7805	0.9429	0.8688	0.7571	0.7993	-						
Mercury	0.5971	0.8087	0.8071	0.8713	0.8918	0.8375	0.5790	0.8675	0.8363	-					
Nickel	0.6445	0.7437	0.8512	0.7902	0.8928	0.8265	0.7800	0.7349	0.8702	0.8307	-				
PCB	0.4995	0.6872	0.8557	0.7157	0.8070	0.7464	0.5748	0.7875	0.8426	0.7998	0.7768	-			
PNA	0.5939	0.6899	0.8757	0.7067	0.8418	0.7773	0.5828	0.7638	0.8798	0.8153	0.7865	0.8782	-		
Quartz	0.7408	0.5893	0.6934	0.4930	0.7362	0.6515	0.9705	0.4173	0.7164	0.5919	0.7880	0.5396	0.5767	-	
TEQ	0.4533	0.6053	0.5320	0.5557	0.6969	0.6180	0.4622	0.6030	0.5559	0.7369	0.6443	0.6682	0.6044	0.4909	-
Zinc	0.4723	0.6237	0.2955	0.8013	0.4839	0.4766	0.2122	0.5684	0.3416	0.6086	0.4177	0.3169	0.2739	0.1950	0.2776

*Green Areas Represent Cases of Good Correlation, i.e. at least 99% Correlated.

Table 3. Correlation Coefficients for Analytes in Background Buildings*.

	Asbestos	Barium	Beryllium	Cadmium	Chromium	Copper	Dust	Lead	Manganese	Mercury	Nickel	PCB	PNA	Quartz	TEQ
Asbestos	-														
Barium	0.8780	-													
Beryllium	N/A	N/A	-												
Cadmium	0.8397	0.8891	N/A	-											
Chromium	0.8688	0.9832	N/A	0.8515	-										
Copper	0.5617	0.7727	N/A	0.6191	0.8238	-									
Dust	0.9115	0.9297	N/A	0.9646	0.8904	0.5661	-								
Lead	0.6507	0.8708	N/A	0.7977	0.8921	0.9103	0.7464	-							
Manganese	0.8448	0.7003	N/A	0.5445	0.7332	0.3743	0.7185	0.3999	-						
Mercury	0.0013	0.2774	N/A	0.0990	0.3721	0.6799	0.0336	0.6408	-0.0543	-					
Nickel	0.1705	0.1916	N/A	-0.0270	0.1353	-0.2374	0.1217	-0.1255	0.2452	-0.2500	-				
PCB	-0.0790	-0.2462	N/A	-0.1874	-0.2456	0.0336	-0.2832	-0.2777	-0.2289	-0.3023	-0.2754	-			
PNA	-0.3196	-0.1887	N/A	-0.1445	-0.2993	-0.2392	-0.1088	-0.2141	-0.2412	-0.2170	-0.2284	-0.1418	-		
Quartz	0.8397	0.8891	N/A	1.0000	0.8515	0.6191	0.9646	0.7977	0.5445	0.0990	-0.0270	-0.1874	-0.1445	-	
TEQ	0.9004	0.7581	N/A	0.6614	0.7724	0.3751	0.8158	0.4630	0.9834	-0.0776	0.2357	-0.2834	-0.2185	0.6614	-
Zinc	0.8983	0.7825	N/A	0.8029	0.7945	0.6493	0.7993	0.6405	0.6878	-0.0217	-0.0997	0.2315	-0.3738	0.8029	0.7294

*Green Areas Represent Cases of Good Correlation, i.e. at least 99% Correlated.

The following represents the major analytical results from metals sampling:

- WTC Dust contained average concentrations for metals that were higher than the average concentrations of the same metals in background dust.
- WTC Dust in the Building contained maximum concentrations for metals that were many times higher than the Maximum Background Building level.
- The distribution of metals in sectors of the Building is non-random and follows a pattern.
- Metals data from the dust from Background Buildings had few positive correlations and these correlations were weak. The lack of positive correlations in dust in Background Buildings indicates the lack of a single source of contamination.
- Analytical results and statistical analyses of organic compounds such as PCBs and PNAs indicates that they are positively correlated with the presence of other metallic species associated with WTC Dust. These materials are present in concentrations approximately 100 to 1000 times above the background building levels.

The results of this study indicate that WTC Dust can be identified using a combination of tracers to define a WTC source signature.

3.0 Building Sectors

For analytical purposes, the Building was divided into five sectors (**Figure 1**). The 5-Sector divisions are as follows:

- The *below gash* sector (Basement B through Floor 7), includes the crushed plaza area and has approximately 300 broken windows and spandrel glass.
- The *gash* sector (north side of Floors 8 through 23) contains significant structural damage and has approximately 800 broken windows/ spandrel glass.
- The *opposite gash* sector (remaining portion of Floors 8 through 23) received WTC Dust deposits from the nearby exposed *gash* sector and has approximately 30 broken windows/ spandrel glass.
- The *above gash* sector (Floors 24 through 39) received WTC Dust deposits from the nearby exposed *gash* sector and has approximately 350 broken windows/spandrel glass.
- The *top* sector (Floors 40 and 41) includes mechanical floors with intake louvers and closet fans and has no broken windows/spandrel glass.

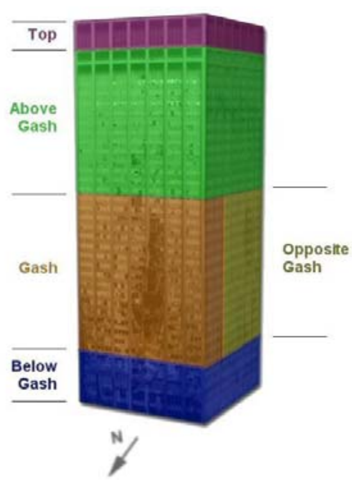

Figure 3. Illustration of the 5-Sector divisions

4.0 Addenda

4.1 Sampling Design and Statistical Analysis

A detailed discussion of sampling design and statistical analysis is presented in the Insurance Claim Report dated May 2003, Volume III: Statistical Analysis. The goal of the sampling design was to establish a confidence level to determine whether the concentration of a contaminant is statistically different (higher, lower) in one area of the Building than in another otherwise equivalent area of the Building.

The basis of the sampling plan was to use stratified sampling combined with stratified analyses to determine division averages and levels of precision for various parameters (e.g., asbestos, silica, metals). Initial building-wide evaluation of the contaminant data demonstrated that the contaminant concentrations are well approximated by a log normal distribution. Therefore log basis standard deviations were used to calculate the number of additional samples required using the following methodology:

- Initial sampling was performed at random locations within predetermined grid locations of the Building.
- A statistical analysis (e.g., average, standard deviation) of the analytical results for each analyte was performed.
- The standard errors of the average values were estimated based upon the standard deviations and number of samples analyzed.
- Using the central limit theorem, the total number of samples (and number of additional samples) required ensuring the desired level of precision with 95% confidence was calculated.
- Additional samples were collected and analyzed, until the desired level of precision was met.

4.2 Protocol Sampling

Samples were collected from the Building using numerous sampling protocols. Metals and organic samples were collected by wiping. The test protocols set forth the complete methodology in the Insurance Claim Report, Volume III: Protocols.

4.3 Sample Location Selection

Upon arrival in the predetermined grid location, a below-ceiling undisturbed area was selected. The sampling areas included, for example, file cabinets, tables or credenzas. In the same vicinity of the below-ceiling sample, an above-ceiling sampling area was selected. These areas were often the tops of drop ceiling lights (**Figure 4**).

Figure 4. Typical drop ceiling used for above-ceiling samples

Most above-ceiling and below-ceiling samples were taken from horizontal surfaces; however, a suitable horizontal surface from which to sample was not always available, in which case, samples were taken from vertical surfaces.

4.4 Sampling Procedures

To sample a finite area, a disposable template (usually 100 cm^2) was utilized (**Figure 5**). The actual area sampled was documented for each wipe and microvac sample collected.

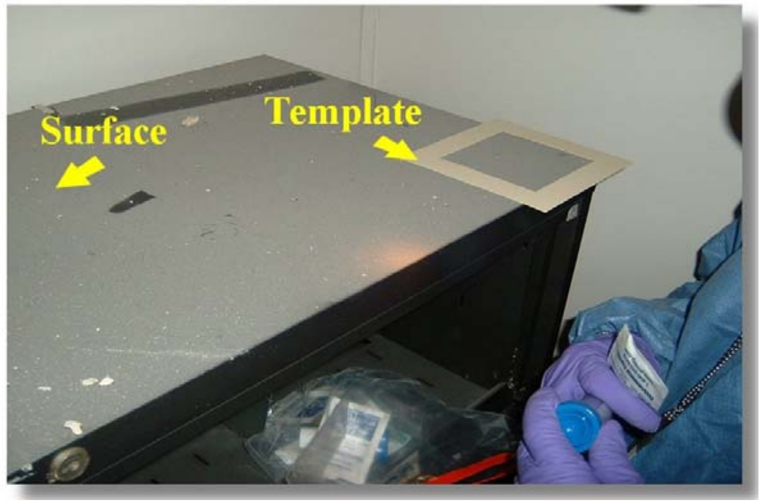

Figure 5. Below-ceiling sampling surface and template

Samples collected throughout the Building were documented using a Personal Data Assistant (PDA). Each sample was given a unique identification number using adhesive bar code labels that were affixed to the sample container. Information regarding the sample including location, area sampled, component sampled, matrix, and visual observations of the area were recorded. Additionally, each sample location was photographed and documented on a grid map. Three types of sampling media were used (wipe, microvac, and lift), as described below.

4.5 Wipe Samples

Before handling wipe media, the sampler donned a new pair of sterile, nitrile gloves. The wet wipe was removed from its packaging, unfolded, and placed within the sampling area defined by the template. Using a standardized wiping motion, the surface within the template area was sampled (**Figure 6**).

Wipes for inorganic contaminants (asbestos, metals, mercury) were taken using a Ghostwipe™. After the predetermined area had been wiped, the wipe was placed inside a 50 ml centrifuge tube. Wipes for organic contaminants (PNAs, PCBs, dioxins/furans) were taken using a sterile, 2"x2" gauze pad soaked in hexane, and placed in a 4 oz., Teflon sealed, glass jar.

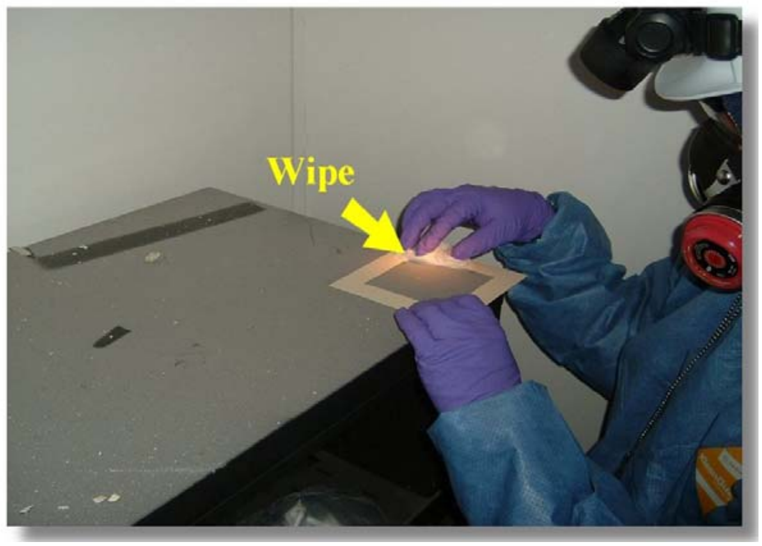

Figure 6. Wipe sampling in 100 cm^2 template

4.6 Indirect Sample Analysis for Metals and Organics

Samples underwent extraction and extracts were analyzed using industry standard analytical laboratory methods as follows:

- Samples were analyzed for metals in accordance with NIOSH 7300 method, using inductively coupled argon plasma (ICP) spectrometry.
- Samples were analyzed for mercury in accordance with EPA Method SW846 7471A, using cold vapor atomic absorption (CVAA).
- Samples were analyzed for PCBs in accordance with EPA Method SW 846 8082 using gas chromatography with electron capture detectors (GC/ECD).

- Samples were analyzed for PNAs in accordance with EPA Method SW 846 8270C using gas chromatography with mass spectrometry (GC/MS).
- Samples were analyzed for dioxins/furans in accordance with EPA Method SW 846 8290 using gas chromatography with high-resolution mass spectrometry (GC/HRMS).