

**388 Bridge Street Site
Soil Vapor/Indoor Air Quality Work Plan
BCP Site # C224134**

**For:
Off-Site Properties
78 Willoughby Street (Block 152 Lot 31),
139 Lawrence Street (Block 152 Lot 122),
and In Front of 381 Bridge Street (Block 145 Lot 15)
Brooklyn, New York**

Prepared For:
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Submitted to:
New York State Department of Environmental Conservation
Division of Environmental Remediation
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FIGURE 2 – Sub-Slab Soil Vapor, Soil Vapor, Indoor Air, and Background Air Sample Locations

FIGURE 3 – Soil Vapor Sample Point Construction

1.0 INTRODUCTION

Pursuant to the Brownfield Cleanup Agreement executed on August 11, 2009 between 384 Bridge Street, LLC (the Volunteer) and the New York State Department of Environmental Conservation (NYSDEC), and on behalf of Stahl Real Estate, Arnold F. Fleming, P.E./Fleming-Lee Shue, Inc. (collectively FLS) has prepared this Soil Vapor/Indoor Air Quality (SV/IAQ) Work Plan for the properties located at 78 Willoughby Street (Block 152, Lot 31), 139 Lawrence Street (Block 152, Lot 122), and in the area directly in front of 381 Bridge Street, Brooklyn, New York (Figure 1). These properties are immediately adjacent to the north, northwest, and northeast portions of the property located at 384-394 Bridge Street, Brooklyn, New York (388 Bridge Street Site or “the Site”). The Site consists of two lots, Lot 37 on Bridge Street and Lot 118 on Lawrence Street on Block 152. A Remedial Investigation Report (RIR) for the Site was submitted to the New York State Department of Environmental Conservation (NYSDEC) in January 2010 in accordance with the requirements of the Brownfield Cleanup Program (BCP). This SV/IAQ Work Plan has been prepared at the request of NYSDEC to assess subsurface soil vapor and indoor air quality on several properties in the vicinity of the Site. These properties are described below:

Lot 31 measures approximately 45 feet by 100 feet along Willoughby Street and borders the 388 Bridge Street Site to the south and Saint Joseph High School to the east. A five-story residential and office building with a footprint of 45 feet by 62 feet and a partial basement occupies the northern portion of Lot 31. A rear yard located south of the five-story building occupies the remaining portion of the lot. The basement is divided into two separated areas. The elevator shaft and boiler are located in the western area of the basement and the eastern area is used as a kitchen for the restaurant that occupies the ground floor.

Lot 122 measures 25 feet by 108 feet along Lawrence Street and borders the northwestern corner of Lot 37 on 384 Bridge Street Site. A single-story building with a full basement occupies the entire area of Lot 122. The building is being used as a restaurant and the basement as storage.

The **381 Bridge Street** property (Block 145 Lot 15) is located across the street from the Site. The ground floor of the building on this property was occupied by a dry cleaning facility between 1997 and 2006.

1.1 Offsite Sampling Objectives

A dry cleaning facility occupied the eastern and northern portions of the Lot 37 portion of the Site between 1950 and 2006. Several subsurface investigations were performed on Lots 37 and 118 to investigate contamination in the soil vapor, soil, and groundwater as a result of the dry cleaning operations. Soil vapor contamination associated with the chlorinated solvent, tetrachloroethene (PCE) and its breakdown products trichloroethene (TCE), dichloroethene (DCE) and vinyl chloride, were detected in soil vapor at concentrations above the New York State Department of Health (NYSDOH) air guidance values (AGVs). Chlorinated solvent contamination was also detected in soil and groundwater.

Sub-slab soil vapor and indoor air samples were collected within the basement of the Saint Joseph High School building, located north of the northeastern portion of the Site to determine if soil vapor detected on the Site had impacted the school building. Soil vapor contamination associated with the chlorinated solvent, PCE and its breakdown products TCE, DCE, and vinyl chloride, was detected in sub-slab soil vapor and indoor air samples at concentrations above the NYSDOH AGVs.

During a January 15th, 2010 conference call, NYSDEC and NYSDOH requested that sub-slab soil vapor, soil vapor and indoor air sampling be performed in the basements of the buildings located on Lots 31 and 122, as well as on the rear yard on Lot 31, the northwestern corner of Lot 37, and below the sidewalk in front of the property at 381 Bridge Street.. The objective of the sampling program is to evaluate the potential for soil vapor intrusion from the north, northwestern, and northeastern portions of Lot 37 into the basements of adjacent buildings on Lots 31 and 122 or across the street in front of 381 Bridge Street.

1.2 Geology and Hydrogeology

The Site is mapped on the *Brooklyn, NY-NY* Quadrant 7.5 Minute Topographic Map, published by the United States Geological Survey (USGS). Review of the topographic map indicates that the Site is located approximately 45 feet above sea level (NGVD).

As indicated in the Meuser Rutledge Consulting Engineers (MRCE) subsurface geotechnical investigation report dated May 2007, there are two strata under the Site and surrounding area. The upper stratum is a miscellaneous fill with thicknesses ranging from three to 17 feet. The stratum below the fill layer is a natural glacial till deposit consisting of very compacted to compacted, brown to red-brown, fine to coarse sand and gravel with a trace of cobbles and boulders. The underlying till layer becomes less compacted and consists of coarse sand intermixed with some gravel at and below the water table. The glacial till stratum extends to 100 feet below street grade (ft-bsg) and is underlain by highly consolidated Gardiner's clay.

The Site was excavated to the depth of 25 ft-bsg to accommodate sub-cellars for a new building. However, based on the delay in starting construction on the development site, the NYCDOB requested that, prior to foundation construction, the Site be temporarily filled to support the foundations of the buildings abutting the Site. The Site was backfilled with 12 feet of mole rock, (pulverized bedrock resulting from tunneling for subway construction) to raise the Site grade to 13 ft-bsg. Brown medium to coarse sand intermixed with some gravel was present in soil borings from just below the mole rock fill to 42 feet bsg.

Findings of the FLS subsurface investigations performed in 2008 and 2009 indicate that groundwater was encountered at depths ranging from approximately 43 to 44 ft-bsg. The local groundwater flow was assumed to be south/southwest toward the East River; however, based on five monitoring events conducted by FLS over four months in 2008, groundwater at the Site was determined to be flowing to the north-northeast. This localized groundwater flow direction may be influenced by the subway tunnels located north and southwest of the site and pumping

operations at a New York City Metropolitan Transit Authority (NYCMTA) de-watering station located within 1.5 miles northeast of the Site.

2.0 SCOPE OF WORK

The purpose of the sub-slab soil vapor, soil vapor, and indoor air sampling program is to evaluate the potential for soil vapor intrusion from the north and northwestern portions of Lot 37 into the basements of the adjacent buildings on Lots 31 and 122 or across the street in front of 381 Bridge Street. A description of the sampling locations and the methodology for collection of sub-slab soil vapor, soil vapor and indoor air samples and outdoor (background) air samples is provided in the following sections

Sub-slab soil vapor and indoor air samples will be collected within the basement of the buildings located on Lots 31 and 122. Soil vapor will be collected from the rear yard on Lot 122, the north western corner of Lot 37 immediately adjacent to Lot 31, and under the eastern sidewalk of Bridge Street in front of the 381 Bridge Street property. One outdoor (background) air sample will also be collected in the rear yard on Lot 122. Sub-slab soil vapor samples will be collected concurrent with the indoor and background air samples.

Prior to the sub-slab soil vapor and indoor and background air sampling, an inventory of any used or stored materials within the building basements that may contain volatile organic compounds (VOCs) will be prepared. The list will include the VOC(s) contained within each product as listed on the Material Safety Data Sheet (MSDS) for that product.

Sampling protocols are provided in the following sections. Sampling locations are provided in Figure 2.

2.1 Sub-Slab Soil Vapor Sampling

Sub-slab soil vapor samples will be collected at seven (7) locations inside the building basements on Lots 31 and 122. Three sample points will be located in the building basement on Lot 31 and four sample points in the building basement on Lot 122.

One sub-slab soil vapor sample will be collected from each of two locations near the eastern wall of the basement on Lot 31, close to the north western corner of Lot 37. One additional sub-slab soil vapor sample will be collected from a location near the middle of the basement at approximately 50 feet from the eastern wall of the basement.

The basement on Lot 122 is divided into two separate areas. The western area of the basement contains the elevator shaft and a heating boiler. The L-shape eastern area is used as a kitchen for the restaurant that occupies the ground floor. Two sub-slab soil vapor samples will be collected from the eastern area of the basement and two from the western area. In the eastern area of the basement, one sample point will be located on the southern end of the kitchen near Lot 37 and the second sample point will be located near Willoughby Street. In the western area of the

basement, one sample point will be located near the elevator shaft and the second sample point will be near the heating boiler.

Sub-slab soil vapor samples will be collected in accordance with the NYSDOH *Guidance for Evaluating Soil Vapor Intrusion in the State of New York (October 2006)*. At each sample location, a 0.5-inch diameter and 3.5-inch long decontaminated stainless steel sampling probe will be driven approximately two (2) inches into the underlying soil under the basement floor slab. The sampling probe will be retracted approximately one inch to expose a sampling screen. The borehole above the sampling probe will be sealed with clay to prevent ambient above-ground air mixing with the soil vapor. To ensure a satisfactory seal above the sampling probe, helium will be utilized to enrich the atmosphere above the sealed borehole. Soil vapor will be purged through 0.25-inch polyethylene (PE) tubing and screened for the presence of helium utilizing a calibrated MGD2002 helium leak detector. Once it is confirmed that helium is not detected in the soil vapor and an appropriate seal is constructed, the soil vapor probe will be purged at a flow rate of approximately 0.2 liters per minute (lpm) for approximately three (3) minutes. Following purging, a laboratory individually-cleaned six-liter SUMMA canister with an 8-hour regulator control valve (the sampling duration), will be connected to the PE tubing to collect a representative soil vapor sample.

2.2 Soil Vapor Sampling

Soil vapor sampling will be conducted in the rear yard on Lot 31, the northwestern corner of Lot 37 near Lot 122, and the eastern sidewalk of Bridge Street in front of the 381 Bridge Street property. Three (3) soil vapor samples will be collected from the rear yard on Lot 31 from temporary soil vapor sample points. One (1) soil vapor sample will be collected from the northwest corner of Lot 37 from a temporary soil vapor sample point. Three (3) soil vapor samples will be collected from 1-inch diameter permanent sample points spaced 25 feet apart in front of the 381 Bridge Street property. The permanent vapor sample points will be used to 1) monitor any soil vapor migration associated with the former dry cleaning operations at 381 Bride Street, and 2) monitor the performance of the proposed on-Site soil vapor extraction system. A special permit from MetroTech Building security will be obtained to perform the soil vapor sampling on the sidewalk along Bridge Street.

Soil vapor samples will be collected from a depth of eight (8) feet below grade using a hand-held/truck-mounted geoprobe unit. The methodology for installing the temporary and permanent soil vapor sampling points and collecting soil vapor samples is provided below:

Temporary Soil Vapor Sampling

At each temporary soil vapor sample point, soil vapor samples will be collected using a 5/8-inch diameter retractable stainless steel sampling probe. The sampling probe consists of a 1.5-inch long hardened point and a 2-inch long perforated vapor intake and will be pushed to the depth of 8 feet below grade or refusal, whichever comes first. Once the soil vapor sampling probe has been driven to the desired depth, the outer protective casing will then be retracted to obtain the soil vapor sample through a 1/4-inch polyethylene tube attached to the sampling probe. The

borehole above the sampling probe will be sealed at grade using an inert sealant such as modeling clay to prevent ambient air mixing with the soil vapors. Ambient air will be purged from the borehole by attaching the surface end of the ¼ -inch polyethylene tube to an air valve which is attached to a vacuum pump. The vacuum pump will remove one to three volumes of air (volume of the sample probe and tube) prior to sample collection. The flow rate for both purging and collecting samples will not exceed 0.2 liter per minute.

Permanent Soil Vapor Sampling

The permanent soil vapor points will be drilled using a truck-mounted geoprobe and will be constructed of 1-inch diameter Schedule 40 PVC casing. The permanent soil vapor points will be installed with a 6-foot long PVC riser and 2-foot long screen (0.020 inch slot). A filter pack of No. 2 Morie sand, or equivalent, will be placed in the annular space around the screens. A grout, consisting of a cement and bentonite mixture or an anti-shrink mixture, will extend from the pack to one foot below ground surface. The top of each soil vapor sample point will be capped and a flush-mounted access steel box will be installed upon its completion. A brass or stainless sample port will be installed on each sample point cap. A soil vapor sample point construction is shown in Figure 3.

Ambient air will be purged from the borehole by attaching ¼ -inch polyethylene tube to the sample port and an air valve which is attached to a vacuum pump. The vacuum pump will remove one to three volumes of air (volume of the sample probe and tube) prior to sample collection. The flow rate for both purging and collecting samples will not exceed 0.2 liter per minute.

The soil vapor samples from all locations will be screened using a PID prior to sample collection in a laboratory individually-cleaned six-liter SUMMA canister. The SUMMA canister will be directly attached to the tubing and the valve will be opened to collect the sample. A one-hour regulator will be used with the SUMMA canister to collect the sample.

2.3 Indoor and Background Air Sampling

In accordance with the NYSDOH *Guidance for Evaluating Soil Vapor Intrusion*, three indoor air samples and one background air sample will be collected concurrent with the sub-slab soil vapor samples. One indoor air sample will be collected from each sample location in the eastern and western areas of the basement on Lot 31 and in the basement on Lot 122. Indoor air samples will be collected in the breathing zone (five feet above basement floor). A background ambient air sample will also be collected in the rear yard on Lot 31. Indoor and background air samples will be collected in six-liter individually-certified clean SUMMA canisters attached to 8-hour flow controllers.

For each sub-slab soil vapor, soil vapor, indoor, and background sample, the start time, end time, maximum and minimum temperature, and beginning and final ambient temperature will be recorded. An identification tag will be attached to each canister prior to shipment to Accutest Laboratories, a NYSDOH Environmental Laboratory Accreditation Program (ELAP)-approved

laboratory. (ELAP certification number 10983). Samples will be analyzed for VOCs using Environmental Protection Agency (EPA) Method TO-15. The reporting limit for all analytical parameters will not exceed one microgram per cubic meter (1 ug/m³).

2.4 Reporting

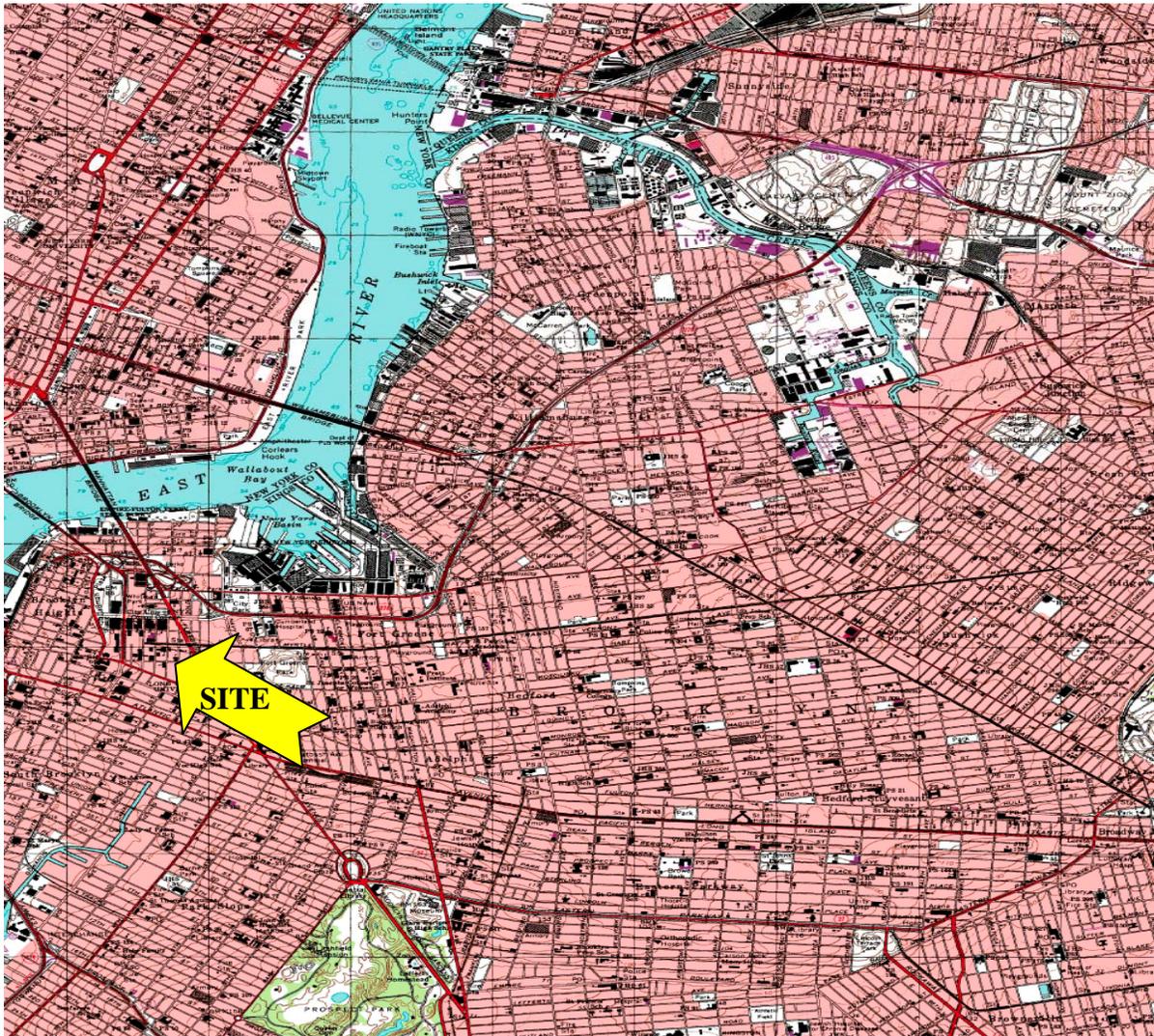
Following the receipt of all field and laboratory results, an Offsite Soil Vapor/Indoor Air Quality Report will be developed and provided to NYSDEC and NYSDOH. The report will detail field activities, laboratory results, conclusions and recommendations.

2.5 Permits and Schedule

Upon NYSDEC and NYSDOH approval of this Work Plan, FLS will arrange to obtain permits for sidewalk closure from the New City Department of Transportation (NYCDOT) and security clearance from the MetroTech Building. Letters from the NYSDEC and NYSDOH will be needed to obtain the permits and security clearance and to be presented to the owner of the properties on Lots 31 and 122 to gain access for sample collection.

Mobilization, including obtaining the sidewalk closure permit and security approval, is estimated at approximately one (1) week, and sample collection will be completed in approximately five (5) days. Laboratory data is expected to be received three (3) weeks after submittal of samples to the laboratory. A report will be prepared and submitted to NYSDEC for review three (3) weeks after receiving the laboratory analytical results.

FIGURES



Site: *Brooklyn Quadrangle USGS Topographic Map (79287)*
Obtained from United States Geological Survey topography compiled 1961



FIGURE 1: SITE LOCATION MAP

SITE: 384 Bridge Street
Brooklyn, New York

Willoughby St.



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388 Bridge Street
Brooklyn, NY

FIGURE 2

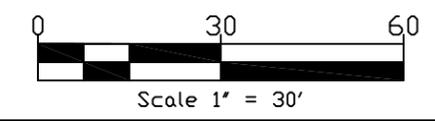
Proposed Sampling Plan for On-Site and Off-Site Soil Vapor, SubSlab and Indoor Air Samples

Date
January 2010

Project Number
10419-001-6

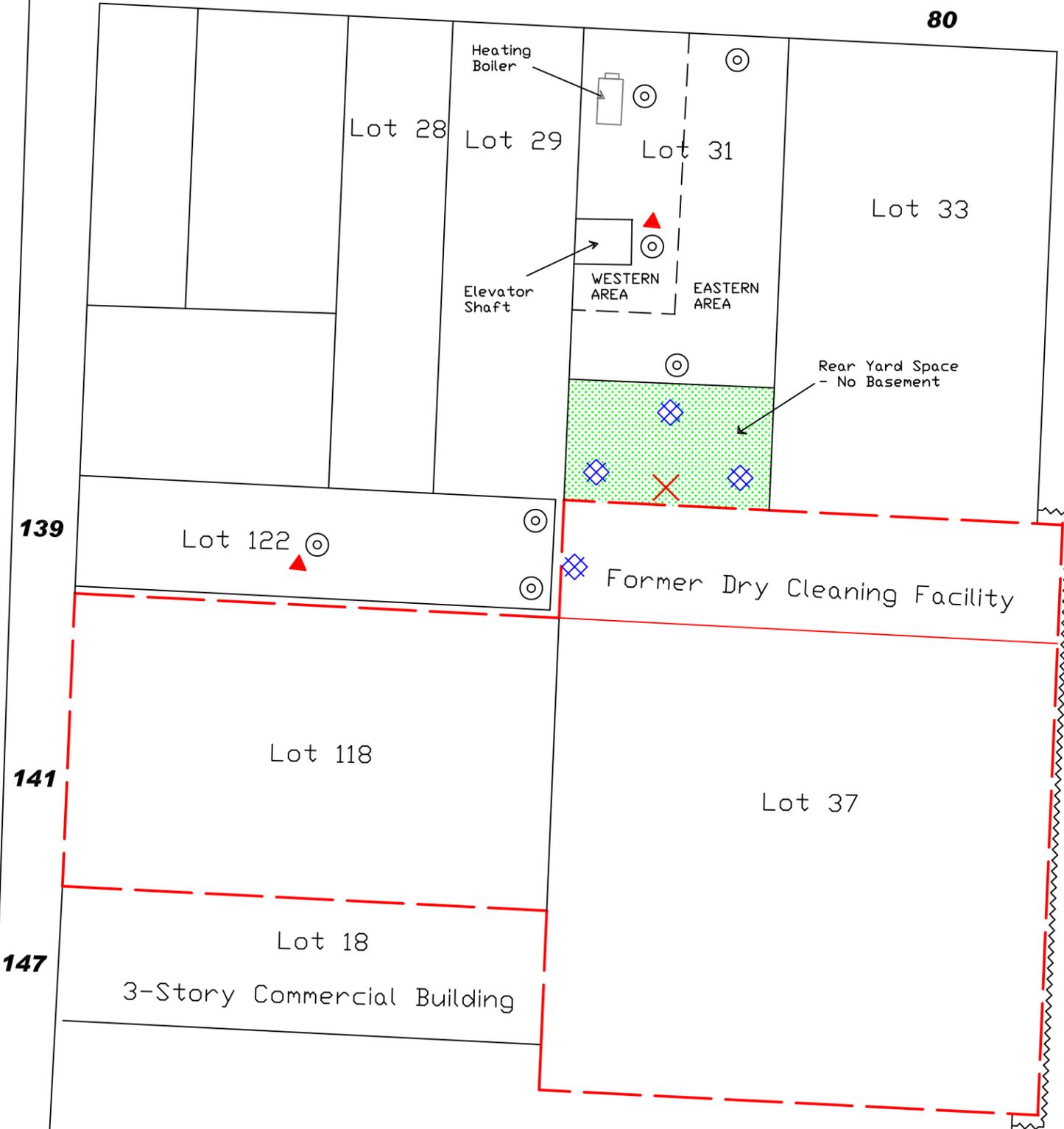
LEGEND

- 384** Site Address
- Site Boundary
- ⊙ SubSlab Sample
- ⊠ Soil Vapor Point
- ▲ Indoor Air Sample
- × Background Sample



Lawrence St.

Bridge St.



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