Bristol-Myers Squibb

6000 Thompson Road, East Syracuse, NY 13057
Tel 315 432-2000
www.bms.com

February 12, 2016

Joshua P. Cook, P.E.
Environmental Engineer 2
New York State Department of Environmental Conservation
Division of Environmental Remediation
Region 7
615 Erie Boulevard West
Syracuse, NY 13204

Re: *Bristol-Myers Squibb Restoration Area*
Site ID No. C734138
Village of East Syracuse, Town of Dewitt, Onondaga County
Phase 1A RIWP - Soil Vapor Addendum, November 2015

Dear Mr. Cook:

By letter dated December 23, 2015, the New York State Department of Environmental Conservation (the Department) approved the November 2, 2015 Phase 1A Remedial Investigation Work Plan – Soil Vapor Sampling Addendum (and referenced January 2015 Phase 1A Remedial Investigation Work Plan - Soil Vapor Module) for the Bristol-Myers Squibb (BMS) Restoration area (site) with specified modifications. BMS responds to several of the modifications below, and agrees with the Department regarding Modification Nos. 3, 4, 7, 8, 9, 10 and 13. For convenience, the Department's substantive modifications are reproduced in italicized text followed by BMS's response.

Modification # 1. Addendum Section 2.1, Paragraph (b) – If the collection of the sub-slab soil vapor sample is possible, the collection of the proposed exterior soil vapor sample may not be necessary. If high water is encountered, the exterior soil vapor sample would be needed. To be clear, if the sub-slab sample is able to be collected, it will be collected concurrently with the indoor air sample and ambient air sample.

<u>Response</u>: As the Department and BMS discussed on January 13, 2016, shallow groundwater was encountered in both the sub-slab sampling point and the exterior soil boring at Building 3. Based on discussion with the New York State Department of Health (NYSDOH) and the Department on February 10, 2016, in lieu of soil vapor sampling, a groundwater sample will be collected from a monitoring well to be installed upgradient of Building 3 (Well BDA-PW-1WT – see attached figure). The well will be constructed of 2-inch diameter, stainless steel materials, with the well screen set to span the Building 3 control room floor elevation. The well will be developed and sampled in accordance with the Field Sampling and Analysis Plan (FSAP; March 2013). Groundwater samples will be submitted for laboratory analysis of volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), glycols, and alcohols in accordance with the methods specified in the Quality Assurance Project Plan (QAPP; March 2013).

Modification # 2. Addendum Section 3.3 & Table 3 – The laboratory detection/reporting levels for trichloroethene, vinyl chloride, and carbon tetrachloride must be less than or equal to 0.25 micrograms per cubic meter for indoor air samples.

Response: The Department's comment may have confused Table 2 (indoor air) and Table 3 (soil vapor). Table 2 indicates the target analytical reporting limits for trichloroethene, vinyl chloride, and carbon tetrachloride are less than 0.25 ug/m3 for indoor air samples. Table 3 provides the target analytical reporting limits for soil vapor samples which, as expected, have higher target reporting limits than for indoor air samples.

Modification # 5. Addendum Section 3.4, 1st Paragraph – If data is to be evaluated against screening values, it should be compared to unrestricted levels and the most stringent guidance for the proposed land use category. If land use within the Brownfield Cleanup Program site is to be restricted to commercial and/or industrial uses, data should be compared to the unrestricted use screening values and the commercial use screening values for on-site locations. Note, evaluation of all data in comparison to unrestricted standards, criteria or guidance values is required for all environmental media as part of the remedial program.

Response: Arcadis will evaluate soil vapor intrusion data in comparison to unrestricted levels where such levels exist, as well as to applicable screening levels for commercial/industrial use (BMS has consistently stated that commercial/industrial land use restrictions will apply to the site). Finally, the last sentence of Modification # 5 does not relate to the Soil Vapor Module or the Soil Vapor Addendum, and for that reason, BMS does not provide a response.

Modification # 6. Addendum Section 3.4 4th Paragraph – New York State does not defer to the United States Environmental Protection Agency (USEPA) Target Groundwater Concentrations or use attenuation factors for screening purposes. Data can be presented and evaluated using such factors, and that data will be reviewed and considered, but all decisions regarding future actions relating to soil vapor intrusion will be made based on a comprehensive evaluation based on compliance with the current NYSDOH guidance as required by the Department's guidance document DER-10: Technical Guidance for Site Investigation and Remediation and the Brownfield Cleanup Agreement.

Response: BMS understands that the USEPA factors can be used and will be considered, among other New York State specific guidance documents.

Modification # 11. Addendum Section 3.4, 5th Paragraph – The increased air exchange rate could actually result in greater soil vapor intrusion, though it might also result in lower concentrations in indoor air. The referenced USEPA guidance document does not support this statement, since other factors relevant to the site (e.g., depth to groundwater, presence of significant utility penetrations and vaults) would tend to decrease attenuation. Refer to item 7 of this letter.

Response: BMS understands the Department's comment, and agrees that increased air exchange volumes could result in greater volume of contaminants extracted from groundwater over time and, if a recirculating air system is in use, could lead to higher concentrations in indoor air. However, if a single pass air system is in use, then higher concentrations of the contaminants in indoor air are not expected.

Modification # 12. Addendum, Section 4.0 – The reporting of results in data summary tables is acceptable; however, in addition to the summary tables, the laboratory results reports, quality assurance/quality control, and data validation data, must also be provided for all compounds analyzed.

Response: This information will be submitted as it becomes available as part of the BCP monthly progress reports.

Modification # 14. Table 2 – Based on the NYSDOH guidance document Guidance for Evaluating Soil Vapor Intrusion in the State of New York, dated October 2006 (NYSDOH SVI guidance), certain site contaminants of concern were included in the BASE Study but are not listed in Table 2, including:

- *1-butanol (BASE Study 90th percentile value of < 4.8); and*
- *2-methyl-1-propanol (isobutanol) (BASE Study 90th percentile value of 3.1).*

Response: The ELAP-certified laboratory is not calibrated for 1-butanol and 2-methyl-1-propanol (isobutanol), and therefore, these butanols will be included in the TO-15 analysis, reported as tentatively identified compounds along with the other specific compounds identified in Tables 2 and 3 to be reported as tentatively identified compounds.

Modification # 15. Table 2 – Based on the NYSDOH SVI guidance, the BASE Study 90th percentile value for:

- *Freon 114 should be "<6.8" (listed in the appendix C of the NYSDOH SVI guidance as dichlorotetrafluoroethane and for*
- *1,1,2-trichloro-1,2,2-trifluoroethane should be "3.5" (listed in the Appendix C of the NYSDOH SVI guidance as trichlorotrifluoroethane).*

Response: The NYSDOH guidance values for dichlorotetrafluoroethane and trichloro-trifluoroethane were not included in Table 2 because the NYSDOH guidance did not indicate that the values applied to the specific isomers listed in Table 2 (i.e., Freon 114 and 1,1,2-trichloro-1,2,2-triflouroethane, respectively). If the NYSDOH values are to be included and NYSDOH cannot clarify that the values apply to the specific isomers, the evaluation should also include the other screening values (note that only a PEL is available for Freon-114).

As proposed at the July 29, 2015 meeting with our EHS staff, if there is a need to meet to discuss the SVI Addendum, BMS and Arcadis will be pleased to do so.

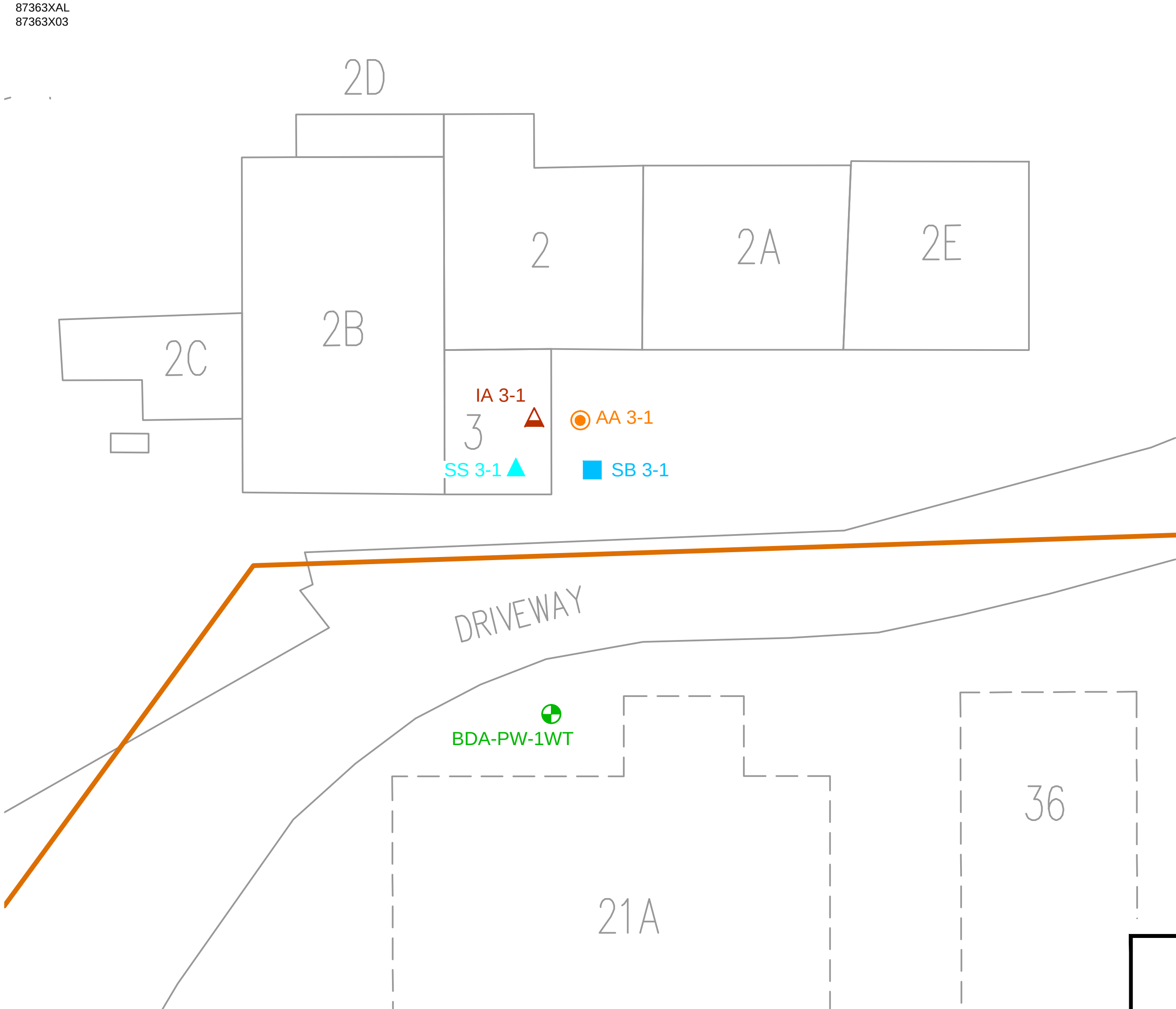
Please call if you have questions.

Sincerely,

John R. Mosack
Executive Director and General Manager
Syracuse GMS
Bristol-Myers Squibb Company

ecc: Harry Warner (NYSDEC)
Maureen Schuck (NYSDOH)
Richard Jones (NYSDOH)
John Killiany (BMS)
Anne Locke (BMS)
J. Richard Pooler (BMS)
David Wright (Arcadis)
JoAnn Robertson (Arcadis)

CITY: SYRACUSE, NY DIV/GROUP: EBC-IM/DV DB/LD: L.POSENAUER TM/TR: A. KORIK LYR: ON=*;OFF=REF, (FRZ)
G:\ENVCAD\SYRACUSE\ACT\B0087363\0009\00007\BLDG-3\87363C03.dwg LAYOUT: 1 SAVED: 2/10/2016 2:49 PM ACADVER: 19.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: MONOCHROME.CTB PLOTTED: 2/10/2016 2:50 PM BY: STEINBERGER, GEORGE
XREFS: IMAGES: PROJECTNAME: ----
87363XAL
87363X03



LEGEND:

- APPROXIMATE BROWNFIELD AREA BOUNDARY
- EXISTING BUILDING
- DEMOLISHED BUILDING
- PROPOSED WATER TABLE MONITORING WELL
- PROPOSED INDOOR AIR SAMPLING LOCATION
- PROPOSED AMBIENT AIR SAMPLING LOCATION
- SUB-SLAB SOIL VAPOR POINT (ATTEMPTED JAN. 2016)
- SOIL BORING (JAN. 2016)

NOTE:

1. BASEMAP BASED ON A MAP TITLED "BRISTOL–MYERS SQUIBB PART OF LOT 41 – TOWN OF DEWITT AND PART OF THE VILLAGE OF EAST SYRACUSE ONONDAGA COUNTY NEW YORK", DATED MARCH 25, 2010 PREPARED BY COTTRELL LAND SURVEYORS, P.C.

0 20' 40'
GRAPHIC SCALE

DRAFT

SITE #C734138: BRISTOL-MYERS SQUIBB SYRACUSE
NORTH CAMPUS RESTORATION AREA
EAST SYRACUSE, NY

BUILDING 3
PROPOSED SAMPLE LOCATIONS

ARCADIS Design & Consultancy for natural and built assets

FIGURE
1

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Environmental Remediation, Region 7
615 Erie Boulevard West, Syracuse, NY 13204-2400
P: (315) 426-7519, (315) 426-7551 | F: (315) 426-2653
www.dec.ny.gov

December 23, 2015

John Mosack
Executive Director, General Manager
Bristol-Myers Squibb Company
Mail Stop A-1; Syracuse Operations
Global Manufacturing and Supply
6000 Thompson Road
East Syracuse, NY 13057

Re: Bristol-Myers Squibb Restoration Area
Site ID No. C734138
Village of East Syracuse, Town of DeWitt, Onondaga County
Phase 1A RIWP – Soil Vapor Addendum, November 2015

Dear Mr. Mosack:

The New York State Department of Environmental Conservation (Department) and the New York State Department of Health (NYSDOH) have reviewed the Phase 1A Remedial Investigation Work Plan – Soil Vapor Sampling Addendum (the addendum) for the Bristol-Myers Squibb Restoration Area (site), dated November 2, 2015, which was prepared by ARCADIS of New York, Inc. (ARCADIS) on behalf of the Bristol-Myers Squibb Company (BMS). The addendum references the Phase 1A Remedial Investigation Work Plan – Soil Vapor Module dated January 2015 (work plan),which was also prepared by ARCADIS on behalf of BMS. The addendum and work plan are hereby approved with the following modifications.

1. Addendum Section 2.1, Paragraph (b) – If the collection of the sub-slab soil vapor sample is possible, the collection of the proposed exterior soil vapor sample may not be necessary. If high water is encountered, the exterior soil vapor sample would be needed. To be clear, if the sub-slab sample is able to be collected, it will be collected concurrently with the indoor air sample and ambient air sample.

2. Addendum Section 3.3 & Table 3 – The laboratory detection/reporting levels for trichloroethene, vinyl chloride, and carbon tetrachloride must be less than or equal to 0.25 micrograms per cubic meter for indoor air samples.

3. Addendum Section 3.4, 1st Paragraph – The primary purpose of evaluating the data is to assess the existence of, or the potential for, human exposures resulting from soil vapor intrusion, not as a basis for land use restrictions.

4. Addendum Section 3.4, 1st Paragraph – In addition to evaluation of the data to determine if additional investigation is needed, the data will be evaluated to determine if actions to mitigate soil vapor intrusion are necessary.

5. Addendum Section 3.4, 1st Paragraph – If data is to be evaluated against screening values, it should be compared to unrestricted levels and the most stringent guidance for the proposed land use category. If land use within the Brownfield Cleanup Program site is to be restricted to commercial and/ or industrial uses, data should be compared to the unrestricted use screening values and the commercial use screening values for on-site locations. Note, evaluation of all data in comparison to unrestricted standards, criteria or guidance values is required for all environmental media as part of the remedial program.

6. Addendum Section 3.4, 4th Paragraph – New York State does not defer to the United States Environmental Protection Agency (USEPA) Target Groundwater Concentrations or use attenuation factors for screening purposes. Data can be presented and evaluated using such factors, and that data will be reviewed and considered, but all decisions regarding future actions relating to soil vapor intrusion will be made based on a comprehensive evaluation based on compliance with the current NYSDOH guidance as required by the Department's guidance document *DER-10: Technical Guidance for Site Investigation and Remediation* and the Brownfield Cleanup Agreement.

7. Addendum Section 3.4, 4th Paragraph – Based on the referenced USEPA guidance document, 0.03 should not be utilized as the attenuation factor for the Building 23 Complex, since groundwater is present immediately below, and in some instances infiltrates into, the building. It may not be appropriate for other buildings which are to be sampled (*e.g.*, Building 3) for similar reasons. The EPA guidance document states, beginning at Section 6.5.2, 5th paragraph (page 107), the following:

> "A critical assumption for this generic model is that site-specific subsurface characteristics will tend to reduce or attenuate soil gas concentrations as vapors migrate upward from the source and into overlying structures. Specific factors that may result in relatively unattenuated or enhanced transport of vapors into a building include the following:
>
> - Significant openings to the subsurface that facilitate soil gas entry into the building (e.g., sumps, unlined crawl spaces, earthen floors) other than typical utility penetrations.
>
> - Very shallow groundwater sources (*e.g.*, depths to water less than five feet below foundation level) (see, for example, EPA (2012a), Section 5.2).

- Significant routes for preferential, subsurface vapor migration whether naturally-occurring (*e.g.*, fractured bedrock) or anthropogenic (see Sections 5.4 and 6.3.2).

These specific factors are likely to render inappropriate the use of the recommended attenuation factors and the sub-slab, groundwater, and soil gas VISLs for purposes of identifying sites or buildings unlikely to pose a health concern through the vapor intrusion pathway. On the other hand, further evaluation of the vapor intrusion pathway is still appropriate when the sub-slab, groundwater, and soil gas VISLs are exceeded for samples from a building or site where these specific factors are present."

8. Addendum Section 3.4, 4th Paragraph, 1st Bullet – Data are not provided to support the assertion that air infiltration rates would be higher in the buildings to be sampled than typical residential structures. Further, there is no reason to believe the residential structures included in the survey were constructed according to modern energy efficiency codes.

9. Addendum Section 3.4, 4th Paragraph, 2nd Bullet – Other sensitive populations may be present within the buildings (*e.g.*, pregnant women, immune-compromised individuals).

10. Addendum Section 3.4, 4th Paragraph, 4th Bullet – Actual slab thicknesses will be determined during installation of the sampling points, and the actual slab thicknesses will be considered in comparison to a typical residential slab thickness.

11. Addendum Section 3.4, 5th Paragraph – The increased air exchange rate could actually result in greater soil vapor intrusion, though it might also result in lower concentrations in indoor air. The referenced USEPA guidance document does not support this statement, since other factors relevant to the site (*e.g.*, depth to groundwater, presence of significant utility penetrations and vaults) would tend to decrease attenuation. Refer to item 7 of this letter.

12. Addendum Section 4.0 - The reporting of results in data summary tables is acceptable; however, in addition to the summary tables, the laboratory results reports, quality assurance/quality control, and data validation data, must also be provided for all compounds analyzed.

13. Addendum – Other factors that may necessitate further sampling may exist. One such factor would be if the construction and/or operation of the heating, ventilation and air conditioning system for a given building changes significantly. For example, if a given building is currently not heated or heated to a limited extent, and that

building is later occupied and therefore the heat is turned on or up, that may affect the potential for soil vapor intrusion.

14. Table 2 – Based on the NYSDOH guidance document *Guidance for Evaluating Soil Vapor Intrusion in the State of New York*, dated October 2006 (NYSDOH SVI guidance), certain site contaminants of concern were included in the BASE Study but are not listed in Table 2, including:

    - 1-butanol (BASE Study 90th percentile value of < 4.8); and
    - 2-methyl-1-propanol (isobutanol) (BASE Study 90th percentile value of 3.1).

15. Table 2 – Based on the NYSDOH SVI guidance, the BASE Study 90th percentile value for:

    - Freon 114 should be “< 6.8” (listed in the Appendix C of the NYSDOH SVI guidance as dichlorotetrafluoroethane); and for
    - 1,1,2-trichloro-1,2,2-trifluoroethane should be “3.5” (listed in the Appendix C of the NYSDOH SVI guidance as trichlorotrifluoroethane).

Pursuant to 6 NYCRR 375-1.6(d)(3), BMS must respond in writing within 15 days as to whether the modifications will be accepted. Alternatives to accepting the modifications are set forth at 6 NYCRR 375-1.6(d)(3)(ii) and (iii). Note, accepting certain modifications included in this letter, but not accepting other modifications provided in this letter is not an alternative provided for by regulation.

If accepted, a copy of the letter from BMS accepting the changes, this letter, and the addendum must be attached to the front of all copies of the work plan, and those four documents will constitute the final approved work plan.

BMS must obtain and comply with any necessary State, local or federal permits. The Department requires notification at least seven days in advance of field work. If you have any questions, please do not hesitate to contact me at 315-426-7411 or joshua.cook@dec.ny.gov.

Sincerely,

Joshua P. Cook, P.E.
Environmental Engineer 2

ec: Harry Warner (NYSDEC)

Joshua Cook (NYSDEC)
Maureen Schuck (NYSDOH)
Richard Jones (NYSDOH)
John Mosack (BMS)
J. Richard Pooler (BMS)
John Killiany (BMS)
Anne Locke (BMS)
David Wright (ARCADIS)
JoAnn Robertson (ARCADIS)

Imagine the result

Bristol-Myers Squibb Company

C734138 Phase 1A Remedial Investigation Work Plan

Soil Vapor Sampling Module Addendum

BMS Syracuse North Campus Restoration Area
East Syracuse, New York

November 2, 2015

ARCADIS

C734138 Phase 1A Remedial Investigation Work Plan

Soil Vapor Sampling Module Addendum

BMS Syracuse North Campus Restoration Area
East Syracuse, New York

Keith White, CPG

I, Keith White, certify that I am currently a Qualified Environmental Professional [as defined in 6 New York Codes, Rules and Regulations Part 375] and that this C734138 Phase 1A Remedial Investigation Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

Prepared for:
Bristol-Myers Squibb Company

Prepared by:
Arcadis of New York, Inc.
6723 Towpath Road
PO Box 66
Syracuse
New York 13214-0066
Tel 315 446 9120
Fax 315 446 8053

Our Ref.:
B0087363.0009.00007

Date:
November 2, 2015

1. Soil Vapor Sampling Module Addendum Overview 1

2. Soil Vapor Intrusion Evaluation Sample Location Addendum 3

2.1 Building 3 3

2.2 Building 7 4

2.3 Buildings 22 & 22A 4

2.4 Building 23 Complex 5

2.5 Building 31 6

2.6 Building 32 Complex 6

3. Soil Vapor 7

3.1 Site Reconnaissance and Sample Locations 7

3.2 Field Duplicate Sampling 7

3.3 Sample and Analytical Methods 7

3.4 Data Evaluation 9

4. Reporting 11

5. Schedule 12

6. References 13

Tables

(Note: Table 1 was created for this SV Addendum; the remaining tables are from the original work plan and have been renumbered accordingly.)

1 Proposed Sampling Locations by Building

2 BASE Values and Indoor Air Screening Levels

3 Reporting Limits and Sub-slab Soil Vapor Screening Levels

Figures

(Note: In addition to Figures 1 through 3 in the SV Work Plan, Figure 4 has been revised from the original work plan; the remaining figures are new to this SV Addendum.)

4 Proposed Sampling Locations

5 Building 3 First Floor Plan and Proposed Sample Locations

6 Building 7 Floor Plan and Proposed Sampling Locations

7 Building 22/22A First Floor Plan and Proposed Sampling Locations

8 Building 23B Basement Floor Plan and Proposed Sampling Locations

9 Building 32 First Floor Plan and Proposed Sampling Locations

Appendices

(*Note: In addition to Appendix A presented in the SV Work Plan, the following Appendices were used in this SV Addendum*.)

B Agency Correspondence

C Building 23 Complex Chemical Inventory

D Excerpts from the Field Sampling and Analysis Plan for Indoor and Ambient Air Sampling

Acronyms and Abbreviations

ACGIH	American Conference of Governmental Industrial Hygienists
BASE	Building Assessment Survey and Evaluation Study
BDA	Brownfield Development Area
COC	Chemicals of Concern
FSAP	Field Sampling and Analysis Plan
NIOSH	National Institute of Occupational Safety and Health
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
QAPP	Quality Assurance Project Plan
RIWP	Remedial Investigation Work Plan
RSL	Regional Screening Level
SV	Soil Vapor
SVI	Soil Vapor Intrusion
SVS	Soil Vapor Sampling
TICs	Tentatively Identified Compounds
VOCs	Volatile Organic Compounds

1. Soil Vapor Sampling Module Addendum Overview

This ***Soil Vapor Sampling Module Addendum*** (SV Addendum) provides updated soil vapor sampling and soil vapor intrusion evaluation strategies to those originally proposed in the ***Phase 1A Remedial Investigation (RI) Work Plan Soil Vapor Sampling Module*** (SV Work Plan) submitted in January, 2015 to the New York State Department of Environmental Conservation (NYSDEC) for the Bristol-Myers Squibb Company (BMS) Syracuse North Campus Restoration Area (Site No. C734138) in East Syracuse, New York.

As discussed with NYSDEC/New York State Department of Health (NYSDOH) during the parties' July 29, 2015 meeting, Buildings 3, 7, 22/22A, and 23B are occupied buildings on or immediately adjacent to the Brownfield Development Area (BDA) that will remain occupied, subject to changes in site master planning. Building 31 will be demolished by the first quarter of 2016. The Building 32 complex is currently less than 20% occupied, but is programmed for full occupancy in the 2016 to 2018 time frame. Buildings 25, 25N, 48, 61, 70, and 82 are present in the BDA but are not occupied and will not be occupied in the future. Buildings 25 & 25N are currently scheduled for demolition in 2016. Therefore, as discussed at our meeting, the soil vapor intrusion (SVI) pathway investigation will evaluate conditions in Buildings 3, 7, 22/22A, 23B, and 32A/32D. An updated partial site plan showing the Brownfield Area Boundary, existing building occupancies, and proposed sampling locations is included as **Figure 4**. Updated building specific sampling locations are shown on **Figures 5** through **9**, and are summarized in **Table 1**.

This SV Addendum includes:

- Scope revisions associated with comments received from the NYSDEC, dated April 7, 2015;
- Updates associated with collection of concurrent indoor air samples at select locations;
- Scope expansion associated with the collection of concurrent ambient outdoor air samples at select locations;
- Updated sampling locations and building specific strategies agreed to during a July 29, 2015 meeting between BMS, Arcadis, NYSDEC, and NYSDOH; and
- Refined SVI evaluation strategies developed during supplemental discussions with the NYSDOH on September 3, 2015 (included in **Appendix B**) specific to laboratory Building 23 Complex (including conjoined buildings 23, 23A, and 23B).

The SVI evaluation strategy has been updated to:

- Clarify existing building occupancies;
- Document existing engineering controls in select buildings that would serve to mitigate SVI issues;
- Clarify site constraints relative to on-going laboratory chemical storage and usage; and
- Provide for contingencies to address shallow groundwater conditions expected within lacustrine deposits located at the eastern flanks of the North Campus Restoration Area.

All proposed sample locations are approximate, and may be field adjusted dependent on geophysical survey results prior to installation. Conditions that may influence sample point locations include: conflicts with subgrade utility services, subgrade obstructions (foundation walls, pilings, piers, grade beams, etc.), and building slab thickness.

The activities presented in this SV Addendum will be performed in accordance with the requirements of the NYSDEC Brownfield Cleanup Program. The Brownfield Cleanup Agreement between BMS and NYSDEC was executed on October 18, 2011. A site location map showing the general location of the site is provided as Figure 1 in the January 2015 SV Work Plan, and the location and boundaries of the BDA at the site are provided in Figure 2 of that work plan.

This SV Addendum was prepared in accordance with the requirements of the Remedial Investigation Work Plan (RIWP; O'Brien & Gere Engineers [OBG] 2013a) which was conditionally approved by NYSDEC/NYSDOH on April 3, 2013.

Additional document references to supplement the references provided in the January 2015 SV Work Plan are included in Section 5.

2. Soil Vapor Intrusion Evaluation Sample Location Addendum

2.1 Building 3

The sensitive receptor occupancy in Building 3 (Boiler House) is located in the operator control room, approximately one story below surface grade. Nearby soil borings indicate that the floor slab of the operator control room may be located within lacustrine deposits where shallow groundwater may be encountered. The proposed sampling strategy for Building 3 includes:

a) Prior to attempting sub-slab sampling, one exterior soil boring (**SB-3 on Figure 5**) will be advanced on the western or southern side of Building 3 to establish approximate depth to groundwater. The location will be dependent on the geophysical survey results for subsurface utility conflicts.

b) One sub-slab soil vapor sample (**SS 3-1 on Figure 5**) will be attempted in the operator control room concurrent with collection of:

- One indoor air sample (**IA 3-1 on Figure 5**);
- One exterior soil vapor sample west or south of Building 3 at the nearest accessible location (**SV 3-1 on Figure 5**); and
- One exterior ambient air sample (**AA-3 on Figure 5**).

c) Should high groundwater be encountered within the operator control room that precludes sub-slab soil vapor sample collection, sampling at Building 3 will be limited to:

- One indoor air sample (**IA 3-1 on Figure 5**);
- One exterior soil vapor sample west or south of Building 3 at the nearest accessible location (**SV 3-1 on Figure 5**); and
- One exterior ambient air sample (**AA-3 on Figure 5**).

d) The exterior ambient air samples will be collected to identify impacts from adjacent railroad operations, construction, maintenance, or demolition activities that may occur concurrently with indoor air sample collection. The exterior ambient air sample location will be adjusted on the day of sampling to correlate with site activities and the upwind direction.

2.2 Building 7

Building 7 is a cafeteria and conference center with a concrete slab on grade construction. Sub-slab soil vapor and concurrent indoor air samples will be collected at three locations (**SS 7-1 / IA 7-1**, **SS 7-2 / IA 7-2**, and **SS 7-3 / IA 7-3**) as shown on **Figure 6**. One exterior ambient air sample (**AA-7**) will be collected south of the building near the intake for the HVAC system. Due to the age of Building 7, sample locations must be evaluated for asbestos containing mastics or floor tiles prior to installation of sampling points.

2.3 Buildings 22 & 22A

Buildings 22 & 22A are conjoined office buildings with one story of topographic relief from west to east. First floor occupancies include a health clinic, data center, file archive, and break room. Approximately 40% of the first floor is comprised of mechanical spaces not normally occupied. Sub-slab soil vapor and concurrent indoor air samples will be collected at three locations (**SS 22A-1 / IA 22A-1**, **SS 22-1 / IA 22-1**, and **SS 22-2 / IA 22-2**) as shown on **Figure 7**. One exterior ambient air sample (**AA-22**) will be collected east of the building near the intake for the HVAC system. Due to the age of Building 22 & 22A, sample locations must be evaluated for asbestos containing mastics or floor tiles prior to installation of sampling points.

Building 22 / 22A sample location details:

- SS 22A-1 / IA 22A-1. A sub-slab soil vapor sampling location and an indoor air sampling location in the mechanical room located at southern end of Building 22A.

- SS 22-1 / IA 22-1. The sub-slab soil vapor sample will be collected in a janitor closet at the northeast corner of Building 22. The closet has a concrete floor and sufficient access to collect a sub-slab sample. The indoor air sample will be collected in a nearby office along the eastern edge of Building 22.

- SS 22-2 / IA 22-2. Health Services area along eastern edge of Building 22. A sub-slab soil vapor sample will be collected from a closet or other location that does not disrupt daily activities. The indoor air sample will be collected from a nearby unoccupied office.

- AA-22. One ambient air sampling location east of the building near an air intake for the building HVAC system.

2.4 Building 23 Complex

Activities within the Building 23 Complex are clarified herein to document SVI evaluation constraints. The Building 23 Complex:

a) Consists of three conjoined laboratory buildings where raw goods and quality control testing is conducted in support of in-process manufacturing.

b) Operates seven days a week.

c) Contains a chemical stockroom located in the basement of Building 23 and 23B with an inventory of several hundred stock laboratory chemicals.

d) Includes a current laboratory chemical inventory of approximately 900 discrete chemical compounds, including numerous Chemicals of Concern (COC) found in groundwater within the North Campus Restoration Area. The most recent chemical inventory is included in **Appendix C**.

e) Contains both chemistry and biology labs designed with single pass through air at 8 to 15 air exchanges per hour, providing a change of the entire building air volume approximately once every 5 minutes. Engineering controls within the Building 23 Complex are designed to maintain concentrations of commonly used laboratory chemicals below OSHA Permissible Exposure Limits, NIOSH Recommended Exposure Limits, ACGIH Threshold Limit Values, and BMS Occupational Exposure Limits. BMS maintains a program of industrial hygiene sampling for laboratory staff located in Building 23 Complex.

Given the operating schedule of the Building 23 Complex, the existing chemical inventory, and variable lab activities, the NYSDOH has determined that it is both impractical to effectively remove chemicals from the building prior to sampling, and technically infeasible to differentiate SVI COC from lab-related chemicals. Considering the engineering controls in use within the Building 23 Complex for exposure control purposes, the NYSDOH has granted relief from the requirement to collect indoor air samples for SVI evaluation within the Building 23 Complex. Copies of correspondence with the NYSDOH are included in **Appendix B**.

Groundwater has been observed entering through the basement slab of Buildings 23 and 23A during periods of high groundwater which may preclude the effective installation of a sub slab vapor monitoring point within the Building 23 Complex. The SVI investigations for the Building 23 Complex will be limited to Building 23B, and will consist of:

a) One sub-slab soil vapor sample (**SS 23B-1 on Figure 8**), **or**

b) If high groundwater is encountered, two exterior soil vapor samples collected adjacent to Building 23B (**SV 23B-1** and **SV 23B-2 on Figure 8**), beneath impervious surfaces where feasible. The southern side of 23B is predominately grass, and the exterior soil vapor sample will likely be installed in an area without impervious surfaces.

2.5 Building 31

Building 31 is currently scheduled for demolition within the fourth quarter of 2015. Occupants have been relocated to other buildings on campus.

2.6 Building 32 Complex

The Building 32 Complex consists of 5 conjoined buildings (32, 32A, 32B, 32C, and 32D) east (down gradient / cross-gradient) of the BDA, comprised of one and two story buildings constructed in an elevated slab on grade configuration for flood mitigation purposes. The Building 32 Complex was formerly used as a drug safety research facility with a mix of animal vivariums, laboratories, and office space. Currently, the Building 32 Complex has limited occupancy within Building 32B and the south east corner of Building 32A. The vast majority of Building 32 and 32A currently contains unoccupied mechanical rooms and former animal husbandry areas used for general storage. Building 32A also contains Universal Waste and RCRA <90 Day storage rooms, and pharmaceutical / biological waste staging areas. Buildings 32C and 32D are currently unoccupied office buildings programmed for re-occupation in the 2016 to 2018 time frame.

Sample locations in the Building 32 Complex were identified to evaluate soil vapor concentrations in relation to VOCs detected in monitoring well BLD 20-1. Due to the distance between monitoring well BLD 20-1 and Building 32A/32D, an exterior soil vapor sample (**SV 32D-1**) will be installed between the well and the building to evaluate subsurface vapor conditions. Two sub-slab soil vapor and indoor air samples (**SS 32A-1 / IA 32A-1** and **SS 32D-1 / IA 32D-1**) will be collected within the Building 32 Complex with the sub-slab and indoor air samples at each sample location to be collected concurrently. An exterior ambient air sample (**AA-32**) will be collected near supply air intakes on the roof of Building 32D in conjunction with interior and soil vapor sampling. Locations of all proposed samples are shown on **Figure 9**.

3. Soil Vapor

This SV Addendum contains the entire scope of work for the exterior soil vapor, sub-slab soil vapor, indoor air, and ambient air sampling to be conducted during the investigation.

3.1 Site Reconnaissance and Sample Locations

Sampling locations were identified that would provide information on subsurface and indoor air VOC concentrations with particular focus on areas of each building closest to impacted groundwater. Sample locations also considered feasibility and access based on occupancy of a given building or the presence of landscaping or other outdoor structural features that cannot be moved.

Prior to sample collection, a detailed building review and reconnaissance will be conducted of each location to confirm and document specific sample locations (i.e., measured from outside walls), to obtain additional information on building layout, uses, HVAC system configuration, and to identify and remove chemical products from the building, if feasible. Chemical products included in daily operations that cannot be removed from the building 48 hours in advance of sampling will be documented. A photoionization detector equipped with an 11.7eV lamp will be used to screen for the presence of detectable vapor-phase chemicals during reconnaissance.

3.2 Field Duplicate Sampling

Arcadis will collect one field duplicate sample for each media (i.e., soil vapor, indoor air, and ambient air). The field duplicates will be consistent with those identified in the Quality Assurance Project Plan (QAPP) for soil vapor sampling included in Attachment A of the January 2015 SV Work Plan.

3.3 Sample and Analytical Methods

Exterior soil vapor, sub-slab soil vapor, indoor air, and ambient air samples will be collected consistent with the approved Field Sampling and Analysis Plan (FSAP; OBG 2013d) with samples to be collected during the heating season. Excerpts of the relevant pages for exterior and sub-slab soil vapor were included in Attachment A of the January 2015 SV Work Plan. Select excerpts of the relevant pages for indoor and ambient air sampling are included in Attachment B of this SV Addendum.

Permanent sub-slab soil vapor sampling points will be installed, provided they do not cause any safety or quality issues with ongoing building operations. A helium tracer test will be conducted on all sub-slab soil vapor samples consistent with the procedures identified in the FSAP for soil vapor sampling. Sub-slab soil vapor samples will be collected over an approximate 8-hour period consistent with a typical work day.

Permanent exterior soil vapor sampling points will be installed, provided they do not cause any safety or quality issues with ongoing building operations. Where applicable, exterior soil vapor samples will be collected along with the exterior ambient air samples from within the same sampling area. Exterior soil vapor samples will be collected from approximately 1 to 2 feet above the water table. Data (United States Environmental Protection Agency [USEPA] 2012) have shown that deep soil vapor samples can provide a worst-case estimate of soil vapor concentrations that can be found under a building slab.

A tracer test will be conducted on all exterior soil vapor samples consistent with the procedures identified in the FSAP for soil vapor sampling. Exterior soil vapor samples will be collected over an approximately 30-minute period at a flow rate not to exceed 200 milliliters per minute. Quality assurance procedures for vacuum measurements, sample canisters and field duplicates will be consistent with those identified in the Quality Assurance Project Plan (QAPP) for soil vapor sampling included in Attachment A of the January 2015 SV Work Plan.

Indoor and exterior ambient air samples will be collected from sampling canisters placed approximately 3 to 5 feet above the ground surface (i.e., at approximate breathing zone height). Samples will be collected over an 8-hour period consistent with a typical work day. Field procedures are identified in the FSAP (included as Appendix D to this SVS Addendum). Quality assurance procedures for vacuum measurements, sample canisters and field duplicates will comply with the QAPP for soil vapor sampling included in Attachment A of the January 2015 SV Work Plan.

The sub-slab soil vapor, exterior soil vapor, indoor air, and exterior ambient air samples will be submitted, under chain-of-custody, to Eurofins AirToxics Laboratory in Folsom, CA in accordance with USEPA Method TO-15. Additionally, as feasible the site-specific VOCs that are not included in AirToxics' standard TO-15 compounds list will be reported by the laboratory as tentatively identified compounds (TICs). The complete list of target analytes is included in **Tables 2** and **3**.

3.4 Data Evaluation

The indoor air, exterior ambient air, exterior soil vapor, and sub-slab soil vapor data collected at the site will be evaluated to assess the need for further investigation. Data will be evaluated against screening levels applicable to future land use, which is commercial/industrial for both the BDA and adjacent down gradient BMS property. In the event that property ownership is ever transferred, land use will be restricted to commercial/industrial use, as is typical of all BMS manufacturing facility property transactions.

Indoor air data will primarily be evaluated using the indoor air background levels as provided in the Building Assessment Survey and Evaluation (BASE) Study (USEPA 2001) from Table C2 of Appendix C of the NYSDOH (2006) guidance, as presented in **Table 2**. The August 2015 Air Guideline Value for trichloroethene of 2 $\mu g/m^3$ will be used in lieu of the BASE Study 90th percentile value of 4.2 $\mu g/m^3$.

Reporting limits are also included in **Table 2** for compounds that were not detected in the BASE Study, as these values represent reasonable estimates of practical quantitation limits. If a BASE Study 90th percentile value was not available for a particular compound, the USEPA Industrial Air Regional Screening Level (RSL) was provided as the indoor air screening level. As discussed in the July 29, 2015 meeting, OSHA PELs may also be used to evaluate potential exposure to occupants of buildings where chemicals are used, handled, and/or stored in the building. OSHA PELs are also included in **Table 2**, where available, along with the indoor air screening levels.

NYSDOH's Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH 2006) does not provide standards, criteria, or guidance values for evaluating sub-slab soil vapor or soil vapor data results. As shown in **Table 3**, the indoor air screening levels developed from the BASE Study 90th percentile values or USEPA (2015b) Industrial RSLs were used to calculate sub-slab and exterior soil vapor screening levels using a conservative attenuation factor of 0.03 (USEPA 2015a). An attenuation factor of 0.03 is recommended by USEPA (2015a) for all volatile compounds based on a conservative analysis of empirical data for both sub-slab soil vapor and deep soil gas (collected above the water table). Because the data used to calculate the attenuation factor of 0.03 are from residential structures, the value of 0.03 is expected to be a conservative estimate for the commercial/industrial buildings on site for the following reasons:

- Site building construction pre-dates modern energy efficiency codes, and site buildings are subject to exterior air infiltration at rates substantially higher than typical residential structures;

- Residential screening criteria reflect exposure thresholds for sensitive receptors in the population (infants and children);

- Air exchange and ventilation rates tend to be larger for commercial/industrial buildings (e.g., Building 23B); and

- Site buildings are expected to have thicker foundation slabs than typical residential applications (e.g., Building 32 A/D).

In combination, these factors tend to decrease SVI, and would therefore support a lower attenuation factor. The sub-slab and soil vapor screening levels are provided in **Table 3**.

The exterior and sub-slab soil vapor and indoor air data collected during this investigation will also be compared to matrices available from NYSDOH (2006) Vapor Intrusion Guidance.

As shown in **Tables 2** and **3**, there are several constituents for which screening levels have not been established. If constituents without screening levels are detected, additional study and evaluation may be required to determine if these compounds present adverse health risks to building occupants that requires remediation. Additional discussions will be conducted with NYSDOH and NYSDEC should compounds with no screening criteria be detected during this phase of the RI.

4. Reporting

An interim deliverable consisting of sampling location figures and data tables comparing results to applicable screening levels will be provided. Final reporting of the exterior soil gas, sub-slab soil gas, indoor and ambient air sampling will be provided in the Phase 1A Report. The Phase 1A Data Summary Report will include identification of data gaps (if any) and a proposed scope (as needed) for Phase 2 investigations.

5. Schedule

Within approximately 45 days of receiving approval of this SV Addendum by the NYSDEC and NYSDOH, BMS will provide the NYSDEC will the 10-day notification as to the planned start of field work, as required by the October 18, 2011 Brownfield Cleanup Agreement. This schedule assumes that weather conditions will be suitable for the intended work.

6. References

In addition to the references presented in the January 2015 SV Work Plan, the following references were used in this SV Addendum:

- USEPA. 2015a. *OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air*. OSWER Publication 9200.2-154. Office of Solid Waste and Emergency Response. June.

- USEPA. 2015b. Regional Screening Levels. June. Available at: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm

ARCADIS

Tables

Table 1
Proposed Sampling Locations by Building

Site #C734138: BMS Syracuse North Campus Restoration Area

Sample Type	Sample ID	Proposed Sampling Location Description
Building 3		
Exterior Soil Vapor	SV 3-1	West of the building biased toward groundwater impacts.
Sub-Slab soil Vapor	SS 3-1	Equipment room.
Indoor Air	IA 3-1	Equipment room.
Ambient Air	AA-3	North of the building near an air intake for the building HVAC system.
Building 7		
Sub-Slab Soil Vapor	SS 7-1	Office area along northern wall.
	SS 7-2	Training room along western edge of building.
	SS 7-3	Storage room in southwest corner of building.
Indoor Air	IA 7-1	Office area along northern wall.
	IA 7-2	Training room along western edge of building.
	IA 7-3	Storage room in southwest corner of building.
Ambient Air	AA-7	South of the building in the vicinity of an air intake for the building HVAC system.
Building 22/22A		
Sub-Slab Soil Vapor	SS 22-1	Janitor closet at northeast corner of Building 22.
	SS 22-2	Closet in Health Services area along eastern edge of Building 22.
	SS 22A-1	HVAC room located at southern end of Building 22A.
Indoor Air	IA 22-1	Office along eastern edge of Building 22.
	IA 22-2	Office in Health Services area along eastern edge of Building 22.
	IA 22A-1	HVAC room located at southern end of Building 22A.
Ambient Air	AA-22	East of the building in the vicinity of an air intake for the building HVAC system.
Building 23B		
Exterior Soil Vapor	SV 23B-1	In an older sidewalk directly east of groundwater monitoring well DS 2-3.
	SV 23B-2	In the grass along the southwestern end of the building.
Sub-Slab Soil Vapor	SS 23B-1	In the basement near the western end of the building.
Building 32A/D		
Exterior Soil Vapor	SV 32D-1	West of the building.
Sub-Slab Soil Vapor	SS 32A-1	Technical office and cubicles area (Room 361) in western portion of Building 32A.
	SS 32D-1	Office area (Office 440) in western portion of Building 32D.
Indoor Air	IA 32A-1	Technical office and cubicles area (Room 361) in western portion of Building 32A.
	IA 32D-1	Office area (Room 440,448,439, or 447) in western portion of Building 32D.
Ambient Air	AA-32	West of the building in the vicinity of an air intake for the building HVAC system.

Notes:
HVAC = heating, ventilation, and air conditioning.

Table 2
BASE Values and Indoor Air Screening Levels

Site #C734138: BMS Syracuse North Campus Restoration Area

Volatile Organic Chemicals	CAS #	Units	Eurofins Analysis	Anticipated Analytical Laboratory Reporting Limit (a) TO-15	BASE Study 90th Percentile Value	USEPA Industrial Air RSL (a)	Indoor Air Screening Level (b)	OSHA Permissible Exposure Limit (c)
1,1,1-Trichloroethane	71-55-6	ug/m^3	TO-15	0.11	20.6		20.6	1,900,000
1,1,2,2-Tetrachloroethane	79-34-5	ug/m^3	TO-15	0.14	---	0.21	0.21	35,000
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ug/m^3	TO-15	0.77	---	130,000	130,000	7,600,000
1,1,2-Trichloroethane	79-00-5	ug/m^3	TO-15	0.11	<1.5		<1.5	45,000
1,1'-Biphenyl	92-52-4	ug/m^3	TO-15 TIC	NA	---	1.8	1.8	1,000
1,1-Dichloroethane	75-34-3	ug/m^3	TO-15	0.081	<0.7		<0.7	400,000
1,1-Dichloroethene	75-35-4	ug/m^3	TO-15	0.040	<1.4		<1.4	---
1,2,3-Trimethylbenzene	526-73-8	ug/m^3	TO-15 TIC	---	---	22	22	---
1,2,4-Trichlorobenzene	120-82-1	ug/m^3	TO-15	3.7	<6.8		<6.8	---
1,2,4-Trimethylbenzene	95-63-6	ug/m^3	TO-15	0.49	9.5		9.5	---
1,2-Dibromoethane	106-93-4	ug/m^3	TO-15	0.15	<1.5		<1.5	153,685
1,2-Dichlorobenzene	95-50-1	ug/m^3	TO-15	0.60	<1.2		<1.2	300,000 C
1,2-Dichloroethane	107-06-2	ug/m^3	TO-15	0.081	<0.9		<0.9	202,372
1,2-Dichloropropane	78-87-5	ug/m^3	TO-15	0.46	<1.6		<1.6	350,000
1,3,5-Trimethylbenzene	108-67-8	ug/m^3	TO-15	0.49	3.7		3.7	---
1,3-Butadiene	106-99-0	ug/m^3	TO-15	0.22	<3.0		<3.0	2,212
1,3-Dichlorobenzene	541-73-1	ug/m^3	TO-15	0.60	<2.4		<2.4	---
1,4-Dichlorobenzene	106-67-8	ug/m^3	TO-15	0.12	5.5		5.5	---
1,4-Dioxane	123-91-1	ug/m^3	TO-15	0.36	---	2.5	2.5	360,000
1-Propene, 3-chloro-	107-05-1	ug/m^3	TO-15	1.6	---	2	2	3,000
2,2,4-Trimethylpentane	540-84-1	ug/m^3	TO-15	2.3	---	---	---	---
2-Butanone	78-93-3	ug/m^3	TO-15	1.5	12		12	590,000
2-Chlorophenol	95-57-8	ug/m^3	TO-15 TIC	NA	---	---	---	---
2-Hexanone	591-78-6	ug/m^3	TO-15	2.0	---	130	130	410,000
2-Methylnaphthalene	91-57-6	ug/m^3	TO-15 TIC	NA	---	---	---	---
2-Nitropropane	79-46-9	ug/m^3	TO-15 TIC	---	---	0.0045	0.0045	90,000
2-Propanol	67-63-0	ug/m^3	TO-15	1.2	250		250	980,000
4-Chlorotoluene	106-43-4	ug/m^3	TO-15 TIC	---	---	---	---	---
4-Ethyltoluene	622-96-8	ug/m^3	TO-15	0.49	3.6		3.6	---
4-Methyl-2-pentanone	108-10-1	ug/m^3	TO-15	0.41	6		6	410,000
Acetone	67-64-1	ug/m^3	TO-15	1.2	98.9		98.9	2,400,000
Acetonitrile	75-05-8	ug/m^3	TO-15 TIC	---	---	260	260	70,000
Acetophenone	98-86-2	ug/m^3	TO-15 TIC	NA	---	---	---	---
alpha-Chlorotoluene	100-44-7	ug/m^3	TO-15	0.52	<6.8		<6.8	5,000
Benzaldehyde	100-52-7	ug/m^3	TO-15 TIC	---	---	---	---	---
Benzene	71-43-2	ug/m^3	TO-15	0.16	9.4		9.4	3,195
Bis(2-chloroethyl)ether	111-44-4	ug/m^3	TO-15 TIC	---	---	0.037	0.037	90,000 C
Bromodichloromethane	75-27-4	ug/m^3	TO-15	0.67	---	0.33	0.33	---
Bromoform	75-25-2	ug/m^3	TO-15	1.0	---	11	11	5,000
Bromomethane	74-83-9	ug/m^3	TO-15	1.9	<1.7		<1.7	80,000 C
Carbon disulfide	75-15-0	ug/m^3	TO-15	1.6	4.2		4.2	62,282
Carbon tetrachloride	56-23-5	ug/m^3	TO-15	0.12	<1.3		<1.3	62,920
Chlorobenzene	108-90-7	ug/m^3	TO-15	0.46	<0.9		<0.9	350,000
Chloroethane	75-00-3	ug/m^3	TO-15	0.13	<1.1		<1.1	2,600,000
Chloroform	67-66-3	ug/m^3	TO-15	0.098	1.1		1.1	240,000 C
Chloromethane	74-87-3	ug/m^3	TO-15	0.10	3.7		3.7	206,503
cis-1,2-Dichloroethene	156-59-2	ug/m^3	TO-15	0.079	<1.9		<1.9	---
cis-1,3-Dichloropropene	10061-01-5	ug/m^3	TO-15	0.45	<2.3		<2.3	---
Cyclohexane	110-82-7	ug/m^3	TO-15	0.34	---	26000	26,000	1,050,000
Cyclohexene	110-83-8	ug/m^3	TO-15 TIC	---	---	4400	4,400	1,015,000
Dibromochloromethane	124-48-1	ug/m^3	TO-15	0.85	---	0.45	0.45	---
Dichlorodifluoromethane	75-71-8	ug/m^3	TO-15	0.099	16.5		16.5	4,950,000

See Notes on Page 2.

Table 2
BASE Values and Indoor Air Screening Levels

Site #C734138: BMS Syracuse North Campus Restoration Area

Volatile Organic Chemicals	CAS #	Units	Eurofins Analysis	Anticipated Analytical Laboratory Reporting Limit (a) TO-15	BASE Study 90th Percentile Value	USEPA Industrial Air RSL (a)	Indoor Air Screening Level (b)	OSHA Permissible Exposure Limit (c)
Epichlorohydrin	106-89-8	ug/m^3	TO-15 TIC	---	---	4.4	4.4	19,000
Ethanol	64-17-5	ug/m^3	TO-15	0.94	210		210	1,900,000
Ethyl acetate	141-78-6	ug/m^3	TO-15 TIC	---	5.4		5.4	1,400,000
Ethylbenzene	100-41-4	ug/m^3	TO-15	0.087	5.7		5.7	435,000
Freon 114	76-14-2	ug/m^3	TO-15	0.14	---	---	---	7,000,000
Heptane	142-82-5	ug/m^3	TO-15	0.41	---	---	---	2,000,000
Hexachlorobutadiene	87-68-3	ug/m^3	TO-15	5.3	<6.8		<6.8	---
Isopropyl ether	108-20-3	ug/m^3	TO-15 TIC	---	---	3,100	3,100	2,100,000
Isopropylbenzene	98-82-8	ug/m^3	TO-15	0.49	---	1,800	1,800	245,000
m&p-Xylenes	108-38-3	ug/m^3	TO-15	0.17	22.2		22.2	---
Methacrylonitrile	126-98-7	ug/m^3	TO-15 TIC	---	---	130	130	---
Methyl acetate	79-20-9	ug/m^3	TO-15 TIC	---	---	---	---	610,000
Methyl tert-butyl ether	1634-04-4	ug/m^3	TO-15	0.36	11.5		11.5	---
Methylene Chloride	75-09-2	ug/m^3	TO-15	0.69	10		10	86,851
n,n-Dimethylaniline	121-69-7	ug/m^3	TO-15 TIC	---	---	---	---	25,000
Naphthalene	91-20-3	ug/m^3	TO-15	0.26	5.1		5.1	50,000
n-Hexane	110-54-3	ug/m^3	TO-15	0.35	10.2		10.2	1,800,000
Nitrobenzene	98-95-3	ug/m^3	TO-15 TIC	---	---	0.31	0.31	5,000
n-Pentane	109-66-0	ug/m^3	TO-15 TIC	---	---	4,400	4,400	2,950,000
N-Propylbenzene	103-65-1	ug/m^3	TO-15	0.49	---	4,400	4,400	---
o-Xylene	95-47-6	ug/m^3	TO-15	0.087	7.9		7.9	---
Propene	115-07-1	ug/m^3	TO-15 TIC	---	---	13,000	13,000	---
Pyridine	110-86-1	ug/m^3	TO-15 TIC	---	---	---	---	15,000
Styrene	100-42-5	ug/m^3	TO-15	0.42	1.9		1.9	425,930
Tetrachloroethene	127-18-4	ug/m^3	TO-15	0.14	15.9		15.9	678,323
Tetrahydrofuran	109-99-9	ug/m^3	TO-15	1.5	---	8,800	8,800	590,000
Toluene	108-88-3	ug/m^3	TO-15	0.075	43		43	753,620
trans-1,2-Dichloroethene	156-60-5	ug/m^3	TO-15	0.4	---	---	---	---
trans-1,2-Dichloropropene	10061-02-6	ug/m^3	TO-15	0.45	<1.3		<1.3	---
Trichloroethene	79-01-6	ug/m^3	TO-15	0.11	4.2		2	537,423
Trichlorofluoromethane	75-69-4	ug/m^3	TO-15	0.56	18.1		18.1	5,600,000
Vinyl chloride	75-01-4	ug/m^3	TO-15	0.026	<1.9		<1.9	2,556

Notes:

(a) USEPA Industrial Air RSL presented is lower of a target cancer risk of $1x10^{-6}$ or a target hazard quotient of 1.
(b) With the exception of trichloroethene (TCE), the indoor air screening level is BASE Study 90th percentile value, when available. The indoor air screening level for TCE is the August 2015 Air Guideline Value. If BASE value is unavailable, the USEPA Industrial Air RSL was selected, when available.
(c) OSHA PEL presented is a time-weighted average unless marked as a ceiling limit (C).
< = Compound not detected in BASE sampling events, associated value is lab reporting limit.
--- = background value/screening level/detection limit (TICs)/PEL not available.
BASE = Building Assessment and Survey Evaluation (Appendix C of NYSDOH guidance).
CAS = Chemical Abstracts Service.
NA = cannot be analyzed via TO-15, including TIC analysis.
OSHA = Occupational Safety and Health Administration.
PEL = Permissible Exposure Limit.
RSL = Regional Screening Level.
TIC = tentatively identified compound.
ug/m^3 = micrograms per cubic meter.
USEPA = United States Environmental Protection Agency.
Bold compounds were detected in soil or groundwater samples collected during the remedial investigation.
[shaded box] = USEPA Industrial Air RSL not used because BASE Study 90th percentile value was available.

Table 3
Reporting Limits and Sub-slab Soil Vapor Screening Levels

Site #C734138: BMS Syracuse North Campus Restoration Area

Volatile Organic Chemicals	CAS #	Units	Eurofins Analysis	Anticipated Analytical Laboratory Reporting Limit (a) TO-15	Soil Vapor Screening Level (b)
1,1,1-Trichloroethane	71-55-6	ug/m^3	TO-15	2.7	687
1,1,2,2-Tetrachloroethane	79-34-5	ug/m^3	TO-15	3.4	7.0
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ug/m^3	TO-15	3.8	4,333,333
1,1,2-Trichloroethane	79-00-5	ug/m^3	TO-15	2.7	50
1,1'-Biphenyl	92-52-4	ug/m^3	TO-15 TIC	NA	60
1,1-Dichloroethane	75-34-3	ug/m^3	TO-15	2	23
1,1-Dichloroethene	75-35-4	ug/m^3	TO-15	2	47
1,2,3-Trimethylbenzene	526-73-8	ug/m^3	TO-15 TIC	---	733
1,2,4-Trichlorobenzene	120-82-1	ug/m^3	TO-15	15	227
1,2,4-Trimethylbenzene	95-63-6	ug/m^3	TO-15	2.4	317
1,2-Dibromoethane	106-93-4	ug/m^3	TO-15	3.8	50
1,2-Dichlorobenzene	95-50-1	ug/m^3	TO-15	3	40
1,2-Dichloroethane	107-06-2	ug/m^3	TO-15	2	30
1,2-Dichloropropane	78-87-5	ug/m^3	TO-15	2.3	53
1,3,5-Trimethylbenzene	108-67-8	ug/m^3	TO-15	2.4	123
1,3-Butadiene	106-99-0	ug/m^3	TO-15	1.1	100
1,3-Dichlorobenzene	541-73-1	ug/m^3	TO-15	3	80
1,4-Dichlorobenzene	106-67-8	ug/m^3	TO-15	2.4	183
1,4-Dioxane	123-91-1	ug/m^3	TO-15	7.2	83
1-Propene, 3-chloro-	107-05-1	ug/m^3	TO-15	6.3	67
2,2,4-Trimethylpentane	540-84-1	ug/m^3	TO-15	2.3	---
2-Butanone	78-93-3	ug/m^3	TO-15	5.9	400
2-Chlorophenol	95-57-8	ug/m^3	TO-15 TIC	NA	---
2-Hexanone	591-78-6	ug/m^3	TO-15	8.2	4,333
2-Methylnaphthalene	91-57-6	ug/m^3	TO-15 TIC	NA	---
2-Nitropropane	79-46-9	ug/m^3	TO-15 TIC	---	0.15
2-Propanol	67-63-0	ug/m^3	TO-15	4.9	8,333
4-Chlorotoluene	106-43-4	ug/m^3	TO-15 TIC	---	---
4-Ethyltoluene	622-96-8	ug/m^3	TO-15	2.4	120
4-Methyl-2-pentanone	108-10-1	ug/m^3	TO-15	2	200
Acetone	67-64-1	ug/m^3	TO-15	12	3,297
Acetonitrile	75-05-8	ug/m^3	TO-15 TIC	---	8,667
Acetophenone	98-86-2	ug/m^3	TO-15 TIC	NA	---
alpha-Chlorotoluene	100-44-7	ug/m^3	TO-15	2.6	227
Benzaldehyde	100-52-7	ug/m^3	TO-15 TIC	---	---
Benzene	71-43-2	ug/m^3	TO-15	1.6	313
Bis(2-chloroethyl)ether	111-44-4	ug/m^3	TO-15 TIC	---	1.2
Bromodichloromethane	75-27-4	ug/m^3	TO-15	3.4	11
Bromoform	75-25-2	ug/m^3	TO-15	5.2	367
Bromomethane	74-83-9	ug/m^3	TO-15	19	57
Carbon disulfide	75-15-0	ug/m^3	TO-15	6.2	140
Carbon tetrachloride	56-23-5	ug/m^3	TO-15	3.1	43
Chlorobenzene	108-90-7	ug/m^3	TO-15	2.3	30
Chloroethane	75-00-3	ug/m^3	TO-15	5.3	37
Chloroform	67-66-3	ug/m^3	TO-15	2.4	37
Chloromethane	74-87-3	ug/m^3	TO-15	10	123
cis-1,2-Dichloroethene	156-59-2	ug/m^3	TO-15	2	63
cis-1,3-Dichloropropene	10061-01-5	ug/m^3	TO-15	2.3	77
Cyclohexane	110-82-7	ug/m^3	TO-15	1.7	866,667
Cyclohexene	110-83-8	ug/m^3	TO-15 TIC	---	146,667
Dibromochloromethane	124-48-1	ug/m^3	TO-15	4.2	15
Dichlorodifluoromethane	75-71-8	ug/m^3	TO-15	2.5	550
Epichlorohydrin	106-89-8	ug/m^3	TO-15 TIC	---	147
Ethanol	64-17-5	ug/m^3	TO-15	3.8	7,000

See Notes on Page 2.

Table 3
Reporting Limits and Sub-slab Soil Vapor Screening Levels

Site #C734138: BMS Syracuse North Campus Restoration Area

Volatile Organic Chemicals	CAS #	Units	Eurofins Analysis	Anticipated Analytical Laboratory Reporting Limit (a) TO-15	Soil Vapor Screening Level (b)
Ethyl acetate	141-78-6	ug/m^3	TO-15 TIC	---	180
Ethylbenzene	100-41-4	ug/m^3	TO-15	2.2	190
Freon 114	76-14-2	ug/m^3	TO-15	3.5	---
Heptane	142-82-5	ug/m^3	TO-15	2	---
Hexachlorobutadiene	87-68-3	ug/m^3	TO-15	21	227
Isopropyl ether	108-20-3	ug/m^3	TO-15 TIC	---	103,333
Isopropylbenzene	98-82-8	ug/m^3	TO-15	2.4	60,000
m&p-Xylenes	108-38-3	ug/m^3	TO-15	2.2	740
Methacrylonitrile	126-98-7	ug/m^3	TO-15 TIC	---	4,333
Methyl acetate	79-20-9	ug/m^3	TO-15 TIC	---	---
Methyl tert-butyl ether	1634-04-4	ug/m^3	TO-15	1.8	383
Methylene Chloride	75-09-2	ug/m^3	TO-15	17	333
n,n-Dimethylaniline	121-69-7	ug/m^3	TO-15 TIC	---	---
Naphthalene (c)	91-20-3	ug/m^3	TO-15	10	170
n-Hexane	110-54-3	ug/m^3	TO-15	1.8	340
Nitrobenzene	98-95-3	ug/m^3	TO-15 TIC	---	10
n-Pentane	109-66-0	ug/m^3	TO-15 TIC	---	146,667
N-Propylbenzene	103-65-1	ug/m^3	TO-15	2.4	146,667
o-Xylene	95-47-6	ug/m^3	TO-15	2.2	263
Propene	115-07-1	ug/m^3	TO-15 TIC	---	433,333
Pyridine	110-86-1	ug/m^3	TO-15 TIC	---	---
Styrene	100-42-5	ug/m^3	TO-15	2.1	63
Tetrachloroethene	127-18-4	ug/m^3	TO-15	3.4	530
Tetrahydrofuran	109-99-9	ug/m^3	TO-15	1.5	293,333
Toluene	108-88-3	ug/m^3	TO-15	1.9	1,433
trans-1,2-Dichloroethene	156-60-5	ug/m^3	TO-15	2	---
trans-1,2-Dichloropropene	10061-02-6	ug/m^3	TO-15	2.3	43
Trichloroethene	79-01-6	ug/m^3	TO-15	2.7	67
Trichlorofluoromethane	75-69-4	ug/m^3	TO-15	2.8	603
Vinyl chloride	75-01-4	ug/m^3	TO-15	1.3	63

Notes:

(a) Eurofins in Folsom, CA; reporting limits subject to change depending on analytical conditions.

(b) Sub-slab and exterior soil vapor screening level calculated from indoor air screening levels shown in Table 2 using an attenuation factor of 0.03 as follows: Soil Vapor Screening Level = Indoor Air Screening Level ÷ AF.

(c) Naphthalene is not a standard TO-15 analyte, therefore for this investigation BMS would be requesting the inclusion of naphthalene in the analytical suite.

(d) For compounds not detected (marked with < in Table 2), the lab detection limit was used to calculate Soil Vapor Screening Levels using the equation in footnote (b).

--- = screening level/detection limit (TICs) not available.

AF = attenuation factor.

CAS = Chemical Abstracts Service.

NA = cannot be analyzed via TO-15, including TIC analysis.

TIC = tentatively identified compound.

ug/m^3 = micrograms per cubic meter.

Bold compounds were detected in soil or groundwater samples collected during the remedial investigation.

Figures

LEGEND:

- APPROXIMATE BROWNFIELD AREA BOUNDARY
- APPROXIMATE PROPERTY LINE, BRISTOL-MYERS SQUIBB
- OCCUPIED BUILDINGS
- UNOCCUPIED BUILDINGS / STRUCTURES
- DEMOLISHED BUILDINGS
- PAVED OR CONCRETE AREAS
- UNPAVED AREAS
- EXISTING RAILROAD
- PROPOSED SOIL VAPOR SAMPLING LOCATION
- SELECTED MONITORING WELLS
- PROPOSED SOIL BORING
- PROPOSED SUB-SLAB SOIL VAPOR SAMPLING LOCATION
- PROPOSED INDOOR AIR SAMPLING LOCATION
- PROPOSED AMBIENT AIR SAMPLE LOCATION

NOTES:

1. BASEMAP BASED ON A MAP TITLED "BRISTOL-MYERS SQUIBB PART OF LOT 41 - TOWN OF DEWITT AND PART OF THE VILLAGE OF EAST SYRACUSE ONONDAGA COUNTY NEW YORK", DATED MARCH 25, 2010 PREPARED BY COTTRELL LAND SURVEYORS, P.C. UPDATED BASED ON ARCADIS FIELD VISIT JULY 2014, SEPTEMBER 11, 2014, AND BING AERIAL IMAGERY ACQUIRED SEPTEMBER, 2014.
2. MONITORING WELL LOCATIONS AND ELEVATION SURVEY BY CT MALE ASSOCIATES, SYRACUSE NY, OCTOBER 2013, JUNE 2014, AND SEPTEMBER 2014. ELEVATIONS NAVD 88, HORIZONTAL NAD 83.
3. ACTUAL AMBIENT AIR SAMPLING LOCATIONS WILL BE SELECTED IN THE FIELD SUCH THAT THEY ARE NEAR A HEATING, VENTILATION, AND AIR CONDITIONING SYSTEM INTAKE FOR EACH BUILDING WHERE SAMPLING IS TO BE CONDUCTED.

0 160' 320'

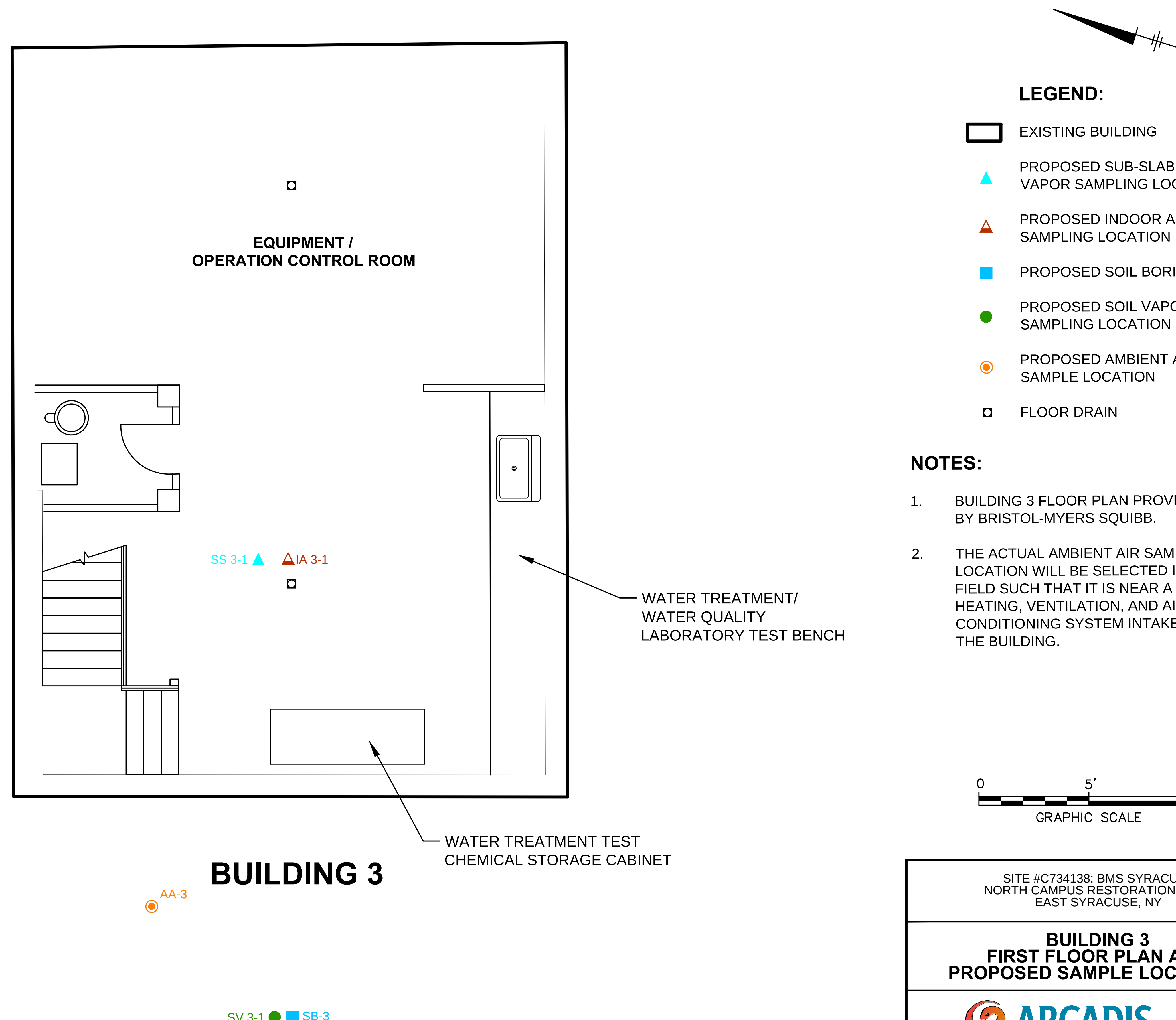
GRAPHIC SCALE

SITE #C734138: BMS SYRACUSE
NORTH CAMPUS RESTORATION AREA
EAST SYRACUSE, NY

PROPOSED SAMPLING LOCATIONS

ARCADIS

FIGURE
4



LEGEND:

- EXISTING BUILDING
- PROPOSED SUB-SLAB SOIL VAPOR SAMPLING LOCATION
- PROPOSED INDOOR AIR SAMPLING LOCATION
- PROPOSED SOIL BORING
- PROPOSED SOIL VAPOR SAMPLING LOCATION
- PROPOSED AMBIENT AIR SAMPLE LOCATION
- FLOOR DRAIN

NOTES:

1. BUILDING 3 FLOOR PLAN PROVIDED BY BRISTOL-MYERS SQUIBB.
2. THE ACTUAL AMBIENT AIR SAMPLING LOCATION WILL BE SELECTED IN THE FIELD SUCH THAT IT IS NEAR A HEATING, VENTILATION, AND AIR CONDITIONING SYSTEM INTAKE FOR THE BUILDING.

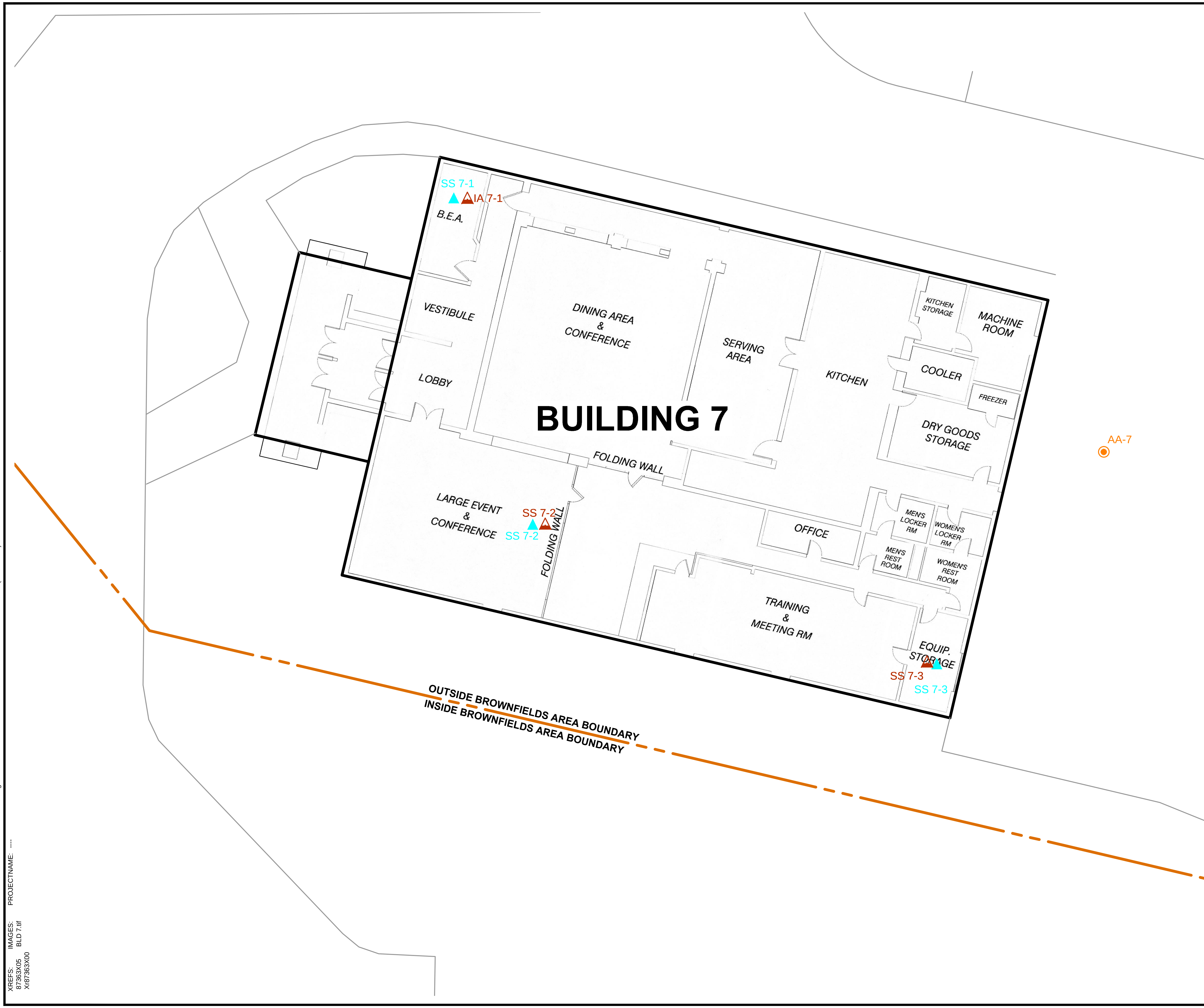
SITE #C734138: BMS SYRACUSE
NORTH CAMPUS RESTORATION AREA
EAST SYRACUSE, NY

BUILDING 3
FIRST FLOOR PLAN AND
PROPOSED SAMPLE LOCATIONS

ARCADIS

FIGURE
5

CITY:SYRACUSE-NY DIV/GROUP:ENV DB:A.SANCHEZ LD: PIC:(Opt) PM:(Reqd) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACT\B0087363\0009\00007\87363P02.dwg LAYOUT: 5 SAVED: 10/22/2015 9:48 AM ACADVER: 19.1S (LMS TECH) PAGESETUP: PDF 11X17 PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 11/2/2015 10:53 AM BY: SANCHEZ, ADRIAN
XREFS: IMAGES: PROJECTNAME: ---
X87363X00



LEGEND:

- EXISTING BUILDING
- PROPOSED INDOOR AIR SAMPLING LOCATION
- PROPOSED SUB SLAB SOIL VAPOR SAMPLING LOCATION
- PROPOSED AMBIENT AIR OUTDOOR SAMPLE LOCATION

NOTES:

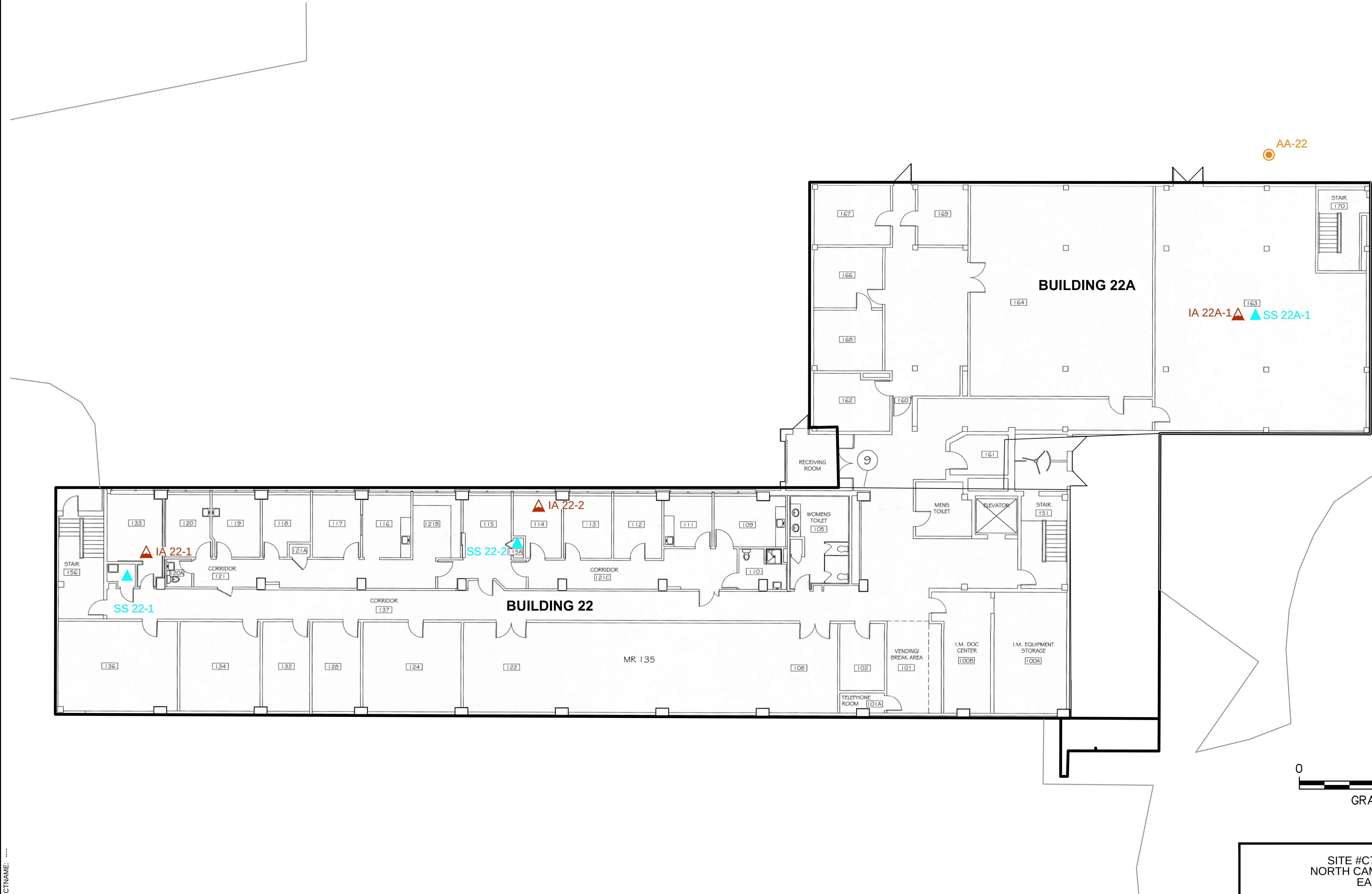
1. BUILDING 7 FLOOR PLAN PROVIDED BY BRISTOL-MYERS SQUIBB.
2. THE ACTUAL AMBIENT AIR SAMPLING LOCATION WILL BE SELECTED IN THE FIELD SUCH THAT IT IS NEAR A HEATING, VENTILATION, AND AIR CONDITIONING SYSTEM INTAKE FOR THE BUILDING.

SITE #C734138: BMS SYRACUSE
NORTH CAMPUS RESTORATION AREA
EAST SYRACUSE, NY

BUILDING 7 FLOOR PLAN AND PROPOSED SAMPLING LOCATIONS

ARCADIS

FIGURE 6



LEGEND:

- EXISTING BUILDING
- PROPOSED SUB-SLAB SOIL VAPOR SAMPLING LOCATION
- PROPOSED INDOOR AIR SAMPLING LOCATION
- PROPOSED AMBIENT AIR OUTDOOR SAMPLING LOCATION

NOTES:

1. BUILDING 22/22A COMPLEX FIRST FLOOR PLANS PROVIDED BY BRISTOL-MYERS SQUIBB.
2. THE ACTUAL AMBIENT AIR SAMPLING LOCATION WILL BE SELECTED IN THE FIELD SUCH THAT IT IS NEAR A HEATING, VENTILATION, AND AIR CONDITIONING SYSTEM INTAKE FOR THE BUILDING.

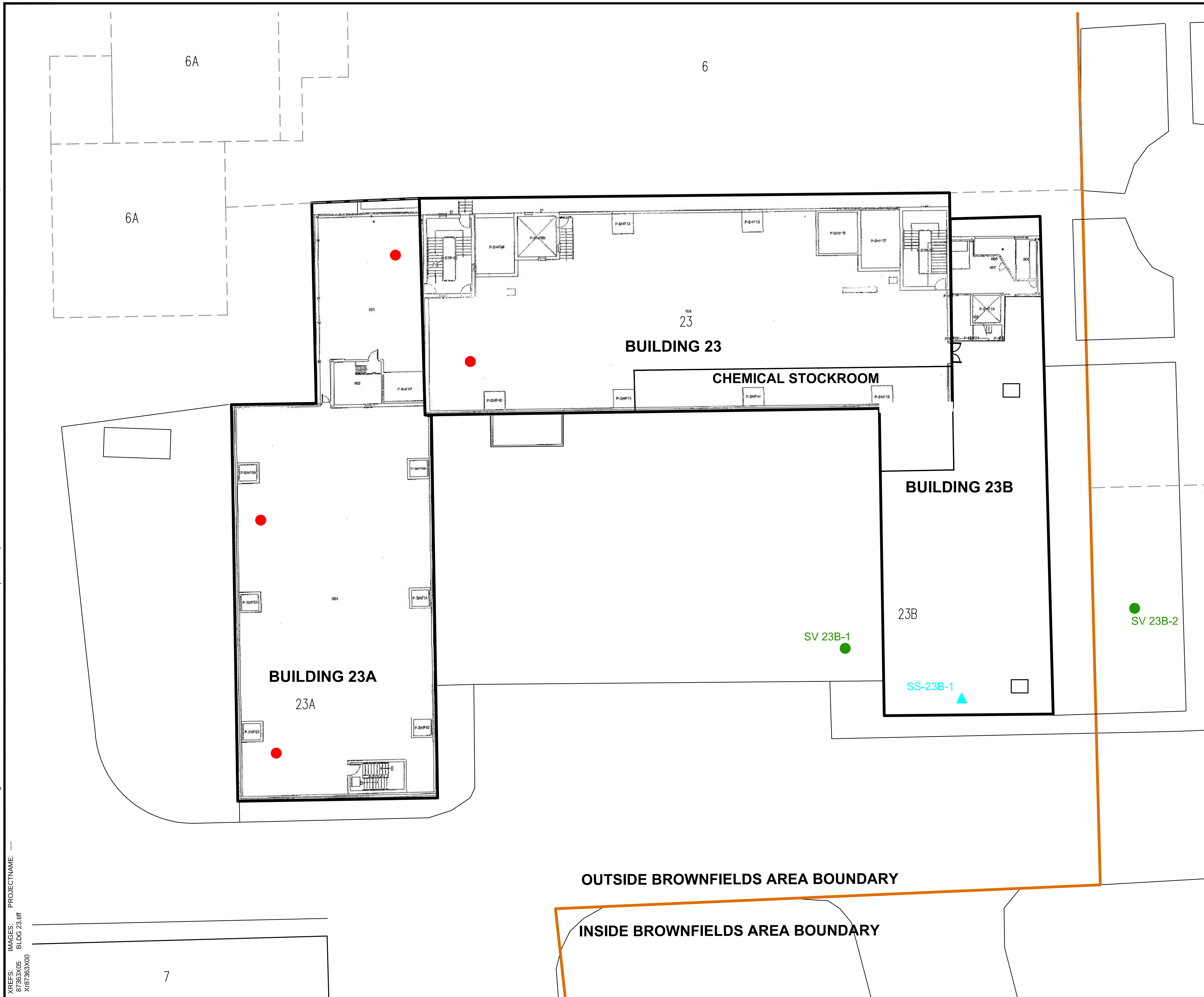
SITE #C734138: BMS SYRACUSE
NORTH CAMPUS RESTORATION AREA
EAST SYRACUSE, NY

BUILDING 22/22A FIRST FLOOR PLAN AND PROPOSED SAMPLING LOCATIONS

ARCADIS

FIGURE 7

CITY:SYRACUSE-NY DIV/GROUP:ENV DB:A.SANCHEZ LD: PIC:(Opt) PM:(Reqd) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACT\B0087363\0009\00007\87363P04.dwg LAYOUT: 7 SAVED: 10/22/2015 9:48 AM ACADVER: 19.1S (LMS TECH) PAGESETUP: PDF 11X17 PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 11/2/2015 10:54 AM BY: SANCHEZ, ADRIAN
XREFS: 87363X05 X87363X00 IMAGES: BLDG 22 &22A.tif PROJECTNAME: ----



LEGEND:

- EXISTING BUILDING
- PROPOSED SOIL VAPOR SAMPLING LOCATION
- PROPOSED SUB-SLAB SOIL VAPOR SAMPLE LOCATION
- GROUNDWATER INFILTRATION APRIL 2015

NOTES:

1. BUILDING 23, 23A, 23B FLOOR PLANS PROVIDED BY BRISTOL-MYERS SQUIBB.

0 30' 60'
GRAPHIC SCALE

SITE #C734138: BMS SYRACUSE
NORTH CAMPUS RESTORATION AREA
EAST SYRACUSE, NY

BUILDING 23B BASEMENT FLOOR PLAN AND PROPOSED SAMPLING LOCATIONS

ARCADIS

FIGURE
8

LEGEND:

- EXISTING BUILDING
- PROPOSED SOIL VAPOR SAMPLING LOCATION
- PROPOSED SUB-SLAB SOIL VAPOR SAMPLING LOCATION
- PROPOSED INDOOR AIR SAMPLING LOCATION
- PROPOSED AMBIENT AIR OUTDOOR SAMPLE LOCATION

NOTES:

1. BUILDING 32 COMPLEX FIRST FLOOR PLAN PROVIDED BY BRISTOL-MYERS SQUIBB.
2. THE ACTUAL AMBIENT AIR SAMPLING LOCATION WILL BE SELECTED IN THE FIELD SUCH THAT IT IS NEAR A HEATING, VENTILATION, AND AIR CONDITIONING SYSTEM INTAKE FOR THE BUILDING.

0 30' 60'

GRAPHIC SCALE

SITE #C734138: BMS SYRACUSE
NORTH CAMPUS RESTORATION AREA
EAST SYRACUSE, NY

BUILDING 32
FIRST FLOOR PLAN AND
PROPOSED SAMPLING LOCATIONS

ARCADIS

FIGURE
9

ARCADIS

Appendix B

Agency Correspondence

From: Jones, Richard E (HEALTH) [mailto:richard.jones@health.ny.gov]
Sent: Thursday, September 03, 2015 11:37 AM
To: Locke, Anne; Cook, Joshua P (DEC)
Cc: Schuck, Maureen (HEALTH); Warner, Harry (DEC)
Subject: RE: BMS Syracuse SVI Investigation #C734138

Ann and John- To confirm our earlier conversation - In talking with my counterparts in Albany we have come to the following conclusions:

It will be very difficult (if not an exercise in futility)to determine the exact percent contribution(if any) to the levels of compounds detected in the laboratory indoor air by soil vapor intrusion. The exact compounds detected could also change depending on what product is being produced at that time. Additionally, it is expected that high groundwater may prevent the collection of sub-slab samples at this building. Based on these conditions and concerns as were explained in the recent meeting held at the NYSDEC offices and in our recent conversation we recommend the following:
-Eliminate the collection of indoor air samples from Building 23B.
-Attempt to collect sub-slab samples from beneath the basement floor. If this is not possible due to high groundwater conditions collect soil vapor point samples (preferably from beneath a nearby sidewalk or other confining structure-if possible). This will provide at least some basic information as to whether SVI may be a concern for the structure.

The work plan should include a listing of those compounds used in the laboratory(similar to a product inventory) and an explanation of why(basically the reasons we discussed in the meeting and today-ie. Constant and changing chemical use-high ground water-HVAC system etc.) we are not following the letter of the current guidance (sub-slab samples coupled with indoor air samples). This is to document conditions and to provide a basis of why things were done as they were for future reference for all parties.

From: Locke, Anne [mailto:anne.locke@bms.com]
Sent: Thursday, September 03, 2015 9:21 AM
To: Jones, Richard E (HEALTH) <richard.jones@health.ny.gov>
Subject: BMS Syracuse quick call

Dick,
Are you available for a quick call from John Killiany and me? We had penciled in 9:30 if you are free.
Thanks
Anne Locke
Associate Manager, Environmental Protection
Bristol-Myers Squibb Syracuse Site
PO Box 4755
Syracuse, NY 13221
(315) 432-2660

Appendix C

Building 23 Complex Chemical Inventory

Appendix C
Building 23 Complex Chemical Inventory

Site #C734138: BMS Syracuse North Campus Restoration Area

Chemical/Product Name	CAS Number	VOC/SVOC Found in Groundwater	All Detected Compounds Found in Groundwater
1,4 Dioxane	123-91-1	X	X
2-Butanone	78-93-3	X	X
3.5% Tetrahydrofuran in Water (Solvent A3)	109-99-9	X	X
4-Methyl-2-Pentanol	108-11-2	X	X
4-Methyl-2-Pentanone	108-10-1	X	X
ACETIC ACID, GLACIAL	64-19-7	X	X
Acetone	67-64-1	X	X
ACETONE (HPLC GRADE)	67-64-1	X	X
Acetonitrile	75-05-8	X	X
Acetonitrile Chromsolv	75-05-8	X	X
Acetonitrile UV	75-05-8	X	X
Acetonitrile, 99.9%	75-05-8	X	X
acetonitrile-1% formic acid	75-05-8	X	X
Benzaldehyde	100-52-7	X	X
Benzene	71-43-2	X	X
Benzoic Acid	65-85-0	X	X
Benzyl Alcohol	100-51-6	X	X
BENZYL ALCOHOL, 99+%, A.C.S REAGENT	100-51-6	X	X
BENZYL ALCOHOL, A.C.S REAGENT/ NF GRADE	100-51-6	X	X
Butyl Alcohol	71-36-3	X	X
Chloroform	67-66-3	X	X
Dichloromethane	75-09-2	X	X
Diethyl Ether	60-29-7	X	X
Ethanol	64-17-5	X	X
Ethyl Acetate	141-78-6	X	X
Ethyl Acetate (S2B)	141-78-6	X	X
Ethyl Alcohol	64-17-5	X	X
Ethyl Alcohol 190 Proof	64-17-5	X	X
Ethyl Alcohol 200 proof	64-17-5	X	X
Ethyl Ether	60-29-7	X	X
Ethyl Ether Anhydrous	60-29-7	X	X
Ethylbenzene	100-41-4	X	X
Glacial Acetic Acid	64-19-7	X	X
Heptane	142-82-5	X	X
Hexamethyldisiloxane	107-46-0	X	X
Hexane	110-54-3	X	X
IPA	67-63-0	X	X
Isopropyl Alcohol	67-63-0	X	X
N,N-dimethylaniline	121-69-7	X	X
N-butyl alcohol	71-36-3	X	X
n-Heptane	142-82-5	X	X
Phenol Crystal	108-95-2	X	X
Phthalic Anhydride	85-44-9	X	X
Pyridine, Low Water	110-86-1	X	X
Septihol	67-63-0	X	X
Stearic Acid Powder	57-11-4	X	X
Tetrahydrofuran	109-99-9	X	X
Toluene	108-88-3	X	X
Trichloroethene	79-01-6	X	X
Trichlortrifluoroethane	76-13-1	X	X
Triethylamine	121-44-8	X	X
Ethylene Glycol	107-21-1		X
Hydranal Coulamat AD	67-56-1		X
Hydranal Methanol dry	67-56-1		X
Mercury 99.9995%	7439-97-6		X
Methanol	67-56-1		X
Phosphoric Acid	7664-38-2		X
PHOSPHORIC ACID	7664-38-2		X
Phosphoric Acid	7664-38-2*		X
PHOSPHORIC ACID 85% NF	7664-38-2		X
Phosphoric Acid 85% w/w	7664-38-2		X
propylene glycol	57-55-6		X
Zinc Metal	7440-66-6		X
(-) - GLUTATHIONE OXIDIZED, 90%	27025-41-8		
(ethylenedinitrilo)tetraacetic acid disodium salt dihydrate	6381-92-6		
0.1% Formic Acid in water	64-18-6		
0.1N Hydrochloric Acid	7647-01-0		
0.25% Trypsin EDTA	N/A		
0.5 M EDTA	15575-02		
0.5% Methyl Cellulose	102505		
1% Methyl Cellulose	101876		
1,000 ppm Nickel AA Standard	N/A		
1,000ppm Iron AA Standard	N/A		
1,000ppm Lead AA Standard	N/A		
1,10-Phenanthroline	66-71-7		
1,10-Phenanthroline, monohydrate	5144-89-8		
1,3,5-Benzenetricarboxylic acid	554-95-0		
1,4-Benzoquinone RS	N/A		
1,4-Benzoquinone, USP	N/A		

See Notes on Page 13.

Appendix C
Building 23 Complex Chemical Inventory

Site #C734138: BMS Syracuse North Campus Restoration Area

Chemical/Product Name	CAS Number	VOC/SVOC Found in Groundwater	All Detected Compounds Found in Groundwater
1,5-Diphenylcarbazide	140-22-7		
100 mOsm/kg Calibration Standard	N/A		
1500 mOsm/kg Calibration Standard	N/A		
1-Bromonaphthalene	90-11-9		
1-ethyl-3(3-dimethylaminopropyl) carbodiimide dihydrochloride (EDC) (Amine Coupling Kit)	N/A		
1-methylpiperidine	109-01-3		
1-Napthol	90-15-3		
1-Nitroso-2naphthol-3,6-disulfonic Acid	525-05-3		
1-pentanesulfonic Acid	22767-49-3		
1X TMB ELISA Substrate Solution (3,3',5,5' - TetraMethyl- benzidine	N/A		
2,2,2-trichloroethanol	115-20-8		
2,2'-Bipyridine	366-18-7		
2,7'-Dichlorofluorescein	76-54-0		
20 Amino Acid PTH Standard	N/A		
25% Trifluoroacetic acid (R4A)	76-05-1		
290 mOsm/kg Calibration Standard	N/A		
2-Aminoethanesulfonic Acid	107-35-7		
2-butanol	78-92-2		
2-Furaldehyde	98-01-1		
2-mercaptoethanol	60-24-2		
2-Methoxyphenyl-acetic Acid	93-25-4		
2-METHYL-2, 4-PENTANEDIOL, 99+%	107-41-5		
2-propanol	71-23-8		
3-10 Ampholyte	10033		
3-methyl pyrazole	1453-56-3		
4-(Dimethylamino)-Benzaldehyde	100-10-7		
4-6 Ampholyte	10038		
4-Aminobenzoic Acid	150-13-0		
4-Ethoxybenzoic Acid	619-86-3		
4-methylumbelliferone	N/A		
4-Nitrobenzoylchloride	122-04-3		
5% Phenylisothiocyanate in n-Heptane	N/A		
5,5'-Dithio-bis (2-Nitrobenzoic acid)	69-78-3		
50 mOsm/kg Calibration Standard	N/A		
500 mOsm/kg Calibration Standard	N/A		
50mM Sodium Hydroide	BR-1003-58		
5-Sulfosalicylic Acid Dihydrate	5965-83-3		
900 mOsm/kg Calibration Standard	N/A		
Abatacept Drug Substance	382707-61-1		
ABI Prism 7900 HT Sequence Detection Systems 96-well Spectral Calibration Ki	N/A		
Abilify IM	N/A		
ABTS Peroxidase Stop Solution (5X)	N/A		
ABTS Peroxidase Substrate (TMB Peroxidase)	N/A		
Acetaldehyde	75-07-0		
Acetaldehyde Diethyl Acetal	105-57-7		
Acetanilide Melting Point Standard	N/A		
Acetate 5.0	N/A		
Acetic Anhydride	108-24-7		
Acetonitrile / 2-propanol (Solvent B)	75-05-8, 67-63-0		
Acetonitrile / N-Acetylcysteine (R5B)	N/A		
Acetonitrile / Water (S4)	76-05-8		
Acetonitrile 0.1% Formic Acid	75-05-8,64-18-6		
Adenosine	58-61-7		
Ag/AgCl	Orion 900011		
Agar	214510		
Alanine CRS	N/A		
Albumin Bovine	9048-46-8		
Albumin from Bovine Serum 30%	N/A		
Albumin Solution from Bovine Serum 35%	N/A		
Albumin Standard (BSA)	N/A		
Alizarin Red S	130-22-3		
Alkaline Phosphatase-Conjugated Affini Pure F(ab')2 Fragment Goat Anti-Human IgG, F(ab')2 Fragment Specific (minimal cross-reaction to Bovine, Horse, and Mouse Serum Proteins)	N/A		
Aluminum-Nickel Catalyst	12635-27-7		
Amikacin DS	N/A		
Amine Coupling Kit	BR-1000-50		
Ammonium Acetate	631-61-8		
Ammonium bicarbamate	1066-33-7		
Ammonium Carbonate	506-87-6		
Ammonium Chloride	12125-02-9		
Ammonium Citrate Dibasic	3012-65-5		
ammonium formate	540-69-2		
Ammonium Formate >99.995%	540-69-2		
Ammonium Hydroxide	1136-21-6*		
ammonium hydroxide (omnitrace)	1336-21-6		
Ammonium Iron (III) Sulfate Dodecahydrate	7783-83-7		
Ammonium Metavanadate	7803-55-6		

See Notes on Page 13.

Chemical/Product Name	CAS Number	VOC/SVOC Found in Groundwater	All Detected Compounds Found in Groundwater
Ammonium Molybdate	N/A		
Ammonium Molybdate 4-Hydrate	12054-85-2		
Ammonium Nitrate	16774-21-3		
Ammonium Oxalate Monohydrate	6009-70-7		
Ammonium Persulfate	7727-54-0		
Ammonium Phosphate, Monobasic	7722-76-1		
Ammonium Pyrrolinedithiocarbamate	5108-96-3		
Ammonium Sulfate	7783-20-2		
Ammonium Thiocyanate	1762-95-4		
Ampicillin Trihydrate High KF Control	N/A		
Anode Fluid 3	N/A		
Anthranilamide	88-68-6		
Anthranilic Acid	118-92-3		
Anthranilic Acid, reagent grade	118-92-3		
Anti CD-137	N/A		
Antibiotic Medium 1	226340		
Antifoam C Medical Emulsion	N/A		
Anti-Human CD86 (B7-2) Biotin	N/A		
APTS-M 20mg	N/A		
Arginine Hydrochloride CRS (Standard)	N/A		
Arginine Hydrochloride RS	N/A		
Arsenic (III) Oxide	1327-53-3		
Asparagine Anhydrous RS	N/A		
Asparagine Anhydrous, USP	N/A		
Aspartic Acid, CRS	N/A		
Aspartic Acid, USP	N/A		
Assay Diluent	N/A		
Barium Chloride Dihydrate	10326-27-9		
Barium Hydroxide 8-Hydrate	12230-71-6		
Belatacept DP	N/A		
Belatacept DS	N/A		
Benzonase	N/A		
Benzyl Alcohol, USP	N/A		
beta- Alanine	107-95-9		
BIA Desorb Solution 1	N/A		
BIA Desorb Solution 2	N/A		
BIA Disinfectant Solution	N/A		
BIA Normalizing Solution, 40%	N/A		
BIA Normalizing Solution, 70%	N/A		
BIA Test Solution	N/A		
Bibenzyl	103-29-7		
Bicyclohexyl	92-51-3		
Biobrene Plus	contains 28728-55-4		
Bio-Lyte 4/6	163-1142		
BIS-TRIS-propane	64431-96-5		
BLEACH	N/A		
Bleach-Rite	7681-52-9		
Blocker Casein in PBS	N/A		
BLUE DEXTRAN	87918-38-6		
BMS 224818	N/A		
Boric Acid	10043-35-3		
Boron Trifluoride Methanol Solution	373-57-9		
Bovine Albumin Fraction V	N/A		
Bovine Serum Albumin	N/A		
Bovine Serum, Heat Inactivated	N/A		
Bright-Glo Luciferase Assay System	N/A		
Bromine	N/A		
Bromocresol Green	76-60-8		
Bromocresol Purple	115-40-2		
Bromophenol Blue	115-39-9		
Bromothymol Blue	76-59-5		
Buffer Solution pH 10.00	N/A		
Buffer Solution pH 10.00	1303-96-4		
Buffer Solution pH 2.00	N/A		
Buffer Solution pH 2.00	7647-01-0		
Buffer Solution pH 4.00	N/A		
Buffer Solution pH 4.00	915-67-3		
Buffer Solution pH 7.00	N/A		
Buffer Solution pH 7.00	7558-79-4		
Bugbuster 10X	N/A		
Buspirone Tablets	N/A		
Caffeine	58-08-2		
Caffeine Melting Point Standard	N/A		
Calcium Carbonate Chelometric Standard	471-34-1		
Calcium Chloride	10043-52-4		
Calcium Chloride Dihydrate	10035-04-8		
Calcium Chloride Dihydrate ACS	10035-04-8		
Calcium Hydroxide	1305-62-0		
Calcium Nitrate	13477-34-4		

See Notes on Page 13.

Appendix C
Building 23 Complex Chemical Inventory

Site #C734138: BMS Syracuse North Campus Restoration Area

Chemical/Product Name	CAS Number	VOC/SVOC Found in Groundwater	All Detected Compounds Found in Groundwater
Calcium Nitrate Tetrahydrate	13477-34-4		
Calconcarboxylic Acid	3737-95-9		
Calgon Ringer Tablets	BR0049G		
CaptoAdhere	17-5444-01		
Carbonate-Bicarbonate Buffer Capsules	N/A		
Carbonic Anhydrase Isozyme II	9001-13-0		
Carboplatin AQ	N/A		
Carboxypeptide B	9025-24-5		
Carminic Acid	1260-17-9		
Casein in PBS	37528		
Catechol	120-80-9		
Cathode Fluid 10	N/A		
Cefadroxil Capsules	N/A		
Cefadroxil for O/S	N/A		
Cefepime for Inj.	N/A		
Cefprozil for O/S	N/A		
Cefprozil Tablets	N/A		
Ceric Sulfate, 0.1N	N/A		
CertiPUR Palladium 1000mg/L	N/A		
CertiPUR Zinc 1000mg/L	N/A		
CHAPS for electrophoresis	75621-03-3		
Chemstat LD-100	N/A		
Chloramine T-trihydrate	7080-50-4		
Chlorine Water	N/A		
Chloroplatanic Acid	16941-12-1		
Chloroplatinic Acid Hexahydrate	16941-12-1		
Chromotropic Acid Disodium Salt dihydrate	5808-22-0		
CIP 100	1310-58-3		
CIP 200	7664-38-2 (also 77-92-9)		
Cisplatin AQ	N/A		
Citric Acid	77-92-9		
Citric Acid	5949-29-1		
Citric Acid Monohydrate	5949-29-1		
CITRIC ACID, ANHYDROUS	77-92-9		
Clear Bath	N/A		
Clorox Bleach	N/A		
Clorox Germicidal Bleach	N/A		
Coating Stabilizer and Block Buffer	N/A		
COBALT (II) CHLORIDE HEXAHYDRATE	7791-13-1 (also 7647-01-0)		
Cobalt (II) nitrate hexahydrate	10026-22-9		
Cobalt Chloride Hexahydrate	7791-13-1		
Cobaltous Chloride, CS	N/A		
Conductivity Calibration Standard, 5.0 uS/cm	N/A		
Conductivity Standard 12.9 mS/cm	N/A		
Conductivity Standard 20 uS/cm	N/A		
Conductivity Standard 80 mS/cm	N/A		
Congo Red	573-58-0		
COOMASSIE BRILLIANT BLUE R 250	6104-59-2		
Copper (II) Chloride Dihydrate	10125-13-0		
Copper Sulfate	7758-98-7		
Crystal Violet	548-62-9		
Cupric Sulfate 5-hydrate Large Crystal	7758-99-8		
Cupric Sulfate, CS	N/A		
CUPRIC SULFATE, PENTAHYDRATE	7758-99-8 (also 7647-01-0)		
Custom Bela Forward Primer/Reverse Primer	N/A		
Custom Elo Forward Primer/Reverse Primer	N/A		
Cystine, CRS	N/A		
Cytidine	65-46-3		
D-(+)-Galactose	59-23-4		
D-(+)-Glucose	50-99-7		
D-(+)-glucose	50-99-7		
D-(+)-Glucose Solution (10%)	N/A		
D-(+)-Trehalose dihydrate	6138-23-4		
Dexamethasone, USP	N/A		
Dextrin from corn, Type I	9004-53-9		
Dextrose Anhydrous	50-99-7		
Diaion ion exchange resin	N/A		
Dichlorofluorescein TS	76-54-0*		
Diethanolamine Substrate Buffer	N/A		
Diethyldithiocabamic acid	N/A		
Diethylene Glycol	111-46-6		
Diethylene Glycol Monoethyl Ether, USP	N/A		
Diethylene Glycol, USP	N/A		
DIETHYLENE TRIAMINE PENTAACETIC ACID (DPTA)	1242531		
Diethylenetriaminepentaacetic Acid	67-43-6		
Diethylenetriaminopentaacetic Acid	80529-94-8		
Diluent	N/A		
Diluent (1% BSA, 0.05% Tween 20, 1X PBS)	N/A		
Dimethyl Sulfoxide	67-68-5		

See Notes on Page 13.

Chemical/Product Name	CAS Number	VOC/SVOC Found in Groundwater	All Detected Compounds Found in Groundwater
Dimethylglyoxime	95-45-4		
Dimethylsulfone	67-71-0		
dimethylsulfoxide	67-68-5		
Diphenyl Phosphate	838-85-7		
Diphenylamine Crystal	122-39-4		
Dithiothreitol	3483-12-3		
Dithizone	60-10-6		
DL Dithiothreitol	12/3/3483		
DL- Dithiothreitol for Electrophoresis	12/3/3483		
DL- Methionine	59-51-8		
DL-Dithiothreitol	12/3/3483		
D-Mannitol	69-65-8		
DNA Extraction Kit (Sodium Iodide Method)	N/A		
DODECYLSULFATE, SODIUM SALT, 99+, A.C.S. REAGENT	151-21-3		
DPBS 1x Liquid	N/A		
Drier rite	7778-18-9 and 7646-79-9		
D-Sorbitol	50-70-4		
Dulbecco's Modified Eagle Medium (DMEM)	N/A		
Dulbecco's Phosphate Buffered Saline (PBS)	N/A		
EDTA	6381-92-6		
EDTA Disodium Salt dihydrate	6381-92-6		
EDTA Iron Derivitive	15708-41-5		
EDTA, 0.01M	N/A		
EDTA, 0.05M	139-33-3		
EDTA, Disodium salt	6381-92-6		
Electrode Storage Solution	N/A		
Eluant A Concentrate	64-18-6 and 75-05-8		
EMD Buffer Solution Blue pH 10.00	1305-96-4 497-19-8 124-07-02 7732-18-5 62625-21-2 62625-32-5		
EMD Buffer Solution Red pH 4.00	915-67-3 877-24-7 132-27-4 7732-18-5		
EMD Buffer Solution Yellow pH 7.00	7558-79-4 7778-77-0 132-27-4 8832-18-5		
EMD pH 12.45 Buffer Solution	1305-62-0 7732-18-5		
Eosin Y (Yellowish)	17372-87-1		
Epothilone B	N/A		
Erichrome Black T	1787-61-7		
Erichrome Black T Powder	1787-61-7		
Ethanolamine (Amine Coupling Kit)	N/A		
Ethyl Dodecanoate	106-33-2		
ethyl propionate	105-37-3		
Ethylene Glycol	9300-03		
Ethylene Glycol, USP	N/A		
Ethylenediaminetetraacetic acid disodium salt solution	159-33-3		
ETHYLENEDIAMINETETRAACETIC ACID, PURIFIED GRADE	60-00-4		
Etoposide Inj.	N/A		
Ex-Cell ACF CHO Medium	N/A		
E-Zinc Reversible Stain Kit	N/A		
F050H Protein A-h ELISA Kit	N/A		
FAME GLC Reference Standard 708	N/A		
FAME GLC Reference Standard 760	N/A		
Ferric Ammonium Nitrate	16774-21-3		
Ferric Ammonium Sulfate Dodecahydrate	7783-83-7		
Ferric Chloride	10025-77-1 (also 7647-01-0)		
Ferric Chloride	7705-08-0		
Ferric Chloride Anyhydrous	7705-08-0		
Ferric Chloride Hexahydrate	10025-77-1		
Ferric Chloride, CS	N/A		
Ferrous Sulfate	7782-63-0		
Fetal Bovine Serum	N/A		
Fetal Bovine Serum, Heat Inactivated	N/A		
Fixing Solution, 5%	N/A		
Florisil	1343-88-0		
Folic Acid	75708-92-8		
Folic Acid Assay Medium	N/A		
Folic Acid, USP	N/A		
Formaldehyde Solution	50-00-0*		
Formamide	75-12-7		
Formic Acid	64-18-6		

See Notes on Page 13.

Appendix C
Building 23 Complex Chemical Inventory

Site #C734138: BMS Syracuse North Campus Restoration Area

Chemical/Product Name	CAS Number	VOC/SVOC Found in Groundwater	All Detected Compounds Found in Groundwater
formic acid >95%	64-18-6		
formic acid >98%	64-18-6		
Formic Acid, 88%	64-18-6		
Fructose CRS	N/A		
Fucose	3615-37-0		
Fumaric Acid	N/A		
Furfural	98-01-1		
Galactose	59-23-4		
Galactose, USP	N/A		
Gatifloxacin Inj.	N/A		
Gatifloxacin Tablets	N/A		
Gel Filtration Standard	9006-59-1, 9007-83-4, 100684-32-0, 68-19-9, 77 86-1, 1185-53-1		
Gelatin	9000-70-8		
GelCode Blue Stain Reagent	N/A		
Geneticin	N/A		
Glucose Assay Reagent	N/A		
Glucose CRS	N/A		
Glutamic Acid CRS	N/A		
Glutamine, USP	N/A		
Glutaraldehyde Solution Grade 2	EC 203-856-5		
Glycan Standards	N/A		
GLYCERIN	56-81-5		
Glycerin/Glycerol	56-81-5		
Glycerine RS	N/A		
GLYCEROL	56-81-5		
Glycine	56-40-6		
Glycine CRS	N/A		
Glycine, USP	N/A		
GLYCINE, USP (AMINO ACETIC ACID)	1176421		
Glycol Internal Standard Mix	N/A		
GlykoPrep 2AB Labeling	83534-39-8, 50-01-1, 200-002-3, 540-69-2, 208-753-9, 67-68-5, 200-664-3, 25895-60-7, 247-317 2		
Guanadine Hydrochloride	50-01-1		
Guanidine Hydroxide Ultra Pure	N/A		
Guanosine	118-00-3		
HBS-EP Buffer	BR-1001-88		
HEPES	7365-45-9		
HEPES	75277-39-3		
HEPES FREE ACID	1176032		
HEPES, free acid	7365-45-9		
Heptafluorobutyric acid	375-22-4		
Hexamethyldisilazane	999-97-3		
Hexamethylenetetramine	100-97-0		
Human CTLA-4 Antibody (anti-hCTLA-4)	N/A		
Human IL-2 OptEIA Set (Human IL-2 ELISA Kit)	N/A		
Hydranal Composite 2	N/A		
Hydranal Composite 5	N/A		
Hydranal-Standard Sodium Tartrate Dihydrate	6106-24-7		
Hydrazine Sulfate	10034-93-2		
Hydrochloric Acid	7732-18-5		
Hydrochloric acid	7647-01-0		
HYDROCHLORIC ACID (36.5-38.0 %)	7647-01-0		
HYDROCHLORIC ACID (6N)	1176117		
Hydrochloric Acid 1.0 N	7647-01-0		
Hydrochloric Acid 6.0 N	7647-01-0		
Hydrochloric Acid, 0.1N	7647-01-0		
Hydrochloric Acid, 0.5N	7647-01-0		
Hydrochloric Acid, 36.5-38.0%	7647-01-1		
Hydrochloric Acid, 6N	7647-01-1		
Hydrocortisone	50-23-7		
Hydrogen Peroxide	772-84-1, 62-144-2		
Hydrogen Peroxide	7722-84-1		
Hydrogen peroxide 30%	7722-84-1		
Hydrogen Sulfide Water	7783-06-4		
Hydroxylamine Hydrochloride	5470-11-1		
Hydroxynaphthol Blue	63451-35-4		
Hygromycin B	N/A		
iCE Electrolyte Kit	102506		
IEF Markers 3-10	N/A		
IEF Mix 3.6-9.3	N/A		
Imidazole	288-32-4		
Iminodiacetic acid	142-73-4		
Immersion Oil	N/A		
In Spec Background Solution	Item # 8300		
In Spec UV Standard #3	Item # 8303		
Indigo Carmine	860-22-0		
Insulin ELISA Kit	N/A		

See Notes on Page 13.

Appendix C
Building 23 Complex Chemical Inventory

Site #C734138: BMS Syracuse North Campus Restoration Area

Chemical/Product Name	CAS Number	VOC/SVOC Found in Groundwater	All Detected Compounds Found in Groundwater
Iodine	7553-56-2		
Iodine Trichloride	865-44-1		
Iodoacetamide	144-48-9		
Iodoacetic acid	64-69-7		
Iodoacetimide	144-48-9		
Ipilimumab BMS 232700	N/A		
Ipilimumab DS	N/A		
IPTG, Dioxane free High Purity	367-93-1		
Iron chloride	7705-08-0		
iron chloride tetrahydrate	13478-10-9		
Iron(II) Sulfide	N/A		
iron(III) chloride	7705-08-0		
Isobutane	75-28-5		
Isomalt CRS	N/A		
Isomalt CRS	N/A		
Isopropanol, 99.8%	N/A		
KCl Electrolyte Solution	N/A		
L Histidine	71-00-1		
L-2 Aminobutyric Acid	1492-24-6		
Lactose CRS	N/A		
Lactose Monohydrate RS	N/A		
Lake Pigment HT	5406		
Lal Reagent Water	W50-640		
Lanthanum Chloride 7-hydrate	1099-58-8		
Lanthanum Oxide	1312-81-8		
L-Arginine	1119-34-2		
L-ARGININE	74-79-3		
L-ARGININE HCL	1246628		
L-Cysteine	52-90-4		
L-Cysteine Hydrochloride	345909-32-2		
L-Cystine	56-89-3		
Lead (II) Nitrate	N/A		
Lead Acetate Cotton	N/A		
Lead Acetate Trihydrate	6080-56-4		
Lead Nitrate	10099-74-8		
L-Glutamic Acid	56-86-0		
L-Glutamine	56-85-9		
L-Glutamine, 200mM	N/A		
L-GLUTATHIONE REDUCED, MIN. 99%	70-18-8		
L-Glutathione, oxidized	27025-41-8		
L-Histidine	71-00-1		
L-Histidine, USP	N/A		
Limulus Amebocyte Lystate	K50-643		
Lithium Chloride in Ethanol	N/A		
L-Methionine Sulfoximine	15985-39-4		
LONG® R^3 IGF-I, human	N/A		
Low Pressure Liquid Nitrogen	N/A		
L-phenylalanine	63-91-2		
L-pyroglutamic acid	98-79-3		
L-Serine, USP	N/A		
L-Tryptophan	73-22-3		
L-Tyrosine	60-18-4		
L-tyrosine disodium salt	69847-45-6		
L-Tyrosine, USP	N/A		
Lysis Buffer (Purelink Viral RNA/DNA mini kit)	N/A		
MacConkey Broth	220100		
Magnesium Chloride Hexahydrate	7991-18-6		
Magnesium hydrogen phosphate trihydrate	7782-75-4		
Magnesium Nitrate 6-Hydrate Flake	13446-18-9		
Magnesium Oxide	1309-48-4		
Magnesium Sulfate 7-hydrate	10034-99-8		
Magnesium Sulfate Anhydrous	7487-88-9		
Maltitol	585-88-6		
Manganese Sulfate Monohydrate	10034-96-5		
MANNITOL	1238186		
Mannitol	69-65-8		
Mannitol CRS	N/A		
Mannitol, USP	N/A		
Mannosamine hydrochloride	5505-63-5		
Mannose	3458-28-4		
Mark 12 Unstained Standard	N/A		
Mecuric Acetate	1600-27-7		
MemCode Reversible Protein Stain Kit for PVDF Membranes	N/A		
M-Endo Hi-Veg	61000-454		
Mercurous Nitrate Dihydrate	7782-86-7		
Mercury (II) Iodide Red	7774-29-0		
Mercury Bromide	7789-47-1		
Mercury Chloride	7487-94-7		

See Notes on Page 13.

Appendix C
Building 23 Complex Chemical Inventory

Site #C734138: BMS Syracuse North Campus Restoration Area

Chemical/Product Name	CAS Number	VOC/SVOC Found in Groundwater	All Detected Compounds Found in Groundwater
MES	145224-94-8		
MES hydrate	N/A		
MES hydrate, Sigma Ultra	4432-31-9		
MES Monohydrate	145224-94-8		
MES Potassium Salt	39946-25-3		
MES Sodium Salt	71119-23-8		
Methotrexate RS	N/A		
Methotrexate, USP	N/A		
methyl D-mannopyranoside	617-04-9		
Methyl Orange	547-58-0		
Methyl Orange Sodium Salt	547-58-0		
Methyl Paraben	99-76-3		
Methyl Red	845-10-3		
Methyl Red Sodium Salt	845-10-3		
Methylene Blue	7220-79-3		
Methylene chloride 98% reagent	N/A		
Methylsulfoxide	67-68-5		
Metol	55-55-0		
Micro - 90 Concentrated Cleaning Solution	N/A		
MKCl	Orion 910008		
Molecular Sieve	N/A		
Molybdic Acid	7782-91-4		
Monothioglycerol	96-27-5		
N-acetyl-D-glucosamine	7512-17-6		
N-ACETYLNEURAMINIC ACID, TYPE VI, MIN 98%	131-48-6		
NaOH 10N	1310-73-2		
NaOH 1N	1310-73-2		
NaOH 50%	1310-73-2		
n-Butyl Acetate	123-86-4		
n-Butyl Chloride (S3)	109-69-3		
N-ethylamleimide (NEM)	128-53-0		
Neuraminidase	A22178		
N-Hydroxysuccinimide (NHS) (Amine Coupling Kit)	N/A		
Nicotinamide	98-92-0		
Ninhydrin Monohydrate	485-47-2		
Nitric acid	7697-37-2		
Nitrilotriacetic Acid	139-13-9		
N-methylpiperidine / Butanol / Isopropanol / Water (R2C)	71-36-3, 626-67-5, 67-63-0		
Novex Colloidal Blue Stain Kit	N/A		
Novex IEF Anode (Lower) Buffer (50X)	N/A		
Novex Tris-Glycine SDS Sample Buffer (2X)	N/A		
N-propyl alcohol	71-23-8		
Nuclease Free Water	1039480		
NuPAGE LDS Sample Buffer (4X)	N/A		
NuPAGE Sample Reducing Agent (10X)	N/A		
Oakton 1413 µs Standard	7447-40-7 7732-18-5		
Oakton 80 µs Standard	7447-40-7 7732-18-5		
Oakton 84 µs Standard	7447-40-7 7732-18-5		
OCTYL-D-GLUCOPYRANOSIDE	54549-23-4		
Orencia DP	N/A		
Orion Filling Solution	Orion 810007		
Orthophenanthroline TS	N/A		
Oxalic Acid	6153-56-6		
Pallidium Nitrate Dihydrate	32916-07-7		
Parafuchsin Hydrochloride	569-61-9		
Pararosaniline Hydrochloride	569-61-9		
PBS 10X	N/A		
PBS 1X	N/A		
Pellet Paint NF Co-Precipitant	N/A		
Penicillin-Streptomycin (PenStrep)	N/A		
pentafluoropropionic acid	422-64-0		
Pentetic Acid RS	N/A		
Peptone	J636-500g		
Perchloric Acid	7601-90-3		
Perchloric acid 70% solution	7601-90-3		
Perchloric Acid, 0.10N	7601-90-3		
Perfluoropentanoic acid	2706-90-3		
Peroxidase Conjugated Streptavidin	N/A		
Petroleum Ether	64742-49-0		
pH 1 buffer	1489-16		
pH 10 buffer	1601-16		
pH 10 Buffer (Borate) Solution	N/A		
pH 10.00 Solution	N/A		
pH 11 buffer	1601-16		
pH 12 buffer	1615-16		

See Notes on Page 13.

Appendix C
Building 23 Complex Chemical Inventory

Site #C734138: BMS Syracuse North Campus Restoration Area

Chemical/Product Name	CAS Number	VOC/SVOC Found in Groundwater	All Detected Compounds Found in Groundwater
pH 13 buffer	1625-16		
pH 2.00 Solution	N/A		
pH 3 buffer	1495-16		
pH 4 buffer	1500-16		
pH 4.7 Phenol Red TS	N/A		
pH 5 buffer	1505-16		
pH 6 buffer	1510-16		
pH 7 buffer	1550-16		
pH 7 Solution	N/A		
pH 8 buffer	1580-16		
pH 9 buffer	1590-16		
pH Buffer pH 10	1303-96-4, 497-19-8, 124-07-2, 62625-21-2, 62625-32-5		
pH Buffer pH 2	7647-01-0, 56-40-6, 132-27-4		
pH Buffer pH 3	7647-01-0, 877-24-7, 132-27-4		
pH Buffer pH 4	915-67-3, 877-24-7, 132-27-4		
pH Buffer pH 6	1310-73-2, 877-24-7, 7732-18-5, 132-27-4		
pH Buffer pH 7	7558-79-4, 7778-77-0, 1934-21-0		
pH Buffer pH 8	7558-79-4, 7778-77-0, 132-27-4		
pH Buffer Solution pH 1.68	N/A		
pH Buffer Solution pH 12.45	N/A		
pH Buffer Solution pH 4.0	N/A		
pH Buffer Solution pH 6.00	N/A		
pH Buffer Solution pH 8.00	N/A		
pH Buffer Solution pH 9.00	N/A		
pH Electrode Filling Solution	7447-40-7		
pH Electrode Storage Solution	7447-40-7, 7558-79-4, 7778-77-0		
pH Electrolyte Solution	N/A		
pH Storage Solution	Orion 910001		
pH2 Buffer (colorless)	N/A		
Phamalyte 5-10	17-0453-01		
Pharmalyte 3-10	17-0456-01		
pharmalyte 8-10.5	17-0455-01		
Phenacetin Melting Point Standard	N/A		
Phenol Red, Sodium Salt	34487-61-1		
Phenolphthalein, Powder	77-09-9		
Phenolphthalein, TS	77-09-8		
Phenylhydrazine	100-63-0		
Phenylhydrazine Hydrochloride	59-88-1		
Phenylmethanesulfonyl floride solution	329-98-6		
Phopshate Buffered Saline, 7.2 (PBS)	N/A		
Phopshate Buffered Saline, 7.4 ((PBS 10X)	N/A		
Phosphate buffered saline	N/A		
Phosphate Buffered Saline (10X)	N/A		
Phosphate Buffered Saline pH 7.4	N/A		
Phosphate buffered saline tablet	N/A		
Phosphate Buffered Saline Tablets	7447-40-7 (also 7647-14-5)		
Phosphorus Pentoxide	1314-56-3		
Phototungstic Acid Hydrate	12501-23-4		
Picrylsulfonic Acid Solution 5%	N/A		
Piperazine	110-85-0		
piperidine	110-85-0		
Plate Count Agar	247940		
Platinum Cobalt Color Standard	N/A		
Pluronic® F-6B	9003-11-6		
Plus One Urea	57-13-6		
p-Naphtholbenzein	145-50-6		
PNGase F	56-81-5 (glycerol)		
pNPP Tablets	N/A		
POLOXAMER 188 (PLURONIC F68:POLYETHYLENE-POLYPROPYLENE GLYCOL, N.F.)	9003-11-6		
Poloxamer 188 CRS	N/A		
Poloxamer Solid, USP	N/A		
POLSORBATE 80, NF	9005-65-6		
Polydimethylsiloxane RS	N/A		
Polydimethylsiloxane, USP	N/A		
Polyethylene Glycol	25322-68-3		
Polysorbate 80	9005-65-6		
Polysorbate 80	7781-2		
polysorbate 80, N.F.	9005-95-6		
Polyvinylpyrrolidone	9003-39-8		
Potassium Acetate	127-08-2		
Potassium Biphthalate	877-24-7		
Potassium Bromate	7758-01-2		
Potassium Bromide	7758-02-3		
Potassium Carbonate	584-08-7		
Potassium Carbonate Anhydrous	584-08-7		
Potassium Chloride	7447-40-7		
Potassium Chloride Saturated	7447-40-7*		

See Notes on Page 13.

Appendix C
Building 23 Complex Chemical Inventory

Site #C734138: BMS Syracuse North Campus Restoration Area

Chemical/Product Name	CAS Number	VOC/SVOC Found in Groundwater	All Detected Compounds Found in Groundwater
POTASSIUM CHLORIDE, ACS REAGENT	7447-40-7		
Potassium Cyanide	151-50-8		
Potassium Dichromate	7778-50-9		
Potassium Dichromate (UV Absorbance Std)	7778-50-9		
Potassium Ferricyanide Trihydrate Crystal	13746-66-2		
Potassium Hydrogen Phthalate	877-24-7		
Potassium Hydroxide	1310-58-7		
Potassium Hydroxide 0.1N, in Methanol	1310-58-3*		
Potassium Hydroxide 0.5N in Ethanol	1310-58-3		
Potassium Hydroxide 10.0 N	7732-18-5		
Potassium Hydroxide 45%	1310-58-3*		
Potassium Hydroxide Pellets	1310-58-3		
Potassium Hydroxide, 45%	1310-58-3		
Potassium Iodide	7681-11-0		
Potassium Nitrate	7757-79-1		
Potassium periodate, ACS, 99.8-100.3%	7790-21-8		
Potassium Permanganate	7722-64-7		
Potassium Phospahte Dibasic	7758-11-4		
Potassium Phospahte, Monobasic	7778-77-0		
Potassium Phosphate Tribasic	7778-53-2		
Potassium Phthalate	877-24-7		
Potassium Sodium Tartrate Tetrahydrate	6381-59-5		
Potassium Sulfate	7778-80-5		
Potassium Thiocyanate	333-20-0		
Premix Buffer Concentrate	64-19-7, 127-09-3, 2832-45-3		
Probe 6FAMTGGCTCACAACMATCMGBNFQ	N/A		
Propane	74-98-6		
Proprionic Acid	79-09-4		
Propyl 4-hydroxybenzoate	94-13-3		
Propylene Glycol Reference Standard	N/A		
Propylene Glycol, USP	N/A		
Propylparaben	94-13-3		
Proteinase K	N/A		
Proteinase K (Purelink Viral RNA/DNA mini kit)	N/A		
PTH Amino Acid Standard	N/A		
Purified Anti-Human CD3, NA/LE (Anti-CD3)	N/A		
Puromycin Dihydrochloride (Puromycin)	N/A		
Purpald (cat# 16.289-2)	N/A		
Pyridine	110-19-0		
Pyridoxine Hydrochloride, USP	N/A		
Qiagen Proteinase K 10mL	N/A		
R2A Agar	218263		
RapiGest SF Surfactant	308818-13-5		
Reagent Water, USP System Suitability Standard	N/A		
Recombinant Human B7-2/CD86 (rh B&-2/Fc Chimera)	N/A		
Recombinant Human CTLA-4 (rhCTLA-4/Fc Chimera)	N/A		
Residual Solvents Class 2 Mixture A RS	N/A		
Residual Solvents Class 2 Mixture B RS	N/A		
Residual Solvents Class 2 Mixture C RS	N/A		
Residual Solvents Mixture Class 1	N/A		
Ribose	50-69-1		
RICCA Chemical Company 1750,000 µs/cm	6100-20-5 132-27-4 7732-18-5		
Rnase Free H_20 (Purelink Viral RNA/DNA mini kit)	N/A		
RPMI 1640	N/A		
RPMI 1640	N/A		
Sabouraud Dextrose Agar	210950		
Salicylaldehyde	90-02-8		
Sample Diluent Buffer	N/A		
SeaBlock Blocking Buffer	N/A		
Semicarbazide hydrochloride	563-41-7		
Septihol Sterile	N/A		
Sequencing grade modified trypsin	N/A		
Servalyte 2-9	42935		
Servalyte 4-7	42948		
Silver Diethyldithiocarbamate	1470-61-7		
Silver Nitrate	7761-88-8		
Silver Nitrate, 0.1N	7761-88-8		
Silver Stain Kit	N/A		
Sodium 1-Heptane Sulfonate	2276-50-6		
sodium 1-hetanesulfonate	22767-50-6		
Sodium Acetate	127-09-3		
Sodium Acetate	6131-90-4		
Sodium Acetate Trihydrate	6131-90-4		
SODIUM ACETATE, ANHYDROUS	127-09-3		
SODIUM ACETATE, ANHYDROUS, 99+% FCC	127-09-3		

See Notes on Page 13.

Appendix C
Building 23 Complex Chemical Inventory

Site #C734138: BMS Syracuse North Campus Restoration Area

Chemical/Product Name	CAS Number	VOC/SVOC Found in Groundwater	All Detected Compounds Found in Groundwater
SODIUM ACETETE TRIHYDRATE	6131-90-4		
SODIUM ACETETE TRIHYDRATE CLINICAL	1246625Z1		
Sodium Azide	26628-22-8		
Sodium Azide 5% w/v solution	26628-22-8		
Sodium Bicarbonate	144-55-8		
Sodium Bitartrate Monohydrate	N/A		
Sodium Borate Decahydrate	1303-96-4		
Sodium borohydride	16940-66-2		
Sodium Bromide	7647-15-6		
Sodium Cabonate Anhydrous	497-19-8		
Sodium Carbonate	497-19-8		
Sodium Chloride	7647-14-5		
Sodium Chloride Solution	7647-14-5		
SODIUM CHLORIDE USP/ EP1310	1176026		
SODIUM CHLORIDE, GRANULAR, USP	3627-07		
Sodium Citrate	6132-04-3		
Sodium Citrate Dihydrate	6132-04-3		
SODIUM CITRATE DIHYDRATE CLINICAL	1246827Z1		
Sodium Citrate Dihydrate, Crystal	6132-04-3		
Sodium citrate monobasic anhydrous	18996-35-5		
Sodium Citrate Tribasic Dihydate	6132-04-3		
SODIUM CITRATE, DIHYDRATE	6132-04-3		
Sodium Cobaltinitrite Powder	13600-98-1		
Sodium Cyanoboro hydride	25895-60-7		
Sodium diethyldithiocarbamate trihydrate	20624-25-3		
SODIUM DODECYL SULFATE	151-21-3		
Sodium Ferrocyanide	13601-19-9		
Sodium Fluoride, USP	N/A		
Sodium Hexanitrocobaltate	13600-98-1		
Sodium Hydrosulfite	7775-14-6		
Sodium Hydroxide	1310-73-2		
Sodium Hydroxide 10N	1310-73-2*		
Sodium Hydroxide 1N	1310-73-2		
Sodium Hydroxide 5N	1310-73-2		
Sodium Hydroxide Pellets	1310-73-2		
Sodium Hydroxide, 1.0N	1310-73-2		
SODIUM HYDROXIDE, 10N VOLUMETRIC SOLUTION	1176418		
SODIUM HYDROXIDE, SOLID	1310-73-2		
Sodium Hypochlorite	N/A		
Sodium lauryl sulfate	151-21-3		
Sodium L-Lactate	ECNo. 2127623		
Sodium meta-Bisulfate Granular	7681-57-4		
Sodium Metaperiodate	7790-28-5		
Sodium molybdate dihydrate	10102-40-6		
Sodium Nitrate	7632-00-0		
Sodium Nitroferricyanide Dihydrate Crystal	13755-38-9		
Sodium Oxalate	62-76-0		
Sodium Perchlorate	7601-89-0		
Sodium Periodate	7790-28-5		
Sodium Phosphate Dibasic	7558-79-4		
Sodium Phosphate Dibasic Anhydrous	7558-79-4		
Sodium phosphate dibasic heptahydrate	7782-85-6		
SODIUM PHOSPHATE DIBASIC USP/EP CHEMICAL	1238184		
Sodium Phosphate Heptahydrate	7782-85-6		
Sodium Phosphate Monobasic	10049-21-5		
Sodium Phosphate Monobasic Dihydrate	13472-35-0		
SODIUM PHOSPHATE MONOBASIC MONOHYDRATE MC	1200261		
SODIUM PHOSPHATE, DIBASIC, ANHYDROUS	7558-79-4		
Sodium Phosphate, Monobasic, Monohydrate	10049-21-5		
Sodium Propionate	137-40-6		
Sodium Pyruvate	N/A		
Sodium Succinate Dibasic Hexahydrate	6106-21-4		
SODIUM SUCCINATE HEXAHYDRATE/ SUCCINIC ACID, DISODIUM SALT, 6-HYDRATE. (SUCCINIC ACID)	1246626Z1		
Sodium Sulfate	7757-82-6		
Sodium Sulfate Anhydrous	7757-82-6		
Sodium Sulfate Nonahydrate	1313-84-4		
Sodium Sulfide Nonahydrate	1313-84-4		
Sodium Sulfite	7757-83-7		
Sodium Sulfoxide	67-68-5		
Sodium Tartrate Dihydrate	6106-24-7		
Sodium Tetraborate	1330-43-4		
SODIUM TETRABORATE DECAHYDRATE	1303-96-4		
Sodium Thiosulfate 0.05N	N/A		
Sodium Thiosulfate 0.1N	7732-18-5*		
Sodium Thiosulfate, 0.01N	N/A		
Sodiumnitroprussiate Dihydrate	13755-38-9		
Soidum Hydroxide, 0.01N	1310-73-2		
Soidum Hydroxide, 0.1N	1310-73-2		

See Notes on Page 13.

Chemical/Product Name	CAS Number	VOC/SVOC Found in Groundwater	All Detected Compounds Found in Groundwater
Soidum Hydroxide, 0.5N	1310-73-2		
Soidum Hydroxide, 1N	1310-73-2		
Soidum Hydroxide, 5N	1310-73-2		
Solujet	N/A		
Sorbitol	50-70-4		
Sorbitol CRS	N/A		
Sorbitol, USP	N/A		
SPOR-KLEZ CONCENTRATE	6520-26		
SQ29006 (Benzyl Alcohol) Quantitative Standarc	N/A		
Stachyose	54261-98-2		
Stannous Chloride Anhydrous	7772-99-8		
Stannous Chloride Dihydrate	10025-69-1		
Starch Indicator	9005-84-9*		
Starch Indicator 0.5%	N/A		
Starch, Soluble, Powder	9005-84-9		
Steady-Glo Luciferase Assay System	N/A		
STOP solution in Sulfuric Acid	N/A		
Succinic Acid	110-15-6		
Succinic Acid, USP	N/A		
Sucrose	57-50-1		
Sucrose	N/A		
Sucrose ACS Reagent	57-50-1		
Sucrose CRS	N/A		
Sucrose Optical Rotation, 17f	N/A		
Sucrose RS	N/A		
Sucrose USP System Suitability Standard	N/A		
Sucrose, USP	N/A		
Sudan Red G	1229-55-6		
Sulfamic Acid	5329-14-6		
Sulfanilamide Melting Point Standarc	N/A		
Sulfapyridine Melting Point Standarc	N/A		
Sulfur	7704-39-4		
Sulfuric Acid	7664-93-9		
Sulfuric Acid 1.0N	7664-93-9		
Sulfuric Acid 2N	7664-93-9		
Sulfuric Acid, <10%	N/A		
Sulfuric Acid, 0.01N	7664-93-9		
Sulfuric Acid, 1.0N	7664-93-9		
Sulfuric Acid, 2.0N	7664-93-9		
Super Block Blocking Buffer	N/A		
SuperBlock Blocking Buffer in PBS	N/A		
Syltherm HF Heat Transfer Fluid	IBI Number: CT-00000-0050		
T.H.E. Dessicant:	63231-67-4		
Tantaric Acid	87-69-4		
Taqman 96-well Verification Plate	N/A		
Taqman Universal PCT Master Mix	N/A		
Taurine	107-35-7		
Taxol for Inj.	N/A		
Tert-butylmethylether	N/A		
tetrabutyl ammonium hydroxide, Titrant	2052-49-5		
tetrabutylammonium hydride	2052-49-5		
Tetrabutylammonium Hydroxide	2052-49-5		
Tetrabutylammonium hydroxide in 1.0M Methano	2052-49-5		
Tetramethyl benzidine	54827-17-7		
Tetramethylammonium Hydroxide 5-Hydrate	10424-65-4		
Thermal HIOS	N/A		
Thermo Buffer Solution pH 10.01	497-19-8 144-55-8 99-76-3 3844-45-9 7732-18-5		
Thermo Buffer Solution pH 4.01	915-67-3 877-24-7 7732-18-5		
Thermo Buffer Solution pH 7.00	7558-79-4 7778-77-0 30007-47-7 1934-21-0 7732-18-5		
Thimerosal	54-64-8		
THIOACETAMIDE	62-55-5		
Thioacetamide Chrystal	62-55-5		
Thioglycolic Acid	68-11-1		
Thymine	65-71-4		
Thymol	89-83-8		
Thymol Blue	76-61-9		
Thymol Blue Sodium Salt	62625-21-2		
Thymolphthalein TS	125-20-2		
Tin, Granule	7440-31-5		

See Notes on Page 13.

Appendix C
Building 23 Complex Chemical Inventory

Site #C734138: BMS Syracuse North Campus Restoration Area

Chemical/Product Name	CAS Number	VOC/SVOC Found in Groundwater	All Detected Compounds Found in Groundwater
TMB + Substrate + Chromogen	N/A		
TMB Stop Solution	N/A		
Trehalose, USP	N/A		
Trichloroacetic acid	76-03-9		
triethanolamine	102-71-6		
Trifluoroacetic acid	76-05-1		
Trifluoroacetic Acid 1mL ampules	76-05-01		
Trifluoroacetic Acid, 98%	76-05-1		
TRIMETHYLAMINE n-OXIDE, 98%	1184-78-7		
Trioctylphosphineoxide	78-50-2		
TRIS	N/A		
TRIS (Base)	77-86-1		
TRIS HYDROCHLORIDE	4103-01		
TRIS HYDROCHLORIDE (HCL)	1247137		
Tris-Glycine SDS Running Buffer (10X)	N/A		
trisodium citrate anhydrous	68-04-2		
trisodium citrate dihydrate	68-04-2		
Triton X-100	9002-93-1		
Trizma Base	77-86-1		
Trizma Hydrochloride	1185-53-1		
Trizma Pre-set Crystals pH 7.6	77-86-1, 1185-53-1		
Trizma Pre-set Crystals pH 8.0	77-86-1, 1185-53-1		
Trometamol CRS	N/A		
Tromethamine	77-86-1		
TROMETHAMINE TRIS USP BIO	1176417		
Tromethamine, USP	N/A		
Trypsin (Sequencing Grade Modified)	9002-07-7		
Trypsin Inhibitor	9035-81-8		
Trypticase Soy Broth	211771		
Tryticase Soy Agar	211046		
TTM Solution	102671		
Turbidity Standard	10034-93-2, 100-97-0		
Tween 20, Polyoxyethylene sorbitan monolaureate	9005-64-5		
Tween 80	N/A		
Urea	57-13-6		
UREA, A.C.S REAGENT	57-13-6		
Uridine	58-96-8		
Vanillin Melting Point Standard	N/A		
Vi-Cell Concentration Control	N/A		
Vi-Cell Reagent Pak	N/A		
Wash Buffer II (Purelink Viral RNA/DNA mini kit)	N/A		
Water	7732-18-5		
Windex	N/A		
XYLITOL, MIN 99%	87-99-0		
Xylose	58-86-6		
Yeast tRNA (Carrier RNA) (Purelink Viral RNA/DNA mini kit)	N/A		
Yeastolate Ultrafiltrate	N/A		
Zinc Sulfate Heptahydrate	7446-20-0		
β-lactoglobulin	N/A		

Notes:
N/A = CAS numbers are not available for the product/chemical.
* = Approximate CAS number presented.

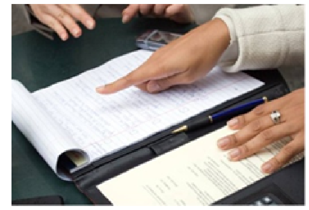
Appendix D

Excerpts from the Field Sampling and Analysis Plan for Indoor and Ambient Air Sampling

FIELD SAMPLING AND ANALYSIS PLAN







Remedial Investigation
BMS Syracuse North Campus Restoration Area
Brownfield Program
East Syracuse, New York

Bristol-Myers Squibb Company

March 2013

O'BRIEN & GERE

- Stop sample collection after the scheduled duration of sample collected, but when the canister still has a minimum amount of vacuum remaining. Check with the laboratory supplying the canister and flow controller for the ideal final vacuum pressure. Typically, the minimum vacuum is between 2 and 5 inches of mercury, but not zero. If there is no vacuum remaining, the sample will be rejected and collected again in a new canister.
- Record the final vacuum pressure and close the canister valve. Record the date and time that sample collection was stopped.
- Remove the flow controller from the canister and replace the protective brass plug.
- Attach labels/tags (sample name, time/date of sampling, etc.) to the canister as directed by the laboratory.
- Place the canister and other laboratory-supplied equipment in the packaging provided by the laboratory.
- Enter the information required for each sample on the chain of custody form, making sure to include the identification numbers for the canister and flow controller, and the initial and final canister pressures on the vacuum gauge.
- Include the required copies of the chain-of-custody form in the shipping packaging, as directed by the laboratory. The field crew will retain a copy of the chain-of-custody for the project file.
- Deliver or ship the samples to the laboratory within one business day of sample collection and via overnight delivery (when shipping).
- For temporary probes, remove the probe and seal the slab hole with cement. Repair flooring, if any.

11.2 INDOOR AIR SAMPLING

Indoor air samples will be collected by following the steps outlined below:

- Sampling personnel must avoid activities immediately before and during the sampling that may contaminate the sample (e.g., using markers, fueling vehicles, etc.).
- Record weather information (temperature, barometric pressure, relative humidity, wind speed, and wind direction) and indoor temperature and humidity at the beginning of the sampling event. Record substantial changes to these conditions that may have occurred over the past 24 to 48 hours and that do occur during the course of sampling. The information may be measured with on-site equipment or obtained from a reliable source of local measurements (e.g., a local airport).
- Identify sampling location(s) on a floor plan that also identifies locations of HVAC equipment, chemical storage areas, garages, doorways, stairways, sumps, drains, utility perforations, north direction, and separate footing sections
- Use an evacuated Summa® passivated (or equivalent) stainless-steel canister to collect the outdoor air sample. The canister will be provided by the laboratory, along with a flow controller equipped with an in-line particulate filter and a vacuum gauge. The flow controller will be pre calibrated by the laboratory for the desired flow rate or duration of sample collection. The sampling flow rate should always be less than 0.2 lpm. The canisters will be individually certified as clean by the laboratory.
- Place the canister at the sampling location. The sample should be collected from breathing height (e.g., 3 to 5 feet above ground). Either mount the canister on a stable platform or attach a length of inert tubing to the flow controller inlet and support it such that the sample inlet will be at the proper height.
- Remove the protective plug (either brass or plastic) from canister. Connect the pre calibrated flow controller to the canister.
- Record the identification numbers for the canister and flow controller. Record the initial canister pressure on the vacuum gauge (check equipment specific instructions for taking this measurement). A canister with a significantly different pressure than originally recorded by the testing laboratory should not be used for sampling. Record these numbers and values on the chain-of custody form for each sample.

- Completely open the valve on the vacuum pressure in the canister. Record the time that the valve was opened (beginning of sampling) and the canister pressure on the vacuum gauge.
- Photograph the canister and the area surrounding the canister.
- Monitor the vacuum pressure in the canister routinely during sampling, when practical (sometimes the canister will sample over a 24-hour period and routine monitoring is not practical). During monitoring, note the vacuum pressure on the gauge.
- Complete the Indoor Air (Canister) Sample Collection Field Form and the NYSDOH building survey and chemical survey form provided as **Appendix 12**.
- Stop sample collection after the scheduled duration of sample collection, but make sure that the canister still has a minimum amount of vacuum remaining. Check with the laboratory supplying the canister and flow controller for the ideal final vacuum pressure. Typically, the minimum vacuum is between 2 and 5 inches of mercury, but not zero. If there is no vacuum remaining, the sample will be rejected and collected again in a new canister or the sample results will be flagged appropriately.
- Record the final vacuum pressure and close the canister valves. Record the date and time that sample collection was stopped.
- Remove the flow controller from the canister and replace the protective brass plug.
- Attach labels/tags (sample name, time/date of sampling, etc.) to the canister as directed by the laboratory.
- Place the canister and other laboratory-supplied equipment in the packaging provided by the laboratory.
- Enter the information required for each sample on the chain of custody form, making sure to include the identification numbers for the canister and flow controller, and the initial and final canister pressures on the vacuum gauge.
- Include the required copies of the chain-of-custody form in the shipping packaging, as directed by the laboratory. The field crew will retain a copy of the chain of custody for the project file.
- Deliver or ship the samples to the laboratory within one business day of sample collection and via overnight delivery (when shipping).

11.3 AMBIENT AIR SAMPLING

The following procedures will be followed for the collection of ambient air samples:

- Sampling personnel must avoid activities immediately before and during the sampling that may contaminate the sample (e.g., using markers, fueling vehicles, etc.).
- Select a location upwind of the building or other area that is being evaluated. If possible, select a location upwind and near the HVAC air intake for the building being sampled.
- Record weather information (i.e., temperature, barometric pressure, relative humidity, wind speed, and wind direction) at the beginning of the sampling event. Record substantial changes to these conditions that may occur during the course of sampling. The information may be measured with on-site equipment or obtained from a reliable source of local measurements (e.g., a local airport).
- Use an evacuated Summa® passivated (or equivalent) stainless-steel canister to collect the ambient air sample. The canister will be provided by the laboratory, along with a flow controller equipped with an in-line particulate filter and a vacuum gauge. The flow controller will be pre calibrated by the laboratory for the desired flow rate or duration of sample collection, as defined in the site-specific work plan. The sampling flow rate should always be less than 0.2 lpm. The canisters will be individually certified as clean by the laboratory.
- Place the canister at the sampling location. If the sample should be collected from breathing height (e.g., 3 to 5 feet above ground), then mount the canister on a stable platform such that the sample inlet will be at the proper height.

- Unless sampling units will be constantly attended during sampling, a sign consistent with **Appendix 11** will be placed on the units indicating "Do Not Disturb – Air Sample Collection In Progress," and providing contact information.
- Remove the protective cap (either brass or plastic) from canister. Connect the pre calibrated flow controller to the canister.
- Record the identification numbers for the canister and flow controller. Record the initial canister pressure on the vacuum gauge (check equipment specific instructions for taking this measurement). A canister with a significantly different pressure than originally recorded by the testing laboratory should not be used for sampling. Record these numbers and values on the chain-of custody form for each sample.
- Completely open the valve on the vacuum pressure in the canister. Record the time that the valve was opened (beginning of sampling) and the canister pressure on the vacuum gauge.
- Photograph the canister and the area surrounding the canister.
- Document on a field form an outdoor plot sketch that indicates the building being sampled, streets, sampling location, location of potential outdoor air sources, north direction and paved areas. Also record pertinent observations such as odors, readings from field instrumentation, and significant activities in the vicinity that result in air emissions.
- Monitor the vacuum pressure in the canister routinely during sampling, when practical (sometimes the canister will sample over a 24-hour period and routine monitoring is not practical). During monitoring, note the vacuum pressure on the gauge.
- Complete the Ambient Air (Canister) Sample Collection Field Form provided as **Appendix 12**.
- Stop sample collection after the scheduled duration of sample collection but make sure that the canister still has a minimum amount of vacuum remaining. Check with the laboratory supplying the canister and flow controller for the ideal final vacuum pressure. Typically, the minimum vacuum is between 2 and 5 inches of mercury, but not zero. If there is no vacuum remaining, the sample will be rejected and collected again in a new canister or the sample results will be flagged appropriately.
- Record the final vacuum pressure and close the canister valves. Record the date and time that sample collection was stopped.
- Remove the flow controller from the canister and replace the protective plug.
- Attach labels/tags (sample name, time/date of sampling, etc.) to the canister as directed by the laboratory.
- Place the canister and other laboratory-supplied equipment in the packaging provided by the laboratory.
- Enter the information required for each sample on the chain of custody form, making sure to include the identification numbers for the canister and flow controller, and the initial and final canister pressures on the vacuum gauge.
- Include the required copies of the chain-of-custody form in the shipping packaging, as directed by the laboratory. The field crew will retain a copy of the chain of custody for the project file.
- Deliver or ship the samples to the laboratory within one business day of sample collection and via overnight delivery (when shipping).

Infrastructure · Water · Environment · Buildings

Imagine the result

Bristol-Myers Squibb Company

C734138 Phase 1A Remedial Investigation Work Plan

Soil Vapor Sampling Module

BMS Syracuse North Campus Restoration Area
East Syracuse, New York

January 2015

ARCADIS

George M. Thomas

I, *George M. Thomas, certify that I am currently a Qualified Environmental Professional [as defined in 6 New York Codes, Rules and Regulations Part 375] and that this C734138 Phase 1A Remedial Investigation Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).*

C734138 Phase 1A Remedial Investigation Work Plan

Soil Vapor Sampling Module

BMS Syracuse North Campus Restoration Area
East Syracuse, New York

Prepared for:
Bristol-Myers Squibb Company

Prepared by:
ARCADIS of New York, Inc.
6723 Towpath Road
PO Box 66
Syracuse
New York 13214-0066
Tel 315 446 9120
Fax 315 446 8053

Our Ref.:
B0087363.0005.00001

Date:
January 2015

Acronyms and Abbreviations **ii**

1. Introduction **1**

2. Soil Vapor **2**

2.1 Site Reconnaissance and Sample Locations 2

2.2 Sample and Analytical Methods 5

2.3 Data Evaluation 6

3. Reporting **8**

4. Schedule **9**

5. References **10**

Tables

1 BASE Values and Indoor Air Screening Levels

2 Reporting Limits and Soil Vapor Screening Levels

Figures

1 Site Location Map

2 Site Plan

3 Phase 1 Results: VOC Concentrations in Groundwater Exceeding NYSDEC TOGS 1.1.1 Criteria

4 Proposed Soil Vapor and Sub-slab Vapor Sampling Locations

Attachment

A Excerpts from Field Sampling and Analysis Plan

Acronyms and Abbreviations

ARCADIS	ARCADIS of New York, Inc.
BASE	Building Assessment and Survey Evaluation
BDA	Brownfield Development Area
BMS	Bristol-Myers Squibb Company
COC	constituent of concern
DER-10	DER-10 Technical Guidance for Site Investigation and Remediation
FSAP	Field Sampling and Analysis Plan
HVAC	heating, ventilation, and air conditioning
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OBG	O'Brien & Gere Engineers
Phase 1A WP	Phase 1A Work Plan
RI	Remedial Investigation
RIWP	Remedial Investigation Work Plan
SV	soil vapor
TIC	Tentatively Identified Compound
USEPA	United States Environmental Protection Agency
VI	vapor intrusion
VOC	Volatile Organic Compound
WP	Work Plan

1. Introduction

This Soil Vapor Sampling Work Plan (SV Work Plan) is the fourth module of the Phase 1A Remedial Investigation (RI) Work Plan (Phase 1A WP) for the Bristol-Myers Squibb Company (BMS) Syracuse North Campus Restoration Area (Site No. C734138; Brownfield Development Area [BDA]) located at 6000 Thompson Road in East Syracuse, New York (site). ARCADIS prepared this Phase IA WP module on behalf of BMS. The activities presented in this SV Work Plan will be performed in accordance with the requirements of the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program. The Brownfield Cleanup Agreement between BMS and NYSDEC was executed on October 18, 2011. A site location map showing the general location of the site is provided on Figure 1. Figure 2 shows the location and boundaries of the BDA at the site.

This SV Work Plan was prepared in accordance with the requirements of the Remedial Investigation Work Plan (RIWP; O’Brien & Gere Engineers [OBG] 2013a) which was conditionally approved by NYSDEC/New York State Department of Health (NYSDOH) on April 3, 2013. As outlined in the RIWP (OBG 2013a), the RI in the BDA is being completed in multiple phases.

2. Soil Vapor

Phase 1 groundwater results were reviewed to identify any dissolved-phase plumes of detected constituents of concern (COCs) and their proximity to occupied buildings (Figure 3). As discussed with NYSDEC/NYSDOH during meetings on May 19 and 23, 2014, Buildings 3, 7, 22/22A, 23B, 31, and 32A/32D are occupied buildings on or immediately adjacent to the BDA that will remain occupied. Buildings 25, 25N, 48, 61, 70, and 82 are present in the BDA but are not occupied and will not be occupied in the future. Therefore the vapor intrusion (VI) investigation will evaluate conditions in Buildings 3, 7, 22/22A, 23B, 31, and 32A/32D.

Due to the proximity of Buildings 7, 22/22A, and 31 to dissolved-phase constituents in groundwater, sub-slab soil vapor sampling will be conducted at these buildings. Building 23B is also located near an area where volatile organic compounds (VOCs) have been detected in groundwater, but the shallow depth to groundwater at Building 23B precludes the collection of sub-slab soil vapor samples. As such, at this location, BMS proposes to collect soil vapor samples from above the water table in soil surrounding the exterior of the Building 23B basement. Building 32A/32D is an on-grade office building located east of the BDA. VOCs were detected in the easternmost temporary groundwater well in the former Building 20 area, which was west of Building 32D. Due to the distance between Building 32A/32D and the dissolved-phase constituents, BMS is proposing soil vapor sample collection from between the former Building 20 and Building 32A/32D to evaluate the VI pathway. Building 3 is the boiler house control room, and VOCs were detected approximately 150 feet west in well BLD 21A-1. Due to the distance between the observed dissolved-phase constituents and Building 3, soil vapor samples will be collected from the area west of Building 3 to evaluate the VI pathway in this area.

The locations to be sampled in or near these buildings are presented in Figure 4 and discussed below.

2.1 Site Reconnaissance and Sample Locations

On June 19, 2014, ARCADIS staff completed a building and site walk to identify preliminary sub-slab soil vapor sample locations inside Buildings 7, 22/22A, and 31 and preliminary exterior soil vapor sample locations outside Buildings 23B and 32A/32D. Locations outside Building 3 were not evaluated because, at that time, sampling in the area of Building 3 was not proposed.

Sampling locations were identified that would provide information on sub-surface VOC concentrations with particular focus on areas of each building closest to impacted groundwater. Preliminary sample locations also considered feasibility and access based on occupancy of a given building or the presence of landscaping or other outdoor structural features that cannot be moved. Approximate sample locations are shown on Figure 4. Specific sample locations will be finalized after the review of utility or building layout information, a detailed location-specific utility clearance procedure, and based upon consideration of any location-specific impediments that may be encountered (e.g., excessive concrete floor thickness, physical access).

The preliminary locations for sub-slab samples are summarized below.

- Building 7 is used as a cafeteria and meeting/training area. Most of the building has a finished tile floor. Groundwater impacts are located closest to the western edge of this building near monitoring well BLD 24-1. Preliminary sample locations were identified considering these conditions as follows:

    - SV 7-1. Office area along northern wall. Although this room was not evaluated during the reconnaissance visit, it does appear that the floor is concrete.

    - SV 7-2. Training room along western edge of Building 7. This area has carpet flooring that can be lifted to install a sub-slab sample point.

    - SV 7-3. Storage room in southwest corner of Building 7. This area has a concrete floor and is used for storage.

- Building 22/22A includes administrative offices, the Health Services offices, a communications room, file storage, and a data network hub. Impacted groundwater is located closest to the eastern side of Building 22A near monitoring well T-36, and the northern end of Building 22 near monitoring well BLD 4B-1. Sample locations were identified to be closest to the location of the impacted groundwater as follows:

    - SV 22A-1. Heating, ventilation, and air conditioning (HVAC) room located at southern end of Building 22A. This location is readily accessible.

    - SV 22-1. Janitor closet at northeast corner of Building 22. The closet has a concrete floor and sufficient access to collect a sub-slab sample.

    - SV 22-2. Health Services area along eastern edge of Building 22. A sample will be collected from a closet or other location that does not disrupt daily activities.

- Building 31 is used for storage of equipment. Impacted groundwater is located to the southwest of Building 31, as identified by COC concentrations in temporary monitoring wells BLD 8D-1 and BLD 8-2.
  - All floors in Building 31 are concrete; however, the room along the northern side of the building is raised above the ground surface by approximately one foot suggesting an above average slab thickness. Based on these considerations, three locations (denoted SV 31-1, SV 31-2, and SV 31-3) will be selected from the two rooms located along the west and south ends of the building.

The preliminary locations for soil vapor samples are summarized below.

- Building 3 is the boiler house control room. The sample location was identified to evaluate soil vapor concentrations in relation to VOC concentrations detected in monitoring well BLD 21A-1. Due to the distance of the building from any detected VOCs, BMS is proposing to collect one exterior soil vapor sample on the western side (upgradient side) of Building 3, closest to the BLD 21A-1 area.
  - SV 3-1. One sample location identified along the western end of the building.
- Building 23B contains a stockroom, laboratories, and offices. This building has an occupied basement that frequently experiences water infiltration. The water table is expected to be directly below the basement slab, precluding the collection of any sub-slab soil vapor samples. In addition, the exterior around this building has been recently remodeled, limiting access to collect soil vapor samples in these areas. Preliminary sample locations were identified considering these conditions as follows:
  - SV 23B-1. One exterior soil vapor sample location was identified in an older sidewalk directly east of groundwater monitoring well DS 2-3.
  - SV 23B-2. The second exterior soil vapor sample is located in the grass along the southwestern end of the building.
- Building 32A/32D is primarily an office building. Sample locations were identified to evaluate soil vapor concentrations in relation to VOCs detected in monitoring well BLD 20-1. Due to the distance between monitoring well BLD 20-1 and Building 32A/32D, BMS is proposing exterior soil vapor samples between the well and the building to evaluate the VI pathway. Grassy areas surround much of the building, but an electrical substation (Building 44) is located adjacent to this

building. Potential sample locations were identified considering these conditions as follows:

- SV 32A-1 and SV 32D-1. Two sample locations were identified along the western side of the building.

- SV 32D-2. One sample location was identified along the southern edge of the building.

Prior to sample collection, a detailed building review and reconnaissance will be conducted of each location to confirm and document specific sample locations (i.e., measured from outside walls) and to obtain additional information on building layout, uses, and HVAC systems. If indoor air samples are collected during future evaluations, a more thorough survey will be completed at that time (e.g., walk-through evaluation to identify and remove potentially-interfering chemicals). As shown on Figure 4, a total of nine sub-slab soil vapor samples are currently identified for Buildings 7, 22/22A, and 31. Six soil vapor samples are identified for Buildings 3, 23, and 32A/32D. ARCADIS will also collect one duplicate sample for each day of sampling.

2.2 Sample and Analytical Methods

Sub-slab soil vapor and exterior soil vapor samples will be collected consistent with the approved Field Sampling and Analysis Plan (FSAP; OBG 2013d; excerpts of the relevant pages are included in Attachment A for reference). Permanent sub-slab soil vapor sampling points will be installed, provided they do not cause any operability or quality issues with the building. ARCADIS will conduct a tracer test on all sub-slab soil vapor samples consistent with the procedures identified in the FSAP for soil vapor sampling. Sub-slab soil vapor samples will be collected over an 8-hour period consistent with a typical work day. The data collected from the sub-slab soil vapor samples will provide direct evidence of COC concentrations below the building slab. As noted below, if all sub-slab soil vapor concentrations are below screening levels, then BMS may propose that no further investigation will be needed.

Exterior soil vapor samples will be collected from approximately 1 to 2 feet above the water table, just outside the capillary fringe. Data (United States Environmental Protection Agency [USEPA] 2012) have shown that deep soil vapor samples can provide a worst-case estimate of soil vapor concentrations that can be found under a building slab. Therefore, collection of samples from 1 to 2 feet above the water table for approximately 30 minutes at a maximum flow rate of 200 milliliters per minute will provide conservative results, and will ensure that potential COC concentrations are not underestimated.

The sub-slab soil vapor and soil vapor samples will be submitted under chain-of-custody protocols to the analytical laboratory and will be analyzed for VOCs via USEPA Method TO-15. In addition, site-specific VOCs that are not included in the standard analysis will be evaluated by the analytical laboratory as tentatively identified compounds (TICs), as feasible. The complete list of VOCs to be analyzed is shown on Table 1. All samples will be analyzed in accordance with USEPA Method TO-15 using standard detection limits.

2.3 Data Evaluation

The vapor data collected at the site will be evaluated to assess the need for further investigation (including indoor air assessments) or if the VI pathway can be considered incomplete. NYSDOH's Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH 2006) does not provide standards, criteria, or guidance values for evaluating sub-slab soil vapor or soil vapor data results. As an initial step in this evaluation, the indoor air background levels as provided in the Building Assessment Survey and Evaluation (BASE) Study (USEPA 2001) from Table C2 of Appendix C of the NYSDOH (2006) guidance were assembled for the COCs as shown in Table 1. If a BASE value was not available for a particular COC, the USEPA Industrial Air Regional Screening Level was provided in Table 1 (again where available). As shown in Table 2, these values were then used to calculate sub-slab soil vapor and soil vapor screening levels using a conservative attenuation factor of 0.03 (USEPA 2012). An attenuation factor of 0.03 is recommended by USEPA (2012) based on a conservative analysis of empirical data for both sub-slab soil vapor and deep soil gas (collected above the water table). Because the data used to calculate the attenuation factors in the USEPA (2012) database are from residential structures, the value of 0.03 is expected to be a conservative estimate for the commercial/industrial buildings on site. The sub-slab and soil vapor screening levels are provided in Table 2.

If sub-slab soil vapor and soil vapor concentrations are less than the screening levels, then BMS may propose that no further action is needed at the site to evaluate the VI pathway.

BMS understands that it may be necessary to collect additional data including indoor air samples to fully evaluate the VI pathway following completion of this current evaluation. If screening levels are exceeded, then additional sampling (e.g., soil vapor, sub-slab soil vapor and/or indoor air) at the buildings will be proposed. As shown in Table 1, there are several constituents for which screening levels have not been established. If constituents without screening levels are detected, BMS's response will depend on the concentration detected in soil gas. Specifically, if the detection suggests that there may be unacceptable exposures in indoor air based on available toxicity data, BMS will propose additional sampling and/or remediation to the Department. In contrast, if the detection does not present an unacceptable exposure, BMS will inform the Department and provide a rationale for not taking any further action with respect to that constituent. If additional sampling is proposed, it will be limited to those buildings where exceedances of screening levels were detected and it will be limited to only those constituents that were detected above a screening level.

3. Reporting

Results of the vapor sample analysis will be included in the Phase 1A Data Summary Report. The Phase 1A Data Summary Report will include identification of data gaps (if any) and a proposed scope (as needed) for Phase 2 investigations.

4. Schedule

The ten day notification to NYSDEC as to the start of field work, as required by the October 18, 2011 Brownfield Cleanup Agreement between BMS and NYSDEC, will be provided within approximately 45 days of approval by the NYSDEC and the NYSDOH, assuming appropriate weather conditions for completion of the exterior locations.

The Phase 1A Data Summary Report will be submitted in accordance with the schedule included in the RIWP (OBG 2013a).

5. References

ARCADIS. 2014. *Health and Safety Plan*. May 2014.

O'Brien & Gere (OBG). 2013a. *Remedial Investigation Work Plan: BMS Syracuse North Campus Restoration Area Site No. C734138*. March 2013.

OBG. 2013b. *Field Sampling Plan: BMS Syracuse North Campus Restoration Area Site No. C734138*. March 2013.

OBG. 2013c. *Quality Assurance Project Plan: BMS Syracuse North Campus Restoration Area Site No. C734138*. March 2013.

OBG. 2013d. *Field Sampling and Analysis Plan: BMS Syracuse North Campus Restoration Area Site No. C734138.* March 2013.

New York State Department of Environmental Conservation (NYSDEC). 1998. Technical & Operational Guidance Series 1.1.1. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June. Available online at: http://www.dec.ny.gov/docs/water_pdf/togs111.pdf

NYSDEC. 1999. Technical Guidance for Screening Contaminated Sediments. Division of Fish, Wildlife and Marine Resources. Last revised January 25. Available online at: http://www.dec.ny.gov/docs/wildlife_pdf/seddoc.pdf

NYSDEC. 2000 Addendum to Technical & Operational Guidance Series 1.1.1. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. April. Available online at: http://www.dec.ny.gov/docs/water_pdf/togs111table1.pdf

NYSDEC. 2004 Addendum to Technical & Operational Guidance Series 1.1.1. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June. Available online at: http://www.dec.ny.gov/docs/water_pdf/June04togs111.pdf

NYSDEC. 2010. DER-10 Technical Guidance for Site Investigation and Remediation. May 3. Available online at: http://www.dec.ny.gov/regulations/67386.html

New York State Department of Health (NYSDOH). 2006. Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York.

USEPA. 2012. *EPA's Vapor Intrusion Database: Evaluation and Characterization of Attenuation Factors for Chlorinated Volatile Organic Compounds and Residential Buildings*. Office of Solid Waste and Emergency Response.

USEPA. 2013. *OSWER Final Guidance for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Sources to Indoor Air (External Review Draft)*, Office of Solid Waste and Emergency Response.

Tables

Table 1
BASE Values and Indoor Air Screening Levels

Site #C734138: BMS Syracuse North Campus Restoration Area

Volatile Chemicals Detected in Soil or Groundwater	CAS #	Units	BASE Indoor Air Value (90%)	USEPA Commercial Indoor Air RSL (a)
1,1,1-Trichloroethane	71-55-6	ug/m3	20.6	
1,1,2,2-Tetrachloroethane	79-34-5	ug/m3	---	0.21
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ug/m3	---	130000
1,1,2-Trichloroethane	79-00-5	ug/m3	<1.5	
1,1'-Biphenyl	92-52-4	ug/m3	---	1.8
1,1-Dichloroethane	75-34-3	ug/m3	<0.7	
1,1-Dichloroethene	75-35-4	ug/m3	<1.4	
1,2,3-Trimethylbenzene	526-73-8	ug/m3	---	22
1,2,4-Trichlorobenzene	120-82-1	ug/m3	<6.8	
1,2,4-Trimethylbenzene	95-63-6	ug/m3	9.5	
1,2-Dibromoethane	106-93-4	ug/m3	<1.5	
1,2-Dichlorobenzene	95-50-1	ug/m3	<1.2	
1,2-Dichloroethane	107-06-2	ug/m3	<0.9	
1,2-Dichloropropane	78-87-5	ug/m3	<1.6	
1,3,5-Trimethylbenzene	108-67-8	ug/m3	3.7	
1,3-Butadiene	106-99-0	ug/m3	<3.0	
1,3-Dichlorobenzene	541-73-1	ug/m3	<2.4	
1,4-Dichlorobenzene	106-67-8	ug/m3	5.5	
1,4-Dioxane	123-91-1	ug/m3	---	2.5
1-Propene, 3-chloro-	107-05-1	ug/m3	---	2
2,2,4-Trimethylpentane	540-84-1	ug/m3	---	---
2-Butanone	78-93-3	ug/m3	12	
2-Chlorophenol	95-57-8	ug/m3	---	---
2-Hexanone	591-78-6	ug/m3	---	130
2-Methylnaphthalene	91-57-6	ug/m3	---	---
2-Nitropropane	79-46-9	ug/m3	---	0.0045
2-Propanol	67-63-0	ug/m3	250	
4-Chlorotoluene	106-43-4	ug/m3	---	---
4-Ethyltoluene	622-96-8	ug/m3	3.6	
4-Methyl-2-pentanone	108-10-1	ug/m3	6	
Acetone	67-64-1	ug/m3	98.9	
Acetonitrile	75-05-8	ug/m3	---	260
Acetophenone	98-86-2	ug/m3	---	---
alpha-Chlorotoluene	100-44-7	ug/m3	---	0.25
Benzaldehyde	100-52-7	ug/m3	---	---
Benzene	71-43-2	ug/m3	9.4	
Bis(2-chloroethyl)ether	111-44-4	ug/m3	---	0.037
Bromodichloromethane	75-27-4	ug/m3	---	0.33
Bromoform	75-25-2	ug/m3	---	11
Bromomethane	74-83-9	ug/m3	<1.7	
Carbon disulfide	75-15-0	ug/m3	4.2	
Carbon tetrachloride	56-23-5	ug/m3	<1.3	
Chlorobenzene	108-90-7	ug/m3	<0.9	
Chloroethane	75-00-3	ug/m3	<1.1	
Chloroform	67-66-3	ug/m3	1.1	
Chloromethane	74-87-3	ug/m3	3.7	
cis-1,2-Dichloroethene	156-59-2	ug/m3	<1.9	
cis-1,3-Dichloropropene	10061-01-5	ug/m3	<2.3	
Cyclohexane	110-82-7	ug/m3	---	26000
Cyclohexene	110-83-8	ug/m3	---	4400
Dibromochloromethane	124-48-1	ug/m3	---	0.45
Dichlorodifluoromethane	75-71-8	ug/m3	16.5	
Epichlorohydrin	106-89-8	ug/m3	---	4.4
Ethanol	64-17-5	ug/m3	210	
Ethyl acetate	141-78-6	ug/m3	5.4	
Ethylbenzene	100-41-4	ug/m3	5.7	
Freon 114	76-14-2	ug/m3	---	---
Heptane	142-82-5	ug/m3	---	---

See Notes on Page 2.

Table 1
BASE Values and Indoor Air Screening Levels

Site #C734138: BMS Syracuse North Campus Restoration Area

Volatile Chemicals Detected in Soil or Groundwater	CAS #	Units	BASE Indoor Air Value (90%)	USEPA Commercial Indoor Air RSL (a)
Hexachlorobutadiene	87-68-3	ug/m3	<6.8	
Isopropyl ether	108-20-3	ug/m3	---	3100
Isopropylbenzene	98-82-8	ug/m3	---	1800
m&p-Xylenes	108-38-3	ug/m3	22.2	
Methacrylonitrile	126-98-7	ug/m3	---	130
Methyl acetate	79-20-9	ug/m3	---	---
Methyl tert-butyl ether	1634-04-4	ug/m3	11.5	
Methylene Chloride	75-09-2	ug/m3	10	
n,n-Dimethylaniline	121-69-7	ug/m3	---	---
Naphthalene	91-20-3	ug/m3	5.1	
n-Hexane	110-54-3	ug/m3	10.2	
Nitrobenzene	98-95-3	ug/m3	---	0.31
n-Pentane	109-66-0	ug/m3	---	4400
N-Propylbenzene	103-65-1	ug/m3	---	4400
o-Xylene	95-47-6	ug/m3	7.9	
Propene	115-07-1	ug/m3	---	13000
Pyridine	110-86-1	ug/m3	---	---
Styrene	100-42-5	ug/m3	1.9	
Tetrachloroethene	127-18-4	ug/m3	15.9	
Tetrahydrofuran	109-99-9	ug/m3	---	8800
Toluene	108-88-3	ug/m3	43	
trans-1,2-Dichloroethene	156-60-5	ug/m3	---	---
trans-1,2-Dichloropropene	10061-02-6	ug/m3	<1.3	
Trichloroethene	79-01-6	ug/m3	4.2	
Trichlorofluoromethane	75-69-4	ug/m3	18.1	
Vinyl chloride	75-01-4	ug/m3	<1.9	

Notes:

(a) RSL presented is lower of a Cancer Risk of 1x10-6 or a Hazard Quotient of 1.

< = Compound not detected in BASE sampling events, associated value is lab detection limit.

--- = screening level/value not available.

BASE = Building Assessment and Survey Evaluation (Appendix C of NYSDOH guidance).

CAS = Chemical Abstracts Service.

RSL = regional screening level.

ug/m3 = micrograms per cubic meter.

USEPA = United States Environmental Protection Agency.

RI = Remedial Investigation.

Bold compounds were detected in soil or groundwater samples collected during the RI.

[shaded box] = USEPA Commercial Indoor Air RSL not used because BASE Indoor Air Value was available.

Table 2
Reporting Limits and Sub-slab Soil Vapor Screening Levels

Site #C734138: BMS Syracuse North Campus Restoration Area

Volatile Chemicals Detected in Soil or Groundwater	CAS #	Units	Eurofins Analysis	Anticipated Analytical Laboratory Reporting Limit (a) TO-15	Sub-Slab Vapor Screening Level (b)
1,1,1-Trichloroethane	71-55-6	ug/m3	TO-15	2.7	687
1,1,2,2-Tetrachloroethane	79-34-5	ug/m3	TO-15	3.4	7.0
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ug/m3	TO-15	3.8	4,333,333
1,1,2-Trichloroethane	79-00-5	ug/m3	TO-15	2.7	50
1,1'-Biphenyl	92-52-4	ug/m3	TO-15 TIC	16	60
1,1-Dichloroethane	75-34-3	ug/m3	TO-15	2	23
1,1-Dichloroethene	75-35-4	ug/m3	TO-15	2	47
1,2,3-Trimethylbenzene	526-73-8	ug/m3	TO-15 TIC	12	733
1,2,4-Trichlorobenzene	120-82-1	ug/m3	TO-15	15	227
1,2,4-Trimethylbenzene	95-63-6	ug/m3	TO-15	2.4	317
1,2-Dibromoethane	106-93-4	ug/m3	TO-15	3.8	50
1,2-Dichlorobenzene	95-50-1	ug/m3	TO-15	3	40
1,2-Dichloroethane	107-06-2	ug/m3	TO-15	2	30
1,2-Dichloropropane	78-87-5	ug/m3	TO-15	2.3	53
1,3,5-Trimethylbenzene	108-67-8	ug/m3	TO-15	2.4	123
1,3-Butadiene	106-99-0	ug/m3	TO-15	1.1	100
1,3-Dichlorobenzene	541-73-1	ug/m3	TO-15	3	80
1,4-Dichlorobenzene	106-67-8	ug/m3	TO-15	2.4	183
1,4-Dioxane	123-91-1	ug/m3	TO-15	7.2	83
1-Propene, 3-chloro-	107-05-1	ug/m3	TO-15	6.3	67
2,2,4-Trimethylpentane	540-84-1	ug/m3	TO-15	2.3	---
2-Butanone	78-93-3	ug/m3	TO-15	5.9	400
2-Chlorophenol	95-57-8	ug/m3	TO-15 TIC	13	---
2-Hexanone	591-78-6	ug/m3	TO-15	8.2	4,333
2-Methylnaphthalene	91-57-6	ug/m3	TO-15 TIC	15	---
2-Nitropropane	79-46-9	ug/m3	TO-15 TIC	9	0.15
2-Propanol	67-63-0	ug/m3	TO-15	4.9	8,333
4-Chlorotoluene	106-43-4	ug/m3	TO-15 TIC	13	---
4-Ethyltoluene	622-96-8	ug/m3	TO-15	2.4	120
4-Methyl-2-pentanone	108-10-1	ug/m3	TO-15	2	200
Acetone	67-64-1	ug/m3	TO-15	12	3,297
Acetonitrile	75-05-8	ug/m3	TO-15 TIC	4	8,667
Acetophenone	98-86-2	ug/m3	TO-15 TIC	12	---
alpha-Chlorotoluene	100-44-7	ug/m3	TO-15	2.6	8
Benzaldehyde	100-52-7	ug/m3	TO-15 TIC	11	---
Benzene	71-43-2	ug/m3	TO-15	1.6	313
Bis(2-chloroethyl)ether	111-44-4	ug/m3	TO-15 TIC	15	1.2
Bromodichloromethane	75-27-4	ug/m3	TO-15	3.4	11
Bromoform	75-25-2	ug/m3	TO-15	5.2	367
Bromomethane	74-83-9	ug/m3	TO-15	19	57
Carbon disulfide	75-15-0	ug/m3	TO-15	6.2	140
Carbon tetrachloride	56-23-5	ug/m3	TO-15	3.1	43
Chlorobenzene	108-90-7	ug/m3	TO-15	2.3	30
Chloroethane	75-00-3	ug/m3	TO-15	5.3	37
Chloroform	67-66-3	ug/m3	TO-15	2.4	37
Chloromethane	74-87-3	ug/m3	TO-15	10	123
cis-1,2-Dichloroethene	156-59-2	ug/m3	TO-15	2	63
cis-1,3-Dichloropropene	10061-01-5	ug/m3	TO-15	2.3	77
Cyclohexane	110-82-7	ug/m3	TO-15	1.7	866,667
Cyclohexene	110-83-8	ug/m3	TO-15 TIC	8	146,667
Dibromochloromethane	124-48-1	ug/m3	TO-15	4.2	15
Dichlorodifluoromethane	75-71-8	ug/m3	TO-15	2.5	550
Epichlorohydrin	106-89-8	ug/m3	TO-15 TIC	9	147
Ethanol	64-17-5	ug/m3	TO-15	3.8	7,000
Ethyl acetate	141-78-6	ug/m3	TO-15 TIC	9	180
Ethylbenzene	100-41-4	ug/m3	TO-15	2.2	190
Freon 114	76-14-2	ug/m3	TO-15	3.5	---
Heptane	142-82-5	ug/m3	TO-15	2	---
Hexachlorobutadiene	87-68-3	ug/m3	TO-15	21	227
Isopropyl ether	108-20-3	ug/m3	TO-15 TIC	10	103,333
Isopropylbenzene	98-82-8	ug/m3	TO-15	2.4	60,000

See Notes on Page 2.

Table 2
Reporting Limits and Sub-slab Soil Vapor Screening Levels

Site #C734138: BMS Syracuse North Campus Restoration Area

Volatile Chemicals Detected in Soil or Groundwater	CAS #	Units	Eurofins Analysis	Anticipated Analytical Laboratory Reporting Limit (a) TO-15	Sub-Slab Vapor Screening Level (b)
m&p-Xylenes	108-38-3	ug/m3	TO-15	2.2	740
Methacrylonitrile	126-98-7	ug/m3	TO-15 TIC	7	4,333
Methyl acetate	79-20-9	ug/m3	TO-15 TIC	8	---
Methyl tert-butyl ether	1634-04-4	ug/m3	TO-15	1.8	383
Methylene Chloride	75-09-2	ug/m3	TO-15	17	333
n,n-Dimethylaniline	121-69-7	ug/m3	TO-15 TIC	5	---
Naphthalene [c]	91-20-3	ug/m3	TO-15	10	170
n-Hexane	110-54-3	ug/m3	TO-15	1.8	340
Nitrobenzene	98-95-3	ug/m3	TO-15 TIC	13	10
n-Pentane	109-66-0	ug/m3	TO-15 TIC	7.3	146,667
N-Propylbenzene	103-65-1	ug/m3	TO-15	2.4	146,667
o-Xylene	95-47-6	ug/m3	TO-15	2.2	263
Propene	115-07-1	ug/m3	TO-15 TIC	4.2	433,333
Pyridine	110-86-1	ug/m3	TO-15 TIC	8	---
Styrene	100-42-5	ug/m3	TO-15	2.1	63
Tetrachloroethene	127-18-4	ug/m3	TO-15	3.4	530
Tetrahydrofuran	109-99-9	ug/m3	TO-15	1.5	293,333
Toluene	108-88-3	ug/m3	TO-15	1.9	1,433
trans-1,2-Dichloroethene	156-60-5	ug/m3	TO-15	2	---
trans-1,2-Dichloropropene	10061-02-6	ug/m3	TO-15	2.3	43
Trichloroethene	79-01-6	ug/m3	TO-15	2.7	140
Trichlorofluoromethane	75-69-4	ug/m3	TO-15	2.8	603
Vinyl chloride	75-01-4	ug/m3	TO-15	1.3	63

Notes:

(a) Eurofins in Folsom, CA; reporting limits subject to change depending on analytical conditions.

(b) Sub-slab vapor screening level calculated from indoor air screening levels shown in Table 2 using an attenuation factor of 0.03 as follows: Sub-Slab Value = Indoor Air Value ÷ AF.

(c) Naphthalene is not a standard TO-15 analyte, therefore for this investigation BMS would be requesting the inclusion of naphthalene in the analytical suite.

For compounds not detected (marked with < in Table 1), the lab detection limit was used to calculate Sub-Slab Screening Levels using the equation in footnote (b).

--- = screening level/value not available.

AF = attenuation factor.

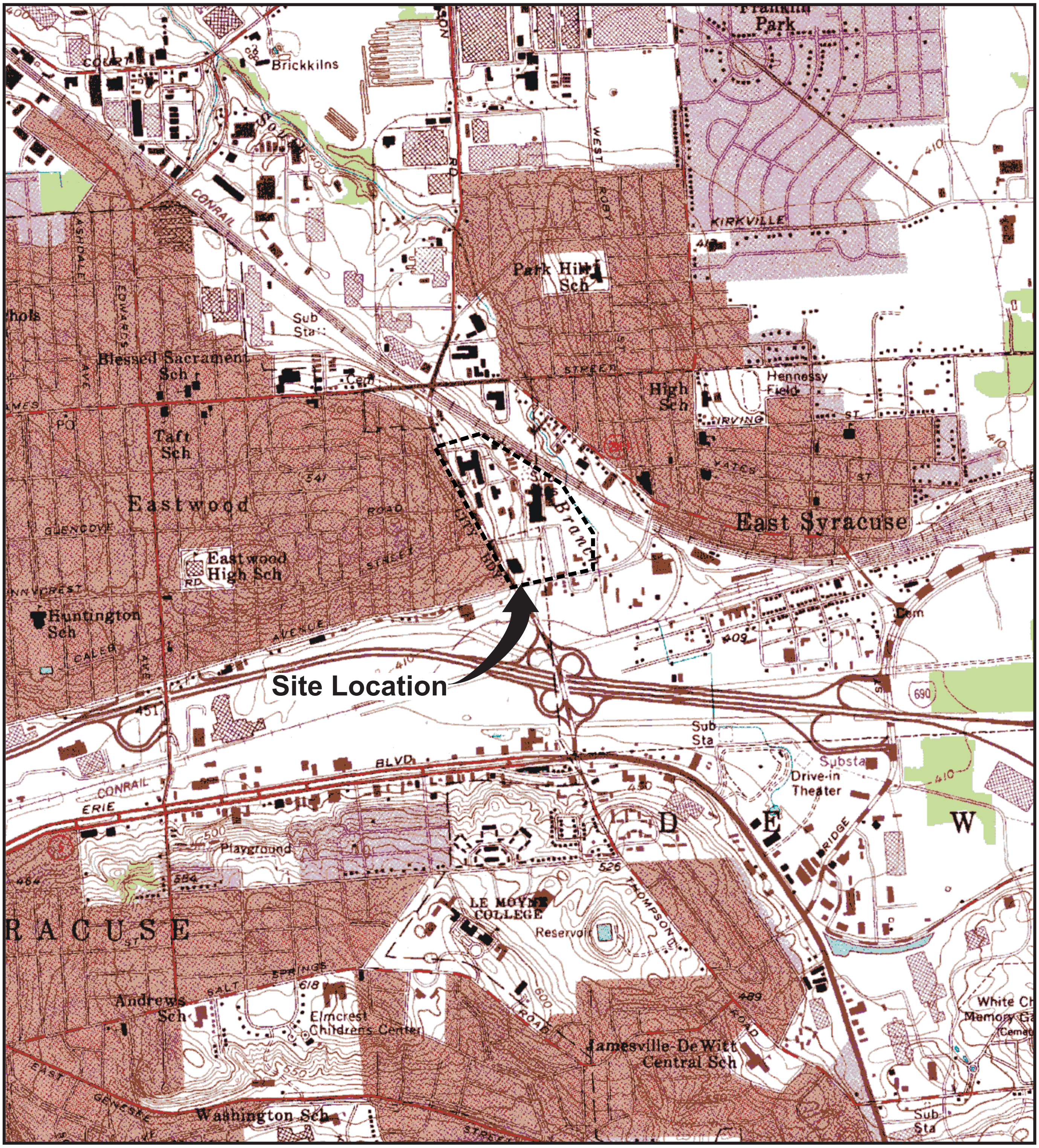
CAS = Chemical Abstracts Service.

ug/m3 = micrograms per cubic meter.

Bold compounds were detected in soil or groundwater samples collected during the RI.

ARCADIS

Figures



REFERENCE: BASE MAP USGS 7.5 MIN. QUAD., SYRACUSE EAST, N.Y., 1957. PHOTOREVISED 1978.

2000' 0 2000'

Approximate Scale: 1" = 2000'

Area Location

SITE #C734138:BMS SYRACUSE
NORTH CAMPUS RESTORATION AREA
EAST SYRACUSE, NY

SITE LOCATION MAP

ARCADIS

FIGURE
1

09/23/2014 SYRACUSE, NY-ENV/CAD-141 DJHOWES
B0087363/0005/00001/CDR/87363N01.CDR

LEGEND:

- APPROXIMATE BROWNFIELD AREA BOUNDARY
- APPROXIMATE PROPERTY LINE, BRISTOL-MYERS SQUIBB
- OCCUPIED BUILDINGS
- UNOCCUPIED BUILDINGS / STRUCTURES
- DEMOLISHED BUILDINGS
- PAVED OR CONCRETE AREAS
- UNPAVED AREAS
- EXISTING RAILROAD
- SOIL BORING
- TEMPORARY MONITORING WELL
- DECOMMISSIONED MONITORING WELL
- BEDROCK MONITORING WELL

NOTES:

1. BASEMAP BASED ON A MAP TITLED "BRISTOL-MYERS SQUIBB PART OF LOT 41 - TOWN OF DEWITT AND PART OF THE VILLAGE OF EAST SYRACUSE ONONDAGA COUNTY NEW YORK", DATED MARCH 25, 2010 PREPARED BY COTTRELL LAND SURVEYORS, P.C.. UPDATED BASED ON ARCADIS FIELD VISIIT JULY 2014, SEPTEMBER 11, 2014 AND BING AERIAL IMAGERY ACQUIRED SEPTEMBER, 2014.
2. MONITORING WELL LOCATIONS AND ELEVATION SURVEY BY CT MALE ASSOCIATES, SYRACUSE NY, OCTOBER 2013, JUNE 2014, AND SEPTEMBER 2014. ELEVATIONS NAVD 88, HORIZONTAL NAD 83.

0 160' 320'
GRAPHIC SCALE

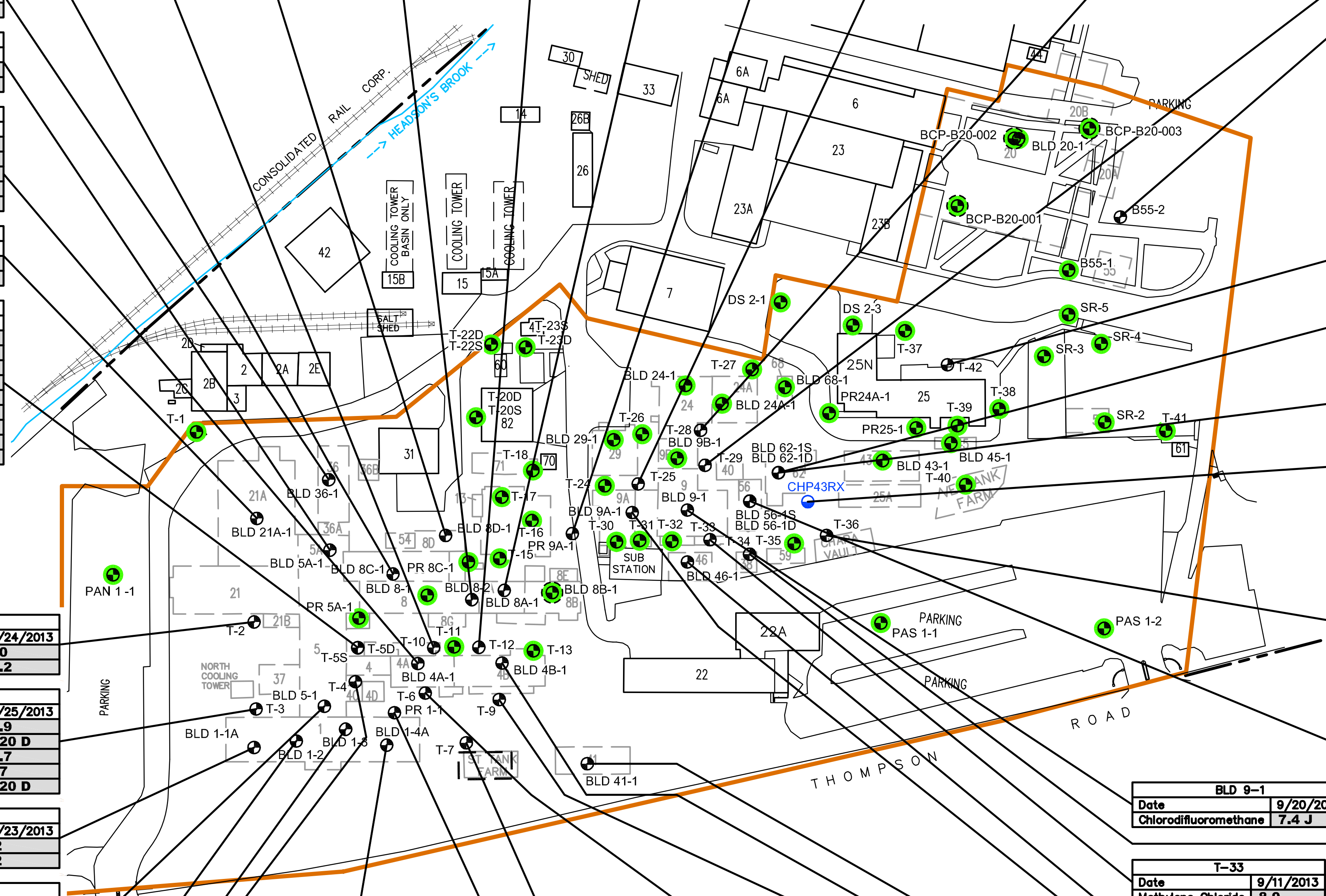
SITE #C734138: BMS SYRACUSE
NORTH CAMPUS RESTORATION AREA
EAST SYRACUSE, NY

SITE PLAN

ARCADIS

FIGURE
2

CITY: SYRACUSE, NY DIV/GROUP: ENV/REM-WIM-DV DB: R PETRIE, R BASSETT, P LISTER PM: G. THOMAS TM/TR: A. KORIK LYR: ON=*;OFF=REF (FRZ) PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 1/21/2015 10:12 AM BY: POSENAUER, LISA
G:\ENVCAD\SYRACUSE\ACT\B0087363\0005\00001\DWG\PHASE1\87363B02.dwg LAYOUT: 2 SAVED: 1/21/2015 9:05 AM ACADVER: 18.1S (LMS TECH) PAGESETUP: ----
XREFS: 87363XBL 87363X05 IMAGES:



BLD 8C-1	
Date	9/19/2013
1,1-Dichloroethene	8.5
Acetone	540
Vinyl Chloride	10

BLD 8D-1	
Date	10/3/2013
Tetrachloroethene	5.4

T-12	
Date	9/26/2013
1,1-Dichloroethene	15
Acetone	65
Vinyl Chloride	19

PR 9A-1	
Date	9/26/2013
Chlorodifluoromethane	38 J

BLD 36-1	
Date	10/1/2013
Acetone	55

T-10	
Date	10/1/2013
Acetone	380

BLD 8-2	
Date	9/19/2013
Trichlorofluoromethane	19
1,1-Dichloroethene	48
Acetone	460
Methylene Chloride	6.4

BLD 8A-1	
Date	9/20/2013
n-Butanol	150 J
Acetone	200
Benzene	1.7 J

T-25	
Date	9/18/2013
1,1-Dichloroethene	11
Vinyl Chloride	2

T-28	
Date	9/18/2013
1,2,4-Trimethylbenzene	43
1,3,5-Trimethylbenzene	21
m,p-Xylene	20
Acetone	140
Benzene	2.6
Methylene Chloride	34
Xylenes (total)	23

T-29	
Date	9/9/2013
1,2,4-Trimethylbenzene	8.1
1,3,5-Trimethylbenzene	6.2
Naphthalene	100 J
m,p-Xylene	14
o-Xylene	6.5
2-Butanone	75
Acetone	1,800
Benzene	3.5 J
Methylene Chloride	16
Toluene	180
Xylenes (total)	21

B55-2	
Date	10/24/2013
1,2,4-Trimethylbenzene	500
1,3,5-Trimethylbenzene	140
Isopropylbenzene	94
m,p-Xylene	300
Naphthalene	320
n-Butylbenzene	34
o-Xylene	68
sec-Butylbenzene	10
Ethylbenzene	350
Methylene Chloride	36
Toluene	9.9
Xylenes (total)	370

BLD 5A-1	
Date	9/24/2013
1,2-Dichloroethane	1.4
Acetone	180

BLD 4A-1	
Date	9/20/2013
n-Butanol	2,100 J
1,1-Dichloroethene	29
Acetone	8,300 DJ
Methylene Chloride	8.1
Toluene	34

BLD 21A-1	
Date	9/19/2013
2-Butanone	57
Acetone	220

T-5S	
Date	9/23/2013
n-Butanol	45,000 J
Tetrahydrofuran	220 J
1,1-Dichloroethene	61 J
2-Butanone	920
Acetone	220,000 EJ
Chloromethane	3,000
cis-1,2-Dichloroethene	310
Methylene Chloride	3,400,000 D
Toluene	180

T-2	
Date	9/24/2013
1,1,2-trichloro-1,2,2-trifluoroethane	20
Dichlorodifluoromethane	5.2

T-3	
Date	9/25/2013
1,1,2-trichloro-1,2,2-trifluoroethane	5.9
cis-1,2-Dichloroethene	420 D
trans-1,2-Dichloroethene	5.7
Trichloroethene	37
Vinyl Chloride	120 D

BLD 1-1a	
Date	10/23/2013
cis-1,2-Dichloroethene	22
Vinyl Chloride	62

BLD 5-1	
Date	9/26/2013
1,1,2-trichloro-1,2,2-trifluoroethane	980 DJ
Trichlorofluoromethane	8.5
1,1-Dichloroethene	15
Chloroform	49
cis-1,2-Dichloroethene	66
trans-1,2-Dichloroethene	7.2
Trichloroethene	250 DJ
Vinyl Chloride	2.1

BLD 1-2	
Date	9/23/2013
1,1,2-trichloro-1,2,2-trifluoroethane	110 D

BLD 1-3	
Date	9/25/2013
1,1,2-trichloro-1,2,2-trifluoroethane	34
1,1-Dichloroethane	14
1,1-Dichloroethene	44

BLD 1-4A	
Date	9/23/2013
1,1,2-trichloro-1,2,2-trifluoroethane	1,200 D
Trichlorofluoromethane	5

T-4	
Date	9/25/2013
1,1,2-trichloro-1,2,2-trifluoroethane	86
1,3,5-Trimethylbenzene	34
Naphthalene	37
1,1-Dichloroethene	13 J
Acetone	8,100
Methylene Chloride	14 J
Toluene	21

T-6	
Date	9/25/2013
1,1,2-trichloro-1,2,2-trifluoroethane	19
Acetone	67
Methylene Chloride	180 D

T-7	
Date	9/25/2013
1,1,2-trichloro-1,2,2-trifluoroethane	8.0
Methylene Chloride	29

PR 1-1	
Date	9/20/2013
1,1,2-trichloro-1,2,2-trifluoroethane	1,800 D
Dichlorodifluoromethane	14
Chloroform	13
Trichloroethene	6.9

T-9	
Date	10/3/2013
1,1,2-trichloro-1,2,2-trifluoroethane	21
n-Butanol	69 J
1,1-Dichloroethene	28
2-Butanone	190 J
Acetone	28,000 D

BLD 4B-1	
Date	9/26/2013
m,p-Xylene	14
Naphthalene	79
n-Butanol	4,700 J
1,1-Dichloroethene	72
Acetone	1,200
Benzene	2.4 J
Methylene Chloride	7.7
Xylenes (total)	19

BLD 9-1	
Date	9/20/2013
Chlorodifluoromethane	7.4 J

T-33	
Date	9/11/2013
Methylene Chloride	8.0

BLD 9A-1	
Date	10/3/2013
Acetone	51

BLD 41-1	
Date	9/26/2013
Trichlorofluoromethane	8.9
1,1-Dichloroethene	25

BLD 62-1D	
Date	9/11/2013
Bromochloromethane	22
Acetone	93
Chloromethane	35
Methylene Chloride	160,000 D

T-42	
Date	8/29/2013
Acetone	3,200
Methylene Chloride	6.2 J
Toluene	11

BLD 62-1S	
Date	9/11/2013
Methylene Chloride	8,400

CHP43RX	
Date	12/19/2013
Acetone	74
Methylene Chloride	100,000 D

T-36	
Date	9/9/2013
1,2-Dichlorobenzene	9.8
Bromochloromethane	13
m,p-Xylene	13
o-Xylene	6.6
1,1-Dichloroethene	24
Acetone	620
Benzene	25
Chlorobenzene	17
Chloromethane	7.8
Methylene Chloride	110,000 D
Toluene	31
trans-1,2-Dichloroethene	11
Trichloroethene	5.8
Xylenes (total)	20

BLD 56-1S	
Date	10/2/2013
Vinyl Chloride	9.1 J

T-34	
Date	9/10/2013
Benzene	1.7 J [1.2 J]

BLD 46-1	
Date	9/17/2013
1,1-Dichloroethene	4.1 [5.7]

LEGEND:

- APPROXIMATE BROWNFIELD AREA BOUNDARY
- APPROXIMATE PROPERTY LINE, BRISTOL-MYERS SQUIBB
- EXISTING BUILDINGS
- DEMOLISHED BUILDINGS
- EXISTING FENCE
- EXISTING RAILROAD
- TEMPORARY MONITORING WELL
- DECOMMISSIONED MONITORING WELL
- BEDROCK MONITORING WELL
- LOCATION WITH NO EXCEEDANCE OF CRITERIA

NOTES:

1. BASEMAP BASED ON A MAP TITLED "BRISTOL-MYERS SQUIBB PART OF LOT 41 - TOWN OF DEWITT AND PART OF THE VILLAGE OF EAST SYRACUSE ONONDAGA COUNTY NEW YORK", DATED MARCH 25, 2010 PREPARED BY COTTRELL LAND SURVEYORS, P.C.
2. MONITORING WELL LOCATIONS AND ELEVATION SURVEY BY CT MALE ASSOCIATES, SYRACUSE NY, OCTOBER 2013, JUNE 2014, AND SEPTEMBER 2014. ELEVATIONS NAVD 88, HORIZONTAL NAD 83.
3. ALL RESULTS ARE IN MICROGRAMS PER LITER (ug/L).
4. SHADED RESULTS PRESENTED IN DATABOXES SHOW COMPOUNDS THAT EXCEED NYSDEC TOGS 1.1.1 CRITERIA. RESULTS FOR LOCATIONS WHERE COMPOUNDS WERE DETECTED BELOW CRITERIA ARE NOT INCLUDED.
5. E - THE COMPOUND WAS QUANTITATED ABOVE THE CALIBRATION RANGE
6. D - CONCENTRATION IS BASED ON DILUTED SAMPLE ANALYSIS
7. J - ESTIMATED CONCENTRATION
8. DUPLICATE RESULTS ARE SHOWN IN BRACKETS.
9. NAPHTHALENE WAS ANALYZED AND REPORTED AS BOTH A VOLATILE ORGANIC COMPOUND AND SEMI VOLATILE ORGANIC COMPOUND. CONCENTRATIONS OF NAPHTHALENE FROM THE TWO METHODS ARE PRESENTED ON THE FIGURE ASSOCIATED WITH THAT METHOD.
10. TA SOIL BORINGS WERE ANALYZED ONLY FOR POLYCHLORINATED BIPHENYLS AND ARE NOT SHOWN ON THIS FIGURE.

Analyte	NYSDEC TOGS 1.1.1 (GA, GROUNDWATER)	Units
1,1,2-trichloro-1,2,2-trifluoroethane	5	ug/L
1,1-Dichloroethane	5	ug/L
1,1-Dichloroethene	5	ug/L
1,2,4-Trimethylbenzene	5	ug/L
1,2-Dichlorobenzene	3	ug/L
1,2-Dichloroethane	0.6	ug/L
1,3,5-Trimethylbenzene	5	ug/L
2-Butanone	50	ug/L
Acetone	50	ug/L
Benzene	1	ug/L
Bromochloromethane	5	ug/L
Chlorobenzene	5	ug/L
Chlorodifluoromethane	5	ug/L
Chloroform	7	ug/L
Chloromethane	5	ug/L
cis-1,2-Dichloroethene	5	ug/L
Dichlorodifluoromethane	5	ug/L
Ethylbenzene	5	ug/L
Isopropylbenzene	5	ug/L
m,p-Xylene	5	ug/L
Methylene Chloride	5	ug/L
Naphthalene	10	ug/L
n-Butanol	50	ug/L
n-Butylbenzene	5	ug/L
o-Xylene	5	ug/L
sec-Butylbenzene	5	ug/L
Tetrachloroethene	5	ug/L
Tetrahydrofuran	50	ug/L
Toluene	5	ug/L
trans-1,2-Dichloroethene	5	ug/L
Trichloroethene	5	ug/L
Trichlorofluoromethane	5	ug/L
Vinyl Chloride	2	ug/L
Xylenes (total)	5	ug/L

0 200' 400'

GRAPHIC SCALE

SITE #C734138: BMS SYRACUSE
NORTH CAMPUS RESTORATION AREA
EAST SYRACUSE, NY

PHASE 1 RESULTS: VOC CONCENTRATIONS IN GROUNDWATER EXCEEDING NYSDEC TOGS 1.1.1 CRITERIA

ARCADIS

FIGURE 3

LEGEND:

- APPROXIMATE BROWNFIELD AREA BOUNDARY
- APPROXIMATE PROPERTY LINE, BRISTOL-MYERS SQUIBB
- OCCUPIED BUILDINGS
- UNOCCUPIED BUILDINGS / STRUCTURES
- DEMOLISHED BUILDINGS
- PAVED OR CONCRETE AREAS
- UNPAVED AREAS
- EXISTING RAILROAD
- PROPOSED SOIL VAPOR SAMPLING LOCATION
- PROPOSED SUB-SLAB SOIL VAPOR SAMPLING LOCATION
- SELECTED MONITORING WELLS

NOTES:

1. BASEMAP BASED ON A MAP TITLED "BRISTOL-MYERS SQUIBB PART OF LOT 41 - TOWN OF DEWITT AND PART OF THE VILLAGE OF EAST SYRACUSE ONONDAGA COUNTY NEW YORK", DATED MARCH 25, 2010 PREPARED BY COTTRELL LAND SURVEYORS, P.C.. UPDATED BASED ON ARCADIS FIELD VISIIT JULY 2014, SEPTEMBER 11, 2014 AND BING AERIAL IMAGERY ACQUIRED SEPTEMBER, 2014.
2. MONITORING WELL LOCATIONS AND ELEVATION SURVEY BY CT MALE ASSOCIATES, SYRACUSE NY, OCTOBER 2013, JUNE 2014, AND SEPTEMBER 2014. ELEVATIONS NAVD 88, HORIZONTAL NAD 83.

0 160' 320'
GRAPHIC SCALE

SITE #C734138: BMS SYRACUSE
NORTH CAMPUS RESTORATION AREA
EAST SYRACUSE, NY

PROPOSED SOIL VAPOR AND SUB-SLAB VAPOR SAMPLING LOCATIONS

ARCADIS

FIGURE
4

CITY: SYRACUSE, NY DIV/GROUP: ENV/REM-WIM-DV DB: R PETRIE R. BASSETT, P LISTER PM: G. THOMAS TM/TR: A. KORIK LYR: ON=*;OFF=REF (FRZ) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 1/21/2015 10:12 AM BY: POSENAUER, LISA
G:\ENVCAD\SYRACUSE\ACT\B0087363\0005\00001\DWG\PHASE1\87363P04.dwg LAYOUT: 4 SAVED: 1/21/2015 9:05 AM ACADVER: 18.1S (LMS TECH)
XREFS: 87363XBL 87363X05 IMAGES:

ARCADIS

Attachment A

Excerpts from Field Sampling and Analysis Plan

WORK PLAN

Remedial Investigation
BMS Syracuse North Campus Restoration Area
Site No. C734138

Bristol-Myers Squibb Company
East Syracuse, New York

March 2013

3.3.15 Soil Vapor Sampling

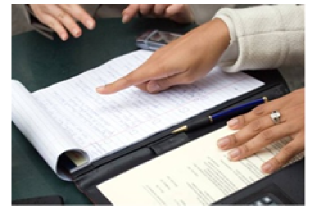
Soil vapor samples will be collected as part of the Phase 1A RI. The number and location of soil vapor samples will be selected based on the locations and distribution of VOCs identified during Phase 1 sampling activities and the presence of occupied structures both within and adjacent to areas where VOCs have been identified. As part of Phase 1A, historic soil vapor data generated in the CHAPA area will be considered. A Soil Vapor Sampling Plan will be submitted to NYSDEC for approval at the conclusion of Phase 1, prior to implementation of Phase 1A.

Procedures pertaining to the collection of the soil vapor samples are provided in Section 10 of the FSAP. Analysis of the samples will be in accordance with the procedures described in the QAPP. The list of parameters to be analyzed and the sample locations will be provided to NYSDEC for approval prior to collection of the samples.

FIELD SAMPLING AND ANALYSIS PLAN







Remedial Investigation
BMS Syracuse North Campus Restoration Area
Brownfield Program
East Syracuse, New York

Bristol-Myers Squibb Company

March 2013

O'BRIEN & GERE

10. SOIL VAPOR SAMPLING PROCEDURE

Temporary soil vapor probes will be installed and samples collected using the procedure outlined below, and pertinent information will be recorded on the Soil Vapor (Canister) Sample Collection Field Form included **Appendix 10**:

10.1 SOIL VAPOR PROBE INSTALLATION

- Record weather information (temperature, barometric pressure, rainfall, wind speed, and wind direction). Record substantial changes to these conditions that may occur during the course of the probe installation. The information may be measured with on-site equipment or obtained from a reliable source of local measurements (e.g., a local airport).
- Install soil vapor probes using a direct-push drill rig (e.g., GeoProbe® or similar) or manually using a slide hammer. Probes will consist of stainless-steel drive points with 1-inch long sample inlet with attached stainless steel screens to preclude clogging of the inlet. The drive point is attached to food-grade (inert) Teflon® tubing through which the soil vapor sample will be drawn.
- Attach the drive points to a drive rod (stainless-steel tube) and drive the rod to the target depth. The target depth will be determined based on location of the sampling point to nearby structures and the approximate elevation difference between the sampling point and basements and/or slabs of those structures.
- Withdraw the drive rods from the hole, leaving the drive point and tubing.
- Place filter pack material, such as glass beads or clean silica sand, in the annular space surrounding the tubing directly above the sample point to a height of approximately 1 to 2 foot. The depth of the filter pack material should always be adequate to prevent the bentonite slurry above from going over the drive point and sample inlet screen.
- Place bentonite slurry in the annulus above the filter pack material to provide a seal in the borehole. Ideally, place the bentonite annular seal at least 3 feet thick, although adjustments to this thickness may be required based on site-specific conditions. The entire borehole must be filled to the ground surface with either entirely bentonite or with natural fill between two bentonite seals (one above the filter pack material and one at the ground surface).
- For permanent installations, install flush-mounted protective covers to protect the probe and the tubing.
- Cut the end of the tubing to allow proper closure of the flush-mounted protective cover, but with a sufficient length of tubing exposed at the surface to facilitate connection of sampling equipment.
- Close or cap the sample tubing following installation and following collection of each sample.
- Collecting soil vapor samples will be accomplished by using the following procedure:

10.2 COLLECTION OF SOIL VAPOR SAMPLES

Record weather information (i.e., temperature, barometric pressure, rainfall, wind speed, and wind direction) at the beginning of the sampling event. Also, record substantial changes to these conditions that may have occurred over the past 24 to 48 hours and that do occur during the course of sampling. The information may be measured with on-site equipment or obtained from a reliable source of local measurements (e.g., a local airport).

- Sampling personnel must avoid activities immediately before and during the sampling that may contaminate the sample (e.g., using markers, fueling vehicles).
- Identify sampling locations on a plot plan that also identifies buildings, other landmarks, and potential sources of VOC contamination to both the surface and outdoor air. Record the depth of the probe screen below grade.
- Unless sampling units will be constantly attended during sampling, a sign consistent with **Appendix 11** will be placed on the units indicating "Do Not Disturb – Air Sample Collection In Progress," and providing contact information.

- If necessary, connect additional tubing to the tubing extending from the soil vapor probe to allow for connection to sample collection equipment.
- Calculate the volume of air in the probe, tubing (volume = $\pi r^2 h$), including any additional tubing added in the step above and the annular space between the probe and the native material if sand or glass beads were used.
- Connect a vacuum pump or gas-tight syringe (~60 cubic centimeters [cc]) to the sample tubing. At a flow rate of no more than 0.2 liter per minute (lpm), purge air from the tubing until one to three of the above-calculated air volumes are removed.
- During purging, evaluate the potential for ambient air to be introduced in the soil vapor sample through the annulus of the soil vapor probe or tubing connections using a tracer gas such as helium. The procedures for the tracer gas evaluation are described below. Note that the bentonite used in the probe installation should have sufficient time to seal before the samples are collected. The tracer gas evaluation will verify if the seal is sufficient.
- Use an evacuated 6-liter (L) Summa® passivated (or equivalent) stainless-steel canister to collect the soil vapor sample. The canister will be provided by the laboratory, along with a flow controller equipped with an in-line particulate filter and a vacuum gauge. The flow controller will be pre-calibrated by the laboratory for a 4-hour sample collection at a flow rate that does not exceed 0.2 lpm. The canisters will be batch certified as clean by the laboratory.
- Remove the protective brass plug from the canister. Connect the pre-calibrated flow controller to the canister.
- Record the identification numbers for the canister and flow controller. Record the initial canister pressure on the vacuum gauge (check equipment-specific instructions for taking this measurement). A canister with a significantly different pressure than originally recorded by the testing laboratory should not be used for sampling. Record these numbers and values on the Chain-of-custody form for each sample.
- Connect the tubing from the soil vapor probe to the flow controller.
- Completely open the valve on the canister. Record the time that the valve was opened (beginning of sampling) and the canister pressure on the vacuum gauge.
- Photograph the canister and the area surrounding the canister.
- Monitor the vacuum pressure in the canister routinely during sampling.
- Stop sample collection when the canister still has a minimum amount of vacuum remaining. Check with the laboratory supplying the canister and flow controller for the ideal final vacuum pressure. Typically, the minimum vacuum is between 2 and 5 inches of mercury, but not zero. If there is no vacuum remaining, the sample will be rejected and collected again in a new canister.
- Record the final vacuum pressure and close the canister valve. Record the date and time that sample collection was stopped.
- Remove the flow controller from the canister and replace the protective brass plug.
- Attach labels/tags (sample name, time/date of sampling, etc.) to the canister as directed by the laboratory.
- Place the canister and other laboratory-supplied equipment in the packaging provided by the laboratory.
- Enter the information required for each sample on the Chain-of-Custody form, making sure to include the identification numbers for the canister and flow controller, and the initial and final canister pressures on the vacuum gauge.
- Include the required copies of the Chain-of-Custody form in the shipping packaging, as directed by the laboratory. The field crew will retain a copy of the Chain-of-custody form for the project file.
- Deliver or ship the samples to the laboratory within one business day of sample collection and via overnight delivery (when shipping).

- Provided that no additional sampling is expected to be conducted, either pull out (if practical) or abandon in place the sampling probe. When abandoning, cut the tubing back as far down as practical and cover to surface with native soil.

10.3 TRACER GAS EVALUATION

The tracer gas evaluation provides a means to evaluate the integrity of the soil vapor probe seal and assess the potential for introduction of ambient air into the soil vapor sample. A tracer gas evaluation should be conducted on all soil vapor probes. After the initial round of sampling and with the approval of the regulating agency, the use of tracer gas may be reduced to a minimum of 10 percent for permanent and semi-permanent probes if the initial round results showed installations with competent seals.

The following tracer gas evaluation procedure uses in-field tracer gas measurements and tracer gases (e.g., helium) that can be measured by portable detectors.

- Retain the tracer gas around the sample probe by filling an air-tight chamber (such as a plastic bucket) positioned over the sample location.
- Make sure the chamber is suitably sealed to the ground surface.
- Introduce the tracer gas into the chamber. The chamber will have tubing at the top of the chamber to introduce the tracer gas into the chamber and a valved fitting at the bottom to let the ambient air out while introducing tracer gas. A tracer gas detector will be attached to the valved fitting at the bottom of the chamber to verify the presence of the tracer gas. Close the valve after the chamber has been enriched with tracer gas at concentrations >50%.
- The chamber will have a gas-tight fitting or sealable penetration to allow the soil vapor sample probe tubing to pass through and exit the chamber.
- After the chamber has been filled with tracer gas, attach the sample probe tubing to a pump that will be pre-calibrated to extract soil vapor at a rate of no more than 0.2 liters per minute. Purge the tubing using the pump. Calculate the volume of air in the tubing and probe and purge one to three tubing/probe volumes prior measuring the tracer gas concentration.
- Use the tracer gas detector to measure the tracer gas concentration in the pump exhaust.
- Record the tracer gas concentrations in the chamber and in the soil vapor sample.

If the evaluation indicates a high concentration of tracer gas in the sample (>10% of the concentration of the tracer gas in the chamber), then the surface seal is not sufficient and requires improvement via repair or replacement prior to commencement of the sample collection. A non-detectable level of tracer gas is preferred; however, if the evaluation indicates a low potential for introduction of ambient air into the sample (<10% of the concentration of the tracer gas in the chamber), then proceed with the soil vapor sampling.

11. VAPOR INTRUSION SAMPLING PROCEDURE

11.1 SUB-SLAB VAPOR SAMPLING

Sub-Slab Vapor Probe Installation

Temporary sampling probes will be installed using the following procedures:

- Sampling personnel must avoid activities immediately before and during the sampling that may contaminate the sample (e.g., using markers, fueling vehicles, etc.).
- If appropriate, record weather information (temperature, barometric pressure, rainfall, wind speed, and wind direction) at the beginning of the sampling event. Record substantial changes to these conditions that may have occurred over the past 24 to 48 hours and that do occur during the course of sampling. The information may be measured with on-site equipment or obtained from a reliable source of local measurements (e.g., a local airport).
- Identify sampling location(s) on a floor plan that also identifies any slab breeches (e.g., utility penetrations, sumps, drains, and cracks) and locations of HVAC equipment.
- Insert a section of food-grade (inert) Teflon® or other appropriate tubing through a 3/8-inch (approx.) hole drilled through the slab. If necessary, advance the drill bit 2 to 3 inches into the sub-slab material to create an open cavity.
- Install the tubing inlet to the specified sampling depth below the slab, not to exceed 2 inches.
- Seal the annular space between the hole and tubing using 100% beeswax or another inert, non-shrinking sealing compound such as permagum®.

Sub-Slab Vapor Sample Collection

Sub-slab vapor samples will be collected by following the steps outlined below.

- Purge the tubing using a vacuum pump or gas-tight syringe (~60 cc). Calculate the volume of air (volume = $\pi r^2 h$) in the tubing and purge one to three tubing volumes prior to sample collection at a rate no greater than 0.2 liter per minute (lpm).
- Use an evacuated Summa® passivated (or equivalent) canister to collect the sub-slab vapor sample. The canister will be provided by the laboratory, along with a flow controller equipped with an in-line particulate filter and a vacuum gauge. The flow controller will be pre calibrated by the laboratory for the desired flow rate or duration of sample collection. The sampling flow rate should always be less than 0.2 lpm. The canisters will be batch certified as clean by the laboratory.
- Remove the protective brass plug from canister. Connect the pre calibrated flow controller to the canister.
- Record the identification numbers for the canister and flow controller. Record the initial canister pressure on the vacuum gauge (check equipment specific instructions for taking this measurement). A canister with a significantly different pressure than originally recorded by the testing laboratory should not be used for sampling. Record these numbers and values on the chain of custody form for each sample.
- Connect the tubing from the sub-slab vapor sampling probe to the flow controller.
- Completely open the valve on the canister. Record the time that the valve is opened (beginning of sampling) and the canister pressure on the vacuum gauge.
- Photograph the canister and the area surrounding the canister.
- Monitor the vacuum pressure in the canister routinely during sampling, when practical (sometimes the canister will sample over a 24-hour period and routine monitoring is not practical).
- Complete the Sub-Slab Vapor (Canister) Sample Collection Field Form and the NYSDOH building survey and chemical survey form provided as **Appendix 12**.

- Stop sample collection after the scheduled duration of sample collected, but when the canister still has a minimum amount of vacuum remaining. Check with the laboratory supplying the canister and flow controller for the ideal final vacuum pressure. Typically, the minimum vacuum is between 2 and 5 inches of mercury, but not zero. If there is no vacuum remaining, the sample will be rejected and collected again in a new canister.
- Record the final vacuum pressure and close the canister valve. Record the date and time that sample collection was stopped.
- Remove the flow controller from the canister and replace the protective brass plug.
- Attach labels/tags (sample name, time/date of sampling, etc.) to the canister as directed by the laboratory.
- Place the canister and other laboratory-supplied equipment in the packaging provided by the laboratory.
- Enter the information required for each sample on the chain of custody form, making sure to include the identification numbers for the canister and flow controller, and the initial and final canister pressures on the vacuum gauge.
- Include the required copies of the chain-of-custody form in the shipping packaging, as directed by the laboratory. The field crew will retain a copy of the chain-of-custody for the project file.
- Deliver or ship the samples to the laboratory within one business day of sample collection and via overnight delivery (when shipping).
- For temporary probes, remove the probe and seal the slab hole with cement. Repair flooring, if any.

11.2 INDOOR AIR SAMPLING

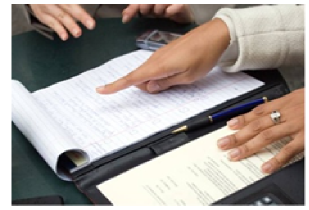
Indoor air samples will be collected by following the steps outlined below:

- Sampling personnel must avoid activities immediately before and during the sampling that may contaminate the sample (e.g., using markers, fueling vehicles, etc.).
- Record weather information (temperature, barometric pressure, relative humidity, wind speed, and wind direction) and indoor temperature and humidity at the beginning of the sampling event. Record substantial changes to these conditions that may have occurred over the past 24 to 48 hours and that do occur during the course of sampling. The information may be measured with on-site equipment or obtained from a reliable source of local measurements (e.g., a local airport).
- Identify sampling location(s) on a floor plan that also identifies locations of HVAC equipment, chemical storage areas, garages, doorways, stairways, sumps, drains, utility perforations, north direction, and separate footing sections
- Use an evacuated Summa® passivated (or equivalent) stainless-steel canister to collect the outdoor air sample. The canister will be provided by the laboratory, along with a flow controller equipped with an in-line particulate filter and a vacuum gauge. The flow controller will be pre calibrated by the laboratory for the desired flow rate or duration of sample collection. The sampling flow rate should always be less than 0.2 lpm. The canisters will be individually certified as clean by the laboratory.
- Place the canister at the sampling location. The sample should be collected from breathing height (e.g., 3 to 5 feet above ground). Either mount the canister on a stable platform or attach a length of inert tubing to the flow controller inlet and support it such that the sample inlet will be at the proper height.
- Remove the protective plug (either brass or plastic) from canister. Connect the pre calibrated flow controller to the canister.
- Record the identification numbers for the canister and flow controller. Record the initial canister pressure on the vacuum gauge (check equipment specific instructions for taking this measurement). A canister with a significantly different pressure than originally recorded by the testing laboratory should not be used for sampling. Record these numbers and values on the chain-of custody form for each sample.

QUALITY ASSURANCE PROJECT PLAN







Remedial Investigation
BMS Syracuse North Campus Restoration Area
East Syracuse, New York
Site No. C734138

Bristol-Myers Squibb Company

March 2013

O'BRIEN & GERE

7. SAMPLING DESIGN AND METHOD REQUIREMENTS

7.1 SAMPLING NETWORK

The types of methods, sample matrices, and numbers of samples to be collected for the Investigation are presented in the Work Plan and **Table 1**. The specific parameters for each method and the associated laboratory QLs and MDLs are listed in **Tables 2-1 through 2-4**.

7.2 SAMPLE LOCATIONS AND DESIGNATIONS

A sample designation system will be used to identify samples for laboratory analysis. A list of the unique identifiers used for each sample will be maintained in the project logbook by the Field Team Leaders. Sample locations and a Brownfield Area map are presented in the Work Plan.

Each sample that is collected will be designated by a unique sample identification number as outlined in the FSAP. Field duplicates will also be identified with a unique sample identification number, such that the laboratory will not be aware of the sample location utilized as the blind duplicate. The field sampling personnel will note the duplicate sample in the logbook so that this information will be available when the laboratory data is reviewed.

7.3. SAMPLING PROCEDURES

Specific sampling procedures are presented in the Work Plan. Procedures for soil vapor sampling and QC sample collection are discussed below.

7.3.1 Soil Vapor Sampling Procedure

Canister vacuum will be measured with a National Institute of Standards and Technology (NIST)-traceable digital vacuum gauge (calibrated within the previous 12 months). Procedures for measurement of helium using field equipment are included in manufacturer's instructions, which will be reviewed by the field staff prior to the commencement of field activities.

Soil vapor samples will be collected into evacuated, individually or batch certified-clean, 1-L or 6-L pre-evacuated canisters supplied by the certified laboratory. Vacuum readings of the canisters will be obtained and documented prior to sample collection and upon completion of sampling. Sample identification, vacuum readings, flow controller identification numbers, and other relevant information will be recorded on appropriate soil vapor collection field forms. Canisters must be returned to the laboratory within 15 days of evacuation and shipment to the Brownfield Area for sampling due to the loss of pressure during storage.

7.3.2 Field Duplicate Sampling Procedure

Field duplicate samples will be collected from the same location as the parent sample and will be analyzed for the same parameters as the parent sample. The actual identification of the duplicate QC samples will be recorded in the field logbook. One field duplicate QC sample will be collected for every 20 samples collected or one per matrix for less than 20 samples for each analysis type.

7.3.3 Matrix Spike/Matrix Spike Duplicate Sampling Procedure

The MS/MSD samples will be collected from the same location as the parent sample and will be analyzed for the same parameters as the parent sample. Each sample will be labeled with the same number as the original sample, designated as MS or MSD, and submitted to the laboratory for the appropriate analyses. One MS and MSD sample will be collected for every 20 samples or one per matrix for less than 20 samples for each analysis type.

7.3.4 Field/Equipment Blank Sampling Procedure

A field/equipment blank will be prepared for sampling when a particular piece of sampling equipment is employed for sample collection and subsequently decontaminated in the field for use for additional sampling. The blank water used to generate the field blank will be provided by the laboratory using the same source of water as that used to prepare method blanks. The field/equipment blank will be composed in the field by collecting, in the appropriate container for the water, a blank water rinse from the equipment after execution of the last step of the proper field decontamination protocol. The identical bottle to bottle transfer technique will be used to generate the field blank. Preservatives or additives will be added to the field blank, where appropriate, for the sampling parameters. One field blank will be collected for every 20 samples or one per matrix for less than 20 samples for each analysis type. The field/equipment blank will be analyzed for the same parameters as the samples collected the same day that the field blank was generated.

7.3.5 Trip Blank Procedure

A trip blank will be included in the cooler used to ship aqueous and solid samples for VOC analysis. The trip blank is designed to address possible sample contamination from transportation between the Brownfield Area and the laboratory. A trip blank will be prepared by the laboratory using the same preservation technique as that used to prepare the sample containers from the same source as the method blank water and sent to the Brownfield Area in the cooler with the other sample containers. Non-aqueous samples collected utilizing methanol preservation will require trip blanks prepared using the same technique as that used to prepare the samples containers. Trip blanks are not opened in the field but travel with the sample containers. One trip blank will be sent to the laboratory for analysis in each cooler that contains samples that have been collected for VOCs.

7.4 DECONTAMINATION OF SAMPLING EQUIPMENT

Sampling methods have been developed to minimize the possibility of cross-contamination. The FSAP describes specific decontamination procedures that will be followed based on the type of equipment that is used.