Indoor Air Sampling Report V
April 2011

For:

Saint Joseph Catholic School
80 Willoughby Street
Brooklyn, New York

Prepared For:

384 Bridge Street LLC
c/o Stahl Real Estate Company Inc.
277 Park Ave
New York, NY 10172
and
R, K & G Associates, LLC
580 Sylvan Avenue
Englewood Cliffs, NJ 07632

Submitted to:

New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway, 12th Floor
Albany, N.Y. 12231-7016

July 2011

Fleming Lee Shue

Environmental Management & Consulting
158 West 29th Street, 9th Floor
New York, New York 10001
www.flemingleeshue.com

TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 BACKGROUND 3

2.1 SITE LOCATION AND DESCRIPTION 3
2.2 GEOLOGY AND HYDROGEOLOGY 3
2.3 PREVIOUS STUDIES 3
2.4 JANUARY 2009 SAMPLING EVENT 4
2.5 FEBRUARY AND MARCH 2009 INDOOR AIR SAMPLING 5
2.6 **MAY 2009 INDOOR AIR SAMPLING 6**
2.7 LONG-TERM REMEDIAL ACTIONS 7
2.7.1 SUB-SLAB DEPRESSURIZATION SYSTEM (SSDS) 7
2.7.2 ELEVATOR PIT VAPOR MITIGATION 7
2.8 SEPTEMBER 2010 INDOOR AIR SAMPLING 8

3.0 APRIL 2011 INDOOR AIR SAMPLING 10

3.1 INDOOR AIR SAMPLING 10
3.1.2 SAMPLING METHODOLOGY 10

4.0 RESULTS 11

4.1 SAMPLING RESULTS 11

5.0 CONCLUSION AND RECOMMENDATIONS 12

FIGURES

FIGURE 1 – Site Location Map
FIGURE 2 – Site Plan
FIGURE 3 – Sub-Slab Soil Vapor, Indoor, and Background Air Sample Results (Basement)
FIGURE 4 – Indoor Air Sample Results (1st Floor)

TABLES

TABLE 1 –Indoor Air Sample Results
TABLE 2 – Indoor Air Temperatures

APPENDIX A – Laboratory Analytical Reports

1.0 INTRODUCTION

Fleming-Lee Shue, Inc. (FLS) has prepared this Indoor Air Sampling Report for the Saint Joseph High School (SJHS) building located at 80 Willoughby Street, Brooklyn, New York. As presented in this report, the results of indoor air sampling conducted in April 2011 indicate that the implementation of the long-term remedial actions have met the objectives of lowering the concentrations of chlorinated solvents previously detected in indoor air within the school building. Prior to the implementation of the remedial actions, concentrations of the chlorinated solvent tetrachloroethene (PCE), had been detected in the indoor air at the school at levels above the New York State Department of Health (NYSDOH) Air Guidance Value (AGV); trichloroethene (TCE) had also been detected in indoor air, but below the NYSDOH AGV. During the April 2011 indoor air sampling, conducted after the remedial actions were completed, all indoor air samples were found to have no detection of TCE and all detected concentrations of PCE were below the NYSDOH AGV. Further details of the sampling and the results are presented below.

The school building is immediately adjacent to the north portion of the property located at 384-394 Bridge Street, Brooklyn, New York (the "Site"). The Site consists of two lots on Block 152, Lot 37 on Bridge Street and Lot 118 on Lawrence Street. Both lots are in the New York State Brownfield Program, as Site #C224134. Lot 37 measures approximately 110 feet along the northern property boundary by 125 feet along Bridge Street and borders the southern wall of SJHS. SJHS is located in the basement and bottom seven floors of a ten-story building on a 100 feet by 62.42 feet parcel located at the corner of Bridge Street and Willoughby Street. A Site location map is provided as **Figure 1**. A Site plan, including the school building, has been included as **Figure 2**.

A dry cleaning establishment previously occupied the northern portion of Lot 37. Dry cleaning facilities were also previously present on neighboring and nearby properties. A number of subsurface investigations were performed on Lot 37 to investigate the soil vapor, soil and groundwater. Soil vapor contamination associated with the chlorinated solvent PCE and its breakdown products, TCE, cis-1,2-dichloroethene (DCE) and vinyl chloride, were detected during Site investigations. PCE and TCE were present in soil vapor samples at concentrations above the AGVs, which are included in the NYSDOH *Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (October 2006, the "Soil Vapor Guidance"). Chlorinated solvents were also detected in soil and groundwater.

Beginning in January 2009, sub-slab soil vapor and indoor air sampling commenced at SJHS. Over several rounds of sampling, it was determined that PCE and TCE were present above the AGVs in the sub-slab soil vapor and PCE was present above the AGV in the indoor air. In order to address the elevated indoor air concentrations, both temporary and long-term engineering controls were installed at SJHS. These controls are summarized in Section 2.0.

On April 29, 2011, following the sustained operation of long-term engineering controls, indoor air sampling was performed on the first floor, basement and inside the sub-basement elevator pit at SJHS. One outdoor (ambient) air sample was collected on the setback roof of the building near an inoperable intake for the heating ventilation and air conditioning (HVAC) system. The

air sampling was performed using the methodologies detailed in FLS' Indoor Air Quality (IAQ) Work Plan approved by the New York State Department of Environmental Conservation (NYSDEC) and the NYSDOH on January 13, 2009.

The purpose of this air sampling event was to evaluate the effectiveness of the long-term engineering controls and to determine if the chlorinated solvent contamination had successfully been remediated to concentrations below the AGVs. As detailed in this report, TCE was not detected in any of the samples collected and PCE concentrations, where detected, were below the AGV.

2.0 BACKGROUND

2.1 Site Location and Description

The Site is located in a mixed-use commercial area of the Borough of Brooklyn, New York and is currently vacant in anticipation of redevelopment. The Site (**Figure 1 and 2**) is bordered to the east by Bridge Street, to the west by Lawrence Street, and to the north by SJHS and other commercial and residential buildings. The Site consists of two lots, Lot 37 on Bridge Street and Lot 118 on Lawrence Street. Lot 37 measures approximately 110 feet by 125 feet along Bridge Street and borders the southern wall of the SJHS building.

The SJHS building is ten stories and used both as a private high school (basement and bottom floors) and as commercial spaces (upper floors). The basement area of SJHS is currently used as kitchen and cafeteria space for the school. A small portion of the basement is occupied by storage, boiler and janitorial rooms. Two elevators are located west of the cafeteria. The first floor is used for reception, a gymnasium and offices.

2.2 Geology and Hydrogeology

Brown coarse sand, intermixed with boulders, cobbles, and fill material, was present in soil borings conducted at the Site. Since the Site had been excavated to 25 feet below grade during the initial soil investigation, little fill material was encountered. Native soils consist of medium to fine sand intermixed with coarse gravel and many cobbles and boulders (glacial till). Very little fines (silt or clay) were present in the soils below the Site.

Groundwater is present approximately 45 feet below the sidewalk grade along Bridge Street. The local groundwater was assumed to flow west-southwest toward the East River. On-Site and off-Site groundwater monitoring wells were surveyed and groundwater flow maps were constructed. The information collected during subsequent investigations indicates that the localized Site groundwater flow direction is towards the northeast. This is possibly due to the presence of subway tunnels located west and southwest of the Site and the Metropolitan Transit Authority (MTA) dewatering station located within 1.5 miles northeast of the Site.

Based on the proximity of the SJHS building to the Site, it is assumed that they are geologically and hydrogeologically similar.

2.3 Previous Studies

In October and November 2008, FLS performed subsurface investigations on Lot 37 and on the sidewalk along Bridge Street east of Lot 37. The subsurface investigations included soil, soil vapor and groundwater sampling. The purpose of the subsurface investigations was to determine whether the Site soils, soil vapor, and groundwater had been impacted by former dry cleaning operations, which were previously present both on the Site and on nearby properties. The subsurface investigations were also performed to determine if soil vapor detected on and in the vicinity of the Site could potentially impact SJHS. Soil vapor contamination associated with the chlorinated solvent, PCE, and its breakdown product, TCE, were detected in soil vapor samples at concentrations above NYSDOH AGVs; DCE and vinyl chloride were also present at elevated

concentrations. Based on these results, an IAQ Work Plan was prepared for the performance of sub-slab vapor and indoor air sampling at SJHS. The IAQ Work Plan was submitted to NYSDEC and NYSDOH for review and was approved on January 13, 2009. Sub-slab and indoor air sampling within the school building commenced on January 19, 2009. Additional indoor air sampling, which included the first floor and basement elevator pit, was performed in February 2009 with the focus of delineating the distribution of chlorinated solvent vapors in indoor air first identified during the January 2009 investigation. Subsequent investigations in March and May of 2009 and September 2010 included delineation sampling and evaluation of the effectiveness of the interim remedial measures (IRMs).

2.4 January 2009 Sampling Event

The purpose of the January 2009 sub-slab soil vapor and indoor air sampling program was to evaluate the potential for soil vapor intrusion into the school building.

Five sub-slab soil vapor and five indoor air samples were collected within the basement of the school building. Sub-slab soil vapor and indoor air samples were collected from the cafeteria, kitchen, boiler room, and near the building elevators. Indoor air samples were collected concurrent with the sub-slab soil vapor samples in the basement. One background air sample was also collected at the setback roof of the building near the intake of the HVAC system, later found to be inoperable. Sub-slab soil vapor, indoor and background air sampling locations are shown in **Figure 3**.

Sub-slab vapor, indoor and background air samples were analyzed for volatile organic compounds (VOCs) using Environmental Protection Agency (EPA) Method TO-15 and the results were compared to the NYSDOH AGVs and background levels included in the NYSDOH Soil Vapor Guidance. The NYSDOH-referenced background levels include the Upper Fence Limit indoor air values from "Table C-1. NYSDOH 2003: Study of Volatile Organic Chemicals in Air of Fuel Oil Heated Homes," the 90th Percentile indoor air values from "Table C-2. EPA 2001: Building Assessment and Survey Evaluation (BASE) Database, SUMMA canister method", and the 95th Percentile Indoor Air Values from "Table C-5, Health Effects Institute (HEI) 2005: Relationship of Indoor, Outdoor and Personal Air published in the NYSDOH Soil Vapor Intrusion Guidance Document, Appendix C" (October 2006).

The chlorinated solvent PCE and its breakdown products (DCE and TCE) were detected in all sub-slab soil vapor samples and all indoor air samples. Concentrations of PCE and TCE in the sub-slab vapor samples and PCE in the indoor air samples were above the NYSDOH AGVs. The results of the sampling event were submitted to the NYSDEC on February 13, 2009 in a report entitled *Sub-Slab Soil Vapor and Indoor Air Sampling Report.*

Based on the sub-slab soil vapor and indoor air sampling results, IRMs were proposed during a conference call held with NYSDEC and the NYSDOH on January 29, 2009. The IRMs included sealing preferential pathways to minimize soil vapor intrusion into the building and treatment of indoor air using air scrubber units. On February 5, 2009, the NYSDOH confirmed the conversation via email, and made recommendations regarding the type of sealant to be used. On February 19, 2009, two weeks after the implementation of the IRMs, indoor air sampling was performed in order to evaluate their performance.

2.5 February and March 2009 Indoor Air Sampling

Indoor air sampling was performed in the basement and first floor of the school building in February and March 2009. The purpose of this air sampling was to delineate the chlorinated solvent vapor contamination detected during the January 2009 sub-slab soil vapor and indoor air sampling event and to evaluate the performance of the IRMs.

Nine indoor air samples were collected within the basement and first floor of the school building. Five indoor air samples were collected from the basement at the same locations as in the previous sampling event. Three samples were collected from the first floor to determine if soil vapor containing elevated levels of contaminants had migrated to the first floor – one in the hallway near the elevators and two within the first floor gymnasium. One background air sample was also collected at the setback roof located at southwest corner of the building.

The indoor air sampling program was performed on February 19, 2009, while school was not in session in order to avoid student traffic in the sampling area. However, the building's HVAC system was operational during the sampling events and was set to maintain an internal temperature typical for a normal school day.

Based on the February 19, 2009 indoor air sampling results, one indoor air sample was collected on March 7, 2009 from the elevator pits located in the hallway of the basement. The purpose of this sample collection was to determine if the elevator pits were a potential pathway for soil vapor intrusion into the basement area.

Indoor and background air samples were analyzed for VOCs using EPA Method TO-15 and the results were compared to the NYSDOH AGVs and background levels included in the NYSDOH Soil Vapor Guidance and outlined in Section 2.4 of this document. The chlorinated solvent PCE was detected in seven out of nine indoor air samples at concentrations exceeding the NYSDOH AGVs. Sample results indicated that elevated levels of PCE, above the NYSDOH AGV, remained in the basement of the school building following the implementation of the IRMs. An elevated level of PCE, above the NYSDOH AGV, was also detected in sample AA-12, located in the hallway of the first floor of the building near the elevators. Elevated levels of PCE were not found on the first floor of the building in the samples collected inside the gymnasium (AA-13 and AA-14) or in the background air sample collected from the setback roof on the second floor. Concentrations of PCE and its breakdown products in the indoor air samples are shown on **Figures 3 and 4**.

Based on the indoor air and background air results, FLS proposed an immediate remedial action and a long-term remedial action plan in order to mitigate vapor intrusion into the school building. Both plans were discussed in an email to the NYSDEC and NYSDOH, dated March 6, 2009.

Immediate action consisted of the following remedial measures:

- Continued operation of existing air scrubbers;
- Venting of the basement indoor air with replacement by fresh air. A total of twelve volumes of indoor air exchanges were planned to be completed during one event;
- Refurbishment of existing heating and ventilation (H-V) unit; and
- Installation of local kitchen hood fan starter buttons.

Long-term action consisted of the following remedial measures:

- Design and installation of a sub-slab depressurization system (SSDS); and
- Sealing the elevator pits in the basement hallway using a spray-applied LiquidBoot® vapor barrier system to a minimum thickness of 60 mils.

Five weeks after the completion of the immediate remedial actions described above, indoor air sampling was performed on May 16, 2009 to evaluate their performance.

2.6 May 2009 Indoor Air Sampling

Indoor air sampling was performed in the basement and first floor of the school building in May 2009 at the same locations as were previously sampled. The purpose of the May air sampling was to evaluate the performance of the immediate remedial actions that were implemented in April 2009.

A total of nine indoor air samples were collected within the basement and first floor of the school building (**Figures 3 and 4**). All indoor air samples were collected from the same locations as in the previous sampling events. Six samples were collected from the basement, including one sample inside the elevator pit located in the hallway. Three samples were collected from the first floor – one in the hallway near the elevators and two within the first floor gymnasium. One background air sample was also collected at the setback roof located at southwest corner of the building.

The indoor air sampling program was performed on May 16, 2009, while school was not in session, in order to avoid student traffic in the sampling area. However, the building's HVAC system was operational during the sampling events and was set to maintain an internal temperature typical for a normal school day.

Indoor and background air samples were analyzed for VOCs using EPA Method TO-15 and the results were compared to the NYSDOH AGVs and background levels included in the NYSDOH Soil Vapor Guidance and outlined in Section 2.4 of this document. PCE was detected at elevated concentrations exceeding the NYSDOH AGVs in five out of nine indoor air samples, but at generally decreased concentrations compared with the February 2009 sampling event. The PCE breakdown product, TCE, was detected at trace levels in six of the nine samples, all below the NYSDOH AGV; the breakdown product DCE was not detected in any of the nine samples.. No chlorinated solvents were detected in the ambient air sample. Concentrations of PCE and its breakdown products in the indoor air samples are presented in **Figures 3 and 4.**

The May 2009 indoor air sampling results indicated that the implementation of the immediate remedial actions decreased the concentrations of chlorinated solvents present in the indoor air of the basement and first floor of the school.

2.7 Long-term Remedial Actions

2.7.1 Sub-Slab Depressurization System (SSDS)

The SSDS was designed in accordance with the NYSDOH Soil Vapor Guidance. The design is largely based on the EPA document, *Radon Reduction Techniques for Existing Detached Houses: Technical Guidance (Third Edition) for Active Soil Depressurization Systems* (1993) but also incorporates elements of the EPA document, *Radon Prevention in the Design and Construction of Schools and Other Large Buildings* (1994). Both EPA documents are referenced in Section 4.2.3, Technical Guidance, of the NYSDOH Soil Vapor Guidance.

The SSDS creates a negative pressure environment beneath the basement slab, relative to the pressure in the occupied building space, and vents the soil vapor to the ambient air. The goal of the SSDS is to provide a minimum pressure drop of 0.002 inches water column (WC) beneath the entire basement slab of SJHS.

The pressure drop was created by installing a series of sub-slab pits (placed in the areas that are not accessible to students) that are ventilated through piping and exhausted above the roof of the building. The primary components of the system include a vent fan, associated polyvinyl chloride (PVC) piping, pressure monitoring points, a flow switch and an alarm panel.

A pressure meter is located in the crawl space above the first floor office (located west of the gymnasium stage area). The alarm panel, which includes a manual shut-off switch, is located in the aforementioned first floor office. The alarm annunciator, which includes both visual and audible alarms, is located on the wall outside of the first floor office within the first floor hallway. The alarm point is set at 2 inches WC. Currently the system is operating at 4 inches WC.

SSDS design details, including as-built figures, design calculations, system specifications and testing, monitoring and maintenance information, are provided in the Operation Monitoring and Maintenance (OM&M) Plan, dated May 2011 and submitted to the Department on June 2, 2011.

After the completion of system modifications in April 2011, system testing and continued operation for 19 months, confirmatory air samples were collected during the heating season, as per NYSDOH Soil Vapor Guidance requirements. The air sampling was conducted on April 29, 2011; the results are discussed in Section 4.0..

2.7.2 Elevator Pit Vapor Mitigation

In order to mitigate soil vapor contamination emanating from the elevator pit in the basement and subsequent impacts to the first floor of the building, Liquid Boot® was applied to the elevator pits located in the basement of the school. Liquid Boot® is a cold, spray-applied, water-based membrane, which provides an impermeable barrier against vapor intrusion into structures. Liquid Boot® is chemical-resistant and seals vapor intrusion pathways, preventing contaminated soil vapors from penetrating the slab.

The liquid-applied vapor barrier was installed on the floors and walls of both elevator pits. The surfaces were cleaned and inspected prior to application. A protective course, consisting of a plastic sheet with fabric covering (composed of BaseFabric T-40 and UltraShield G-800,

geotextile fabrics) was placed over the Liquid Boot® vapor barrier. A non-flammable coating (Andek Firegard™ Fire Resistant Waterproof Coating) was added over the protective course to comply with New York City regulations.

The vapor barrier was installed by a licensed installer according to the manufacturer's recommendations and was checked for proper thickness with a blunt-nose depth gauge, at several locations within the elevator pit.

2.8 September 2010 Indoor Air Sampling

Indoor air sampling was performed in the basement and first floor of the school building in September 2010. The purpose of the air sampling was to determine the efficacy of the long-term remedial actions.

A total of nine indoor air samples were collected within the basement and first floor of the school building (**Figures 3 and 4**). All indoor air samples were collected from the same locations as in the previous sampling events. Six samples were collected from the basement, including one sample inside the elevator pit located in the hallway. Three samples were collected from the first floor – one in the hallway near the elevators and two within the first floor gymnasium. One background air sample was also collected at the setback roof located at southwest corner of the building.

The indoor air sampling program was performed on September 1, 2010, while school was not in session, in order to avoid student traffic in the sampling area. However, the building's HVAC system was operational during the sampling events and was set to maintain an internal temperature typical for a normal school day.

Indoor and background air samples were analyzed for VOCs using EPA Method TO-15 and the results were compared to the NYSDOH AGVs and background levels included in the NYSDOH Soil Vapor Guidance and outlined in Section 2.4 of this document. The chlorinated solvent PCE was detected in all indoor air samples and TCE was detected in eight indoor air samples. All detected concentrations were below their respective NYSDOH AGVs. No chlorinated solvents were detected in the ambient air sample above NYSDOH AGVs. Concentrations of PCE and its breakdown products in the indoor air samples are presented in **Figures 3 and 4.**

The September 2010 indoor air sampling results indicated that the implementation of the long-term remedial actions met the objectives of lowering the concentrations of chlorinated solvents potentially related to vapor intrusion. The average indoor air PCE concentrations in the previous three sampling events, before the implementation of the long-term remedial actions, were 217.20, 185.01 and 121.25 µg/m^3, respectively. The average indoor air PCE concentration during this sampling event, following the startup of the SSDS, was only 8.24 µg/m^3.

For other constituents that do not have NYSDOH AGVs, there were no constituents likely related to vapor intrusion that were detected at concentrations above the NYSDOH-referenced background levels.

The results of the September 2010 sampling event were discussed in *SJHS Indoor Air Sampling Report IV* and submitted to the Department in December 2010.

3.0 APRIL 2011 INDOOR AIR SAMPLING

3.1 Indoor Air Sampling

Indoor air sampling was performed in the basement and first floor of the school building in April 2011. The purpose of the air sampling was to confirm the continued effectiveness of the long-term remedial actions, which was documented during the previous sampling event in September 2010.

3.1.2 Sampling Methodology

A total of nine indoor air samples were collected within the basement and first floor of the school building (**Figures 3 and 4**). All indoor air samples were collected from the same locations as in the previous sampling events. Six samples were collected from the basement, including one sample inside the elevator pit located in the hallway. Three samples were collected from the first floor – one in the hallway across from the elevators and two within the first floor gymnasium. One background air sample was also collected at the setback roof located at southwest corner of the building. A summary of the sample results are presented in **Table 1**.

Each indoor and background air sample was collected in six-liter individually-certified clean SUMMA canisters with an 8-hour flow controllers (the sampling interval). For each sample, the start time, end time, maximum and minimum temperature, and beginning and final ambient temperature were recorded and are presented in **Table 2**. An identification tag was attached to each canister prior to shipment to Accutest Laboratories, a NYSDOH Environmental Laboratory Accreditation Program (ELAP)-approved laboratory. Accutest Laboratories' ELAP certification number is 10983. Indoor and background air samples were analyzed for VOCs using EPA Method TO-15. Laboratory analytical reports are provided as **Appendix A**.

The indoor air sampling program was performed on April 29, 2011, while school was not in session, in order to avoid student traffic in the sampling area. However, the building's HVAC system was operational during the sampling events and was set to maintain an internal temperature typical for a normal school day.

4.0 RESULTS

4.1 Sampling Results

The indoor and background air sampling results were compared to the NYSDOH AGVs and background levels included in the NYSDOH Soil Vapor Guidance.

PCE was detected in all 9 indoor air samples collected, at concentrations below the AGV of 100 micrograms per cubic meter (µg/m^3). TCE was not detected in any of the samples collected. No chlorinated solvents were detected in the ambient air sample above NYSDOH AGVs. A summary of the sample results are presented in **Table 1**. Concentrations of PCE, TCE and DCE in the indoor air samples for all sampling events are presented in **Figures 3 and 4.**

Concentrations of PCE, which appear to be related to potential vapor intrusion, have decreased considerably following the implementation of the long-term remedial actions. The average indoor air concentration of PCE in first sampling event was 217.20µg/m^3. Following SSDS startup, the April 2011 sampling results show PCE concentrations have decreased to an average concentration of only 1.16 µg/m^3 .

Several other compounds were detected in one or more indoor air samples, including: acetone; benzene; chloroform; chloromethane; cyclohexane; dichlorodifluoromethane; p-dichlorobenzene; ethanol; ethylbenzene; ethyl acetate; heptane; hexane; isopropyl alcohol; methylene chloride, methyl ethyl ketone (MEK); 1,2,4-trimethylbenzene; toluene and xylenes. Of the aforementioned compounds, only methylene chloride has an AGV. All detected concentrations of methylene chloride were well below the AGV of 60 µg/m^3. Comparison of the detected concentrations of these compounds to NYSDOH-referenced background levels indicates that only ethyl acetate concentrations are above background levels. Ethyl acetate is used as a solvent in oil-based lacquers and enamels and is most likely related to floor stripping/waxing preformed at the school. None of these compounds have been a contaminant of concern at the Site. The presence of these compounds in indoor air in the school appears to be unrelated to potential vapor intrusion.

5.0 CONCLUSION AND RECOMMENDATIONS

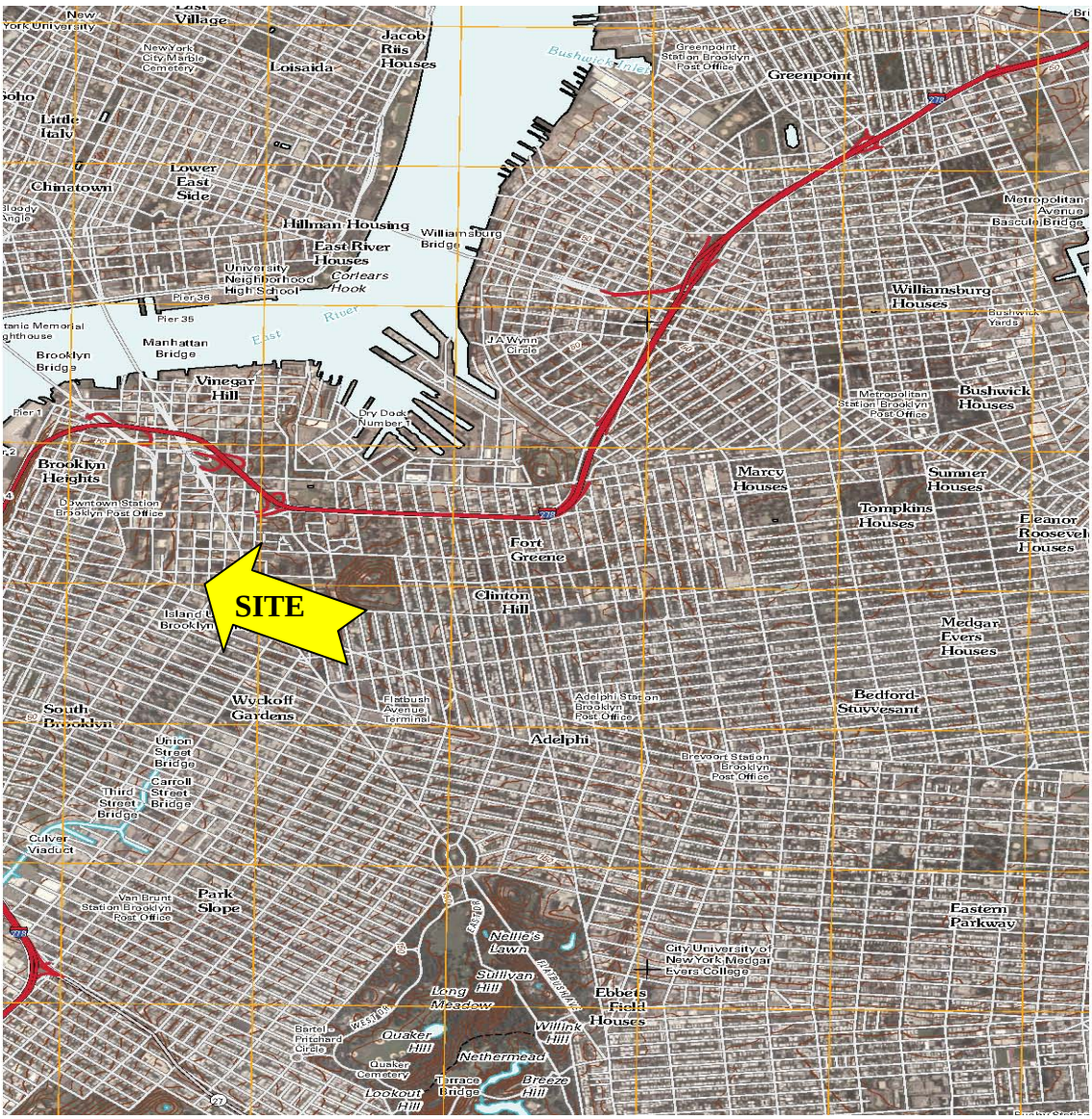
The April 2011 indoor air sampling results indicate that the implementation of the long-term remedial actions met the objectives of lowering the concentrations of chlorinated solvents potentially related to vapor intrusion. TCE concentrations were non-detect in all of the recent indoor air samples and concentrations of PCE in all samples were below the NYSDOH AGVs. For other constituents that do not have NYSDOH AGVs, there were no constituents likely related to vapor intrusion that were detected at concentrations above the NYSDOH-referenced background levels.

FLS recommends that indoor air sampling be discontinued and replaced by annual system inspections by a representative of the Remedial Engineer. The annual inspection will include the screening of effluent VOC concentrations using a calibrated photoionization detector (PID). If effluent VOCs concentrations exceed 10 parts per million (ppm), an air sample will be collected by EPA Method TO-15.

In the event that any component of the long-term remedial actions (i.e., SSDS, vapor barrier) is compromised for more than one week, indoor air samples will be collected in the basement and first floor. Results will be provided to NYSDEC and NYSDOH within three weeks of sampling. Continued monthly sampling will be conducted until the system is restored. One confirmatory round of sampling will be conducted two weeks after the system is restored.

Documentation supporting the installation of these controls and the procedures for continued operation and inspection of the long-term remedial actions are outlined in the OM&M Plan.

FIGURES

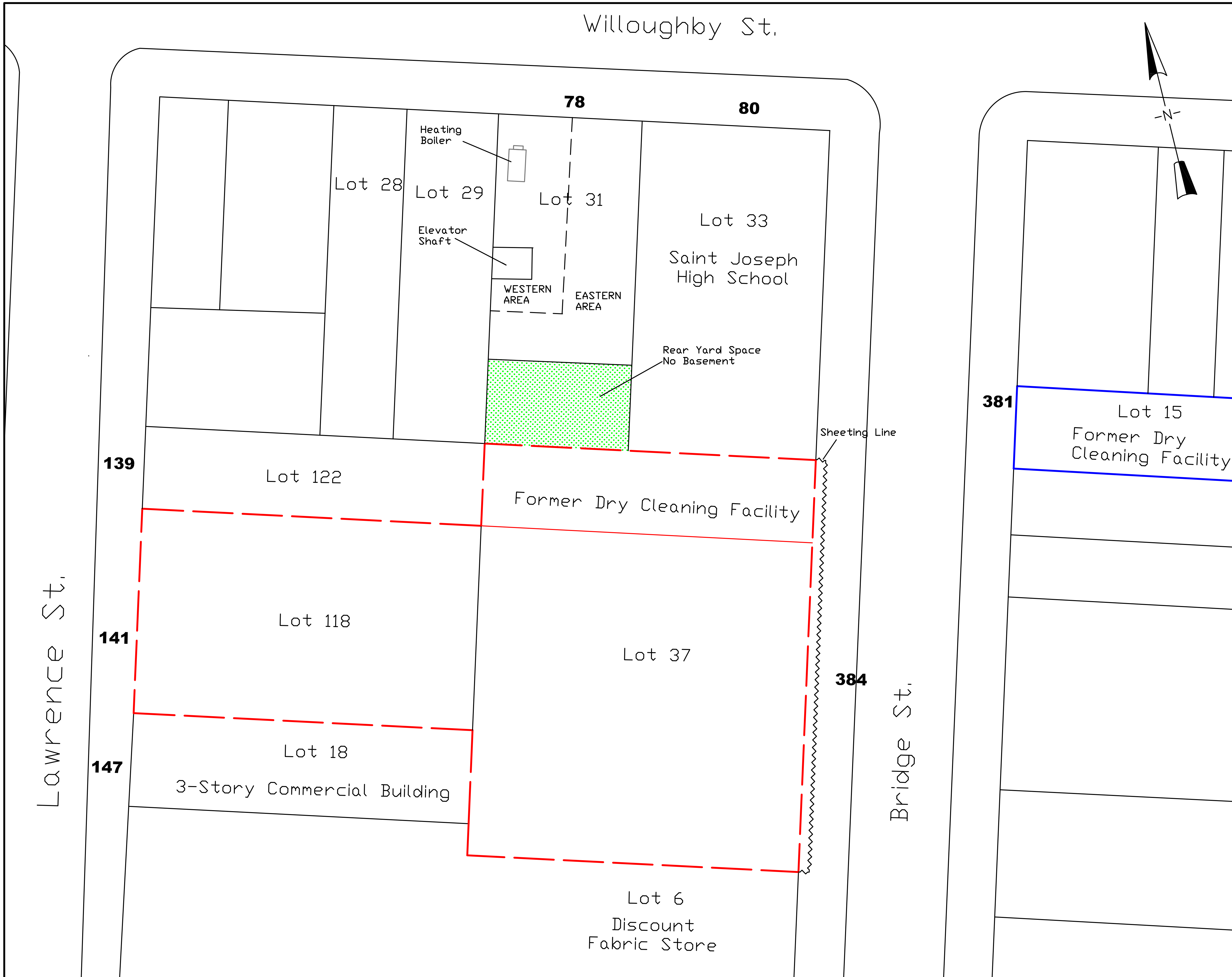


Site: *Brooklyn Quadrangle, New York 7.5 Minute series USGS Topographic Map (79287)\ Obtained from United States Geological Survey topography compiled 2010*

FIGURE 1: SITE LOCATION MAP

Fleming Lee Shue

SITE: 388 Bridge Street
Brooklyn, New York



Fleming Lee Shue

Environmental Management & Consulting

158 West 29th Street, 9th Fl.
New York, NY 10001

388 Bridge Street
Brooklyn, NY
BCP# C224134

FIGURE 2

SITE PLAN

Date
September 2010

Project Number
10149-001-8

LEGEND

384 Site Address

Site Boundary

0 30 60

Scale 1" = 30'

	SS-4 1/09	AA-4 1/09	AA-10 2/09	AA-19 5/09	AA-HWB 9/10	AA-HWB 4/11	NYSDOH GV (ug/m3)
PCE	**1800**	**216**	**239**	**277**	6.0	0.25	100
TCE	**182**	1.7	1.3	2.3	0.27	ND	5
DCE	1730	2.5	3.0	ND	ND	ND	NS

	AA-EP 2/09	EP2 5/09	AA-EP 9/10	AA-EP3 4/11	NYSDOH GV (ug/m3)
PCE	**393**	**313**	4.2	1.0	100
TCE	1	3.5	0.28	ND	5
DCE	1.9	ND	ND	ND	NS

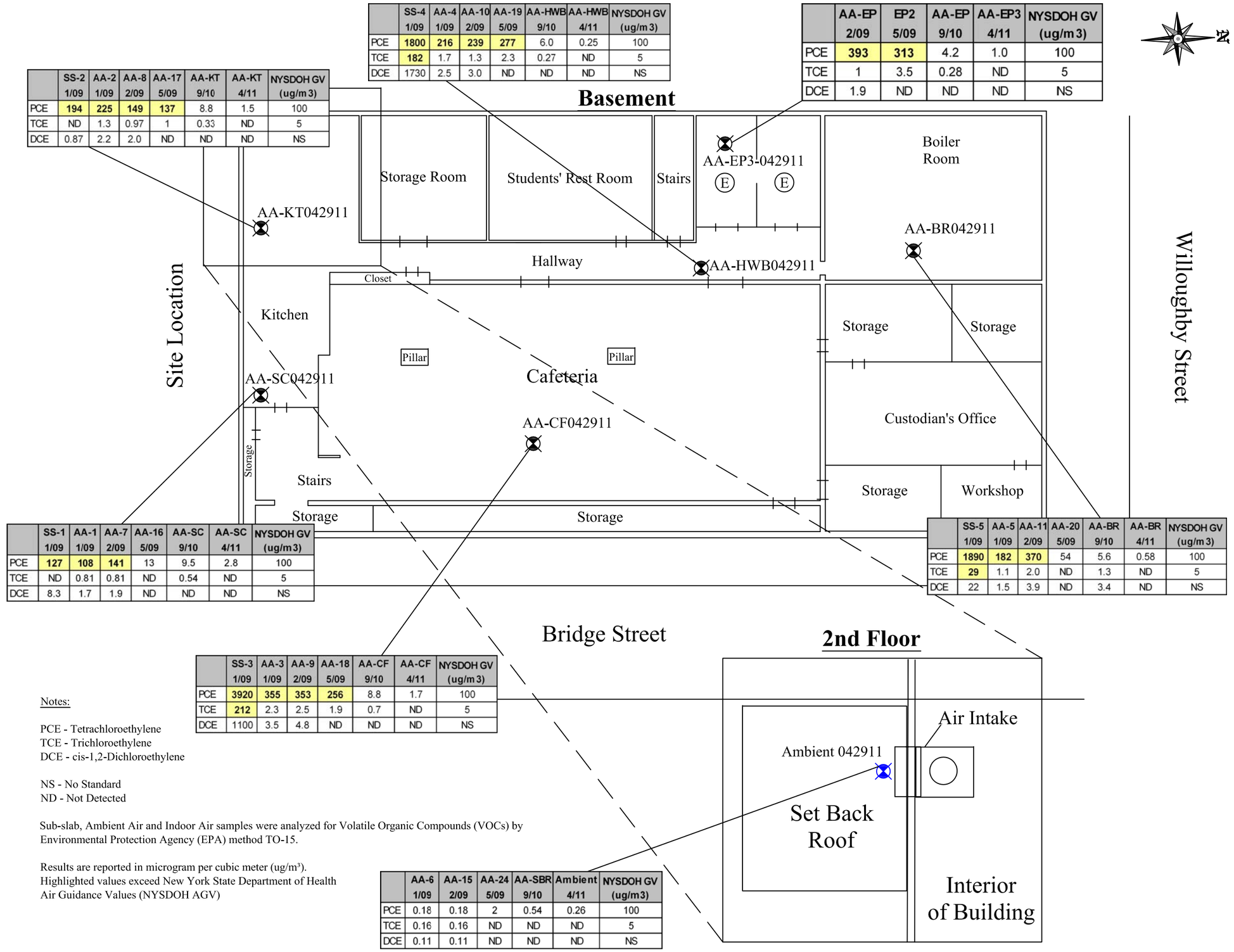
	SS-2 1/09	AA-2 1/09	AA-8 2/09	AA-17 5/09	AA-KT 9/10	AA-KT 4/11	NYSDOH GV (ug/m3)
PCE	**194**	**225**	**149**	**137**	8.8	1.5	100
TCE	ND	1.3	0.97	1	0.33	ND	5
DCE	0.87	2.2	2.0	ND	ND	ND	NS

	SS-1 1/09	AA-1 1/09	AA-7 2/09	AA-16 5/09	AA-SC 9/10	AA-SC 4/11	NYSDOH GV (ug/m3)
PCE	**127**	**108**	**141**	13	9.5	2.8	100
TCE	ND	0.81	0.81	ND	0.54	ND	5
DCE	8.3	1.7	1.9	ND	ND	ND	NS

	SS-5 1/09	AA-5 1/09	AA-11 2/09	AA-20 5/09	AA-BR 9/10	AA-BR 4/11	NYSDOH GV (ug/m3)
PCE	**1890**	**182**	**370**	54	5.6	0.58	100
TCE	**29**	1.1	2.0	ND	1.3	ND	5
DCE	22	1.5	3.9	ND	3.4	ND	NS

	SS-3 1/09	AA-3 1/09	AA-9 2/09	AA-18 5/09	AA-CF 9/10	AA-CF 4/11	NYSDOH GV (ug/m3)
PCE	**3920**	**355**	**353**	**256**	8.8	1.7	100
TCE	**212**	2.3	2.5	1.9	0.7	ND	5
DCE	1100	3.5	4.8	ND	ND	ND	NS

	AA-6 1/09	AA-15 2/09	AA-24 5/09	AA-SBR 9/10	Ambient 4/11	NYSDOH GV (ug/m3)
PCE	0.18	0.18	2	0.54	0.26	100
TCE	0.16	0.16	ND	ND	ND	5
DCE	0.11	0.11	ND	ND	ND	NS



Notes:

PCE - Tetrachloroethylene
TCE - Trichloroethylene
DCE - cis-1,2-Dichloroethylene

NS - No Standard
ND - Not Detected

Sub-slab, Ambient Air and Indoor Air samples were analyzed for Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) method TO-15.

Results are reported in microgram per cubic meter (ug/m³).
Highlighted values exceed New York State Department of Health Air Guidance Values (NYSDOH AGV)

Fleming Lee Shue

Environmental Management & Consulting

158 West 29th Street, 9th Fl.
New York, NY 10001

Saint Joseph High School
80 Willoughby Street
Brooklyn, NY

FIGURE 3

SUB SLAB, INDOOR AIR AND AMBIENT AIR SAMPLE RESULTS - BASEMENT- -All Investigations-

Date
May 2011

Project Number
10149-001-6

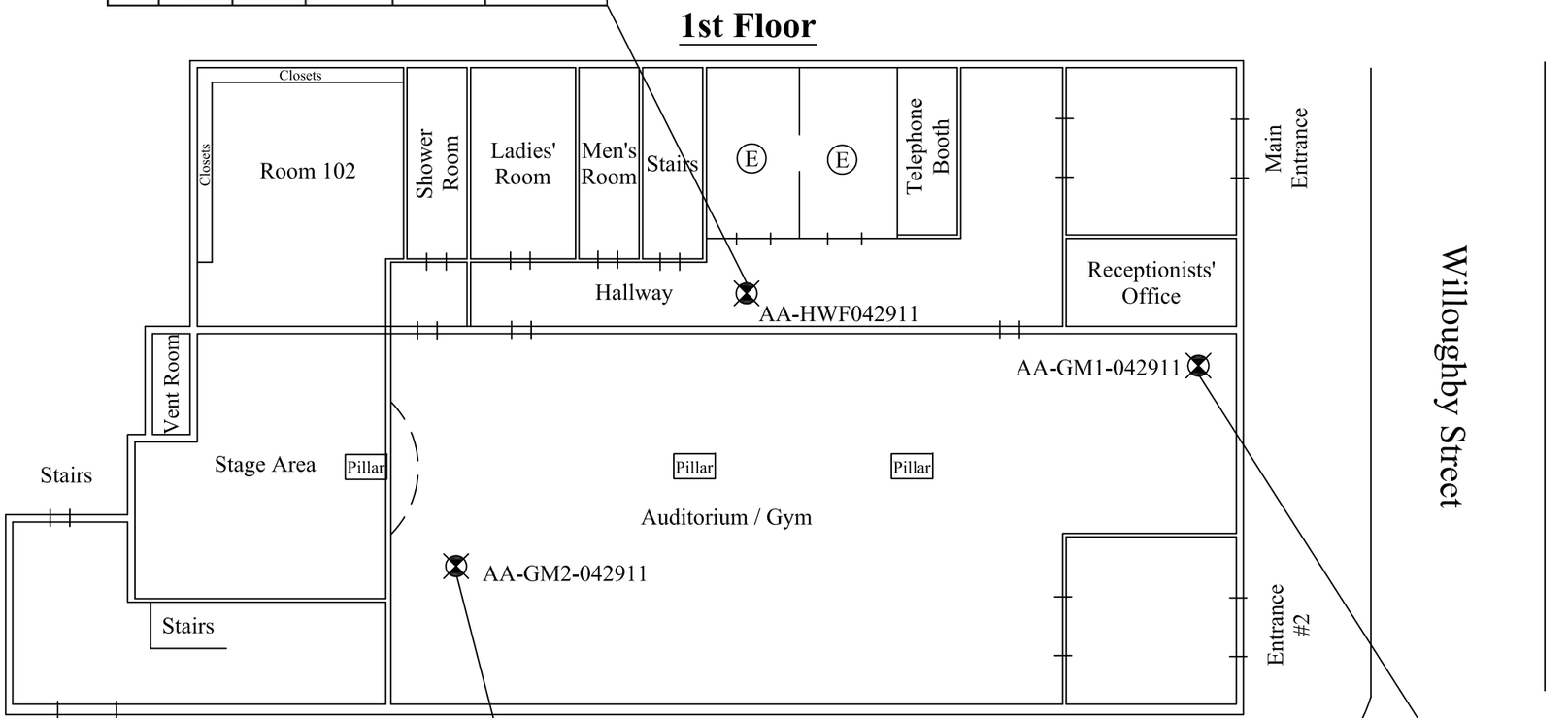
LEGEND

AA-1 — Sub Slab Air Samples (01/09) and Indoor Air Samples (01/09 - 04/11)

Ambient Air Samples

0 15 30
Scale in Feet

	AA-12 2/09	AA-21 5/09	AA-HFW 9/10	AA-HFW 4/11	NYSDOH GV (ug/m3)
PCE	**214**	**139**	1.0	0.67	100
TCE	1.3	1.1	ND	ND	5
DCE	2.9	ND	ND	ND	NS



	AA-14 2/09	AA-23 5/09	AA-GM2 9/10	AA-GM2 4/11	NYSDOH GV (ug/m3)
PCE	6.6	9.5	16.0	1.2	100
TCE	ND	0.23	1.4	ND	5
DCE	ND	ND	ND	ND	NS

	AA-13 2/09	AA-22 5/09	AA-GM1 9/10	AA-GM1 4/11	NYSDOH GV (ug/m3)
PCE	7.5	12	22	0.75	100
TCE	0.16	ND	0.47	ND	5
DCE	0.11	ND	ND	ND	NS

Notes:

PCE - Tetrachloroethylene
TCE - Trichloroethylene
DCE - cis-1,2-Dichloroethylene

NS - No Standard
ND - Not Detected

Indoor Air samples were analyzed for Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) method TO-15.

Results are reported in microgram per cubic meter (ug/m³).
Highlighted values exceed New York State Department of Health Air Guidance Values (NYSDOH AGV)

Fleming Lee Shue

Environmental Management & Consulting

158 West 29th Street, 9th Fl.
New York, NY 10001

Saint Joseph High School
80 Willoughby Street
Brooklyn, NY

FIGURE 4

INDOOR AIR SAMPLE RESULTS - 1ST FLOOR -All Investigations-

Date
May 2011

Project Number
10149-001-6

LEGEND

AA-1 Indoor Air Samples (01/09 - 04/11)

0 15 30
Scale in Feet

TABLES

Table 1
Indoor Air Sample Results
Saint Joseph High School
80 Willoughby Street
Brooklyn, NY

Client ID Lab Sample ID Date Sampled	NYSDOH Fuel Oil 2003 Upper Fence Value Indoor Air µg/m³	HEI 2005 95th Percentile Value Indoor Air µg/m³	USEPA BASE 90th Percentile Value Indoor Air µg/m³	NYSDOH Air Guidance Value µg/m3	AABR042911 JA74540-5 4/29/2011 Result Q	AACF042911 JA74540-3 4/29/2011 Result Q	AAEP3042911 JA74540-6 4/29/2011 Result Q	AAGM1042911 JA74540-8 4/29/2011 Result Q	AAGM2042911 JA74540-9 4/29/2011 Result Q	AAHWB042911 JA74540-4 4/29/2011 Result Q	AAHWF042911 JA74540-7 4/29/2011 Result Q	AAKT042911 JA74540-1 4/29/2011 Result Q	AASC042911 JA74540-2 4/29/2011 Result Q	AMBIENT042911 JA74540-10 4/29/2011 Result Q
GC/MS Volatiles (ug/m3)														
Acetone	115	98.9	45.8	NS	14	22	17	19	24.9	13	14	21	24.7	15
1,3-Butadiene	NS	<3.0	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	13	9.4	10	NS	1.3	1.2	1.2	0.86	1.2	0.58 J	0.89	1.5	1.4	0.89
Bromodichloromethane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	0.5	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoethene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzyl Chloride	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon disulfide	NS	4.2	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	0.4	<0.9	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	0.4	<1.1	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	1.2	1.1	6.34	NS	ND	0.54 J	ND	ND	ND	ND	ND	0.68 J	0.54 J	0.54 J
Chloromethane	4.2	3.7	NS	NS	1.1	1.2	1.2	1.3	1.5	1.3	1.3	1.3	1.3	1.2
3-Chloropropene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chlorotoluene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	1.3	<1.3	1.1	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cyclohexane	2.9	NS	NS	NS	0.34 J	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.4	<0.7	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethylene	0.4	<1.4	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromoethane	1.9	<1.5	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	0.4	<0.9	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	0.4	<1.6	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dioxane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.20
Dichlorodifluoromethane	10	16.5	NS	NS	2.2	2.2	2.4	2.6	2.5	2.6	2.5	2.6	2.3	2.6
Dibromochloromethane	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethylene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	0.4	<1.9	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	0.4	<2.3	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
m-Dichlorobenzene	0.5	<2.4	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
o-Dichlorobenzene	0.5	<1.2	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-Dichlorobenzene	NS	NS	344	NS	ND	ND	ND	ND	0.66 J	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	NC	<1.4	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethanol	NS	210	NS	NS	46.5	111 E	107 E	65.4	90.1 E	44.7	82.3 E	119 E	116 E	30.7
Ethylbenzene	6.4	5.7	7.62	NS	0.52 J	0.56 J	0.52 J	0.43 J	0.56 J	ND	ND	0.56 J	0.56 J	ND
Ethyl Acetate	NS	5.4	NS	NS	21	25	17	11	32	7.9	25	20	53.6	30
4-Ethyltoluene	NS	3.6	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Freon 113	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Freon 114	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptane	18	NS	NS	NS	0.86	1.1	0.78 J	0.57 J	0.82	0.40 J	0.49 J	1.2	1.0	0.49 J
Hexachlorobutadiene	NS	<6.8	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexane	NS	10.2	NS	NS	1.4	1.4	1.3	2.4	1.2	3.5	3.5	1.6	1.4	2.0
2-Hexanone	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isopropyl Alcohol	NS	NS	NS	NS	15	40.8	22	19	29.0	28.8	4.2	29.0	32.4	4.2
Methylene chloride	16	10	7.5	60	0.90	1.0	1.1	4.9	1.3	10	6.6	0.97	1.3	5.6
Methyl ethyl ketone	16	NS	NS	NS	1.6	2.5	2.7	1.9	2.6	1.0	1.1	2.8	2.9	1.3
Methyl Isobutyl Ketone	16	NS	NS	NS	ND	0.61 J	ND	ND	ND	ND	ND	ND	ND	ND
Methyl Tert Butyl Ether	14	11.5	36	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylmethacrylate	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Propylene	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	1.4	1.9	5.13	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	2.5	20.6	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.4	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	0.4	<1.5	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	0.5	<1.4	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	9.8	9.5	NS	NS	1.6	1.4	1.2	0.88 J	1.2	0.48 J	0.64 J	1.3	1.3	0.79 J
1,3,5-Trimethylbenzene	3.9	3.7	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,2,4-Trimethylpentane	NS	NS	NS	NS	1.4	1.0	1.1	0.79 J	1.0	ND	0.84 J	1.1	1.1	0.51 J
Tertiary Butyl Alcohol	NS	NS	NS	NS	0.79	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethylene	2.5	15.9	6.01	100	0.58	1.7	1.0	0.75	1.2	0.25 J	0.67	1.5	2.8	0.26 J
Tetrahydrofuran	0.8	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	57	43	39.8	NS	4.1	7.5	4.5	4.1	6.0	2.4	3.4	6.8	7.2	3.0
Trichloroethylene	0.5	4.2	1.36	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	12	4.2	NS	NS	1.3	1.6	1.6	5.6	1.7	7.9	3.9	1.8	1.8	3.6
Vinyl chloride	0.4	<1.9	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl Acetate	NS	NS	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
m,p-Xylene	11	22.2	22.2	NS	1.8	1.9	1.7	1.4	1.9	0.87	1.2	1.8	1.8	1.0
o-Xylene	7.1	7.9	7.24	NS	0.65 J	0.69 J	0.65 J	0.56 J	0.74 J	ND	ND	0.65 J	0.69 J	ND
Xylenes (total)	NS	NS	NS	NS	2.4	2.6	2.3	2.0	2.6	0.87	1.2	2.5	2.5	1.0

Notes:
Samples analyzed for VOCs by EPA Method TO-15
NS = No Standard
ND = Not Detected
Qualifiers:
U = Analyte not detected at or above reporting limit.
J = Value is estimated (greater than detection limit but below reporting limit).
E = Estimated
-AGV refers to the New York State Department of Health (NYSDOH) Air Guideline Value (AGV) as provided in the Final NYSDOH Guidance for Evaluating Vapor Intrusion in the State of New York dated October 2006
-NYSDOH-referenced background levels are given in the NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York, dated October 2006, and include:
-NYSDOH Fuel Oil 2003 Upper Fence Value and refers to the Upper Fence value provided in Table C1
-USEPA BASE 90th Percentile Value and refers to the 90th Percentile value provided in Table C2
-HEI 2005 95th Percentile Value and refers to the 95th Percentile value provided in Table C5

Table 2
Indoor Air Temperatures
Saint Joseph Catholic School
80 Willoughby Street
Brooklyn, NY

Sample ID	AAEP3-042911	AAKT-042911	AASC-042911	AACF-042911	AAHWB-042911
Date	4/29/2011	4/29/2011	4/29/2011	4/29/2011	4/29/2011
Start Time	0757	0752	0753	0754	0755
Start Temperature	68	68	68	70	69
End Time	1557	1552	1553	1554	1555
End Temperature	73	72	72	74	72

Sample ID	AABR-090110	AAHWF-090110	AAGM2-090110	AAGM1-090110	Ambient 042911
Date	4/29/2011	4/29/2011	4/29/2011	4/29/2011	4/29/2011
Start Time	0756	0759	0801	0800	0803
Start Temperature	69	65	70	70	60
End Time	1556	1559	1601	1600	1603
End Temperature	75	65	72	72	65

Note: All temperatures are in degrees Farenheit
Time is represented as a 24hr clock

APPENDIX A
Laboratory Analytical Reports
(on CD)