

**Work Plan Addendum  
Indoor Air and Sub-Slab Vapor Sampling  
Round 10  
February 2011  
Lockheed Martin Middle River Complex  
2323 Eastern Boulevard  
Middle River, Maryland**

Prepared for:

Lockheed Martin Corporation

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# ACRONYMS

ACM	Asbestos-containing material
IAQ	indoor-air quality
MRC	Middle River Complex
SV	sub-slab vapor
VLS	vertical-launch system
VMP	vapor-monitoring point
VOC	volatile organic compound

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# Section 1

# Introduction and Scope

This document serves as a technical memorandum documenting the proposed field activities in support of the February 2011 Indoor Air Quality (IAQ) and Sub-Slab Vapor (SV) sampling event at the Lockheed Martin Middle River Complex (MRC). This technical memorandum is an addendum to Tetra Tech's Indoor Air Quality Assessment Work Plan for Buildings A, B, C, and Vertical-Launch System (VLS), Lockheed Martin Middle River Complex, (Tetra Tech, 2006).

The proposed February 2011 sampling of IAQ and SV at the MRC will be the tenth sampling event performed to evaluate potential sub-slab vapor intrusion of volatile organic compounds (VOCs) present in soil, groundwater, and soil gas beneath the MRC. Figures 1-1, 1-2, and 1-3 illustrate the locations at the MRC that have been sampled to date. The scope-of-work associated with the proposed field investigation and addressed by this memorandum includes: identification of proposed SV sampling locations; identification of proposed IAQ sample locations; installation of permanent vapor monitoring points (VMPs); and, collection and analysis of IAQ and SV samples.

## **1.1 PROPOSED PERMANENT SUB-SLAB VAPOR MONITORING POINT LOCATIONS**

Based on the results of the Round 6, 7, 8, and 9 sub-slab and indoor air sampling investigations and discussions with Lockheed Martin and the Managing Contractor, locations for the installation of new VMPs were identified. The current layout of VMPs at the MRC covers Block I Buildings with an approximately 200 foot by 200 foot sampling grid. Additional VMPs are recommended to further investigate areas where elevated concentrations of contaminants were previously detected in sub-slab vapor and not fully delineated (data gap). These areas may also coincide with locations of historic chemical usage.

Ten new VMPs are proposed in key areas of the buildings to fill data gaps identified from the results of the previous round of sampling. Additional VMPs can be installed if requested by

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Lockheed Martin and the Managing Contractor. The proposed new VMP locations are illustrated in Figure 1-4. Table 1-1 presents detailed information on the proposed sample locations, their unique identifiers and sample-specific notes. As presented in Table 1-1, the samples are identified first by the type of sample being collected (i.e., SV), followed by building identifier (A, C), sequential numbering, and sample round. Final sample locations will be determined based on conditions at the time of VMP installation and/or utility locations.

In Building A, a total of five new VMPs are proposed. The purpose of the proposed VMP locations is to fill identified data gaps. One VMP is proposed for installation at column 40-22 east of the Building A Plating Shop in the former paint shop that is now used for storage on the first floor of Building A. This sample will provide information regarding the presence or absence of sub-slab contamination between locations where sub-slab contamination is known to be present (Building A Plating Shop and sample location SV-A-6). Two proposed VMP locations are north (column 33-22) and east (column 32-25) of sample location SV-A-6 on the eastern side of Building A. These sample locations will help fill a data gap by providing information about the possible extent of sub-slab contamination north and east of where it has been detected at sample location SV-A-6 and will also help fill a data gap between sample locations in the western part of Building B and the eastern part of Building A. Two new VMPs are proposed for installation in the Building A Basement west of the former Marform Press location between columns D-11 and D-12, and southwest of the former Marform Press between columns D-14 and D-15. These locations are proposed to evaluate the potential presence of a sub-slab vapor plume below the former Marform Press.

In Building C, a total of five new VMPs are proposed. These samples will build upon the results of the Round 9 sampling and fill data gaps around the former Patriot plating line. During Round 9, the results from new sample location SV-28-C-9 indicated the presence of elevated concentrations of chlorinated VOCs. This location is west of the former plating line. It is believed that the detected contamination may be associated with the former plating line so additional samples are proposed to fill this data gap. The first proposed VMP is located at the north end of the former plating line between columns T-13 and U-13 in the east central section of the Building C Basement. The second VMP will be placed at the southern end of the former plating line between columns T-26 and U-26. One new VMP is proposed for installation between columns Q-26 and Q-27. This location will fill in additional information between sample locations SV-C-4, SV-28,



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and the location proposed at the southern end of the Patriot line. This location is also believed to possibly be downgradient of the former plating line.

One VMP is proposed at Column O-29 to fill a data gap between SV-C-4 to the south, SV-C-2 to the north and SV-C-28 to the east. The last proposed VMP is located between Columns M-15 and N-15. This is the location of a former vapor degreasing operation.

## **1.2 PROPOSED IAQ SAMPLING LOCATIONS**

Based on discussions with Lockheed Martin's oversight contractor, locations for collection of IAQ samples were identified. All IAQ sample locations were co-located with VMP locations proposed for sampling to evaluate potential relationships between sub-slab and IAQ results. IAQ sample locations are also intended to further evaluate areas where elevated results and chemical markers of vapor intrusion (i.e. cis-1,2-dichloroethene and trans-1,2-dichloroethene) had been previously reported. The proposed SV/IAQ locations are illustrated in Figure 1-4. A total of 34 IAQ samples are proposed for sampling and analysis. In addition to the proposed IAQ locations, ambient air samples will be collected from four background locations. Background samples will be collected at locations used in previous rounds of sampling. Figure 1-5 illustrates the proposed background sample locations.

## **1.3 PERMANENT SUB-SLAB VAPOR MONITORING POINT INSTALLATION**

Upon confirmation of new sampling locations, Tetra Tech will initiate subsurface utility clearance. All MRC requirements will be addressed prior to initiating any intrusive activities. Subsurface utility clearance of the proposed new VMP locations will be conducted in accordance with [Corporate Staff Procedures CS-28 Digging Projects]. The utility clearance program will include the notification of an underground utility location center (Miss Utility of Maryland 1-800-257-7777; [www.MissUtility.net](http://www.MissUtility.net)), obtaining and review of available facility maps containing utility information including, but not limited to, the Site Plan (TAI, October 2002), and the use of a private utility locating contractor. The utility locating contractor will utilize geophysical survey to locate and mark all underground utility lines within a 20-ft radius of the proposed VMP locations. A combination of electromagnetic resistivity/conductivity and line locating, and ground penetrating radar will be used to assure that all proposed sampling locations

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will not encounter underground utilities. Proposed VMP locations may be offset based on the results of the subsurface utility survey. VMPs that require relocation due to subsurface obstructions will be positioned as close as possible to the original location identified.

Prior to installation of the VMPs, appropriate procedures will be followed to address the potential presence of asbestos-containing materials (ACM) at all proposed VMP locations. An outside contractor licensed by the State of Maryland to manage all aspects of asbestos will perform inspections and sampling if necessary to determine the absence or presence of ACM prior to any work being performed. If necessary, ACM such as floor tile will be removed to facilitate installation of the new VMPs. All removed materials will be replaced to prevent any potential tripping hazards.

Nine permanent soil VMPs will be installed beneath the slabs of Buildings A, B, and C at the MRC. All new VMPs will be installed in accordance with the methods detailed in the Phase II Investigation Work Plan Block I (Tetra Tech, 2008).

Based on the historic implementation of this type of work, Tetra Tech will conduct this work under the existing Health and Safety Plan which already addresses all aspects of the IAQ-SV study. The plan will be reviewed and updated as necessary prior to conducting work under this project.

## **1.4 IAQ AND SUB-SLAB VAPOR SAMPLING**

Sampling for IAQ will be performed in accordance with the IAQ Assessment Work Plan (Tetra Tech, 2006). Sampling will be conducted as up to 8-hour events using pre-conditioned Summa canisters in accordance with Environmental Protection Agency Toxic Organic Method 15 (EPA TO-15).

Up to 36 IAQ samples plus two duplicate samples will be collected during the proposed sampling event. Four background samples will be collected at the locations historically used (Figure 1-5). All IAQ samples will be collected over a period of up to 8 hours.

Sub-slab vapor samples will be collected at the same time as the IAQ samples. Up to 36 sub-slab samples and two duplicate samples will be collected during the proposed sampling event from beneath the slabs of the MRC Buildings A, B, and C. Samples will be collected from newly

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installed and existing VMPs as illustrated in Figure 1-4. Each sub-slab sample will be collected for a period of 1 hour. Sub-slab sampling will be performed in accordance with the Phase II Investigation Work Plan Block I (Tetra Tech, 2008).

For SV and IAQ samples collected from existing locations (i.e. SV-5, ISG-3) sample nomenclature will remain the same except for the inclusion of a building letter (i.e. A, B, C), and the number 10 to identify the sample as having been collected during Round 10. For example, the sample collected at locations SV-5 and ISG-3 will become SV-5-C-10 and ISG-3-C-10, respectively.

For samples collected from SV and IAQ locations, laboratory submitted samples will be identified by the matrix sampled (i.e. SV) for sub-slab vapor, IAQ for indoor air quality, followed by a building letter (i.e. A, B, C), then the number of the location (1, 2, 3...). Finally, the number 10 will be added at the end to identify the sample as having been collected during Round 10. A new SV sample location in the Building C basement may be SV-C-5-10.

Following the sampling period, each canister will be closed and sent to an off-site laboratory under proper chain-of-custody procedures. Each sample will be submitted for EPA TO-15 analysis. The current analytical parameter list used for indoor air sampling and sub-slab sampling at the MRC includes:

- Benzene
- Carbon tetrachloride
- Chloroform
- Chlorodifluoromethane
- Dichlorodifluoromethane
- 1,1-Dichloroethane
- 1,1-Dichloroethene
- 1,2-Dichloroethane
- cis-1,2-Dichloroethene
- trans-1,2-Dichloroethene
- Ethylbenzene
- Methyl tert-butyl ether
- Methylene Chloride
- Naphthalene
- Tetrachloroethene
- Toluene
- 1,2,4-Trichlorobenzene
- 1,1,1-Trichloroethane
- 1,1,2-Trichloroethane
- Trichloroethene
- Vinyl chloride
- m-Xylene, o-Xylene, &
- p-Xylene

**Table 1-1**

**Proposed Permanent Soil Vapor Points Round 10 Rationale  
Lockheed Martin Middle River Complex  
Middle River, Maryland**

<b>New Permanent Sub-Slab Vapor (SV)/Temporary Soil Gas (SG) Points</b>	<b>Location</b>	<b>Investigation Depth (feet)</b>	<b>Rationale/Purpose</b>
SV-31-A and SV-32-A	Located north and east of SV-A-6 in the eastern part of Building A	0.5	Evaluate spatial extent of sub-slab contamination north and east of SV-A-6.
SV-33-A	Located east of Building A Plating Shop in former Paint Shop	0.5	Evaluate area between Plating Shop and SV-A-6 east of Plating Shop.
SV-34-A and SV-35-A	Located in A Basement west of former Marform Press	0.5	Evaluate potential sub-slab vapor contamination beneath former Marform Press location.
SV-36-C through SV-37-C	Located in east-central portion of Building C Basement	0.5	Evaluate area north, and south of former Patriot plating line.
SV-38-C and SV-39-C	Located in central portion of Building C Basement	0.5	Fill data gap between SV-28-C, SV-C-4, and SV-C-2.
SV-40-C	Located in west-central portion of Building C Basement	0.5	Evaluate location of the former vapor degreasing operation.
Existing SV locations	Throughout facility	0.5	Locations with past SV contaminant concentrations above screening levels and that provide complete grid coverage.
New IAQ	Near new permanent soil vapor locations	0	To evaluate presence/absence of VOCs in indoor air.
Existing IAQ	Locations with historic TCE > 1 µg/m <sup>3</sup> and chemical markers of vapor intrusion	0	Continued characterization of sub-slab to indoor air pathway.

Legend: SV = Sub-Slab Vapor (indoor locations)  
IAQ = Indoor Air Quality

# Figure 1-1

## Indoor Air and Sub-Slab Vapor Monitoring Locations for Building A Round 9 August 2010

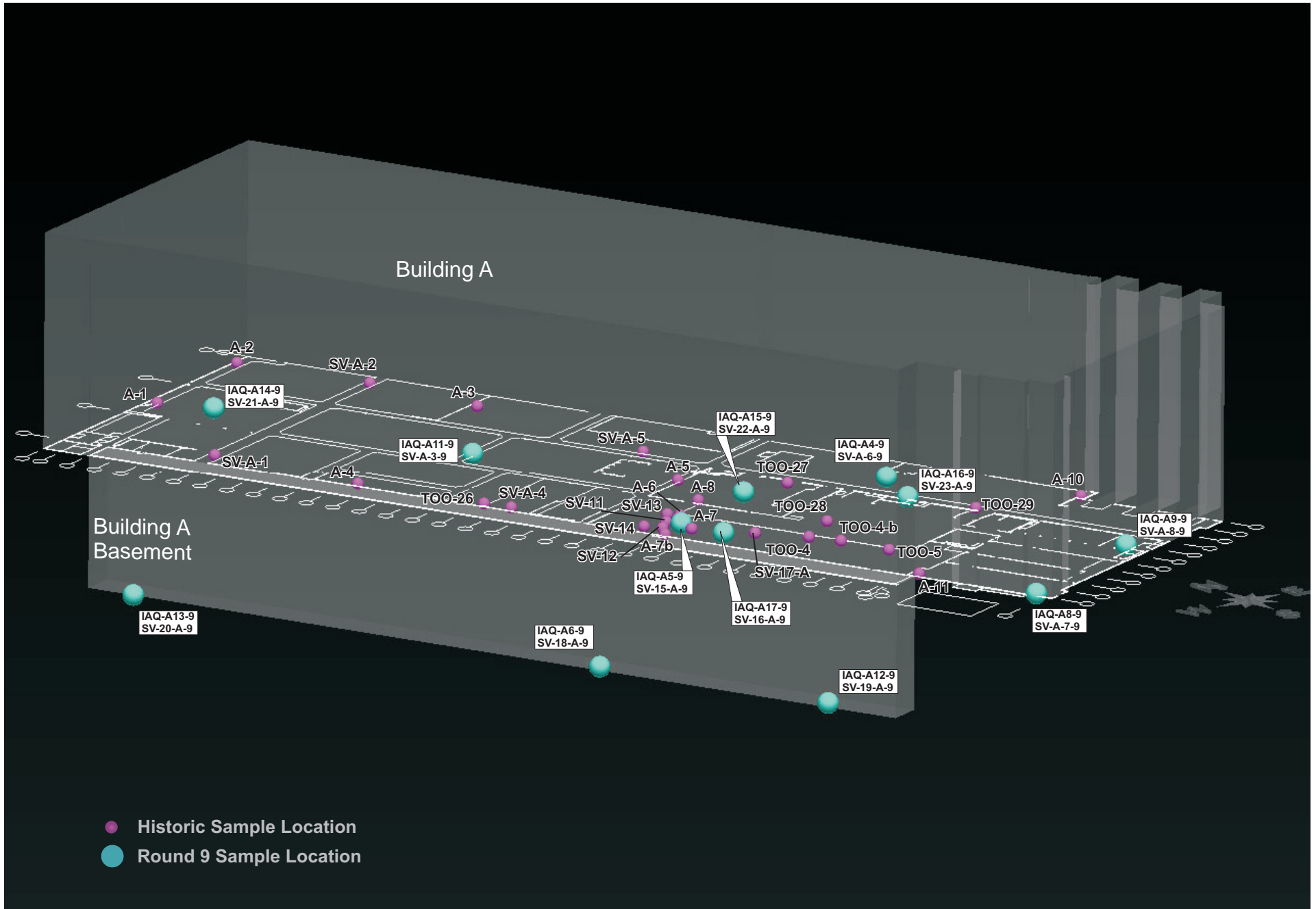


Figure 1-2  
 Indoor Air and Sub-Slab Vapor Monitoring  
 Locations for Building B Round 9 August 2010

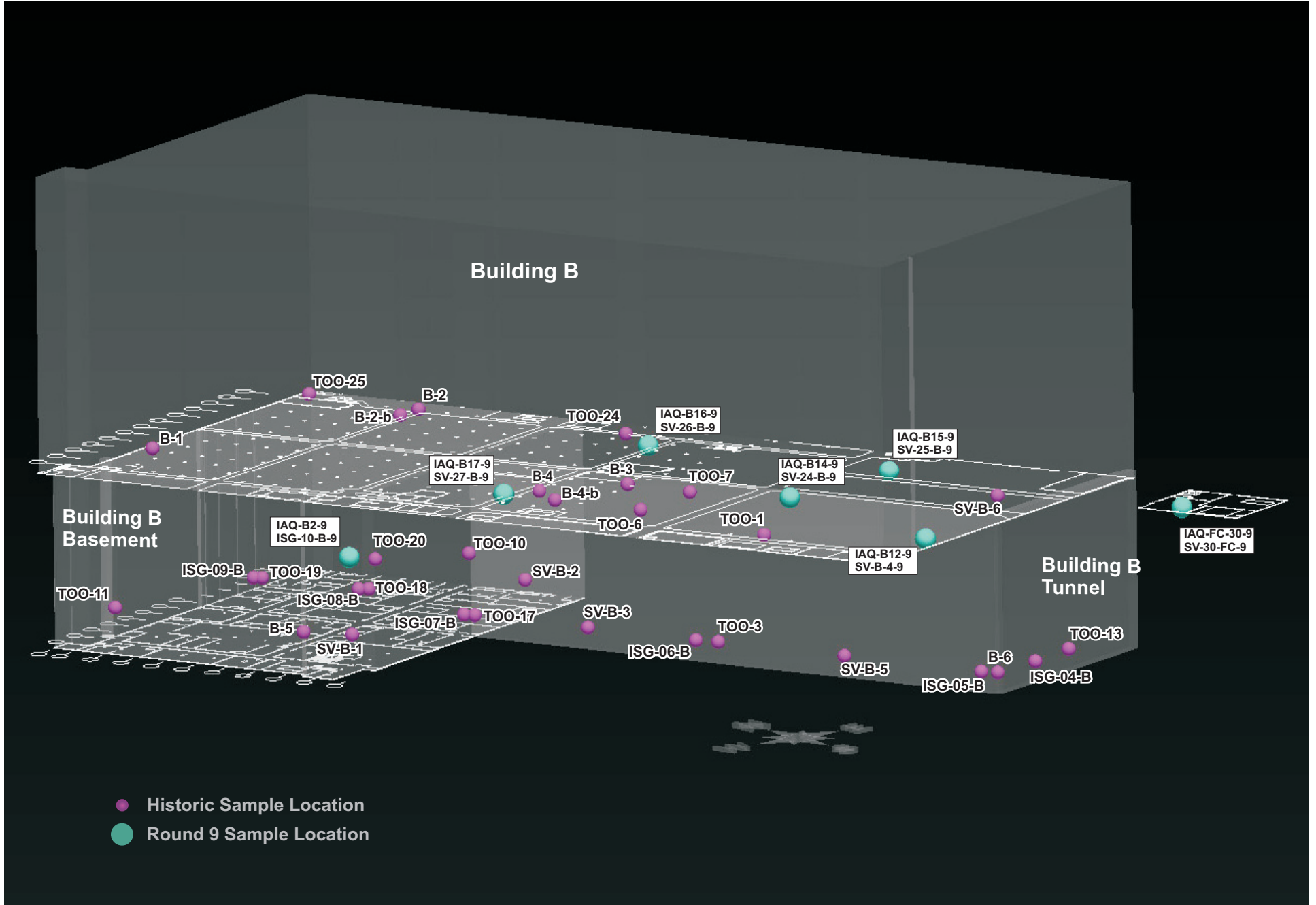


Figure 1-3  
 Indoor Air and Sub-Slab Vapor Monitoring  
 Locations for Building C Round 9 August 2010

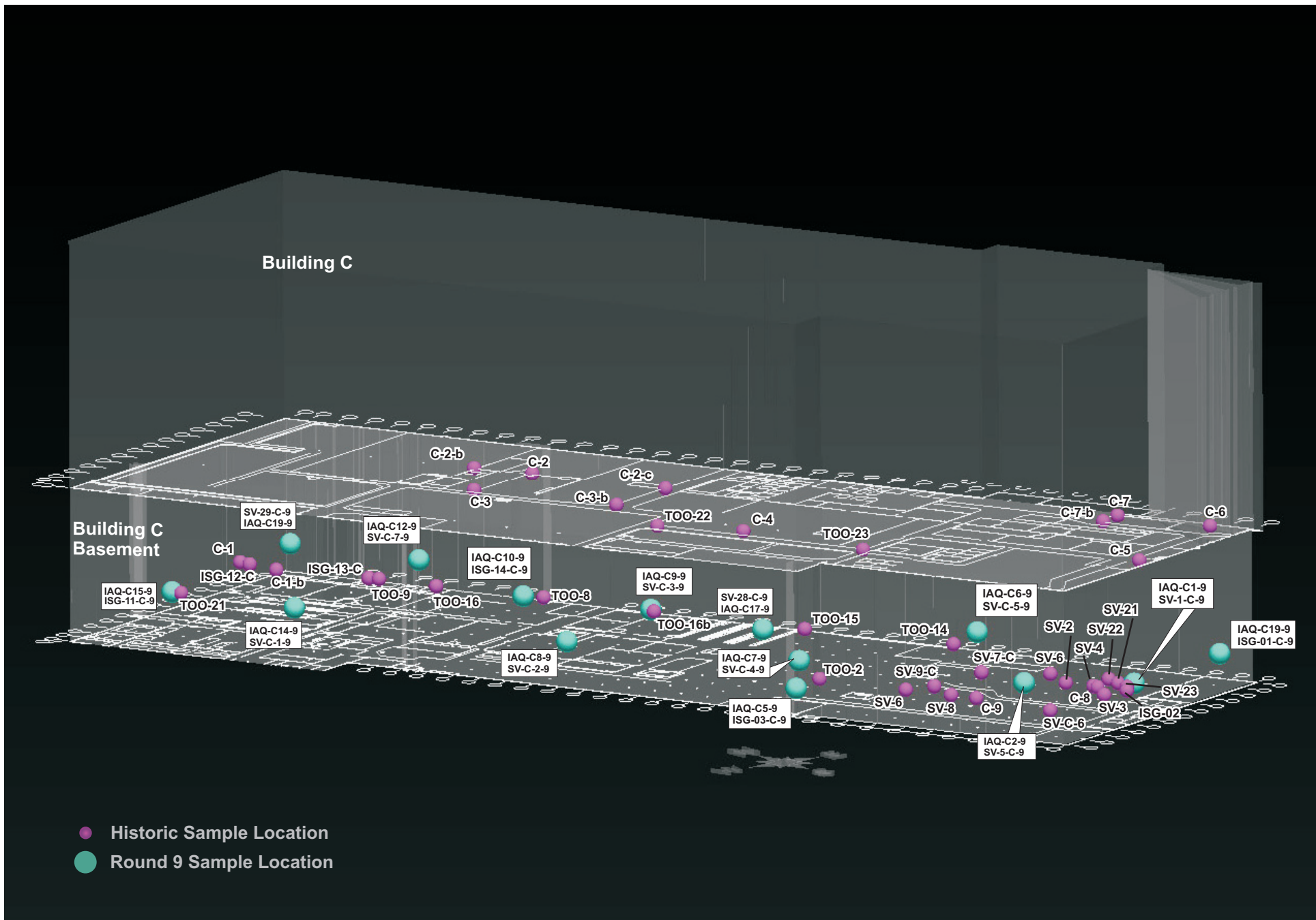


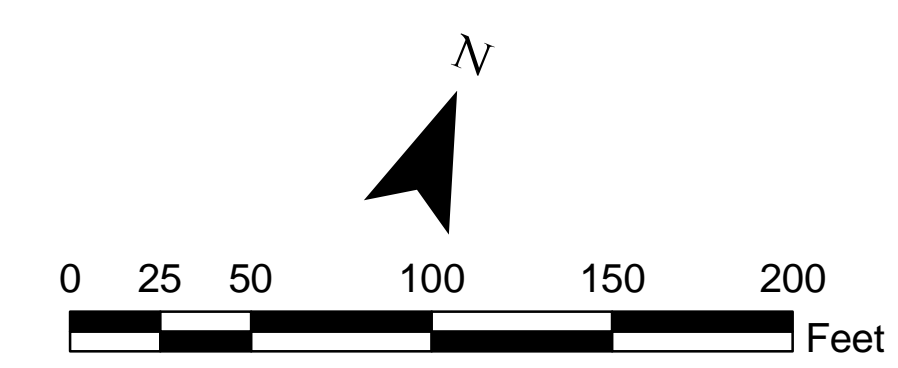
Figure 1-4

February 2011 Indoor Air and Sub-Slab Vapor Sample Locations for Buildings A, B, and C



**Legend**

- New SV Basement Samples
- New SV First Floor Samples
- IAQ, Basement
- IAQ, 1st Floor
- SV/ISG
- Tunnel
- Buildings A, B, and C
- Building B and C Basement
- SSD Treatment Unit
- SV Sampling Location
- IAQ/SV Location Proposed for Sampling



Lockheed Martin Middle River Complex  
Middle River, Maryland

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## Section 2

# References

1. TAI Consulting Engineers, October 2002. Drawing titled “Site Plan, Chesapeake Park, LMC Properties, Inc.” (Revision C, October 2, 2002).
2. Tetra Tech, Inc., 2006. Indoor Air Quality Assessment Work Plan for Buildings A, B, C, and VLS, Lockheed Martin Middle River Complex, November, 2006.
3. Tetra Tech, Inc., 2008. Phase II Investigation Work Plan Block I Lockheed Martin Middle River Complex, August, 2008.
4. Tetra Tech, Inc., 2009. Phase II Block I Site Investigation Report Lockheed Martin Middle River Complex, July, 2009.

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