Analysis of Brownfields Cleanup Alternatives: TLR Complex, Bellows Falls, Vermont

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1. Introduction and Background

Stone Environmental, Inc (Stone) has prepared this Analysis of Brownfields Cleanup Alteranives (ABCA) under contract with Windham Regional Commission (WRC) on behalf of the Sustainable Valley Group, Inc. (SVG) for the property located at 10 and 16 Mill Street, Bellows Falls, Windham County, Vermont (the Site). SVG is enrolled in the Brownfields Reuse Environmental Liability Limitation Program (BRELLA) as a prospective purchaser. SVG currently owns the Site. The Site was assigned Sites Management Section (SMS) #2002-2989 by the Vermont Department of Environmental Conservation (VT DEC) for the historical detection of contaminants.

1.1. Site Location

The Site is a 0.66-acre parcel located at 10 and 16 Mill Street in Bellows Falls, Windham County, Vermont. The Site consists of two primary brick buildings (north/Russell building and south/Moore building) and a small outbuilding. The Site is bounded by Mill Street to the west, the former Wyman Flint Paper Mill to the east, an access road to the north, and the Adams Grist Mill and undeveloped land to the south.

The Site previously had two additional buildings, a pulp mill and a paper mill that were demolished in 2003.

1.2. Project Goal

SVG plans to rehabilitate the Site buildings to support the Connecticut River Cultural Heritage Center, including historical preservation and museum space. The Site will include an amphitheater for educational talks and performances.

1.3. Previous Site Uses

The Site was historically used as a paper mill complex beginning in the early 1800s; the buildings were constructed circa 1869. Past uses included carpentry, shipping, and office and storage. A covered canal ran through the south building where the water was used to power the mill buildings at the Site and at adjoining paper mills and a grist mill. Paper manufacturing continued until 1986 under multiple owners (e.g., John T. Moore Paper Mill, Fall Mountain Paper Company, International Paper Company, Kelley Paper Corporation, and White Mountain Paper Company).

1.4. Site Assessment Findings and any Previous Cleanup/Remediation

The Site has been subject of environmental assessment and cleanup activities since the 1990s. Below documents a summary of significant findings that remain applicable to the Site context today:

- In 1991, there was a release of approximately 1,500 gallons of No. 6 fuel oil via a floor drain. Subsequent soil excavation and drum removal followed, and the underground storage tank (UST) was abandoned in place due to construction constraints.
- In 2003, the Site was subject of a United States Environmental Protection Agency (US EPA) removal action involving the large-scale removal of asbestos-containing materials (ACM) and abandoned containers and drums that stored spent petroleum and hazardous products. The US EPA determined

that a large part of the complex was unstable and had to be demolished to perform the cleanup. The pulp mill and the main paper mill were demolished, the basements of the buildings were filled in and the perimeter of the TLR site was secured with a fence.

- Multiple investigations occurring between 2001 and 2023 documented volatile organic compounds (VOCs), specifically, tetrachloroethylene (PCE), trichloroethylene (TCE), benzene, and naphthalene, in soil gas above Vermont Vapor Intrusion Standards (VIS), with highest concentrations of PCE and TCE occurring beneath and adjacent to both buildings. Concentrations are highest, particularly of benzene and naphthalene, beneath the north building and PCE beneath both the northern and south building.
- In 2023, a Supplemental Phase II Environmental Site Assessment was performed and determined that the vapor intrusion (VI) risk into the buildings is high. Contaminants of concern including VOCs and metals in groundwater were found below the Vermont Groundwater Enforcement Standard (VGES). The assessment also identified hazardous building materials present including lead-based paint and asbestos containing materials in both buildings, and polychlorinated biphenyls (PCBs) in elevator and pulley hydraulic oil.
- In 2025, an Evaluation of Corrective Action Alternatives (ECCA) and a Site Investigation (SI) including pilot testing were performed to evaluate remedial alternatives to mitigate the VI pathway. The pilot test included high-volume sub-slab sampling, and the results will be used to inform the design of the selected remedy.

1.5. Regional and Site Vulnerabilities to Extreme Weather and Natural Disasters

According to the State of Vermont's Initial Vermont Climate Action Plan, climate change is and will continue to result in changes to wind and snowfall, increasing temperatures, and increases in overall precipitation. Impacts of an increase in overall rainfall and flood hazards are most applicable to the remedial strategy at the Site. The Site is not located in a mapped floodplain; however, design considerations will include strategies to support resilience to anticipated extreme weather events from increased temperatures and rainfall.

2. Applicable Regulations and Cleanup Standards

Cleanup alternatives presented in this Analysis of Brownfield Cleanup Alternatives (ABCA) were developed to address inhalation risk posed by VOCs through the vapor intrusion pathway. To achieve the project goal, the VI pathway must be mitigated to meet current standards and protect Site users.

2.1. Cleanup Oversight Responsibility

Corrective action implementation will be overseen by the VT DEC. All documents prepared for this Site are submitted to the VT DEC under SMS#20022989.

2.2. Cleanup Standards for Major Contaminants

The VIS and Vermont Soil Standards (VSS) for resident and non-resident properties published in the VT DEC's IRule as Appendix A - § 35-APX-A2 are the cleanup standards that apply to this ABCA as regulated by VT DEC.

Vermont Department of Health regulates both asbestos and lead-based paint. Asbestos abatement includes the repair, enclosure, removal, encapsulation or any other activity for the evaluation or control of any material which contains more than one percent asbestos by weight or area as defined in V.S.A. Title 18, Chapter 26. Lead-based paint abatement includes the removal or permanent containment or encapsulation of paint or other surface coatings that contain lead in an amount equal to 1.0 milligram per square centimeter or 0.5 percent by weight or greater as defined in V.S.A. Title 18, Chapter 38.

PCBs are regulated by the EPA under 40 CFR Part 761, under the authority of Toxic Substance Control Act (TSCA). PCBs present within the elevator and pulley systems hydraulic oil are PCB remediation wastes that require cleanup in accordance with TSCA regulations, where PCBs are present at levels above 10 micrograms per 100 centimeters squared on non-porous surfaces.

2.3. Laws and Regulations Applicable to the Cleanup

The following laws and regulations apply to the cleanup at this Site:

- VT ANR Environmental Protection Rules, Chapter 25, Investigation and Remediation of Contaminated Properties Rule (IRule; effective Feb. 23, 2024),
- BRELLA program codified at 10 V.S.A. §6641-§6656,
- ACBM: Vermont Regulations for Asbestos Control V.S.A. Title 18, Chapter 26,
- Lead-Based Paint: Vermont Regulations for Lead Control V.S.A. Title 18, Chapter 38,
- PCBs: EPA under 40 CFR Part 761, under the authority of TSCA,
- OSHA HAZWOPER (29 CFR 1910.120), and
- Applicable permits (e.g., electrical for system power drops).

3. Evaluation of Cleanup Alternatives

Hazardous materials remediation including the abatement of lead and asbestos containing building materials and the decontamination of the elevator and pulley systems containing PCBs in hydraulic oil are inherent to the cleanup of the Site. Additionally, soil management and the installation of engineered barriers are required to mitigate the direct contact risk at the Site and will be included in the cleanup plan.

3.1. Cleanup Alternatives Considered

To address VI risk at the Site, three alternatives were considered:

- Alternative #1: No Action
- Alternative #2: Install Sub-slab Depressurization (SSD) System.
- Alternative #3: Source Area Removal by Installing a Soil Vapor Extraction (SVE) System.

3.2. Cost Estimate of Cleanup Alternatives

The effectiveness, implementability, and cost of each alternative is considered below.

3.2.1. Effectiveness – Including Vulnerability/Resiliency Considerations

- Alternative #1: The No Action alternative is not protective and contaminants remain. VI risk persists to future Site occupants and adjoining properties.
- Alternative #2: This alternative would install an SSD system in the Site buildings. Active SSD uses an energized radon fan to create a negative pressure gradient between the soil gas below a building and the indoor air. This negative pressure gradient prevents advection of soil gas into the building. Conveyance/riser pipes made of PVC would be connected to the basement floor and/or basement walls and vented above the roof line. This alternative provides sustained protection against intrusion of soil vapors even with increased precipitation and temperatures. This alternative is not effective at reducing VI risk at adjoining properties.
- Alternative #3: This alternative would install an SVE system utilizing PVC extraction wells to remove contaminant mass from the presumed source areas at the north and south building. The SVE system would use a regenerative blower in conjunction with five extraction wells that mechanically draw contaminated soil gas from the vadose zone. The laterals of the extraction wells would be plumbed together to a single monitoring and treatment system. Water infiltration from heavy rainfall may pose operational issues for SVE systems. During periods of heavy rainfall, the SVE system may be shut down, or the vacuum may need to be reduced to prevent issues. This alternative would help to reduce VI risk at adjoining properties.

Resiliency considerations for Alternatives #2 and #3 include ensuring reliable and sustainable power source and weatherproofing. Electrical components and blowers should be housed in weatherproof enclosures or within conditioned spaces to prevent damage from moisture, freezing, or extreme heat. System design should also include storm protection measures (e.g., elevated platforms, sealed conduits) to mitigate risks from heavy precipitation or wind events. Periodic resiliency audits should confirm that protective measures remain effective over time.

3.2.2. *Implementability*

- Alternative #1: Very easy (no action).
- Alternative #2: Technically and administratively practical and local contractors can install the SSD system. Prior to installing the SSD system, this alternative requires sealing holes/utility trench and assessing sub-slab features (e.g., raised platform in north building). Ongoing maintenance would be required by the site owner to ensure the long-term operation of the SSD system.
- Alternative #3: An SVE system would utilize the existing extraction wells and vapor points and would involve the installation of additional extraction wells; SVE system components could be installed using existing technologies and local contractors making this alternative easy to implement. This alternative also includes sealing holes/utility trench and assessing sub-slab features (e.g., raised platform in north building). On-going operations and maintenance of the SVE system is required until SVE system removes enough contaminated mass such that risk of VI is no longer present.

3.2.3. *Cost*

Table 1 below describes the alternative costs:

Table 1: Cost of Each Alternative

Alternative	Description	Estimated Total Cost
#1	No Action	$0
#2	Sub-slab Depressurization (SSD)	$44,800
#3	Soil Vapor Extraction (SVE)	$131,400

3.3. Recommended Cleanup Alternative

Alternative #3: Installation of an SVE System is the recommended alternative. The implementation of Alternative 3 will reduce contaminant mass and mitigate VI risk, supports redevelopment while buildings are vacant, and addresses potential offsite vapor migration to the adjacent Adams Grist Mill property. Institutional controls will be required to ensure the SVE is monitored and maintained until contaminated mass no longer presents a VI risk. A Corrective Action Plan (CAP) will be prepared in accordance with VT DEC IRule §35-606.

3.3.1. *Green and Sustainable Remediation Measures for Selected Alternative*

Best Management Practices (BMPs) issued under ASTM Standard E-2893-16: Standard Guide for Greener Cleanups will be implemented where possible in this effort. The following BMPs have been identified as pertinent to this project:

- Utilize energy-efficient regenerative blowers and consider renewable electricity supply.
- Minimize material use and waste generation; reuse existing infrastructure where safe; seal slabs/utility trenches to improve system efficiency.

- Optimize extraction well layout to reduce run time and emissions; periodically evaluate need for effluent treatment and optimize operation and maintenance (O&M) schedules.
- Implement robust storm/weather protection for equipment and electrical components to improve resilience to extreme events.
- Plan for eventual shutdown and rebound testing, with post-operations verification sampling to avoid unnecessary energy use.

4. Proposed Cleanup

The proposed cleanup will install an SVE system to conduct source area removal. This will not only help to eliminate the vapor intrusion risk to site users as well as reduce the toxicity, mobility and volume of contamination in sub-slab soil gas. Source area remediation will also prevent offsite migration of PCE to the adjacent Adams Grist Mill property. In addition, the proposed cleanup will include asbestos abatement prior to redevelopment including all friable asbestos or asbestos containing building materials. For lead-based paint, exterior and interior surfaces with deteriorating paint will be abated or encapsulated to mitigate direct exposure risk and potential migration of exterior flaking paint to soil. Moreover, the proposed cleanup will include the decontamination of the elevator and pulley systems that are contaminated or are assumed to be contaminated with hydraulic oil containing PCBs. Lastly, soil management and the installation of engineered barriers will mitigate direct contract risk to contaminated soil across the site. Engineered barriers will consist of green space and landscaping around the exterior of the buildings, including an earthen amphitheater designed to accommodate the current topographic relief at the Site. Hardscaping will include a pedestrian walkway and a road connecting the Island to Under the Hill.

A Corrective Action Plan (CAP) will be prepared in accordance with §35-606 of the VTDEC IRule, to implement the proposed cleanup.