Evaluation of Corrective Action Alternatives:

Former Bennington High School, 650 Main Street, Bennington, Vermont, SMS# 2023-5275

January 2, 2024

STONE
ENVIRONMENTAL

PROJECT NO.

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Acknowledgements

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Title and Approval Page

Document Title

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I certify under penalty of perjury that I am an environmental professional and that all content contained within this deliverable is to the best of my knowledge true and correct.

January 2, 2024

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Katrina Mattice, P.E.

By my signature, as a Vermont Registered Engineer that I hereby certify that I have reviewed this document.

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Executive Summary

Stone Environmental, Inc. (Stone) has prepared this Evaluation of Corrective Action Alternatives (ECAA) Report on behalf of Hale Resources, LLC (Hale) for the proposed brownfield redevelopment of the former Bennington High School property located at 650 Main Street in Bennington, Vermont (the Site). The Site is enrolled in the Brownfield-Reuse Environmental Liability Limitation Act (BRELLA) Program and is a listed State of Vermont Hazardous Waste Site under Sites Management Section (SMS) #2023-5275.

The Site is located at 42.878750° north latitude and -73.189987° west longitude at an elevation of approximately 713 feet above sea level. The Site is comprised of a 2.29-acre parcel and is identified by the Town as parcel 51535800. The Site is situated in a mixed-use district in the east-central portion of Bennington. The Site is currently vacant and is owned by Bennington High, LLC. The Site building was formerly the location of Bennington High School, later Bennington Middle School, and is known locally as "Benn High."

Hale and the Town of Bennington seek to redevelop the Site for a mixed-use development including a mixture of market-rate and assisted housing, a day care, senior center, Meals on Wheels, and YMCA. Construction is slated to begin in spring 2024.

Prior environmental assessment of the Site has revealed the following environmental conditions that require corrective actions prior to reuse of the site:

1. Surface soil contains polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs) at concentrations that are greater than the resident Vermont Soil Standards (VSS), where PAHs also exceed the non-resident VSS. Lead is also present at concentrations that exceed the resident VSS in one of seven samples. Under current conditions, there is a risk to current and future Site users.
2. Indoor air quality is at risk due to the potential for vapor intrusion of volatile organic compounds (VOCs).
3. Materials containing PCB bulk product and dielectric fluids containing PCBs have impacted indoor air quality. Indoor air was found to contain PCBs in concentrations exceeding the non-residential EPA Regional Screening Levels (RSL) in all samples.
4. Asbestos containing materials (ACM) are present throughout the Site building. Redevelopment of the Site building will need to include abatement or encapsulation of these materials prior to or as part of renovations.

The following remedial alternatives were considered during this ECAA:

- Direct contact risk to contaminated soils:
  - Alternative 1: No Action
  - Alternative 2: Engineered Barriers
  - Alternative 3: Targeted Soil Removal with Engineered Barriers
- Vapor intrusion risk into the Site building:

- Alternative 1: No action
- Alternative 2: HVAC System Manipulation
- Alternative 3: Sub-Slab Depressurization System

Common to all alternatives are measures to remove PCB and asbestos contaminated materials from the Site building.

Based on the results of the ECAA, the proposed corrective actions are:

- Soil Management Alternative: Targeted Soil Removal to Maintain grades within Site tolerances with installation of Engineered Barriers.
- Soil Vapor Alternative: Active SSD with Vapor Barrier
- Asbestos and PCB Containing Materials Management: Building material abatement prior to renovations.
- Universal Waste Management

Following concurrence by Vermont Department of Environmental Conservation (VT DEC) and the Development Team, a Corrective Action Plan (CAP) will be prepared that incorporates all previous investigation results and provides details for the corrective actions selected by this ECAA. The CAP will be prepared in accordance with the Investigation and Remediation of Contaminated Properties Rule (IRule).

Acronyms and Abbreviations

Term	Definition
ACM	Asbestos Containing Materials
AHERA	Asbestos Hazardous Emergency Response Act
AMI	Area Median Income
ANR	Agency of Natural Resources
BCRC	Bennington County Regional Commission
ft bgs	Feet Below Ground Surface
BRELLA	Brownfields Reuse and Environmental Liability Limitation Act
BTEX	Sum of Benzene, Toluene, Ethylbenzene, and Xylenes
CAP	Corrective Action Plan
Catamount	Catamount Environmental, Inc.
CSM	Conceptual Site Model
ECAA	Evaluation of Corrective Action Alternatives
EPA	Environmental Protection Agency
ESA	Environmental Site Assessment
Griffin	Griffin International Inc.
Hale	Hale Resources, LLC.
HREC	Historical Recognized Environmental Condition
IDW	Investigation Derived Wastes
IRule	Investigation and Remediation of Contaminated Properties Rule
LAG	Lincoln Applied Geology
MTBE	Methyl-Tert-Butyl-Ether
MMIP	Monitoring and Maintenance Implementation Plan
PAHs	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PCE	Tetrachloroethylene
PE	Professional Engineer
PG	Professional Geologist
PID	Photoionization Detector
PPE	Personal Protective Equipment
ppm	Parts Per Million

PUF	Polyurethane Foam
QA	Quality Assurance
QC	Quality Control
QEP	Qualified Environmental Professional
REC	Recognized Environmental Condition
RPD	Relative Percent Difference
RSL	Regional Screening Level
SMS	Sites Management Section
SOP	Standard Operating Procedure
Stone	Stone Environmental Inc.
TEF	Toxicity Equivalence Factor
TEQ	Toxicity Equivalence Quotient
TPH	Total Petroleum Hydrocarbons
TSCA	Toxic Substances Control Act
UST	Underground Storage Tank
VIS	Vapor Intrusion Standard
VOC	Volatile Organic Compound
VSS	Vermont Soil Standards
VT DEC	Vermont Department of Environmental Conservation

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1. Introduction

Stone Environmental, Inc. was commissioned by the Bennington County Regional Commission (BCRC) and Hale Resources, LLC (Hale) to develop this Evaluation of Corrective Action Alternatives (ECAA) of the property located at 650 Main Street, Bennington, Vermont (the Site). Working in partnership with the Town of Bennington, Hale intends to redevelop the Site for a mixed-use development including non-residential and residential uses. The residential component will include 22 market rate and 15 affordable housing units. Non-residential uses will include a day care facility, senior center, Meals on Wheels, and YMCA.

Corrective actions are necessary at the Site to address the following conditions:

1. Surface soil contains polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs) at concentrations that are greater than the resident Vermont Soil Standards (VSS), where PAHs also exceed the non-resident VSS. Lead is also present at concentrations that exceed the resident VSS in one of seven samples. Under current conditions, there is a risk to current and future Site users.
2. Indoor air quality is at risk due to the potential for vapor intrusion of volatile organic compounds (VOCs).
3. Materials containing PCB bulk product and dielectric fluids containing PCBs have impacted indoor air quality. Indoor air was found to contain PCBs in concentrations exceeding the non-residential EPA Regional Screening Level (RSL) in all samples.
4. Asbestos containing materials (ACM) are present throughout the Site building. Redevelopment of the Site building will need to include abatement or encapsulation of these materials prior to or as part of renovations.

1.1. Site Description

The Site is located at 42.878750° north latitude and -73.189987° west longitude at an elevation of approximately 713 feet above sea level in Bennington, Bennington County, Vermont (Figure 1, Appendix A). The Site is comprised of a 2.29-acre parcel, located at 650 Main Street in Bennington, Vermont, as depicted on Figure 1, Location Map (Appendix A). The Subject Property is identified by the Town as parcel 51535800.

The Site is situated in a mixed-use district in the east-central portion of Bennington, Vermont. The Site is currently vacant and is owned by Bennington High, LLC. The Site building was formerly the location of Bennington High School, later Bennington Middle School, and is known locally as "Benn High."

The Site is abutted by commercial and residential properties (Figure 2). The Walloomsac River is located approximately 180 feet north of the Site and the Site is partially within the 1% flood inundation hazard area. The building has road frontage on both Main Street (south) and Pleasant Street (north and east). Exterior grassy areas are limited to a small lawn south of the main entrance, a small side lawn, and grassy medians within the southern parking lot (Figure 3, Appendix A).

The Site is improved by a former school building with a total square footage of 98,962 square feet and associated parking and driveways. The Site was first developed in 1913. Benn High was built in four distinct phases (1913, 1939, 1958, and 1975); in 2005, the 1913, 1939, and 1958 portions of the Site building were listed on the National Register of Historic Places.

The building construction techniques vary depending on the location as follows:

- 1913: Basement plus two additional floors; wood framing; measures approximately 10,950 feet per floor.
- 1939: Two stories with partial slab on grade; crawlspace below gymnasium. Measures approximately 12,000 square feet.
- 1958: Two story, slab on grade, steel framed with structural concrete slabs. Measures approximately 17,600 square feet per floor.
- 1975: One story, slab on grade. Measures approximately 7,600 square feet. Includes a 300 square foot vestibule attached to 1958 building.

The Site is accessed from Main Street and Pleasant Street. There is a 33,000-square foot paved parking lot along Pleasant connecting to Main Street, east of the Site building. The Subject Property building occupies roughly half of the Site; the balance of the property is paved with flat terrain with small areas of sod.

1.2. Site Contact Information

Contact information for the current property owner and prospective purchaser are included in Table 1, below:

Table 1: Site Contact Information

Name	Description/Relationship to Site	Contact Information
Bennington High, LLC Christopher P. Gilbert	Owner	chrisgilbert@frontiernet.net 93 Fraleigh Lane Red Hook, NY 12571
650 Main Street, LLC Jon Hale, President Zak Hale, Partner, CEO	Prospective Purchaser	jon@haleresources.com zak@haleresources.com Hale Resources, LLC 111 South Main Street Bennington, VT 05201

1.3. Redevelopment Plan

The redevelopment of the former Bennington High School is a public/private partnership between the Town of Bennington and Hale Resources, LLC to repurpose the historic Old Bennington High School building for housing, community recreation, and social services. In April 2022, the Town entered into a lease to own agreement with the current owner to gain control of the building and began predevelopment work on architectural plans and cost estimates for community spaces. In August 2022, the Town entered into an agreement with Hale Resources to begin predevelopment work on the 70,000 square feet of potential residential space in the building. In October 2022, the Bennington Select Board committed $2 million in local American Rescue Plan Act funding to the Benn High redevelopment. Thirty-seven housing units are planned, with 15 units being perpetually affordable. The 15 perpetually affordable units will target three persons experiencing homelessness, in addition, two families earning less than 30% of the area median income (AMI), three families less than 50% of the AMI, and ten Families less than 60% of the AMI. Twenty-two additional units will consist of both market rate and some affordable housing for 5 –10 years. The development will also include a childcare facility. Approximately 14,000 square feet are slated to be occupied by the Town's Senior Center and Meals on Wheels program. An additional 16,000 square feet of gymnasium space, exercise/activity rooms and locker rooms will be operated by the YMCA. The remaining areas will be used as workshops and office spaces occupied by community organizations.

1.4. Site History

The Site was developed sometime prior to 1835 when the use consisted of four residential homes. By 1852, the Site was still occupied by four residential buildings but also had industrial development along Pleasant Street by a brick maker. By 1877, industrial use shifted to become the Olin Scott's Foundry & Machine Shops, later referred to as the Bennington Machine Works. The machine works continued operating at the Site and immediately northeast of the Site until at least 1925. According to the 1946 Sanborn Fire Insurance Map, the former Bennington Machine Works foundry building, located at the current 334 Pleasant Street property, was converted to an automotive sales and service business that included four gasoline USTs; these USTs were located within 100 feet of the Site and there is no record of their removal.

In 1913, construction of Bennington High School began. Additions to the original school building were made in 1939, 1958, and 1975. The building served as Bennington High School from 1913 to 1967, upon which it became Bennington Middle School. In 2004, Bennington transferred its students to a new school building and plans were set to reuse the school building as a senior living facility. In 2005, the building was listed on the National Register of Historic Places by the US Department of Interior. In 2006, due to a water line rupture, the building suffered damage. The property was foreclosed in 2009 and later transferred to ML Development, LLC through auction. Improvements made during ML Development's ownership included roof repairs, removal of the boiler and associated ACM, and removal of a 10,000-gallon fuel oil UST. Bennington High, LLC took ownership of the Site in 2020 and began renovations including replacing windows, trash removal, plumbing, waterline replacement, upgrades to the sprinklers, insulation, and various other improvements.

1.5. Prior Environmental Investigations

Environmental assessments of the Site include the following:

- Griffin International, 1993. Tank Closure Inspection Report, Former Mount Anthony Middle School, December.
- Griffin International, 1994, Report on the Investigation of Subsurface Petroleum Contamination at Mount Anthony Union Middle School, Bennington, Vermont, March.
- George Desch, Site Management Activities Completed, Mount Anthony Union High School, Bennington (site #93-1555), Letter to Mr. Dick Lavariere, Mount Anthony Union School District # 14, May.
- Lincoln Applied Geology, 2009, Phase I Environmental Site Assessment Report, Former Mount Anthony Junior High School, July.
- Paul D.G. Miller/Consulting Hydrogeologist, 2009, UST Closure Report, Former Mt. Anthony Middle School, 640 Main Street (*sic)* Bennington, VT, November.
- Paul D.G. Miller/Consulting Hydrogeologist, 2022, Phase I Environmental Site Assessment, 650 Main Street Property, 650 Main Street, Bennington, Vermont 05201, October.
- Catamount Environmental, 2023, Asbestos Building Materials Investigative Report for Hale Resources of the Former High School located at 650 Main Street, Bennington, Vermont, February.

- Stone Environmental Inc., 2023, Phase II Environmental Site Assessment: Former Bennington High School, December 12.

Summaries of the reports mentioned above can be found in the sections below:

1.5.1. Tank Closure Inspection Report, Former Mount Anthony Middle School, Griffin International, December 24, 1993

On December 22, 1993, an inspection was performed following the removal of a 10,000-gallon, single-walled UST used to contain #2 fuel oil (UST#2). The tank was in the alcove between the 1913 and 1975 portions of the Site building. The age of the UST was unknown and was out of service since 1975 when a new UST was installed. No evidence of contamination was observed during the removal of the UST, fill port, or suction lines. Groundwater was observed at approximately nine (9) feet below ground surface (bgs) and did not show evidence of sheen. Soil was logged as coarse sand and gravel.

1.5.2. Report on the Investigation of Subsurface Petroleum Contamination at Mount Anthony Union Middle School, Bennington, Vermont, Griffin International, March 23, 1994

In November 1993, a leak was detected within underground piping for a 10,000-gallon fuel oil UST (UST#1); the volume and duration of the release is unknown. In December 1993, Griffin International Inc. (Griffin) performed a closure inspection of separate 10,000-gallon UST (UST#2) located approximately 75 feet from UST#1. Due to the nature of the leak, at the request of and under contract with the Vermont Department of Environmental Conservation (VT DEC), Griffin performed assessment of the release from the UST#1 delivery system. In February 1994, Griffin oversaw the installation of three groundwater monitoring wells using air rotary technique due to the cobbly nature of the subsurface soils. A fourth well was previously installed on site adjacent to UST#1. No soil samples were collected during the well installation because of the reliance of high-pressure air to remove soil cuttings from the bore hole during drilling. Despite the use of air rotary, VOCs were measured up to 15 parts per million (ppm) by photoionization detector (PID) in MW3 at the northeast corner of the building in the upgradient direction. Groundwater samples were collected from the four Site monitoring wells[1] and submitted for laboratory analysis of petroleum hydrocarbons by Environmental Protection Agency (EPA) Method 602, specifically benzene, toluene, ethylbenzene, xylene (collectively known as BTEX), methyl-tertiary-butyl-ether (MTBE), and total petroleum hydrocarbons (TPH). No other VOCs were targeted during the analysis.

Groundwater concentration results did not indicate the presence of target analytes in three of the four groundwater wells. MW3, located at the northeast corner of the Site, contained detectable concentrations of ethylbenzene, toluene, and xylene but were lower than the Vermont Drinking Water Standards that were in effect at the time of the assessment.

Groundwater was found to be within 8 to 10 feet of the ground surface and flow to the southwest[2] at a gradient of 2%.

Petroleum contaminated soil impacted from the 1993 leak was previously stockpiled at the Site and was found to contain up to 6 ppm total VOCs by PID. The fate of these soils is not known, but there are no soil stockpiles at the Site currently.

[1] The methodology for collection of groundwater samples was not specified. At this time, it was common industry practice to sample groundwater using bailers.

[2] Griffin International provided contradictory statements in their narrative of the 1994 SI report. The data in the same report, and the contouring thereof, indicate a hydraulic gradient to the southwest. We presume the claimed southeasterly groundwater flow in the narrative was an error.

1.5.3. Sites Management Activities Completed, Mount Anthony Union High School, Bennington (site #93-1555), Letter to Mr. Dick Lavariere, Mount Anthony Union School District #14 from George Desch, Sites Management Section of VT DEC, May 24, 1994

The subject letter mentions that the Site building had extensive vapor impacts from an unknown source. Measures to identify the source of the vapor contamination were deemed inconclusive but have dissipated over time. The letter also provides results of an additional round of groundwater samples collected from three of the four Site monitoring wells (MW1, 2, and 3) in April 1994. The samples were submitted for analysis by EPA Method 8240, which includes a broader suite of target analytes including ketones and chlorinated aliphatic hydrocarbons. No target analytes were detected in the April 1994 sampling round. Based on the condition of the Site and dissipation of the indoor air impacts, the SMS ceased ongoing management of the Site.

1.5.4. Phase I Environmental Site Assessment Report, Former Mount Anthony Junior High School, Lincoln Applied Geology, July 6, 2009

A Phase I ESA was performed by Lincoln Applied Geology (LAG) for Chittenden Bank in accordance with ASTM E1527-05, which was the standard practice at the time of the report. The Phase I ESA identified the following RECs and recommendations associated with the Site:

- Moldy surfaces existed inside of the building. To avoid future health hazards, LAG recommended that the mold be removed prior to future occupancy.
- Bird guano exists in the building upper floor. Since bird droppings can cause infectious diseases, guano should be properly managed when removed for disposal.
- All unknown substances observed in unmarked containers should be identified and properly disposed of.
- A 10,000-gallon heating oil UST appeared to exist in the parking lot between the building and Main Street. The condition of the tank was not known. Similarly, it was not known if the UST still contains product. It was recommended that the UST be removed, and an assessment be performed at the time of the removal.
- The whereabouts of the contaminated soil previously excavated and stockpiled at the Site is unknown.
- The monitoring well discovered by LAG on the east side of the Site and labeled by Griffin as MW3 contained low levels of contamination at the time it was last sampled in 1994.
- Potential ACM, consisting of ceiling tiles, floor tiles, plaster wallboards, thermal pipe insulation, and furnace insulation exist in the building. LAG recommended that an asbestos survey be performed to determine the presence or absence of asbestos.
- Due to the age of the building and its deteriorating condition, the presence of lead-based paint is likely. It was recommended that a survey be performed of the building to determine the presence of lead-based paint.

1.5.5. UST Closure Report, Former Mt. Anthony Middle School, 640 Main Street (*sic*), Bennington, VT, Paul D.G. Miller/Consulting Hydrogeologist, November 18, 2009

Report consists of an UST closure report for 10,000-gallon UST-1 containing #2 fuel oil located south and east of the Site building in the parking area. The UST was reportedly installed in 1987 and was single wall construction. No pitting or degradation was noted on the UST or piping. Soils in the excavation were found to consist of silt with some cobbles and fine to coarse gravel and little fine to coarse sand. No VOCs were detected above 0.0 ppm by PID field screening.

1.5.6. Phase I Environmental Site Assessment, 650 Main Street Property, 650 Main Street, Bennington, Vermont 05201, Paul D.G. Miller Consulting Hydrogeologist, October 28, 2022

A Phase I ESA report with performed for the Hales and includes the results of an indoor air assessment for PCBs. The report provides much background information including detailed site history and renovations. Through the Phase I ESA, no findings were noted aside from two (2) historical recognized environmental conditions (HRECs) related to the two former USTs. No additional assessment was recommended in the Phase I ESA.

Assessment of indoor air for PCBs consisted of the collection of 11 samples of indoor air using polyurethane foam on April 21 and 22, 2022. Samples were collected over eight (8)-hour periods and submitted for analysis of PCBs by Method TO-10. No information on flow rate or justification for sample locations is provided in the report. Sample results contained no detectable concentrations of PCBs.

The Phase I ESA indicated that the building was constructed prior to the ban on ACM and lead-based paint and that these materials could be present in the Site building.

1.5.7. Asbestos Building Materials Investigative Report for Hale Resources of the Former High School Located at 650 Main Street, Bennington, Vermont, Catamount Environmental, Inc., February 22, 2023

Catamount Environmental, Inc. (Catamount) developed a report on an inspection of potential ACM within the Site building under contract with Hale. The assessment was focused on proposed areas of renovations and did not attempt to comply with Asbestos Hazardous Emergency Response Act (AHERA) guidelines. In the assessment, Catamount documented the occurrence of asbestos throughout the Site in plaster, cove base molding cement, joint compound, paneling glue, wall glue, floor adhesives, caulk, chalk board adhesive, and floor tile mastic.

1.5.8. Phase II Environmental Site Assessment: Former Bennington High School, Stone Environmental Inc., December 12, 2023.

Stone performed a Phase II ESA to evaluate whether RECs and HRECs identified in the October 2022 Phase I ESA constitute an actual release to the environment. The Phase II ESA included assessment of surface and subsurface exterior soil, soil gas, an indoor air quality assessment, and assessment of building materials for PCBs and asbestos. Based on the findings of the Phase II ESA, Stone makes the following conclusions:

1. Surface soil contains PAHs, and PCBs at concentrations that are greater than the resident and non-resident VSS. Lead is also present at concentrations that exceed the resident VSS in one of seven samples.
    i. Under current conditions, there is a risk to current and future Site users; despite limited surface soil on-Site, concentrations of the contaminants listed above are high enough to warrant corrective action.
2. Subsurface conditions present an unacceptable risk to indoor air quality through vapor intrusion.
    i. Subsurface soils around the former USTs show little to no contamination of petroleum contamination from past releases. However, residual vapor phase petroleum contamination, specifically naphthalene, is present in soil gas at concentrations that exceed the residential Vapor Intrusion Standard (VIS). The most likely source of naphthalene in soil gas is from the prior releases of heating fuel from the former Site USTs.

ii. Past land use of the Site and possibly nearby properties for metal machining has resulted in a release of tetrachloroethylene (PCE) to the subsurface. Soil gas concentrations of PCE exceed the residential VIS.
iii. Chloroform, likely related to past or possibly ongoing leaks/discharges of chlorinated water from the municipal drinking water system, is present in soil gas at concentrations that exceed both the residential and non-residential VIS.

3. Materials containing PCB bulk product and dielectric fluids containing PCBs have impacted indoor air quality. Indoor air was found to contain PCBs in concentrations exceeding the non-residential EPA RSL in all samples.
   i. Low levels of PCBs in bulk products have been detected in all Site areas in various construction materials. The product with the highest concentrations, which exceed the Toxic Substances Control Act (TSCA) bulk product threshold, is paint found within room 319. Other detections are considered excluded bulk product under TSCA.
   ii. Liquid releases of PCB contaminated fluids have occurred from hydraulic and dielectric fluids. The highest concentrations of PCBs were associated with fluorescent light ballasts.
4. ACM is present throughout the Site building. Redevelopment of the Site building will need to include abatement or encapsulation of these materials prior to or as part of renovations.

2. Conceptual Site Model

The following Conceptual Site Model (CSM) provides a set of working hypotheses that describe key aspects of the Site. As with any hypothesis, the CSM may require additional testing to arrive at the desired level of confidence. The CSM includes a discussion of the physical, geologic, and hydraulic attributes of the Site and surrounding area, how chemicals were released at the Site, their transport pathways, fate mechanisms, and potential routes of exposure to ecological and human receptors. The CSM provides the context from which the site investigation is developed and a framework to make sound Site management decisions.

2.1. Geology and Hydrogeology

2.1.1. Bedrock

According to the Bedrock Geologic Map of Vermont (Ratcliffe et al., 2011) the primary bedrock type below the Site is Winooski Dolostone; a well-bedded dolostone with phyllite, siliceous partings, and thin beds of blue quartz pebble conglomerate and quartzite.

2.1.2. Surficial Geology

According to the Vermont Agency of Natural Resources (ANR) Natural Resources Atlas, surficial geology at the Site consists of glaciofluvial outwash – a horizontally bedded glaciofluvial gravel. Past site investigations and the subsurface assessment performed during the 2023 Phase II ESA have shown that soils below the Site contain silt to stony loam with coarse gravel, fine to coarse sand, and cobbles. Past Site investigations performed in the 1990s (e.g., Griffin 1992) relied on rotary air hammer drilling technique due to the predominance of coarse cobbles and gravel at the Site.

Based on our understanding of the Site, the stratigraphic setting can best be described as a high-energy depositional environment that was near sources of glacial meltwater following the deglaciation of this portion of Vermont following the last glacial maximum (circa 21,000 years before present); the Laurentide Ice Sheet retreated from southern Vermont by approximately 13,000 years before present.

It is unknown if the coarse outwash deposits are in direct contact with bedrock below the Site.

2.1.3. Hydrology and Hydrogeology

The Site is located approximately 500 feet southwest of the Walloomsac River, which flows east to west nearest the Site before merging with the Roaring Branch of the Walloomsac River approximately one (1) mile northwest of the Site.

Past investigations of the Site for assessment of release(s) from former USTs reported groundwater at nine (9) feet below ground surface and with a horizontal component of hydraulic head to be at a gradient of two percent and flowing to the southwest. Given the high hydraulic conductivity of Site soils, the reported hydraulic gradients are suspiciously steep, however, it is consistent with other sites in Bennington that lie the Walloomsac River outwash deposits (e.g., Jard Company Site, SMS# 770138).

2.2. Contaminant Distribution, Fate, and Transport

The following sections describe the sources, magnitude, nature, and extent of potential contaminants of concern.

2.2.1. VOCs

VOC impacts to the Site building date back to odors noted by school staff in indoor air in 1993. Past operation of heating fuel USTs at the Site resulted in a release of fuel oil to the subsurface on the south side of the Site and was believed to be, in part, responsible for the odors in indoor air. The extent of contamination from this release appears to be minimal, with a limited impact to soil near the UST. During assessment of the release, groundwater upgradient of the USTs and Site building was found to contain detectable concentrations of VOCs and soils contained 15 ppm total VOCs even with potential low bias on the result given the drilling technique (air rotary). Historic use of the Site and upgradient property included machining, foundering, automotive repair, and retail gasoline sales. It is not known whether these prior uses of the Site or upgradient property have resulted in impacts to the environmental condition of the Site.

Through the findings of this Phase II ESA, volatile contaminants of concern include petroleum VOCs, specifically naphthalene, the chlorinated solvent PCE, and chloroform, were each detected in Site soil gas above the residential VIS. Acetone was also detected in soil gas samples at the Site with a high concentration found in one sample (SG-04) which also had elevated isopropyl alcohol and PID measurement. While acetone and isopropyl alcohol are common laboratory contaminants, their occurrence at the Site may also be the result of an on-Site release. Neither acetone nor isopropyl alcohol have a VIS.

In general, once released to the subsurface, petroleum compounds and chlorinated solvents can partition into four phases 1) vapor (i.e., soil gas), 2) aqueous (dissolved in pore water or groundwater), 3) sorbed (to soil minerals and organic matter), and 4) remain as non-aqueous phase liquid (NAPL), either residual or mobile. Once released to the subsurface, the phase portioning and migration of VOCs depends on several factors including: the volume of the release, the physical and chemical properties of the individual VOC, and the physical and chemical properties of the media that the VOCs were released into. Petroleum related compounds are typically readily absorbed in soil and organic matter, have a relatively low aqueous solubility, and are biodegradable under both aerobic and anaerobic conditions.

Naphthalene was detected above the resident VIS at two soil gas sampling locations; one in the northeast corner of the Site (SG-02) and one in the center of the Site (SG-05). Since sample SG-05 is next to the location of a former UST, this detection of naphthalene is likely from a release of that UST. The source of naphthalene at SG-02 is difficult to determine but may be related to an off Site upgradient release. While these detections are greater than the residential VIS, they were below the laboratory reporting limit.

Chloroform was detected above the resident VIS in two soil gas samples in the northeast corner of the Site (SG-01 and SG-03). Chloroform was detected above the non-resident VIS at two soil gas samples in the southern half of the Site (SG-07 and SG-08). Chloroform is a common byproduct from the disinfection of drinking water treated with chlorine. A leak in the municipal water system occurred in 2006 and is a likely source for the elevated chloroform in soil gas of the Site.

PCE is present in soil gas at a concentration that exceeds the resident VIS at one location in the southwest portion of the Site. PCE is a common industrial solvent and commonly used in the dry-cleaning industry. Based on the historical land use as a machine shop, we expect that this finding may be attributable to an unreported release of PCE during degreasing activities.

2.2.2. Lead

Lead contamination in surface soil appears to be present in all samples above the laboratory reporting limit. The most likely source of lead in soil is from lead-based paint on exterior trim. Lead is also a common contaminant in historic fill from burning coal. Given the minimal extent of soil at the Site, exterior impacts from lead-based paint are likely limited to the narrow greenbelt along the west side of the Site building.

Lead was detected above the resident VSS in one surface soil sample on the western portion of the Site (SS-04). Given the proposed use of the Site for residential units, the occurrence of lead in soil presents an unacceptable risk of exposure and will require corrective action.

2.2.3. Polychlorinated Biphenyls (PCBs)

PCBs are a group of structurally similar man-made chemicals that were manufactured in the United States from 1929 until 1979, when manufacturing PCBs was banned. PCBs were commonly used in dielectric fluid used in electrical equipment, including transformers and capacitors. Also, PCBs were commonly used as plasticizers in building products, such as paint, caulk, and window glazing used in construction and renovations of large buildings, such as schools and manufacturing plants, between approximately 1950 and 1979.

Assessment of indoor air quality performed during the 2023 Phase II ESA indicates that PCB containing bulk products or liquid releases of PCB fluids off-gassing to indoor air are present at the Site.

Hydraulic oils and electrical equipment commonly contain PCBs due to their exceptional heat and electrical isolation properties. At the Site, hydraulic oil is suspected in the Site elevator equipment. One electrical transformer is present on the exterior of the Site building on a concrete pad along the western façade. Electrical transformers, fluorescent light ballasts, capacitors, and switches are present in the Site building. Wipe sampling of fluorescent light ballasts, hydraulic equipment, and electrical equipment have indicated that PCB contaminated fluids have been released from the ballasts to the exterior of the ballasts and light trays. Light ballasts were found to have leaked dielectric fluid in many areas of the Site and these fluids contain PCBs. We expect that more light ballasts have leaked than was observed during this assessment.

PCBs can diffuse into adjacent porous materials, such as brick and masonry, and serve as a secondary source of contamination— often re-contaminating new caulks and adjacent materials through back diffusion. At the Site, PCBs were detected in various construction materials and were found to be at concentrations that exceed the TSCA bulk product threshold in paint in one room. While not pervasive at the Site in bulk product at concentrations above the TSCA threshold, we expect that lightly contaminated materials covering a large surface may be contributing to the observed indoor air quality conditions.

Weathered PCB building materials on exterior trim, if present, can impact surface soil. Detectable concentrations of PCBs in surface soil were observed in six of twelve locations. All but one location with detections were less than the VSS for residential properties, however, one location, in the greenbelt along Pearl Street in the northwest corner of the Site, contained PCBs at a concentration of 0.251 ppm which exceeds the residential VSS. No exterior soil sample contained PCBs above the TSCA bulk remediation waste walkaway criteria for high occupancy sites of 1.0 ppm.

2.2.4. PAHs

PAHs are common contaminants in urban areas from increased occurrence of combustion for heating and transportation while also used for common construction materials, such as asphalt.

PAHs were detected in all surface soil samples except for SS-01. PAHs were detected above the Vermont Urban Background levels in ten of twelve surface soil samples (SS-02, SS-03, SS-04, SS-06, SS-07, SS-08, SS-09, SS-10, SS-11, and SS-12). Four surface soil samples (SS-02, SS-03, SS-06, and SS-09) display levels of PAHs higher than the non-resident VSS standard.

2.2.5. ACM

ACM is present in all areas of the Site in thermal system insulation, vinyl tile mastic, plaster, drop ceiling tiles, and joint compound, among other materials. Friable asbestos fibers, if disturbed, will present an unacceptable risk to occupants through inhalation.

2.3. Sensitive Receptor Evaluation

Contamination from Site sources has been evaluated for its potential to adversely affect sensitive receptors. Table 2 presents the potentially affected media, potential pathways, and potential receptors.

Table 2: Sensitive Receptors Evaluation

Potentially Affected Media	Potential Pathways	Sensitive Receptors	Relative Level of Risk
Surface Soil	Direct contact to impacted soils via dermal adsorption, ingestion, and inhalation.	Construction workers, Site users, building occupants.	High – While most of the Site is covered by the building imprint or pavement, surface soils are contaminated with elevated levels of lead, PAHs, and PCBs.
Subsurface Soil	Direct contact to subsurface soils if Site improvements cause future disturbances. Source of soil vapor contamination (VI Risk) or groundwater contamination.	Construction workers, Site users, building occupants.	Medium – Past operation of machine works at Site, migration from historical occurrence of gasoline USTs and automotive service upgradient of the Site may have caused releases to subsurface soils, as indicated by VOCs in soil gas. Concentrations of VOCs in subsurface soils around the former USTs are low.
Groundwater	Dissolved phase VOCs migrating in groundwater. Source of soil vapor contamination (VI Risk).	Indoor air, bedrock aquifer.	Low – Past assessment of the Site has demonstrated impacts to groundwater from an unknown source but at concentrations that are below relevant regulatory criteria.
Surface Water	Discharge of potential groundwater plume to surface water.	Recreational users, aquatic biota.	Low – Current understanding of groundwater flow indicates the hydraulic gradient of groundwater below the Site is away from nearby surface water (i.e., the Walloomsac

Potentially Affected Media	Potential Pathways	Sensitive Receptors	Relative Level of Risk
			is a losing stream adjacent the Site).
Indoor Air	Impact to indoor air from intrusion of contaminated soil vapor.	Building occupants, construction workers.	High – All indoor air samples display detections of PCBs above the EPA RSLs for non-residential properties. Soil gas contamination is present at concentrations that are higher than the residential VIS standard for PCE, naphthalene, and chloroform. ACM is present in all areas of the building.

Using the ANR Natural Resources Atlas, a qualitative receptor analysis was completed to evaluate the occurrence of potential receptors relative to the Site.

2.3.1. Drinking Water Supplies

Potable water at the Site and surrounding area is provided through the municipal water supply. One well (205 Pleasant Street; WRM#170) and one groundwater source protection area are located within one quarter mile of the Site.

2.3.2. Surface Water and Groundwater Source Protection Areas

The Walloomsac River is located approximately 500 feet to the northeast of the Site. Based on past investigations of the Site, groundwater beneath the Site is to the southwest away from the Walloomsac River.

2.3.3. Buildings with Basements

The Site building has a partial basement. Information concerning nearby properties is not readily available, but it is likely that nearby residences possess basements.

2.3.4. Wetlands

No wetlands were identified within 0.25 miles of the Site.

2.3.5. Sensitive Ecological Areas

No sensitive ecological areas, including deer wintering yards, significant natural communities, Vermont Fish and Wildlife managed lands, and Indiana Bat hibernacula, were identified within 0.25 mile of the Site.

2.3.6. Rare, Threatened, and Endangered Species

No rare, threatened, or endangered species are identified within 0.25 miles of the Site.

3. Evaluation of Corrective Action Alternatives

The intent of the ECAA is to determine what remedial strategies will be best suited to support the mitigation or remediation of exposure risk to Site users from Site contaminants of concern. The selected remedial approaches are then used to develop a recommendation for a specific corrective action strategy, in addition to providing criteria for design, construction, and operations and maintenance (O&M).

3.1. Regulatory Guidelines

Regulatory guidelines applicable to contaminated media identified at the Site includes:

- Soil Gas: Vapor Intrusion Standards (VIS) for resident and non-resident properties included as Appendix A - §35-APX-A2 of the Investigation and Remediation of Contaminated Properties Rule (IRule).
  - Chloroform, naphthalene, and PCE have been detected in soil gas above the resident VIS.
- Soils: Vermont Soil Standards (VSS) for resident and non-resident properties published in the Vermont Department of Environmental Conservation's (VT DEC) (IRule; effective July 6, 2019) as Appendix A - § 35-APX-A1. Analytes that do not have a VSS will be compared to current (November 2023) United States Environmental Protection Agency (EPA) Regional Screening Levels (RSLs) for resident and industrial soil.
  - Lead, total PCBs, and PAHs are above the VSS for residential properties;
  - PAHs are above the VSS for non-residential properties.
- Building Materials: US EPA TSCA Division for PCB bulk product and remediation wastes (40 CFR 761.61).
  - Fluorescent light ballasts appear to have leaked PCB contaminated di-electric fluid to shrouds and ballast pans; we expect that PCB-containing ballasts are present in building areas that did not receive upgrades to LED-lighting.
  - PCB-bulk product is present above the TSCA threshold in one room (paint in 319).
    - While not above the TSCA threshold, several paints were found to contain greater than 10 ppm, but less than 50 ppm. These include rooms BR202, 200-H7, 235, 229, and 224.
- Indoor Air: US EPA Regional Screening Levels (PCBs)
  - PCBs were detected in air above the US EPA Regional Screening Level for residential properties in all Site areas where indoor air samples were collected.

3.2. Remedial Alternatives Comparison

The remedial alternatives were subjected to a comparative analysis of their appropriateness for mitigating or remediating risk to known Site contaminants. The criteria listed below were used as the basis for the comparative analysis and are in accordance with §35-604 of the IRule.

- Overall Protectiveness – how well the technology will prevent exposure risk to Site users,

- Compliance with Applicable and Relevant Appropriate Requirements – whether the technology will effectively mitigate or remediate direct exposure risks and comply with legal requirements,
- Long-Term Effectiveness and Permanence – whether the technology is a viable long-term solution,
- Reduction in Toxicity, Mobility or Volume through Treatment – how well the technology will provide these contaminant treatment objectives,
- Short-Term Effectiveness – how well the technology will provide the desired effects in the early stage of implementation,
- Implementability – level of practical difficulty of implementing the technology,
- Environmental Impact and Sustainability,
- Capital Cost – qualitative rating of cost to construct the technology; and
- Community acceptance – assessment of whether interested people in the community would support, have reservations about, or oppose the alternative.

3.3. Evaluation of Remedial Alternatives for Soil Contamination

Remedial alternatives are required due lead, PCBs, and PAHs in soil above the relevant Site action levels (Figure 4, Appendix A). The following remedial alternatives have been considered as part of this ECAA to prevent the risk of exposure through direct contact:

- Alternative 1: No action
- Alternative 2: Engineered barriers
- Alternative 3: Targeted Soil Removal with Engineered Barriers

Costs for soil excavation, transport and disposal, and installation of engineered barriers were developed from recently completed remediation projects and using the VTrans 2-year price list:

- Vermont Agency of Transportation, *2-year Averaged Price List, December 2021 – 2023,* https://vtrans.vermont.gov/sites/aot/files/documents/2023%20December%20Average%20Prices%20-%202%20year.pdf, accessed December 12, 2023

3.3.1. Alternative 1: No action

Under the no action alternative, no remedial action will be performed to mitigate direct contact risk to Site users. This alternative will not be protective of human health due to the lead, PCBs, and PAHs in surface soil at concentrations that exceed the residential VSS.

Cost Considerations

There will be no direct monetary costs associated with the no action alternative.

Advantages

- Easy to implement and lowest cost since no action.

Disadvantages

- The risk of exposure to Site occupants and contractors would remain, occupants may have an unacceptable risk of exposure to Site contaminants.
- Does not comply with regulatory requirements for Site management. Site redevelopment for residential use would not be possible under Alternative 1.

3.3.2. Alternative 2: Engineered Barriers

Alternative 2 includes the installation of engineered barriers to prevent direct contact risk. The method and type of barrier will vary based on the desired finish but include at least 6 inches of material for impervious surfaces (e.g., asphalt or concrete) or 18 inches material for pervious surfaces such as grassy areas or playgrounds, as prescribed in the IRule. In either scenario, barrier materials are segregated from underlying contaminated soil with geotextile fabric whose purpose is to alert future users conducting earth work of the occurrence of contaminated soils. The engineered barrier would need to be maintained in perpetuity, but if the barrier is installed in accordance with the IRule (i.e., 18" thick), there are no annual reporting requirements. Thinner barriers often can be deployed in low-use areas in exchange for increased monitoring under an approved corrective action plan (CAP).

Estimated Cost

Table 3, below, presents the estimated costs to perform Alternative 2:

Table 3: ECAA Cost Estimate - Engineered Barriers

ITEM #	ITEM	AMOUNT	UNIT COST		TOTAL
1	MOBILIZATION	1	Est.	$15,000.00	$15,000.00
2	EXCAVATION	536	CY	$18.97	$10,166.66
3	TRANSPORT, DISPOSAL, & DISTRICT FEE - ADC	0	TON	$89.75	$0.00
4	INDICATOR FABRIC	893	SY	$2.01	$1,794.93
5	LANDSCAPE FILL	417	CY	$24.34	$10,145.81
6	TOPSOIL	119	CY	$46.43	$5,529.64
7	SOD	893	SY	$15.00	$13,395.00
				CONSTRUCTION TOTAL	***$56,032***
				CONSTRUCTION OVERSIGHT	***$9,218***
				CORRECTIVE ACTION COMPLETION REPORT	***$3,500***
				CONTINGENCY (20%)	***$11,206***
				TOTAL (ROUNDED TO NEAREST $100)	***$80,000***

Estimated costs assume the following:

- All volumes presented herein assume an expansion of 20% from in situ bank measurements due to sloughing of excavation walls and aeration.
- Tonnage estimates assume a density of 1.5 tons per cubic yard of soil.

Advantages

- The risk of exposure to contaminated soil will be eliminated.
- Lower cost.

Disadvantages

- Without removal of soil, exterior grades will change requiring changes to drainage designs and exterior access points.
- Increasing the elevation of the Site in areas within the flood plain may not be allowable.

3.3.3. Alternative 3: Targeted Soil Removal with Engineered Barriers

Alternative 3 includes the removal of volume from areas containing soil contamination to the extent that, following the installation of an engineered barrier, final grades will be unchanged from current Site conditions; eighteen inches of soil would be removed before installing indicator fabric and engineered barriers. Soils generated during Alternative 3 would be characterized for disposal off Site. If, following removal of soil, sub soil is found to not contain contaminants of concern above the residential VSS, the excavation can be backfilled using industry norms and would not need to serve as an engineered barrier and would not need to be maintained in accordance with institutional control plan.

Estimated Cost

Table 4, below, presents the estimated costs to perform Alternative 3:

Table 4: ECAA Cost Estimate – Targeted Soil Removal with Engineered Barriers

ITEM #	ITEM	AMOUNT	UNIT COST		TOTAL
1	MOBILIZATION	1	Est.	$15,000.00	$15,000.00
2	EXCAVATION	536	CY	$18.97	$10,166.66
4	TRANSPORT, DISPOSAL, & DISTRICT FEE - ADC	804	TON	$89.75	$72,150.03
3	LOADING	536	TON	$18.97	$10,167.92
4	CONFIRMATION SAMPLING	2,025	Est.	$1.00	$2,025.00
5	INDICATOR FABRIC	893	SY	$2.01	$1,794.93
6	LANDSCAPE FILL	417	CY	$24.34	$10,145.81
7	TOPSOIL	119	CY	$46.43	$5,529.64
8	SOD	893	SY	$15.00	$13,395.00
				CONSTRUCTION TOTAL	***$140,375***
				CONSTRUCTION OVERSIGHT	***$20,281***
				CORRECTIVE ACTION COMPLETION REPORT	***$3,500***
				CONTINGENCY (20%)	***$28,075***
				TOTAL (ROUNDED TO NEAREST $100)	***$192,300***

Estimated costs assume the following:

- All volumes presented herein assume an expansion of 20% from in situ bank measurements due to sloughing of excavation walls and aeration.
- Tonnage estimates assume a density of 1.5 tons per cubic yard of soil.
- We assume any waste soil will be managed as alternative daily cover at the NEWSVT landfill in Coventry, Vermont.

Advantages

- The risk of exposure to contaminated soil will be eliminated.
- Under this scenario, an institutional control plan may not be required if all contaminated soil is removed from the Site.
- The flood plain elevation will not be altered.

Disadvantages

- Higher costs than engineered barriers alone.

- Soil is assumed to be disposed of as alternative daily cover, but additional costs may incur based on results of waste characterization.

3.4. Evaluation of Remedial Alternatives for Soil Vapor Contamination

Remedial alternatives are required due to VOCs concentrations in soil vapor, which, if unmitigated, present a risk to indoor air through vapor intrusion (VI). Specifically, PCE, naphthalene, and chloroform are present at concentrations that exceed the residential VIS (Figure 5, Appendix A). The following remedial alternatives have been considered as part of this ECAA to prevent VI.

- Alternative 1: No action
- Alternative 2: Heating Ventilation Air Conditioning (HVAC) system manipulation
- Alternative 3: Sub-slab depressurization

Source removal, such as using soil vapor extraction with or without air sparging, was not considered viable given the low concentrations seen in soil gas and the uncertainty of the source; extensive further assessment would be needed to further evaluate source removal of VOCs.

Specific costs of construction to address vapor intrusion were not developed as part of this ECAA and are subject to building-specific design. Comparisons of capital costs were developed using published estimates of remedial strategies on a per-unit basis. Stone relied on the following references in developing estimates of capital costs:

- Lutes, C., et al., 2022, Cost Comparison of Soil Vapor Extraction and Sub Slab Depressurization for Vapor Intrusion Mitigation, Groundwater Monitoring and Remediation, Issue 42, number 4.
- ITRC, *Heating, Ventilation, and Air Conditioning (HVAC) Modification Tech Sheet*, https://vim-1.itrcweb.org/heating-ventilation-and-air-conditioning-hvac-modification-tech-sheet, accessed December 12, 2020.

3.4.1. Alternative 1: No Action

Under the no action alternative, no remedial action will be performed to mitigate the inhalation risk to Site users. This alternative will not be protective of human health due to the VI risk from sub-slab soil gas contamination into the Site building. There will be no direct monetary costs associated with the no action alternative.

Advantages

- Easy to implement and lowest cost since no action.

Disadvantages

- The VI risk in the Site building would remain, occupants may have an unacceptable risk of exposure to Site contaminants.
- Does not comply with regulatory requirements for Site management. Site redevelopment for residential use would not be possible under Alternative 1.

3.4.2. Alternative 2: HVAC Manipulation

Under normal conditions, heating buildings can enhance vapor intrusion by creating a negative pressure through the stack effect of the building. Seasonally, vapor intrusion is greater in winter months. Under Alternative 2, the building HVAC system would be designed to maintain positive pressure within the building relative to sub-slab conditions. Specifically, air handling units (AHUs) are altered such that the ratio of outdoor air and return air (i.e., air recycled from the building space) results in more supply air than return air.

Cost Considerations

Costs for implementing HVAC manipulations are very design dependent. As the renovation will include reuse of historic site finishes, including windows and doors, the cost for conditioning exterior air of sufficient volume to maintain the desired differential pressures between interior and sub slab air would be significant; the costs for conditioning outdoor air ranges from $6 to $12 per cubic foot per minute, where additional operating costs to modify HVAC systems to mitigate VI could exceed $1.53 per square foot annually[3]. Given the footprint of the Site building as approximately 48,000 square feet, costs for HVAC manipulation on an annual basis may exceed $73,400.

Advantages[4]

- Mitigation via HVAC can be used as a rapid response to lower indoor air concentrations quickly, and in some cases, positive pressures can effectively prevent VI.
- Normal HVAC operations in some buildings can maintain acceptable indoor air quality, despite VI potential from sub-slab VOC presence.
- Some buildings subject to VI are too technically difficult or costly to mitigate using other mitigation technologies (e.g., active manufacturing constraints, complex subgrade utility networks, complex foundations, very large areas).

Disadvantages

- Mitigation via HVAC does not address/remediate the VI source or pathway.
- HVAC systems are not intentionally designed for VI mitigation.
- Increase of air exchange rates leads to dilution of VI rather than prevention.
- There are many operating parameters to maintain.
- There are multiple points of operating variability/vulnerability.
- This solution is subject to human interference.
- Mitigation via HVAC can be energy intensive, resulting in increased cost – this is especially true in northern latitudes.
- Manipulating HVAC can alter humidity and cause moisture or mold damage.
- Automatic operating schedules may result in elevated indoor air concentrations when the system is shut off or shortly after it is turned on.
- It can take long periods of time to confirm effectiveness (verification sampling during different seasons).
- For positive pressure systems, the building must have a tight envelope; thus, positive pressure approaches work poorly on older buildings having poor insulation, windows, doors, etc.

In other solutions, HVAC manipulation can include increasing the air exchange rate of the building such that contaminants do not accumulate to unacceptable levels.

[3] ITRC, 2007a ITRC. "Vapor Intrusion Pathway: A Practical Guideline." Washington, DC: Interstate Technology & Regulatory Council, 2007a, accounting for 65% inflation from 2007 to 2023.
[4] Adapted from https://vim-1.itrcweb.org/heating-ventilation-and-air-conditioning-hvac-modification-tech-sheet/#:~:text=For%20some%20buildings%2C%20mitigation%20of,VI%20on%20indoor%20air%20quality.

3.4.3. Alternative 3: Sub-Slab Depressurization

This alternative would use a sub-slab depressurization (SSD) system and vapor barrier to eliminate the risk of vapor intrusion. The SSD system consists of extraction well points or laterals installed across the building footprint. The extraction wells would be routed through manifolds of adjacent wells to an electric blower or blowers to create a negative pressure below the slab relative to indoor air. In areas of the Site building that have a crawlspace with a dirt floor (i.e., the gymnasium), a vapor barrier (15-mil) would be installed above laterals. Based on concentrations of VOCs in soil gas, we assume that extracted soil gas can be discharged directly to the atmosphere without treatment. This assumption would be evaluated during pilot testing and system startup.

To ensure adequate negative pressure (i.e., >0.008" WC or 2 Pascals) across the entire building footprint, soil gas monitoring ports will be installed. Differential pressures would be monitored using a micro magnehelic gauge. Combined vacuum will be monitored with an audible or telemetric alarm to alert the owner in the event of system shutdowns. Routine monitoring would be performed quarterly for the first year and annually thereafter.

Fans typically have a working life of 5 to 10 years and would require periodic replacement. Periodic collection and analysis of air emission samples from the SSD system, although not necessary to monitor performance, would allow for evaluation of whether continuous, active operation of the electric fan is needed. VOC mass in the sub-slab area will likely decrease over time and the system could be made passive via wind-driven fans.

Cost Considerations

Approximate costs for SSD mitigation system construction vary between $4.76 to $10.71 per square foot of the lowest level of the building[5]. Variables affecting the cost include the size and number of blowers needed to achieve design parameters, sub slab conditions, and ease of routing effluent piping through the interior space. Given the footprint of the Site building as approximately 48,000 square feet, costs for installation of an SSD system at the Site may range from $228,480 to $514,080. Operations and maintenance costs will vary based on cost of electricity.

Advantages

- Widely accepted as a remedial technology for preventing vapor intrusion.
- Easily constructed by contractors during planned building construction and renovation.
- Can be operated in passive mode without the use of an electric fan if conditions allow.
- Less expensive than Alternative 2 for long-term operation.

Disadvantages

- Ongoing O&M will be required for the lifespan of the building or until Site action limits are achieved.
- Removal of contaminant mass is slow over time.
- Requires institutional control to maintain SSD system.
- High initial costs.

[5] https://vim-1.itrcweb.org/sub-slab-depressurization-ssd-tech-sheet/ December 18, 2023, accounting for 19% inflation from 2022 to 2023.

3.5. Evaluation of Remedial Alternatives of PCB Impacts

Due to the co-contamination of building materials with asbestos containing materials, costs for PCB abatement are not included here. Stone is currently developing abatement work scopes in coordination with the Project Architect and will be soliciting estimates from contractors to be included within the CAP. Building material abatement activities will be performed in accordance with Vermont Department of Health (VT DOH) and AHERA protocols.

3.5.1. PCB Bulk Products

Abatement of building materials to remove source material of vapor-phase PCBs in indoor air will occur in six rooms, as follows:

Room	Material	Concentration (ppm)
319	Pale Green Paint	**150**
	Light Blue Paint	**190**
	Wood Panel Adhesive	29
BR202	Sky Blue Paint	13
229	Pale Blue Paint	26
200-H7	Sky Blue Paint (doorways)	49

Bold values indicate an exceedance of the TSCA Bulk Product threshold of 50 ppm.

Depictions of the distribution of PCB bulk products and excluded bulk products for abatement are provided on Figures 6a, 6b, and 6c.

PCB bulk product materials for abatement will be either loaded into roll-off dumpsters or other suitable canisters given the volume of material generated and transported to the disposal facilities in accordance with 40 CFR §761.61(a)(5)(i). Materials believed to contain total PCBs at concentrations >50 ppm will be segregated from other waste upon removal; waste generated from the abatement of sky-blue paint in 200-H7 will be managed with the >50 ppm waste given its concentration as barely less than the bulk product threshold.

For materials containing PCBs at concentrations >50 ppm, materials will be disposed of as PCB bulk product at US Ecology's landfill in Wayne, Michigan, which is an approved PCB disposal facility in accordance with 40 CFR Part §761.75. For materials containing PCBs at concentrations <50 ppm, materials will be disposed of as PCB excluded bulk product at a Subtitle D landfill permitted to receive TSCA remediation waste, such as the Waste USA Landfill in Coventry, Vermont.

Following removal of PCB bulk product and excluded bulk product, confirmation sampling of underlying material and indoor air will be performed to ensure PCB remediation wastes do not remain in Site building materials.

3.5.2. PCB Liquids

Light ballasts, in most areas of the Site building as shown on Figures 6a, 6b, and 6c, are suspected to contain PCB contaminated dielectric fluid. In some cases (e.g., Room 103), the light ballasts have leaked.

Stone proposes to manage all light ballasts as universal wastes. Ballasts will be consolidated and contained within 55-gallon drums or cubic yard boxes for disposal as PCB waste. Shrouds and pans of fluorescent lights will be inspected for visible indications of a release of PCB oil and, if a release is noted, managed with the ballasts.

3.6. Universal Waste Management

As reported in the Phase I ESA, liquid hazardous waste containers (e.g., methanol, paint, varnishes), thermometers, and fire extinguishers are present throughout the Site building. These materials will be inventoried and managed under the CAP by a licensed hazardous waste contractor.

3.7. ECAA Summary

Based on the results of the ECAA, the proposed corrective actions are:

- Soil Management Alternative: Targeted Soil Removal to Maintain grades within Site tolerances with installation of Engineered Barriers.
- Soil Vapor Alternative: Active SSD with Vapor Barrier
- PCB Containing Materials Management: Building material abatement prior to renovations.
- Universal Waste Management

Following concurrence by VT DEC and the Development Team, a Corrective Action Plan (CAP) will be prepared that incorporates all previous investigation results and provides details for the corrective actions selected by this ECAA. The CAP will be prepared in accordance with the IRule.

4. References

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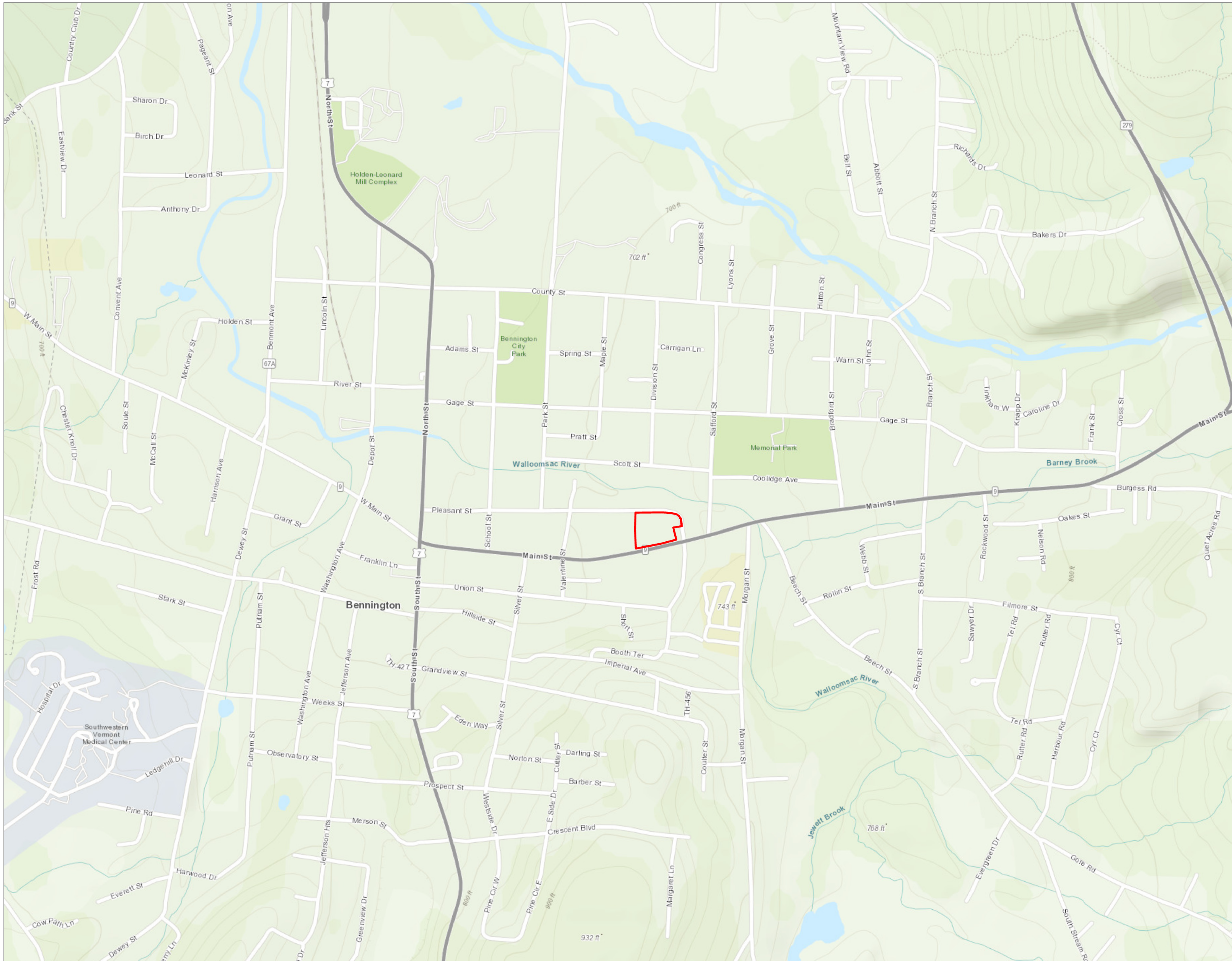
Stone Environmental Inc., 2023, Phase II Environmental Site Assessment: Former Bennington High School, December 12.

Vermont Agency of Natural Resources (2020). Natural Resources Atlas. Retrieved from http://anrmaps.vermont.gov/websites/anra5/ (November 11, 2020).

Appendix A: Figures



LEGEND

Site Boundary

Source: Esri World Imagery, VCGI

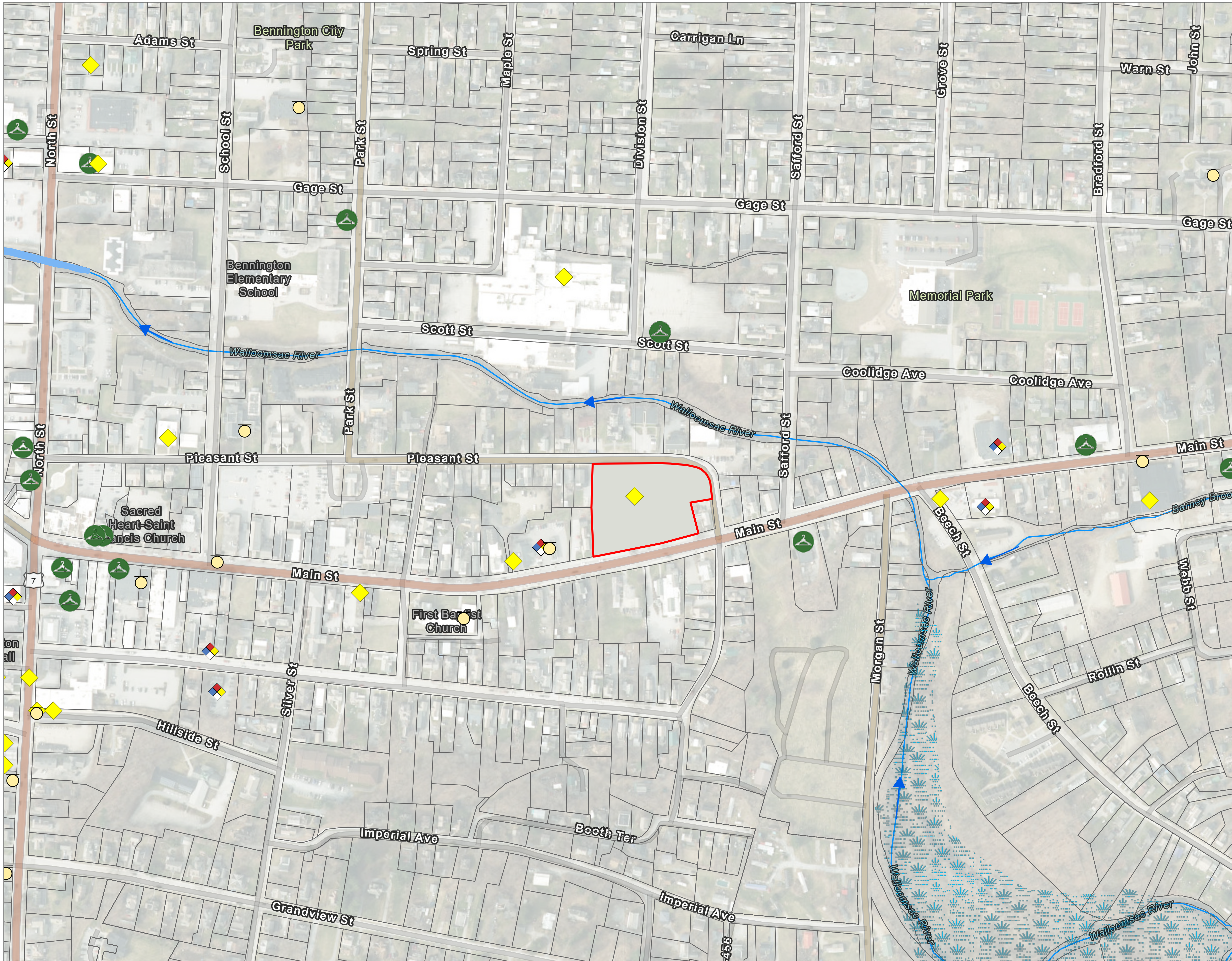
Path: O:\PROJ-23\EAR\20231034 Benn Hi Env Due Diligence\GIS\20231034 Benn Hi.aprx Figure 1 - Location Map Exported: 6/1/2023 2:58 PM by lrajnak

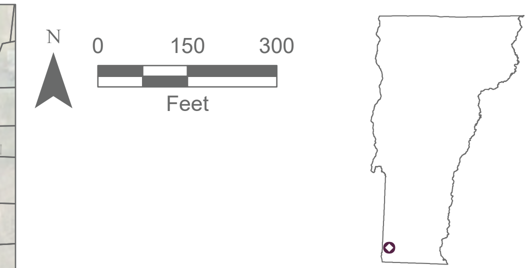
Figure 1: Location Map

Former Bennington High School

650 Main Street
Bennington, Vermont

STONE ENVIRONMENTAL





LEGEND

- Site Boundary
- Parcel Boundary
- VT Significant Wetlands Inventory
- Stream
- Dry Cleaner
- Hazardous Waste Generators
- Hazardous Waste Site
- Underground Storage Tank (working)

Source: Esri World Imagery, ANR Atlas, VCGI

Path: O:\PROJ-23\EAR\20231034 Benn Hi Env Due Diligence\GIS\20231034 Benn Hi.aprx Figure 2 - Vicinity Map Exported: 1/2/2024 9:04 AM by lrajnak

Figure 2: Vicinity Map

Former Bennington High School

650 Main Street
Bennington, Vermont

STONE ENVIRONMENTAL

Source: Esri World Imagery, VCGI, ANR Atlas

Path: O:\PROJ-23\EAR\20231034 Benn Hi Env Due Diligence\GIS\20231034 Benn Hi.aprx ECAA Figure 3 - Site Map Exported: 1/2/2024 10:02 AM by lrajnak

Figure 3: Site Map

Former Bennington High School

650 Main Street
Bennington, Vermont

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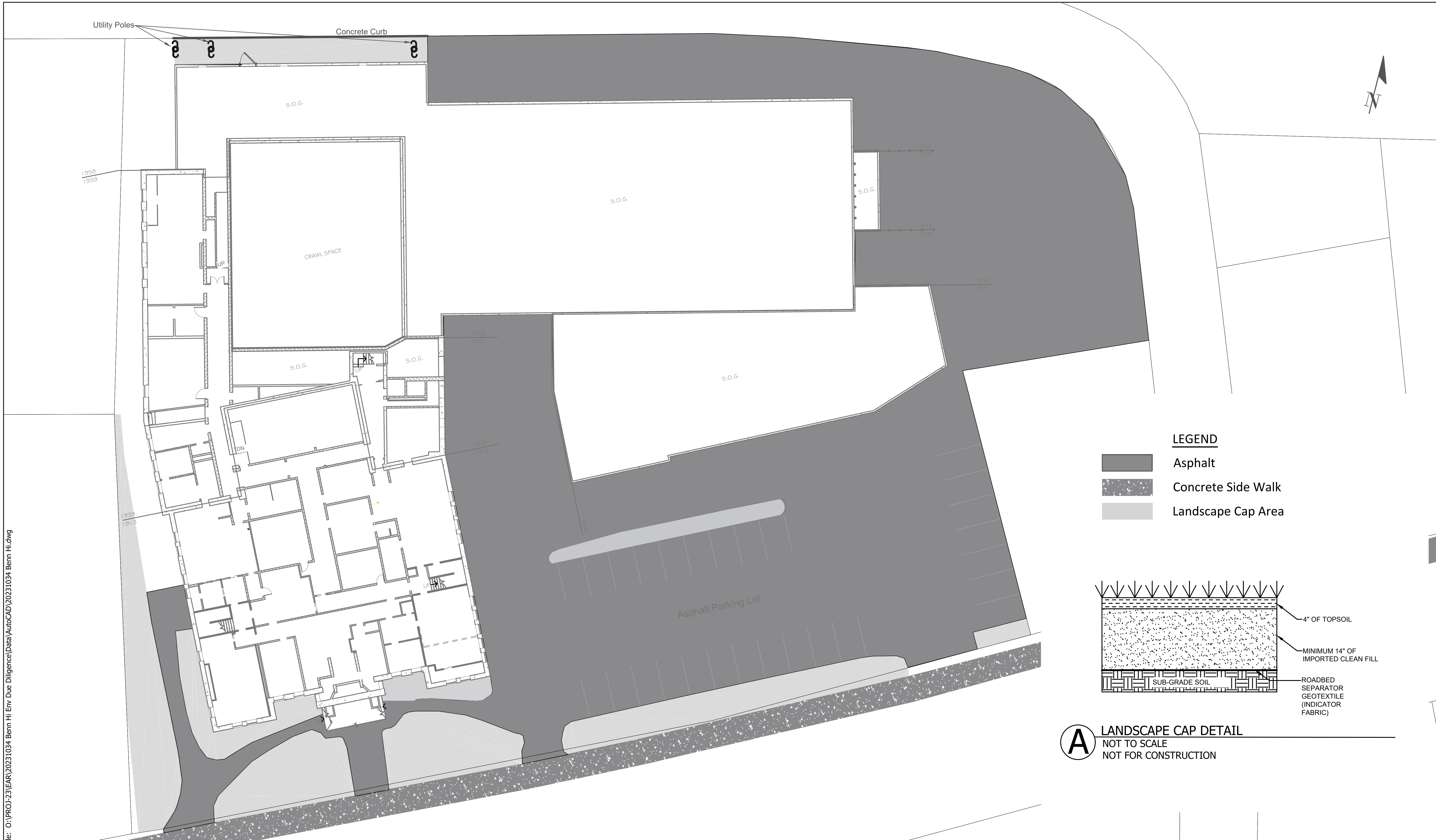

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DRAWING CREDITS

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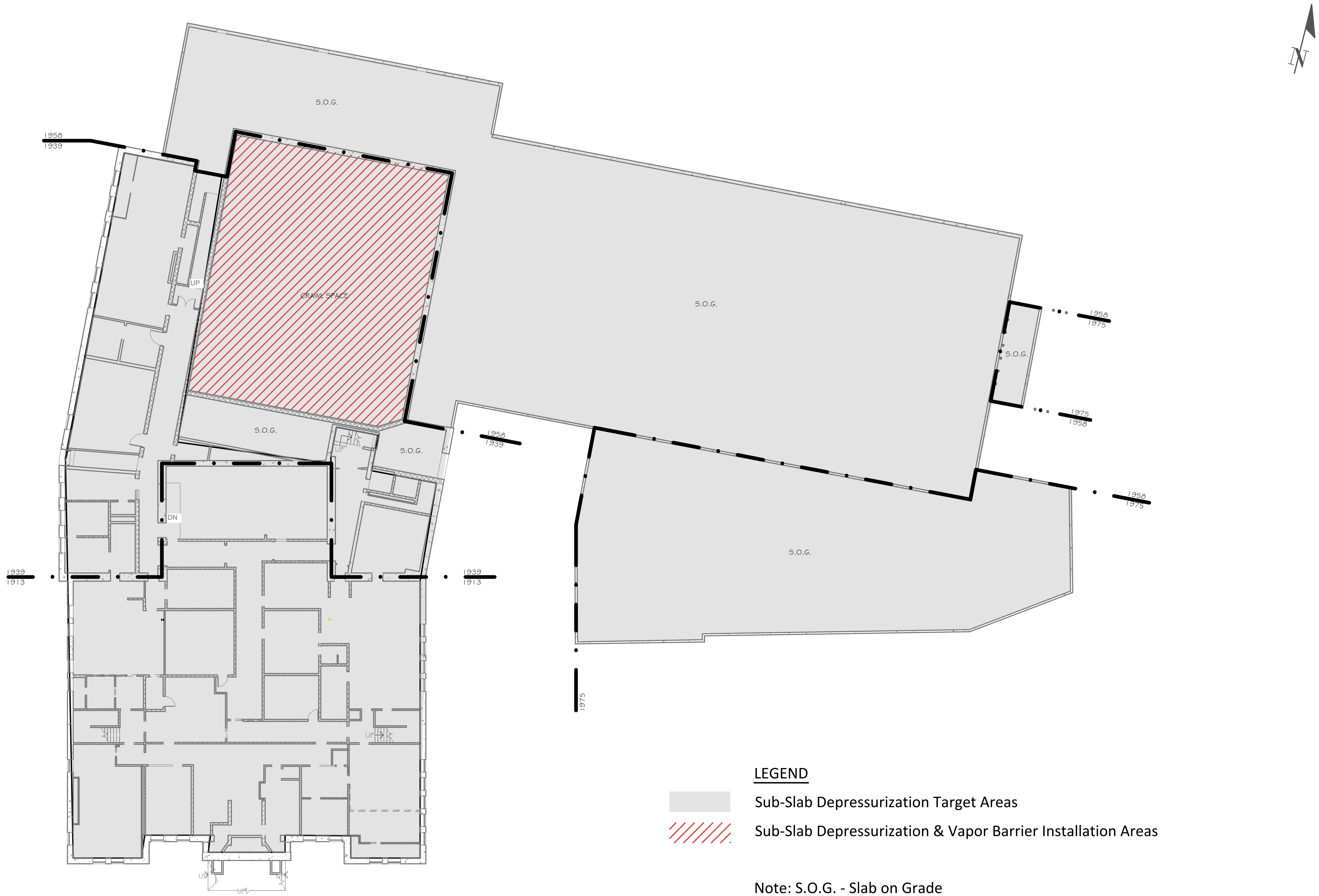
SOIL MANAGEMENT PLAN
FORMER BENNINGTON HIGH SCHOOL
650 MAIN STREET
BENNINGTON VERMONT

FIGURE NO. 4



LEGEND

Sub-Slab Depressurization Target Areas

Sub-Slab Depressurization & Vapor Barrier Installation Areas

Note: S.O.G. - Slab on Grade

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0 20 40 Feet

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VAPOR INTRUSION MITIGATION PLAN
FORMER BENNINGTON HIGH SCHOOL
650 MAIN STREET

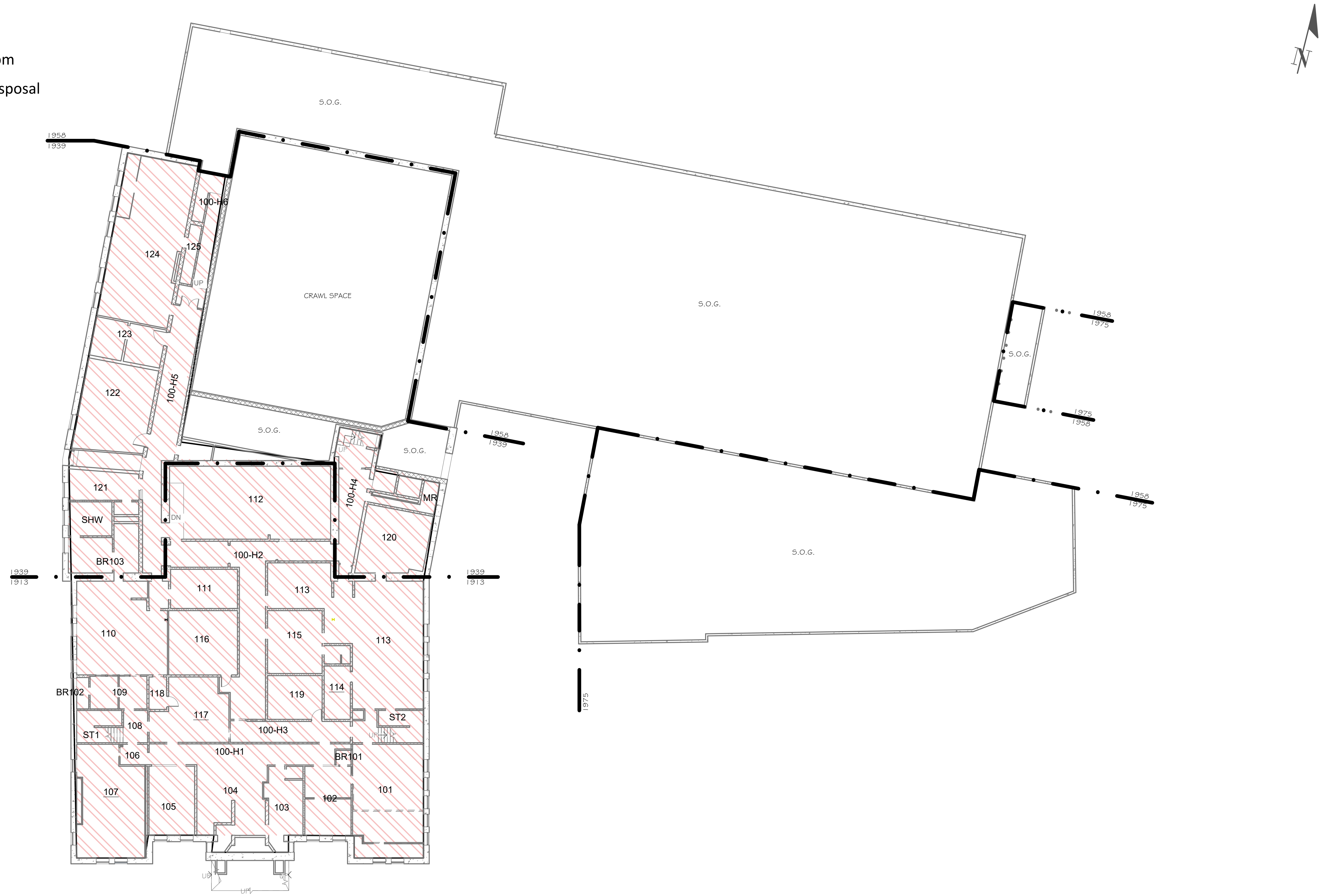
BENNINGTON VERMONT

FIGURE NO.
5

LEGEND

Bulk Products with PCBs >10ppm

Rooms with Light Ballast for Disposal



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0 20 40 Feet

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PCB MITIGATION PLAN - BASEMENT LEVEL
FORMER BENNINGTON HIGH SCHOOL
650 MAIN STREET
BENNINGTON VERMONT

FIGURE NO. 6A

LEGEND

Bulk Products with PCBs >10ppm

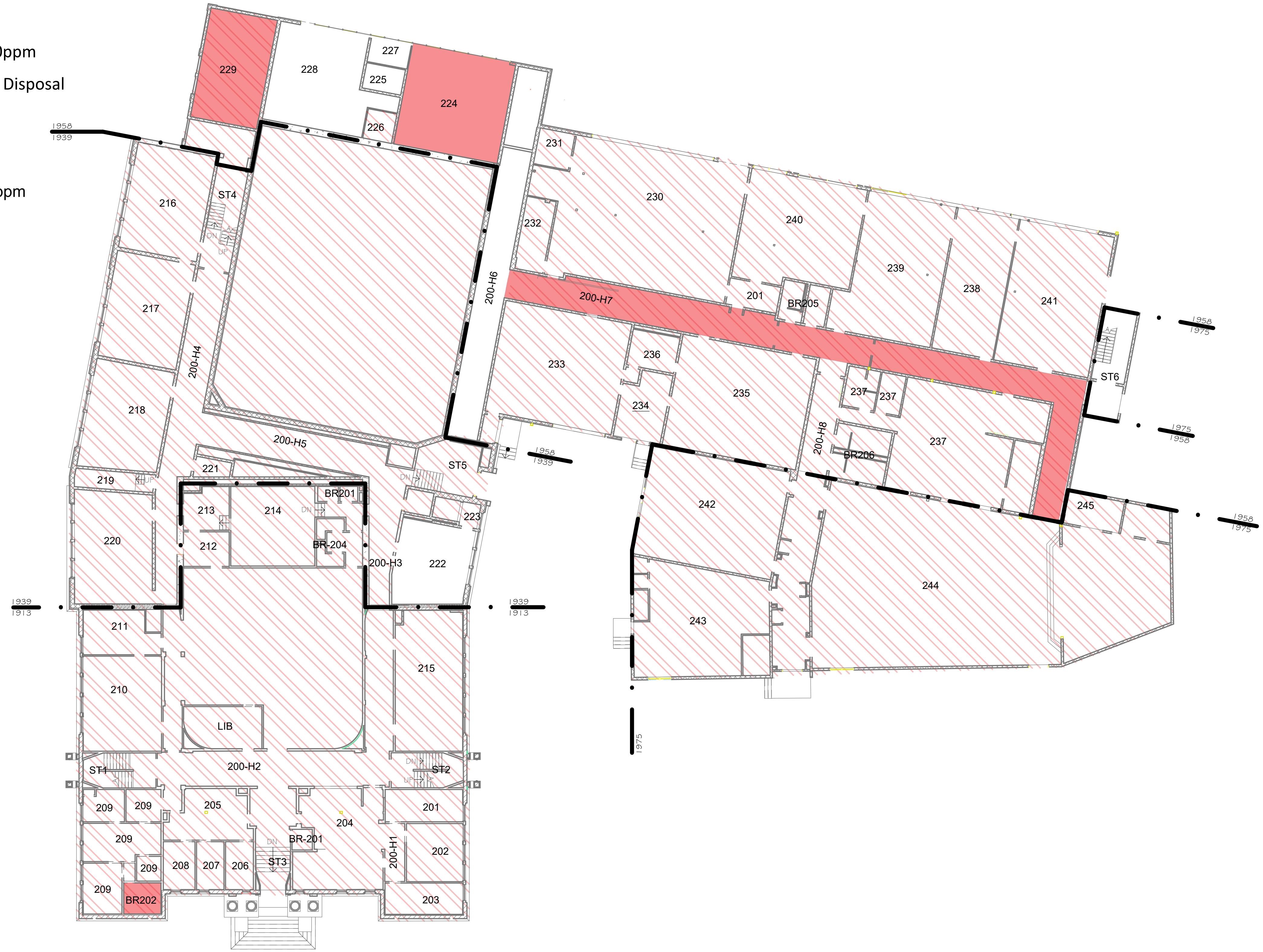
Rooms with Light Ballast for Disposal

Rooms with Bulk Products >10ppm

BR202 - Sky Blue Paint - 13 ppm

229 & 224 - Pale Blue Paint - 26 ppm

200-H7 - Sky Blue Paint (Doorways) - 49 ppm



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DRAWING SCALE

0 20 40 Feet

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PCB MITIGATION PLAN - MAIN LEVEL

FORMER BENNINGTON HIGH SCHOOL

650 MAIN STREET

BENNINGTON VERMONT

FIGURE NO. 6b

LEGEND

Bulk Products with PCBs >10ppm

Rooms with Light Ballast for Disposal

Rooms with Bulk Products >10ppm

319 - Pale Green Paint - 150 ppm

319 - Light Blue Paint - 190 ppm

319 - Wood Panel Adhesive - 29 ppm

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DRAWING SCALE

0 20 40 Feet

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PCB MITIGATION PLAN - UPPER LEVEL
FORMER BENNINGTON HIGH SCHOOL
650 MAIN STREET

BENNINGTON VERMONT

FIGURE NO.

6c