Appendix 3

Uncertainties Regarding the Risk and Public Health Evaluation of the Building.

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Introduction

As noted previously, many factors about the destruction of the WTC were unprecedented or were not applicable to past assessments of human chemical exposure. Therefore, numerous sources of uncertainty presented themselves and prompted a necessarily conservative approach to the protection of the health of potential future inhabitants of the Building. These sources of uncertainty included:

1. Uncertainty of the potential for human exposure to residual WTC Dust or WTC Hazardous Substances that could not be remediated:

Assuming the presence of residual WTC Dust or WTC Hazardous Substances in reservoirs that could not be adequately cleaned, it was unclear whether those chemicals could migrate to previously cleaned areas with potential for human exposure, thus becoming a risk to the health of potential future building inhabitants. Subsequent testing by RJ Lee Group has verified this occurrence. Furthermore, after surface cleaning, it was unclear whether construction workers involved in tearing out walls and other structures in the repair of the Building would be similarly exposed. In addition, after reoccupation of the Building, there was concern that future routine maintenance or repairs might expose maintenance and office workers to residual WTC Dust and WTC Hazardous Substances. Subsequent questions arose as to which jobs would likely be exposed and what activities would be safe to perform.

2. Uncertainty about the unknown health risks of combinations of WTC Hazardous Substances potentially formed and dispersed throughout the Building:

The large amounts of particulate matter including asbestos, silica, other fibers, and smoke formed in the collapse of the WTC presented an abundant medium for the adsorption of toxic chemicals (i.e. dioxin, PCBs, PAHs), individually or in combination, and subsequent dispersal throughout the Building. Very little was known about the formation, bioavailability, or potential toxicity of such mixtures.

Following are examples of conservative approaches to risk assessment that are driven by uncertainty:

i) Sources of uncertainty in toxicological data generally are reflected in safety factors (or uncertainty factors) that are frequently applied in risk assessments to be further protective of human health when uncertainty affects our confidence in what is considered a safe or acceptable exposure level. This conservatism is practiced by numerous regulatory bodies with regard to setting permissible exposure limits. OSHA states the following in its “Preamble to the Final Rule-Section 6-Air Contaminants-Health effects discussion and determination of final PEL”:

> *"The scientific issues surrounding the concept of no-observed-effect levels or experimentally derived thresholds have important implications for their use in establishing protective occupational exposure limits. Because the no-observed-effect level cannot represent the "true" threshold for an adverse effect…regulators and others have used the concept of safety factors (also known as uncertainty factors) to aid them in setting permissible exposure limits; that is, the exposure limit is established at some interval below the no-observed-effect level to provide additional assurance that exposed populations are not likely to suffer harm."*

This statement demonstrates the conservative approach to setting health-based exposure limits in which uncertainty is produced by the reliance on a no-effect dose. In order to be more confident that the permissible exposure limit is safe for occupational exposure, a level that is lower than the no-effect level is chosen because of that uncertainty.

OSHA also applies this approach for the protection of sensitive individuals, which was a source of uncertainty in the Building exposure assessment:

> *"Safety factors have also been used to recognize the fact that the human population is heterogeneous and that there may be a wide variation in individual responses to toxic substances…"*

ii) The history of occupational exposure guidelines and regulations for toxic substances also provides examples of conservative approaches to exposure assessment. One example is the ACGIH's Threshold Limit Value-Time Weighted Average (TLV-TWA) recommendations and OSHA's Permissible Exposure Limit-Time Weighted Average (PEL-TWA) for asbestos. In 1971, OSHA promulgated an initial PEL-TWA for asbestos of 12 fibers per cubic centimeter. In 1974, the recommended ACGIH TLV-TWA for asbestos, then a known human carcinogen, was 5 respirable fibers (>5 mm in length) per cubic centimeter. In contrast, the current OSHA PEL-TWA of 0.1 fibers per cubic centimeter and the ACGIH's TLV-TWA for asbestos (in all forms) of 0.1 fibers per cubic centimeter amount to 120-fold and 50-fold decreases in the earlier time-weighted occupational exposure limits, respectively. In the last 30 years, the PEL-TWA and recommended TLV-TWA for the various forms of asbestos as well as total asbestos fibers have been lowered several times as a result of higher-quality monitoring technology and increasing evidence of health effects at lower exposure levels (ACGIH, TLVs, 2001). The lowering of these exposure limits represent responses to the uncertainty of whether the existing exposure limits are protective of human health.

3. Uncertainty about the pattern of contamination throughout the Building:

The gash that resulted from the second WTC tower crashing into the Building produced an opening through which a large amount of particulate matter, smoke, and other contaminants entered the Building for a period of months. It was unclear as to the amount of these contaminants that entered and the extent to which they were dispersed throughout the Building. This led to great uncertainty as to the efficacy of preliminary wipe testing to predict the pattern of WTC Dust and WTC Hazardous Substance dispersal and the relative levels of each WTC Hazardous Substance in specific areas of the Building. In other words, it was possible that there may have been higher levels of certain WTC Hazardous Substances in areas that were not sampled due to the widespread nature of the contamination. In addition, it was unclear whether the list of contaminants of potential concern (COPC) from the draft EPA document on selecting COPC and health-based benchmarks was relevant since the selection of COPC was based on sampling in lower Manhattan in areas many of which were not as significantly impacted as was the Building. Therefore, additional WTC Hazardous Substances that were not addressed by the EPA may have entered the Building at toxic levels.

4. Uncertainty about potential exposure pathways of employees, maintenance workers, and cleaning crew entering the Building:

Due to the dispersal of numerous WTC Hazardous Substances throughout the Building and its infrastructure, it was unclear what potential exposure routes would pose significant health risks for potential future building occupants. The most likely pathways were to be through dermal exposure to WTC Dust or WTC Hazardous Substances on indoor surfaces and ingestion (largely from hand-to-mouth transfer). However, the potential for inhalation exposure to residual WTC Dust or WTC Hazardous Substances volatilizing or being re-dispersed as dust from various reservoirs in the Building (i.e. ductwork) could not be ignored.

5. Uncertainty derived from relying on multiple exposure assumptions to predict exposure to WTC Hazardous Substances in settled dust:

The use of exposure assumptions is an important method for estimating the frequency of or potential for exposure by specific routes. The number and diversity of potential receptors, the presence of numerous WTC Hazardous Substances with multiple toxicological endpoints, and a potentially varied patterns of WTC Hazardous Substance distribution in the Building will require multiple complex exposure assumptions to adequately predict exposure risks.

The uncertainty in the Building exposure assessment made necessary an conservative approach to determining the feasibility of cleaning the Building and to determining the increased risk of health effects to potential future building occupants.

6. Uncertainty regarding the applicability of health-based screening levels and benchmarks established by the WTC Committee.

At the start of this health evaluation, there was a lack of scientific studies regarding the acceptable levels of certain WTC Hazardous Sustances, specifically in a commercial setting. As noted elsewhere, the COPC Committee health-based screening levels and benchmarks served as starting points for the Health Group's evaluation of the Building. For a number of reasons, we determined that these levels are not directly applicable to the Building, and began the process of establishing Building-specific levels for a select group of WTC Hazardous Substances.