# Reduced Carbon Inputs for an Innovative Large-Scale Sub-Slab Depressurization System Using a Repurposed HVAC Distribution System

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**Background/Objectives.** Sub-slab soil gas investigations identified areas with elevated VOC concentrations in soil gas beneath three buildings comprising an engine maintenance facility located in a remote area. Inspection trenches are present beneath every equipment repair area, with a sub-grade forced air ventilation system that provided heat directly to the trenches. Groundwater at the site is shallow, with depths from ground surface varying seasonally between 5 ft to 15 ft below ground surface (bgs). A sub-slab depressurization (SSD) system was designed and constructed to incorporate the existing HVAC distribution system elements into the SSD.  A new suspended heating system replaced the former HVAC functionality. The remedy was selected instead of installing a permeable piping system, which would have included excavation, disposal, and subsequent re-construction of inspection trench floors. SiteWise™, a tool developed for green and sustainable remediation, was used to evaluate the innovative design and efficiency of the SSD system.  The purpose of the evaluation is to perform a screening level life cycle assessment of the construction and maintenance options for the SSD system.

**Approach/Activities.** Two approaches for SSD system construction are considered – construction of the SSD with either: (1) repurposing of select components of the HVAC system and introduction of a replacement suspended heating system, or (2) installation of permeable piping underlying the existing inspection trench floors. Pilot-phase testing of pressure field extension identified limited development of the pressure field, with the sub-grade heating system piping identified as a likely source of short-circuiting. Isolated testing of components of the HVAC system identified the system as a viable component of the remedy. Specific differences in this evaluation include potential harm to construction workers associated with durations of field activities, transportation and disposal of excavated materials in landfills, transportation and placement of new materials, materials associated with the new heating system, differences in operational efficiencies of the former and replacement heating systems, carbon costs associated with heavy equipment use for either option, and energy costs associated with relocating equipment in need of repair to another facility. These components for the two options were assessed for four categories: accidental risk and injury, energy footprint, electrical consumption, and carbon footprint.

**Results/Lessons Learned.** Comparison of the two options illustrates that the accidental risk and injury impacts, carbon footprint, energy footprint and were smaller with the innovative design. The re-use of existing infrastructure results in a less carbon-intensive and less energy-intensive installation compared to a more standard approach. Challenging site conditions can drive innovation within the industry, and can help adapt practices to incorporate a more focused consideration of lifecycle impacts. At this site, the innovative approach led to the successful construction and operation of a SSD system, which is associated with a less-carbon intensive approach than the more traditional floor excavation and replacement installation approach.