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Dean Chartrand
IBM Corporate Environmental Affairs
8976 Wellington Road
Manassas, Virginia 20109

August 5, 2015
File No. 2999.03

Re: Pilot Test Report – B310/B308 Linkway Subslab Depressurization System
Former IBM East Fishkill Facility
Hopewell Junction, New York

Dear Mr. Chartrand:

This letter presents the findings of a subslab depressurization pilot test and outlines the conceptual design of a subslab depressurization system (SSDS) for the linkway between Building 310 (B310) and Building 308 (B308) (the linkway) at the former IBM East Fishkill facility (the site). A site location plan is provided as Figure 1, and the location of the linkway on the site is shown on Figure 2. We understand that IBM will forward this letter to the New York State Department of Environmental Conservation (NYSDEC) and the New York State Department of Health (NYSDOH), collectively the Agencies, for their review.

Indoor air screening and sampling within the linkway has indicated the presence of volatile organic compounds (VOCs), primarily tetrachloroethene (PCE). To address the indoor air VOC presence, certain measures were implemented to mitigate vapor intrusion pathways, such as sealing of floor cracks, construction joints, and a manhole/access-way inside the linkway. This work was documented in a May 2014 report[1] to the Agencies.

Subsequent indoor air screening conducted in the linkway in conjunction with heating, ventilation, and air conditioning (HVAC) system shutdown testing within B310 in January 2015 indicated PCE presence within the linkway. Screening of subslab vapor samples collected from beneath the linkway in March 2015 confirmed PCE presence in soil gas below the linkway. In respone, in May 2015 IBM elected to conduct a pilot test to evaluate subslab depressurization as a supplemental remedial measure for the linkway. This letter documents the results of the May 2015 pilot test and presents the conceptual design of an SSDS to intercept PCE presence below the linkway.

SSDS PILOT TEST

Subslab depressurization pilot testing was conducted to: 1) evaluate the method as a potential mitigation measure to intercept PCE presence in soil gas below the linkway, and 2) obtain observational data that could be used to support design of a full-scale mitigation system. This section provides a summary of the testing procedures and results.

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1 Report of Remedial Measures and Confirmatory Sampling Results, Building 308 and Linkway to Building 310, IBM East Fishkill Facility, Sanborn Head Engineering P.C. and IBM Corporation, May 2014.

Test Procedures

Subslab depressurization pilot testing was conducted in two phases at four extraction ports (EPs) installed along the northern side of the linkway as shown on Figure 3. Each extraction port was constructed by coring a hole through the concrete floor slab and installing a 2-in.-diameter by approximately 1-ft-long 60 slot PVC screen equipped with a capped port installed to be flush with the concrete floor. The first testing phase was conducted at EP-211 through EP-213. A regenerative-type vacuum blower was used to withdraw vapor from the ports for durations of approximately 20 minutes each. The vapor flow rate and applied vacuum was monitored and recorded at the extraction ports using a TSI Velocicalc® air meter and Dwyer Magnahelic® pressure gauge, respectively. While testing EP-211 through EP-213, a sample of the vapor stream was collected into a Tedlar bag and screened using a photoionization detector (PID). The flow rate, applied vacuum, and PID screening values for the extraction tests at EP-211 through EP-213 are posted on Figure 3. During each test, the differential pressure response between the subslab and indoor air was monitored at nearby subslab monitoring ports (SS) using digital micromanometers.

The second testing phase was conducted at EP-214, which was installed after the first phase of testing to address an area that did not show subslab vacuum influence as a result of testing EP-211 through EP-213. After installation, a vacuum was applied to the port to evaluate differential pressure response between the subslab and indoor air at vicinity monitoring ports.

Test Results

Figure 3 summarizes the vapor extraction conditions and the extent of subslab pressure response for each of the individual extraction tests. On this figure, negative values of differential pressure indicate subslab pressure less than the indoor air pressure (i.e., vacuum), thus showing the approximate extent of subslab vacuum influence resulting from each vapor extraction test.

Based on the results, the extent of vacuum influence for simultaneous operation of three extraction ports suggests sufficient depressurization of the subslab for the entire linkway in the east-west direction. It is anticipated that sufficient depressurization of the subslab across the width of the linkway (north-south direction) will occur based on the rapid differential pressure response observed in the east-west direction at distances greater than the width of the linkway.

SSDS DESIGN BASIS

The SSDS design is based on the results of pilot testing, which indicates that applying a vacuum will achieve the goals of depressurizing the linkway subslab to intercept PCE vapors before they can migrate into the building space. The design of the SSDS is described below, including the configuration of the vapor extraction ports, target operating conditions (applied vacuum and extraction flow rate), and discharge of VOC-containing vapor.

Extraction Port Configuration and Target Operating Conditions

Pilot test results show subslab vapor extraction from the existing extraction ports would effectively depressurize the entire linkway subslab. The SSDS will consist of three extraction ports: EP-211, EP-213, and EP-214. Extraction from EP-212 is not needed because EP-211 was shown to have vacuum influence to the most easterly monitoring port, SS-300, as shown on Figure 3.

The design target for the applied vacuum at the extraction ports will range from approximately 3 to 7 inches of water column (in. wc) because this was the vacuum during pilot testing that provided a reasonable balance among extraction flow, vacuum influence, and the efficient operating range of blower capability.

At the target applied vacuum, the total subslab vapor extraction rate estimated by summing the extraction rates observed during pilot testing at EP-211 and EP-213, while including a similar extraction rate from EP-214, would be approximately 86 cubic feet per minute (cfm). The actual withdrawal rate during simultaneous extraction from the port network will likely be lower than estimated above due in part to superposition effects and competition among extraction ports. Overall, the planned extraction port network and target operating conditions will provide for operating flexibility and redundancy via overlapping areas of influence. Additional ports can be added if appropriate based on the results of system startup performance testing.

Process Flow Diagram

The planned process flow diagram for the system is shown in Exhibit 1. Sub-slab soil vapor will be withdrawn from the three extraction ports using three separate RadonAway™ HS2000 fans. The soil vapor collected from each individual extraction port will be discharged to atmosphere through a polyvinyl chloride (PVC) exhaust stack extended above the linkway roofline and fitted with a no-loss stack head for weather protection.

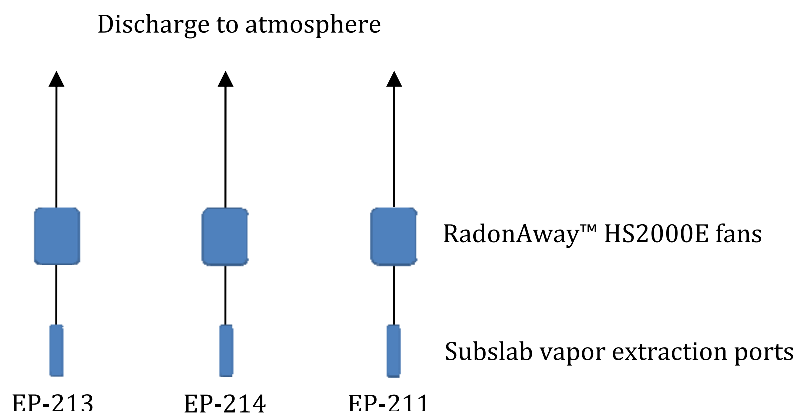

Exhibit 1 – Subslab Depressurization System Process Flow Diagram

The radon fans offer sufficient vacuum and flow rate to achieve the results observed during pilot testing, are easy to operate and maintain, and consume considerably less power than typical vacuum blowers.

VOC Mass Removal and Treatment

Using the most recent subslab vapor screening data from March 2015, an estimated 0.03 pounds per hour (lbs/hr) of VOC mass would be discharged to the atmosphere. It should be noted that this is a conservative estimate, as the highest soil vapor concentration was assumed rather than the actual concentration in the extracted vapor stream. In addition, the actual VOC mass recovery rate is expected to decrease according to an exponential decay curve that approaches an asymptote that represents the mass transfer limitations in the subsurface. This emission rate of 0.03 lbs/hr is well below the threshold of 0.5 lbs/hr that would require air pollution controls under NYSDEC Division of Environmental Remediation guidelines[2], therefore no treatment of the extracted vapor is required.

System Location and Safeguards

The major subslab vapor extraction equipment, including the three radon fans, PVC discharge piping, and power and telemetry panels is planned for installation on the outside of the exterior wall along the north side of the linkway. The discharge points will be approximately three feet above the linkway roofline. The extraction port riser pipes, including monitoring and sampling ports and pressure indicating switches will be installed on the interior of the north linkway wall. All interior piping will be operated under vacuum to limit the potential for human exposure to VOCs. In addition, the system will be equipped with sensors, alarms (e.g., low vacuum, power outage), and an autodialer that will automatically communicate such alarms to the appropriate personnel.

CONCLUSIONS

The results of this work have met the objectives of: 1) evaluating the feasibility of subslab depressurization to reduce indoor air PCE concentrations within the linkway, and 2) gathering sufficient information to prepare a conceptual design for an effective SSDS.

Pilot testing confirmed the viability of employing an SSDS within the linkway to address indoor air PCE concentrations. A design basis for an SSDS has been developed from the results of pilot testing. The design basis is intended to achieve the goal of subslab depressurization to reduce VOC mass entry into the linkway, while also providing for operating flexibility, redundancy, and future expansion, if appropriate.

IBM is moving forward with the detailed design of the SSDS, targeting construction beginning in the third quarter of 2015 and startup in the fourth quarter 2015. IBM understands that construction and operation of the system can proceed once the Agencies have accepted this report.

[2] NYSDEC, Division of Environmental Remediation, Internal memorandum from Dale Desnoyers, "Substantive Compliance with Air Requirements", February 28, 2003.

Very truly yours,
SANBORN, HEAD ENGINEERING, P.C.

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Encl. Figure 1 Site Location Plan
Figure 2 B310/B308 Linkway Site Plan
Figure 3 Subslab Pressure Response to Vapor Extraction Testing

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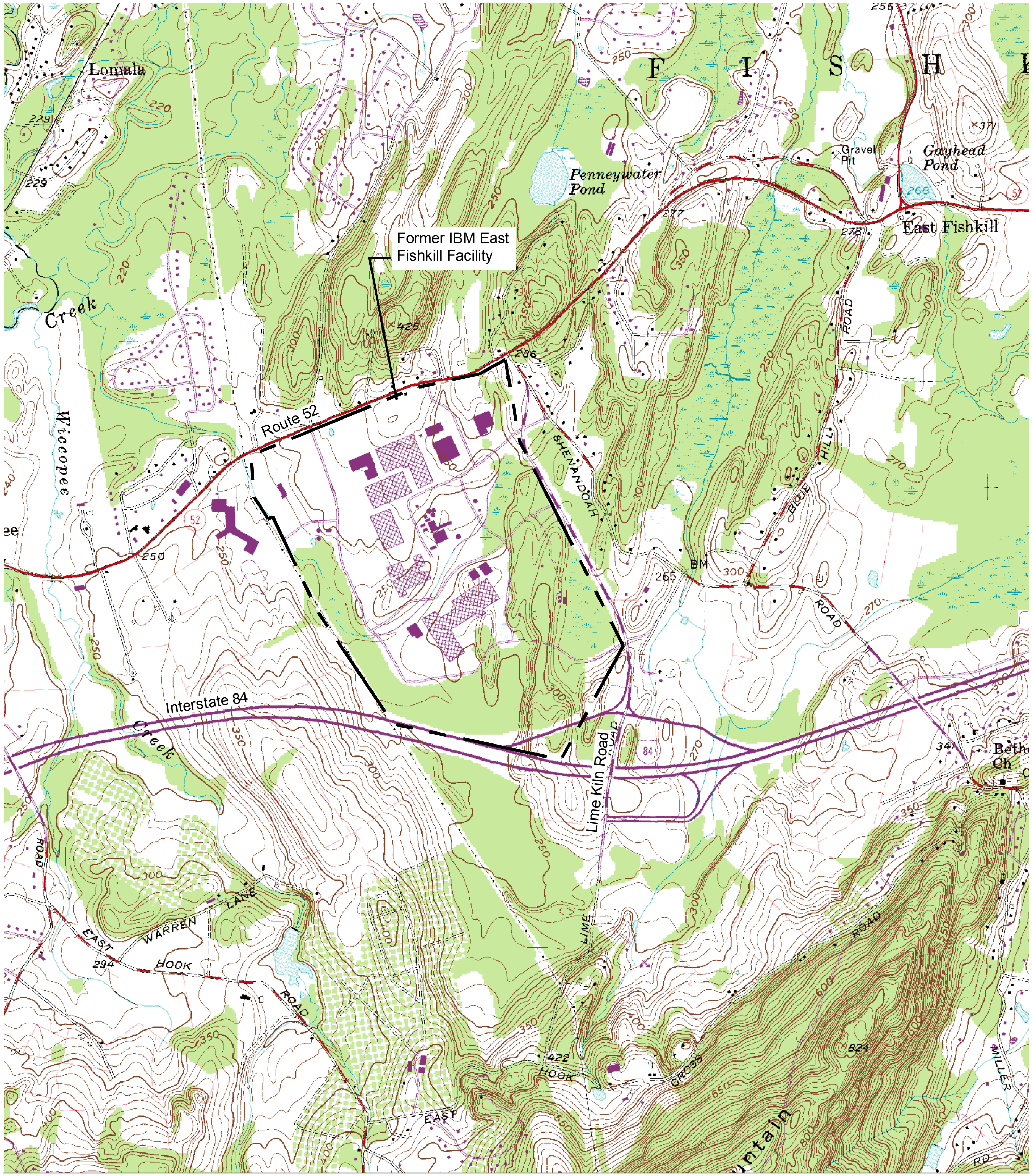

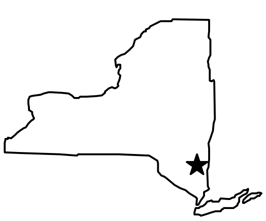

Notes:
Base map taken from 7.5 minute USGS Quadrangle Maps: Hopewell Junction, New York, Dated 1957, Photorevised in 1981.

Drawn By: E. Wright
Designed By: J. Corsello
Reviewed By: S. Soos
Project No: 2999.03
Date: August 2015

1,000' 0 2,000' Feet

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Figure 1

Site Location Plan

Pilot Test Report - B310/B308 Linkway Subslab Depressurization System

Former IBM East Fishkill Facility
Hopewell Junction, New York

Figure 2

B310/B308 Linkway Site Plan

Pilot Test Report - B310/B308 Linkway
Subslab Depressurization System

Former IBM East Fishkill Facility
Hopewell Junction, New York

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Figure Narrative

This figure shows the buildings at the former IBM East Fishkill facility. The B310/B308 Linkway is highlighted.

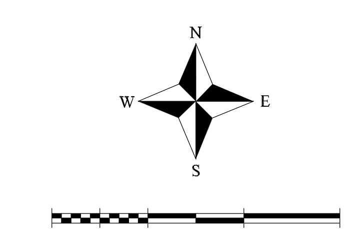
Legend

- - - IBM Property Line

Unlabeled features include wastewater treatment tanks, pump houses, trailers, and other structures and features not intended for human occupancy

B320B Indicates building number

Indicates the location of the B310/B308 Linkway



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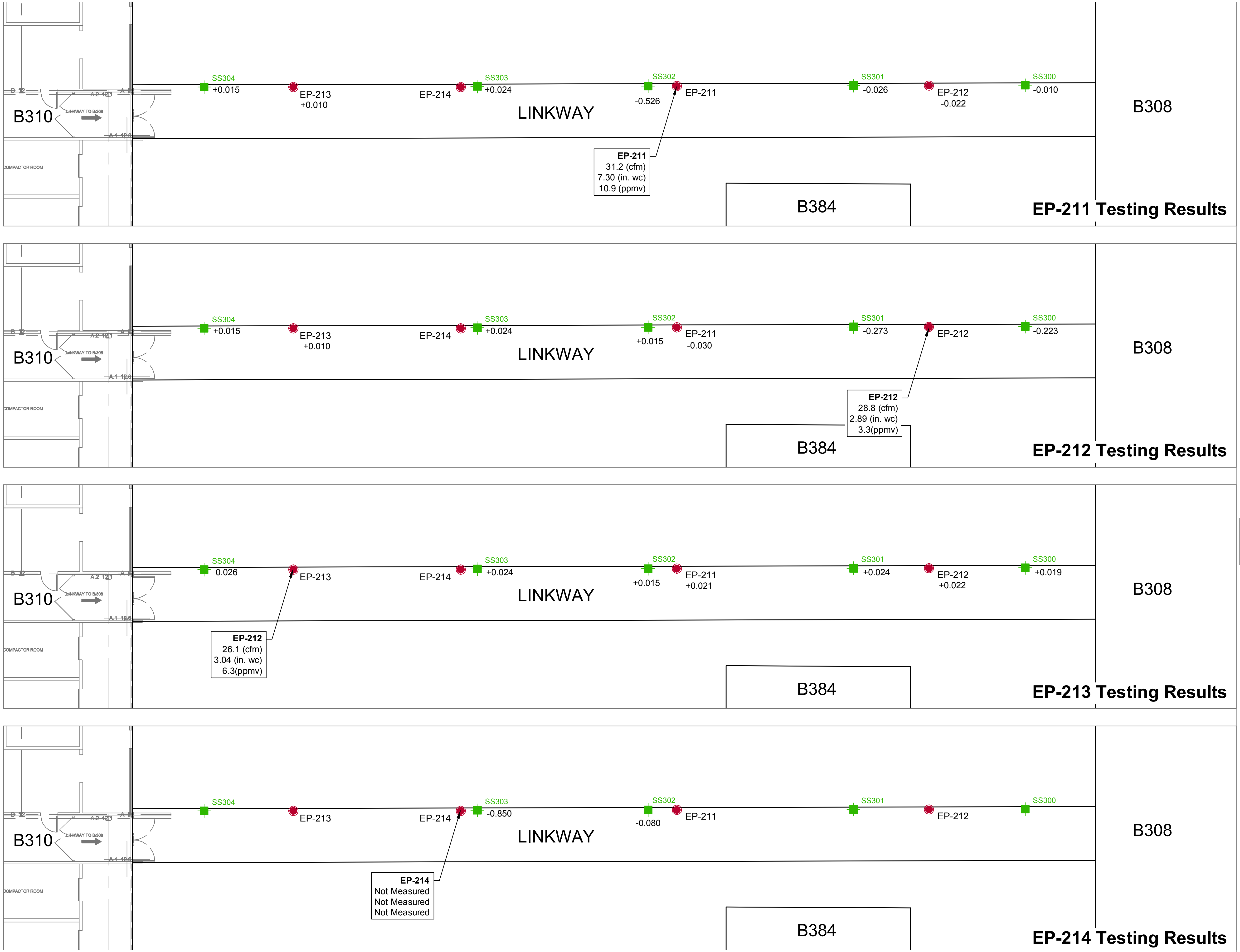

Figure 3

Subslab Pressure Response to Vapor Extraction Testing

Pilot Test Report - B310/B308 Linkway
Subslab Depressurization System

Former IBM East Fishkill Facility
Hopewell Junction, New York

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Figure Narrative

This figure shows the vapor extraction test data and observed subslab pressure response. The extraction tests were conducted individually. Flow rate, vacuum, and a PID reading were not recorded during the EP-214 extraction test. Subslab pressure was monitored using a digital manometer referenced to the indoor pressure. Negative values indicate subslab pressure less than room air pressure.

Legend

SS300 — 1/2 inch subslab monitoring port

EP-211 — Subslab extraction port

-0.026 — Differential pressure measurement (in. wc)

EP-212 / 26.1 (cfm) / 3.04 (in. wc) / 6.3(ppmv) — Extraction port / Flow rate (cu. ft. per min.) / Vacuum (extraction port) / PID concentration

N

10' 5' 0 10' 20' Feet

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