ADAPTING CERCLA TO ADDRESS VAPOR INTRUSION BY AMENDING THE HAZARD RANKING SYSTEM

INTRODUCTION

Beneath a residential neighborhood in Billings, Montana lies a 140-acre plume of a hazardous material suspended in groundwater.[1] Dangerous gases have migrated from this plume into many of the almost 300 houses overlying the contamination through a phenomenon called vapor intrusion.[2] While the State of Montana has tried to clean up the contamination, the scope of the problem is much too large for a state with such meager financial resources.[3] Congress enacted the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as Superfund, to fund the cleanup of sites such as this.[4] However, the United States Environmental Protection Agency (EPA) is limited in the steps it can take to clean up the contamination at the Billings site because the Agency does not currently consider vapor intrusion when determining whether sites should receive federal funding.[5]

Fortunately, EPA will soon remedy this glaring omission in CERCLA.[6] Following the lead of several progressive state programs, EPA recently announced that it will add a vapor intrusion component to the Hazard Ranking System (HRS).[7] EPA uses the HRS to evaluate whether a site warrants inclusion on the Agency's National Priorities List (NPL) for sites

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1. SCOTT A. SEACAT, STATE OF MONT. LEGIS. AUDIT COMM., PROGRAM AND POLICY ISSUES IMPACTING STATE SUPERFUND OPERATIONS, Mont. Leg. 08P-05, 60th Sess., at 28 (2008).

2. Memorandum from Kerry Guy, On-Scene Coordinator, Emergency Response Unit, U.S. Envtl. Prot. Agency, Region 8, to David A. Ostrander, Program Director, Preparedness, Assessment & Emergency Response, U.S. Envtl. Prot. Agency, Region 8 (Oct. 12, 2007), *available at* http://ndep.nv.gov/pce/doc/epa_billings_am_2007.pdf. The contamination at the Billings site was caused by a release from a historical dry cleaning operation. *Id.* at 1.

3. SEACAT, *supra* note 1, at 28–30.

4. *See* Burlington N. & Santa Fe Ry. Co. v. United States, 556 U.S. 599, 602 (2009) (stating that CERCLA was "designed to promote the 'timely cleanup of hazardous waste sites' and to ensure that the costs of such cleanup efforts were borne by those responsible for the contamination" (quoting Consol. Edison Co. of N.Y. v. UGI Util., Inc., 423 F.3d 90, 94 (2d. Cir. 2005))).

5. U.S. GOV'T ACCOUNTABILITY OFFICE, SUPERFUND, GAO-10-380, EPA'S ESTIMATED COSTS TO REMEDIATE EXISTING SITES EXCEED CURRENT FUNDING LEVELS, AND MORE SITES ARE EXPECTED TO BE ADDED TO THE NATIONAL LIST 31 (2010) [hereinafter SUPERFUND, EPA'S ESTIMATED COSTS], *available at* http://www.gao.gov/new.items/d10380.pdf (noting that the "EPA is limited in its ability to fully remediate the source of contamination" at sites such as the Billings plume).

6. *See Addition of Subsurface Component to the Hazard Ranking System (HRS)*, U.S. ENVTL. PROT. AGENCY, http://yosemite.epa.gov/opei/RuleGate.nsf/byRIN/2050-AG67#5 (last updated Nov. 7, 2012) [hereinafter *Addition of Subsurface Component*] (proposing a rule, which was still in the pre-notice stage when this Note was prepared, that would consider vapor intrusion when determining whether to place sites on the National Priorities List).

7. *Id.*

regulated under CERCLA.[8] While the inclusion of vapor intrusion on the HRS is a positive, albeit overdue, development in CERCLA, how EPA structures and implements the vapor intrusion component into the existing HRS will determine whether this new enhancement will actually benefit the many sites in need of CERCLA funding and oversight.

This Note identifies three key components that would promote the efficacy of the proposed rule. First, the rule should require that EPA reevaluate those sites that it has already scored using the HRS. Second, when limited data bear uncertainty regarding the existence of vapor intrusion, EPA should incorporate a rebuttable presumption that vapor intrusion is occurring. Lastly, the rule should incorporate a mechanism that enables EPA to act quickly to address immediate health risks. A rule that includes these three factors would help to ensure that EPA addresses the dangers that vapor intrusion poses.

Part I of this Note provides a technical overview of vapor intrusion. Part II identifies and analyzes the various ways in which EPA and states regulate vapor intrusion. Part III presents the three criteria EPA should incorporate into the proposed rule. Part IV chronicles how the suggested improvements to the HRS will address a number of challenges facing the inclusion of vapor intrusion.

I. BACKGROUND

A. Technical Background

Vapor intrusion is the process by which volatile chemical constituents in subsurface soil and groundwater emit vapors that migrate into buildings and affect indoor air.[9] These chemicals can be released into the environment in a number of different ways. Common release mechanisms include leaks from underground storage tanks,[10] seeps from landfills,[11] or outflows of

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8. U.S. ENVTL. PROT. AGENCY, OVERVIEW OF THE PRESENT HAZARD RANKING SYSTEM 1–2, *available at* http://www.epa.gov/superfund/sites/npl/overview_of_present_hrs_info_sheet.pdf (last visited Nov. 17, 2012) [hereinafter OVERVIEW OF THE HAZARD RANKING SYSTEM]. EPA describes the NPL as "a list of contaminated sites identified to have known releases or threatened releases of hazardous substances . . . ." *Id.* at 1. The purpose of the NPL is "to guide EPA in determining which sites warrant further investigation to ascertain whether remedial action is needed to protect human health and the environment affected by releases from those sites." *Id.*

9. INTERSTATE TECH. REGULATORY COUNCIL, VAPOR INTRUSION PATHWAY: A PRACTICAL GUIDELINE 1 (2007), *available at* http://www.itrcweb.org/documents/VI-1.pdf.

10. *Vapor Intrusion*, WIS. DEP'T OF HEALTH, http://www.dhs.wisconsin.gov/eh/air/pdf/VI.pdf (last revised Oct. 30, 2012).

11. FRED D. TILLMAN & JAMES W. WEAVER, U.S. ENVTL. PROT. AGENCY, REVIEW OF RECENT RESEARCH ON VAPOR INTRUSION 1 (2005), *available at* http://www.epa.gov/athens/publications/reports/Weaver600R05106ReviewRecentResearch.pdf.

chemicals from leaking sewer pipes.[12] Chemicals released to the environment then can saturate soil and, depending on the nature of subsurface and other conditions, can migrate to groundwater where contaminants can travel for miles.[13] Volatile chemicals, substances that readily evaporate, will emit vapors that migrate up through pores in the soil and then through cracks or openings in the envelope of a building.[14] The vapors may then accumulate in indoor air and be inhaled by building occupants.[15]

In some cases, vapors may accumulate to the extent that they present an explosion risk or cause acute risks to human health.[16] In most documented cases of vapor intrusion, however, chemical vapor concentrations present a chronic health risk from long-term exposure to lower levels of chemicals.[17] Chemicals that can cause vapor intrusion include many substances that are used in residential areas, such as dry cleaning chemicals.[18] The type of health risks associated with vapor intrusion will depend on what chemical an individual inhales. For example, inhalation exposure to tricholoroethylene (TCE)—a volatile chemical often found at vapor intrusion sites—can cause cancer in humans[19] as well as result in damage to the central nervous system, liver, and kidneys.[20]

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12. *See, e.g.*, Westfarm Assoc. Ltd. P'ship v. Wash. Suburban Sanitary Comm'n, 66 F.3d 669, 675 (4th Cir. 1995) (finding that tetrachloroethylene leaked from a sewer and impacted area groundwater).

13. *See Superfund Program, Lockwood Solvent Ground Water Plume,* U.S. ENVTL. PROT. AGENCY, http://www.epa.gov/region8/superfund/mt/lockwood_solvents/index.html (last updated Sept. 2012) (noting that a plume of contaminants extends under 580 acres of land in Billings, Montana).

14. INTERSTATE TECH. REGULATORY COUNCIL, *supra* note 9, at 1–2.

15. *Id.* at 2.

16. U.S. ENVTL. PROT. AGENCY, OSWER DRAFT GUIDANCE FOR EVALUATING THE VAPOR INTRUSION TO INDOOR AIR PATHWAY FROM GROUNDWATER AND SOILS (SUBSURFACE VAPOR INTRUSION GUIDANCE) 5 (2002) [hereinafter OSWER], *available at* http://www.epa.gov/epawaste/hazard/correctiveaction/eis/vapor/complete.pdf.

17. *Id.*

18. STATE OF WIS., DEP'T OF HEALTH AND FAMILY SERV., CHEMICAL VAPOR INTRUSION AND RESIDENTIAL INDOOR AIR 5 (Feb. 13, 2003), *available at* http://www.dhs.wisconsin.gov/eh/air/pdf/VI_guide.pdf.

19. *See* Press Release, U.S. Envtl. Prot. Agency, EPA Release Final Health Assessment for TCE (Sept. 28, 2011) (on file with author), *available at* http://yosemite.epa.gov/opa/admpress.nsf/bd4379a92ceceeac8525735900400c27/b8d0e4d8489ad991852579190058d6c3!OpenDocument (characterizing TCE as carcinogenic to humans).

20. *Trichloroethylene, Hazard Summary,* U.S. ENVTL. PROT. AGENCY, http://www.epa.gov/ttn/atw/hlthef/tri-ethy.html (last updated Nov. 6, 2007).

B. History of Regulating Vapor Intrusion

Even though vapor intrusion presents extraordinary risks to human health, regulators have only recently addressed this serious issue.[21] Prior to the 1990s, regulators focused on assessing risks from other exposure pathways such as ingestion of contaminated drinking water.[22] A series of studies conducted by the Massachusetts Department of Environmental Protection (MassDEP) in the 1990s elucidated the prevalence and risks of vapor intrusion.[23] Since these studies were published in the 1990s, state environmental agencies have begun to address vapor intrusion in the absence of federal regulation.[24]

EPA first took notice of vapor intrusion through the oversight of several sites regulated under CERCLA.[25] However, EPA did not issue draft guidance documents addressing vapor intrusion until 2001 and 2002.[26] These guidance documents were not regulations but instead intended to inform assessments already being conducted under CERCLA and the Resource Conservation and Recovery Act (RCRA).[27] While these guidance documents provided useful information regarding the technical aspects of how to respond to vapor intrusion at sites already being regulated under CERCLA or RCRA, they did not provide for a mechanism that draws sites into these federal programs. Until sites were regulated under CERCLA or RCRA, there were no requirements for assessing, mitigating, or remediating vapor intrusion. EPA's inclusion of a vapor intrusion component to the HRS provides a mechanism for vapor intrusion sites to attain a listing on the NPL regardless of the existence of other exposure pathways.

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21. INTERSTATE TECH. REGULATORY COUNCIL, *supra* note 9, at 1–2.

22. *Id.* at 1.

23. *Id.*; *see also* NANCY A. FITZPATRICK & JOHN J. FITZGERALD, MASS. DEP'T OF ENVTL. PROT., AN EVALUATION OF VAPOR INTRUSION INTO BUILDINGS THROUGH A STUDY OF FIELD DATA 16 (1996), *available at* http://www.mass.gov/dep/cleanup/gw2proj.pdf (documenting a number of sites where vapor intrusion has been a problem and concluding that existing regulations "may not be protective enough under certain site conditions" to address vapor intrusion at sites in Massachusetts).

24. FITZPATRICK & FITZGERALD, *supra* note 23, at 1–2; THOMAS DIPERSIO & JOHN J. FITZGERALD, MASS. DEP'T OF ENVTL. PROT., GUIDELINES FOR THE DESIGN, INSTALLATION, AND OPERATION OF SUB-SLAB DEPRESSURIZATION SYSTEMS 1–2 (1995), *available at* http://www.mass.gov/dep/cleanup/laws/ssd1e.pdf (describing vapor intrusion and providing basic steps to installing a sub-slab depressurization system); CAL. REG'L WATER QUALITY CONTROL BD., INTERIM GUIDANCE FOR ACTIVE SOIL GAS INVESTIGATION 1 (1997), *available at* http://www.swrcb.ca.gov/rwqcb4/water_issues/programs/ust/guidelines/03_0210_interim%20guidance%20for%20active%20soil%20gas%20investigations.pdf (providing guidance on how to collect soil gas samples for the purposes of identifying the vapor intrusion pathway).

25. INTERSTATE TECH. REGULATORY COUNCIL, *supra* note 9, at 2.

26. *See* OSWER, *supra* note 16 (addressing how to evaluate the vapor intrusion pathway).

27. *Id.* at 2.

C. Mitigating and Remediating Vapor Intrusion

Vapor intrusion conditions vary radically depending on the chemicals, soils, presence of groundwater, and many other site-specific factors.[28] Furthermore, the vapor intrusion pathway often exhibits significant long-term temporal variations, often corresponding to seasonal changes,[29] and short-term variations, which can depend on changes in the barometric pressure and the operation of heating, ventilation, and cooling (HVAC) systems.[30] Because vapor intrusion is such a dynamic issue, the collection of a variety of analytical data and site-specific information is a critical first step in developing a strategy for addressing vapor intrusion.[31]

There are two general approaches to addressing vapor intrusion. The first approach involves cleaning up, or remediating, the source material.[32] Since the vapors entering a building emanate from chemicals in the subsurface, one approach is to eliminate or reduce the concentrations of these chemicals in soil or groundwater. This usually involves remediation measures typically seen in CERCLA sites, including the removal of source material through excavation of soil, treatment of groundwater, or removal of source material through soil vapor extraction.[33] While the successful removal of source material often can be more effective at protecting human health over the long term, source removal can often be technically or financially infeasible.[34]

The second approach, often referred to as "mitigation," addresses the short-term goals of cutting off human exposure to hazardous materials.[35] Source removal can take many years to reduce contaminant levels;[36] therefore, mitigation provides a temporary remedy to the risks posed by vapor intrusion. Mitigation measures can include easy and inexpensive

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28. U.S. ENVTL. PROT. AGENCY, BROWNFIELDS TECHNOLOGY PRIMER: VAPOR INTRUSION CONSIDERATIONS FOR REDEVELOPMENT 12 (2008) [hereinafter BROWNFIELDS], *available at* http://brownfieldstsc.org/pdfs/BTSC%20Vapor%20Intrusion%20Considerations%20for%20Redevelopment%20EPA%20542-R-08-001.pdf.

29. INTERSTATE TECH. REGULATORY COUNCIL, *supra* note 9, at 39.

30. *Id.*

31. *Id.* at 11.

32. *Id.* at 10.

33. *Id.* at 43.

34. OFFICE OF SOLID WASTE & EMERGENCY RESPONSE, U.S. ENVTL. PROT. AGENCY, GUIDANCE FOR EVALUATING TECHNICAL IMPRACTICABILITY OF GROUND-WATER RESTORATION 12–19 (1993), *available at* http://www.epa.gov/superfund/health/conmedia/gwdocs/techimp.htm.

35. INTERSTATE TECH. REGULATORY COUNCIL, *supra* note 9, at 10.

36. U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-10-857, TESTIMONY BEFORE THE SUBCOMMITTEE ON SUPERFUND, TOXICS AND ENVIRONMENTAL HEALTH, EPA'S COSTS TO REMEDIATE EXISTING AND FUTURE SITES WILL LIKELY EXCEED CURRENT FUNDING LEVELS 3 (2010), *available at* http://www.gao.gov/new.items/d10857t.pdf.

actions, such as sealing cracks in the foundation of buildings[37] or altering the pressurization of buildings through modification of a building's HVAC system,[38] to more expensive measures, including the active or passive venting of sub-slab air.[39] These measures are often more cost-effective when done in conjunction with the construction of a new building as opposed to the more costly alternative of retrofitting existing structures.[40]

D. Implications

Because vapor intrusion often involves individuals who are exposed to chemicals in their home, it has become a "hot button" issue.[41] Regulators have identified exposure to hazardous materials in indoor air as being of the "greatest concern" for several reasons.[42] First, people spend a large amount of time indoors, particularly in the winter months, where they may be exposed to contamination persistently.[43] Second, the inhalation exposure pathway is an efficient means by which chemicals are introduced into the body.[44] According to the Center for Disease Control, "[i]nhalation is the easiest and the fastest means of exposure to toxic substances . . . ."[45] Third, residents, workers, and other building occupants often have little recourse for avoiding indoor air contamination.[46] While residents can avoid drinking

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37. BROWNFIELDS, *supra* note 28, at 20 (noting that, because vapors often migrate from the subsurface into indoor air through cracks in a building's foundation, sealing cracks can eliminate the vapor intrusion pathway).

38. *Id.* at 21, 23.

39. *Id.* at 20–23. The term "sub-slab venting" refers to a process whereby vapors are intercepted below the slab or foundation of a building and then are vented to the exterior through a system of piping. U.S. ENVTL. PROT. AGENCY, ENGINEERING ISSUE: INDOOR AIR VAPOR INTRUSION MITIGATION APPROACHES 6 (2008), *available at* http://www.clu-in.org/download/char/600r08115.pdf. Active venting systems use a vacuum to suck or blow vapors from underneath a building to the exterior. *Id.* at 12. Passive systems vent vapors from below the building slab to the outdoor air using wind currents and natural pressure gradients to ensure vapors are vented to the exterior. BROWNFIELDS, *supra* note 28, at 21.

40. BROWNFIELDS, *supra* note 28, at 23.

41. INTERSTATE TECH. REGULATORY COUNCIL, *supra* note 9, at 1.

42. MASS. DEP'T OF ENVTL. PROT., BUREAU OF WASTE SITE CLEANUP, STANDARD OPERATING PROCEDURE, INDOOR AIR CONTAMINATION 1 (2007) [hereinafter MASSDEP SOP], *available at* http://www.mass.gov/dep/cleanup/laws/iaqsop0.pdf.

43. *Id.*

44. *See id.* ("[T]he lungs are an efficient *mass-transfer* mechanism for introducing air contaminants into the body[.]").

45. *A Toxicology Curriculum for Communities Trainer's Manual, Module 2: Routes of Exposure*, CTR. FOR DISEASE CONTROL, AGENCY FOR TOXIC SUBSTANCES & DISEASE REGISTRY 99, http://www.atsdr.cdc.gov/training/toxmanual/pdf/module-2.pdf (last visited Nov. 17, 2012).

46. MASSDEP SOP, *supra* note 42, at 1.

contaminated tap water by purchasing bottled water, building occupants can do little to avoid indoor air contamination in their homes.[47]

Furthermore, the trend of risk-based cleanups[48] has resulted in greater quantities of oil and hazardous materials being left in place in soil and groundwater. Many of these risk-based cleanups were conducted before vapor intrusion was considered a health risk; therefore, this method of exposure was not considered in risk assessments.[49] Consequently, many sites that have achieved regulatory closure may still be harming individuals through vapor intrusion.

Lastly, since the CERCLA program began, EPA has focused on addressing contamination at sites where people were exposed to chemicals through the ingestion of contaminated drinking water or food.[50] Indeed, many sites have been regulated through the CERCLA program because of the human health implications of ingesting contaminated drinking water. However, other sites, which could exhibit the same concentrations of contaminants but have not impacted drinking water sources, may not have been considered simply because EPA did not contemplate a vapor intrusion exposure pathway. For instance, many sites located in cities such as Boston, New York, and San Francisco may not attain NPL status simply because these cities obtain drinking water from sources located tens or hundreds of miles from urban population.[51] While hazardous waste sites in these cities may be extremely contaminated, and residents at these sites may be inhaling toxic vapors, EPA may not place such contaminated sites on the NPL because the means by which people are exposed to hazardous

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47. *Id.*

48. INTERSTATE TECH. REGULATORY COUNCIL, USE OF RISK ASSESSMENT IN MANAGEMENT OF CONTAMINATED SITES 1–2 (2008) [hereinafter USE OF RISK ASSESSMENT], *available at* http://www.itrcweb.org/Documents/Risk_Docs/RISK2.pdf. The determination of how clean a site needs to be before it achieves regulatory closure is based on the "risk" that the contaminants pose to humans and other living organisms. *Id.* at 1. In light of cost and feasibility, EPA and other agencies use risk assessment rather than requirements mandating that potentially responsible parties remove all contamination from a site. *Id.* at 1–2.

49. INTERSTATE TECH. REGULATORY COUNCIL, *supra* note 9, at 1 (stating that "[f]or more than a decade, environmental scientists and risk assessors viewed contaminated groundwater as a threat principally to the drinking water supply").

50. *Id.*

51. Boston obtains its water from two reservoirs located 35 miles and 65 miles west of the City. *How the MWRA Water System Works*, MASS. WATER RES. AUTH., http://www.mwra.state.ma.us/04water/html/watsys.htm (last updated Oct. 12, 2012). New York's water supply is sourced from several reservoirs located more than 125 miles northwest of the City. N.Y.C. DEP'T OF ENVTL. PROT., NEW YORK CITY 2010 DRINKING WATER SUPPLY AND QUALITY REPORT 2 (2011), *available at* http://www.nyc.gov/html/dep/pdf/wsstate10.pdf. San Francisco's main water source is the Hetch Hetchy Reservoir in the Sierra Mountains, located approximately 160 miles east of the bay area. *Hetch Hetchy Water System*, BAY AREA WATER SUPPLY & CONSERVATION AGENCY, http://bawsca.org/water-supply/hetch-hetchy-water-system/ (last visited Nov. 17, 2012).

materials—vapor intrusion—is not currently contemplated by the HRS. Fortunately, EPA has announced that it is conducting a rulemaking that will incorporate vapor intrusion into the HRS. In order to write an effective rule, EPA should examine the ways in which states and other federal programs have integrated vapor intrusion into existing regulation.

II. STATE AND FEDERAL REGULATORY MECHANISMS CURRENTLY USED TO ADDRESS VAPOR INTRUSION

A. Regulation of Vapor Intrusion on the State Level

Since 1980, most states have enacted legislation that addresses soil and groundwater contamination.[52] Because many of these state laws are independent of federal environmental statutes such as CERCLA, states have been able to experiment with a variety of approaches in regulating hazardous waste sites.[53] How states have handled vapor intrusion is no exception. Invoking Justice Brandeis's celebrated dissent in *New State Ice Co. v. Liebmann*, several states have "serve[d] as . . . laborator[ies]" by experimenting with different methods of regulating vapor intrusion.[54] When integrating vapor intrusion into the HRS, EPA may look at the various ways in which states have addressed vapor intrusion to identify successful regulatory mechanisms in dealing with this important issue.

States have generally redressed vapor intrusion through their hazardous waste cleanup laws and regulations.[55] In the majority of states, scopes of work to investigate and remediate contamination are initially developed by consultants hired by potentially responsible parties.[56] State agencies then review and comment on the scopes of work before the consultants implement the prescribed actions.[57] Most states have issued guidance to consultants that may be used when evaluating vapor intrusion; however, the majority of states have not promulgated regulations that specifically address

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52. ENVTL. LAW INST., AN ANALYSIS OF STATE SUPERFUND PROGRAMS 13 (2002), *available at* www.elistore.org/data/products/d12-10a.pdf.

53. *Id.*

54. New State Ice Co. v. Liebmann, 285 U.S. 262, 311 (1932) (Brandeis, J., dissenting).

55. *See* PARSONS, FINAL VAPOR INTRUSION/INDOOR AIR GUIDANCE SURVEY 5–7 (2010) [hereinafter PARSONS], *available at* http://indoorairproject.files.wordpress.com/2010/07/final-massdep-vi-report-072710.pdf (describing how states regulate hazardous waste sites including those sites that present vapor intrusion risks).

56. *See id.* at 5–6 (noting that 28 states follow this model while several other state programs, such as Massachusetts and Michigan, use a more privatized approach with less regulatory oversight).

57. *Id.* at 6.

vapor intrusion.[58] Other states, including New York and California, have been particularly proactive by enacting legislation that regulates vapor intrusion directly.

1. California's Efforts to Legislate Vapor Intrusion

To account for vapor intrusion, California enacted legislation in 2007 that amended the Porter-Cologne Water Quality Control Act (Water Quality Act), the State's water quality statute,[59] and the Carpenter-Presley-Tanner Hazardous Substances Account Act (California Superfund Act),[60] which "[e]stablish[es] a program to provide for response authority for releases of hazardous substances."[61] Like CERCLA, the California Superfund Act imposes liability for the remediation of contaminated sites and ranks sites according to the risk that they present to human health and the environment.[62] Actions conducted under the California Superfund Act must consider certain requirements, including the performance of a health risk assessment, which takes into consideration exposure to chemicals via a variety of exposure pathways.

The 2007 amendment, commonly known as AB 422, requires that responsible parties, such as property owners and developers, develop threshold exposure levels for contamination found in indoor air.[63] Furthermore, AB 422 also amended the Water Quality Act to ensure that any assessment would consider health risks stemming from "drinking water, food, ambient and indoor air, or soil."[64] The previous version of the statute did not consider health impacts from indoor air.[65]

By requiring risk assessments to consider exposure to contaminants in the indoor air, AB 422 mandated that all risk assessments performed under the program contemplate vapor intrusion. The practical effect of this legislation was that fewer sites exhibiting potential vapor intrusion issues would escape regulatory scrutiny and that exposure by vapor intrusion would receive the same treatment as exposure through other pathways such as ingestion and dermal contact.

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58. *Id.* at 5 (finding that 29 states have issued have specific vapor intrusion guidance and eight states relied on guidance from EPA or other institutional sources).

59. CAL. WATER CODE § 13000 (West 2009); 2007 Cal. Legis. Sess. Ch. 597 (West), *available at* http://www.leginfo.ca.gov/pub/07-08/bill/asm/ab_0401-0450/ab_422_bill_20071013_chaptered.html.

60. CAL. HEALTH & SAFETY CODE § 25301 (West 2006).

61. *Id.*

62. WATER SUPPLY—HAZARDOUS SUBSTANCES AND WASTE—CLEAN UP, 2007 Cal. Legis. Serv. Ch. 597 (West).

63. *Id.*

64. *Id.*

65. *Id.*

Also, by opting to enact legislation rather than merely change rules or regulations, the legislature made a strong statement about its commitment to addressing vapor intrusion. While California's decision to enact legislation regarding vapor intrusion deserves a great deal of credit, accomplishing a similar feat at the federal level would be incredibly difficult because of the environmental record of the current Congress.[66] However, in the event that the new HRS rule does not effectively address vapor intrusion concerns at CERCLA sites, the only course available may be to follow California's lead in enacting a statute.

2. New York's Progressive Vapor Intrusion Program

In 2008, New York enacted a law that required property owners to provide tenants with certain information regarding indoor air quality.[67] The New York Legislature enacted this law in response to landlords who knowingly rented apartments adversely affected by vapor intrusion in Ithaca and Endicott.[68] If property owners obtain sampling results that indicate concentrations of chemicals above those set forth by the New York State Department of Health or by the Occupational Safety and Health Administration (OSHA), then the law requires landlords to provide those results to tenants.[69]

Furthermore, New York incorporated vapor intrusion into its remedial program requirements for hazardous waste sites.[70] Specifically, the amendment stated that "[a]ll remedial programs shall be protective of public health and the environment including but not limited to groundwater[,] . . . drinking water, surface water and air (including indoor air)" and that assessment work should address "the existing and potential impact of groundwater contamination on private or community water supply wells, surface water quality, air quality, and indoor air quality."[71] Like California, an amendment stating the inclusion of indoor air with other previously recognized means of exposure suggests the seriousness with which the New York Legislature views vapor intrusion. Such an endorsement enables the

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66. *See* Editorial, *G.O.P. vs. the Environment*, N.Y. TIMES, Oct. 14, 2011, http://www.nytimes.com/2011/10/15/opinion/the-republicans-vs-the-environment.html (opining as to the anti-environmental policies of the current House of Representatives, which Representative Henry Waxman "calls . . . 'the most anti-environmental Congress in history'").

67. N.Y. ENVTL. CONSERV. LAW § 27-2405 (McKinney 2007 & Supp. 2012) (effective Dec. 3, 2008) [hereinafter ENVTL. CONSERV.].

68. A.B. 10952B, 231st Leg., Reg. Sess. (N.Y. 2008).

69. ENVTL. CONSERV. § 27-2405.

70. *Id.* § 27-1415.

71. *Id.*

regulating agency, the Department of Environmental Conservation (NYDEC), to actively address vapor intrusion sites without the questions of legal authority that may encumber states with less explicit environmental statutes.

New York has also issued regulations under existing statutes to address vapor intrusion. Notably, NYDEC has determined that it will retroactively evaluate sites that have been closed in the past.[72] The State established this policy after determining that many previously closed sites may present hazards to human health.[73] By reevaluating previously closed sites, New York is ensuring that many of its worst vapor intrusion sites do not escape regulatory scrutiny. This proactive step is one of the key elements of the proposed rule, discussed *infra* Part III.

B. Regulation of Vapor Intrusion at the Federal Level

1. CERCLA

In 1980, Congress enacted CERCLA "to promote the 'timely cleanup of hazardous waste sites' and to ensure that the costs of such cleanup efforts were borne by those responsible for the contamination."[74] To implement the cleanup of hazardous waste sites under CERCLA, EPA uses a regulation called the National Contingency Plan (NCP)[75] to provide a blueprint of the response actions authorized by the law.[76] Once EPA identifies a site that may be regulated under the authority of CERCLA, EPA will enter the site into the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS), which EPA uses as an inventory of potential hazardous waste sites.[77] EPA will then conduct a series of site assessments during which time the agency gathers information to evaluate the risks that may exist at a site.[78] If the site assessment process indicates

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72. CARL JOHNSON, N.Y. STATE DEP'T OF ENVTL. CONSERV., DER-13/STRATEGY FOR EVALUATING SOIL VAPOR INTRUSION AT REMEDIAL SITES IN NEW YORK 1 (2006) [hereinafter DER-13], *available at* www.dec.ny.gov/docs/remediation_hudson_pdf/der13.pdf.

73. *See id.* (noting the increasing awareness that soil vapors can cause exposure).

74. Burlington N. & Santa Fe Ry. Co. v. United States, 556 U.S. 599, 602 (2009) (quoting Consol. Edison Co. of N.Y. v. UGI Util., Inc., 423 F.3d 90, 94 (2d Cir. 2005)).

75. Martha L. Judy & Katherine N. Probst, *Superfund at 30*, 11 VT. J. ENVTL. L. 191, 194 (2009).

76. *Superfund, Basic Information*, U.S. ENVTL. PROT. AGENCY, http://www.epa.gov/superfund/about.htm (last updated May 14, 2012).

77. U.S. ENVTL. PROT. AGENCY, THE SUPERFUND SITE ASSESSMENT PROCESS 2, *available at* http://www.epa.gov/superfund/sites/npl/site_assessment_info_sheet.pdf (last visited Nov. 17, 2012).

78. *Id.*

that a site may impose risk to human health or the environment, EPA will use the HRS to determine if the site should be included on the NPL.[79]

The HRS scores sites by evaluating four potential exposure pathways—groundwater, surface water, soil, and outdoor air[80]—through which humans may come into contact with hazardous materials.[81] EPA will assign a score to each of the four pathways. If the sum of pathways scored by the HRS is equal to or greater than 28.5, the site will be included on the NPL.[82] While the HRS considers exposure to hazardous materials in the outdoor air, the ranking system currently does not contemplate the vapor intrusion pathway.[83]

EPA does, however, regulate vapor intrusion at CERCLA sites tangentially in one of two ways: through its emergency response program, or when a site is placed on the NPL because of risks presented by other exposure pathways, such as ingestion of drinking water or dermal contact with contaminated soil.[84] In this latter means of addressing vapor intrusion, EPA can actively regulate vapor intrusion only *after* a site obtains NPL status.[85]

In an effort to assess the state of the Superfund program, the Government Accountability Office (GAO) recently found that contaminated sites that pose significant risk to human health may be overlooked if vapor intrusion is not assessed.[86] Based on this report, EPA initiated a notice-and-comment period in early 2011 soliciting input from the public on whether to include vapor intrusion in the HRS.[87] After reviewing the comments, EPA then announced that it was moving towards a notice of proposed rulemaking in 2012.[88] The rule would "add a new screening component to the HRS that would allow sites with vapor intrusion contamination to be evaluated for placement on the NPL."[89]

This amendment to the HRS is long overdue. Vapor intrusion poses risks both at sites that have been denied NPL status in the past and at sites

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79. OVERVIEW OF THE HAZARD RANKING SYSTEM, *supra* note 8, at 1.

80. *Id.* at 2. Impacts from indoor air are explicitly excluded from the outdoor air pathway. *Id.*

81. *Id.*

82. *Id.* The HRS assigns each site a score between 0 and 100. *Id.*

83. Potential Addition of Vapor Intrusion Component to the Hazard Ranking System, 76 Fed. Reg. 5370, 5372 (Jan. 31, 2011) [hereinafter Potential Addition].

84. *Addition of Subsurface Component, supra* note 6.

85. *Id.*

86. SUPERFUND, EPA'S ESTIMATED COSTS, *supra* note 5, at 3–4, 33.

87. *See Vapor Intrusion and the Superfund Program*, U.S. ENVTL. PROT. AGENCY, http://www.epa.gov/superfund/sites/npl/hrsaddition.htm (last updated June 15, 2012) (stating that notice was published on January 31, 2011 and allowed for comments until April 16, 2011).

88. *Addition of Subsurface Component, supra* note 6.

89. *Id.*

that will be ranked in the future. While the inclusion of vapor intrusion is a step in the right direction, how EPA writes the rule integrating vapor intrusion into the HRS will determine its true efficacy.

2. RCRA

EPA has also addressed vapor intrusion sites through the Resource Conservation and Recovery Act (RCRA). Enacted in 1976, RCRA is a "comprehensive environmental statute"[90] crafted to manage and regulate hazardous waste materials from "cradle to grave."[91] However, "RCRA is not principally designed to effectuate the cleanup of toxic waste sites or to compensate those who have attended to the remediation of environmental hazards."[92] Rather, it is intended "to ensure the proper treatment, storage, and disposal of that waste which is nonetheless generated, 'so as to minimize the present and future threat to human health and the environment.'"[93] RCRA also contains imminent hazard provisions "designed to protect health and the environment by effectuating the prompt cleanup of contaminated sites by those who contributed to the contamination."[94] Section 7003 of RCRA, the "[i]mminent hazard" provision, permits EPA to sue for injunctive relief to clean up hazardous or solid waste.[95] Specifically, section 7003 provides that EPA may bring an action "upon receipt of evidence that the past or present handling, storage, treatment, transportation or disposal of . . . hazardous waste may present an imminent and substantial endangerment to health or the environment."[96]

RCRA also provides for citizen suits authorizing any person to sue those who have contributed to a condition of substantial endangerment.[97]

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90. Randall James Butterfield, *Recovering Environmental Cleanup Costs Under the Resource Conservation and Recovery Act: A Potential Solution to A Persistent Problem*, 49 VAND. L. REV. 689, 692 (1996) (citing William L. Kovacs & John F. Klucsik, *The New Federal Role of Solid Waste Management: The Resource Conservation and Recovery Act of 1976***,** 3 COLUM. J. ENVTL. L. 205 (1977)).

91. *Id.* at 693 (quoting City of Chicago v. Envtl. Def. Fund, 511 U.S. 328, 331 (1994) (internal quotation marks omitted)).

92. Meghrig v. KFC W., Inc., 516 U.S. 479, 483 (1996).

93. *Id.* (quoting 42 U.S.C. § 6902(b) (2006)).

94. Kenneth K. Kilbert, *Re-Exploring Contribution under RCRA's Imminent Hazard Provisions*, 87 NEB. L. REV. 420, 426 (2008) (citing United States v. Price, 688 F.2d 204, 211–14 (3d. Cir. 1982)).

95. 42 U.S.C. § 6973 (2006) (stating that "upon receipt of evidence that the past or present handling, storage, treatment, transportation or disposal of any solid waste or hazardous waste may present an imminent and substantial endangerment to health or the environment, the Administrator may bring suit on behalf of the United States").

96. *Id.*

97. 42 U.S.C. § 6972(a) (2006).

These suits enable citizens to sue "any person, including the United States."[98] Both EPA and citizens have sought relief for vapor intrusion contamination through these mandatory injunction mechanisms. However, plaintiffs have had mixed success in demonstrating that vapor intrusion constitutes an "imminent and substantial endangerment."[99]

Several courts have found that vapor intrusion of contamination at a site constituted an "imminent and substantial endangerment."[100] For example, in *United States v. Apex Oil Co.*, the U.S. District Court for the Southern District of Illinois determined that vapor intrusion, caused by the release of millions of gallons of oil, had adversely affected the indoor air quality of numerous residences.[101] In determining whether an imminent and substantial endangerment existed, the court found that "the United States 'must only show that there is a *potential* for an imminent threat of serious harm.'"[102] The court held that "[v]apors emanating from hydrocarbon contamination in soils at the Hartford Site present or may present an imminent and substantial endangerment to health, because Hartford residents who are exposed [to] chemicals contained in those vapors may suffer adverse health effects."[103] The court found that an "[i]mminent and [s]ubstantial [e]ndangerment to [public] [h]ealth" existed and held that the defendant was jointly and severally liable for taking action to clean up the Hartford site.[104] The Seventh Circuit affirmed, holding that Apex's "challenge [that no substantial endangerment exists] has no possible merit," and the Supreme Court denied a petition for certiorari.[105] While this case appears to open the door to addressing vapor intrusion under RCRA, the facts in this case—including the release of *millions* of gallons of oil—are extreme. Given a release of this magnitude, it should come as no surprise that this site represented an "imminent and substantial endangerment."

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98. *Id.* § 6972(a)(1)(B).

99. *Id.*

100. *See, e.g.*, Voggenthaler v. Md. Square, LLC, No. 2:08-CV-1618-RCJ-GWF, 2010 WL 2947296, at *11 (D. Nev.), *reconsideration denied*, No. 2:08-CV-1618-RCJ-GWF, 2010 WL 4316916 (D. Nev. Oct. 20, 2010) (holding the plume of PCE contamination posed imminent and substantial endangerment to local residences); United States v. Apex Oil Co., No. 05-CV-242-DRH, 2008 WL 2945402, at *79 (S.D. Ill. Jul. 28, 2008), *aff'd*, 579 F.3d 734 (7th Cir. 2009) (holding exposure to hydrocarbon vapors presents an imminent and substantial endangerment to the health of residents).

101. *Apex Oil*, 2008 WL 2945402, at *79.

102. *Id.* at *78 (quoting Interfaith Cmty. Org. v. Honeywell Int'l, Inc., 399 F.3d 248, 258 (3d Cir. 2005) (emphasis in original)).

103. *Id.* at *79.

104. *Id.* at *82.

105. United States v. Apex Oil Co., 579 F.3d 734, 735 (7th Cir. 2009), *cert. denied*, 131 S. Ct. 67 (2010) (mem.).

Cases in which the releases to the environment are less extreme or catastrophic have proven to be more problematic for plaintiffs.[106] In *Grace Christian Fellowship v. KJG Investments Inc*., a church sued the owners of a gas station under RCRA's citizen suit provision.[107] The claim alleged that elevated levels of gasoline constituents in indoor air within the plaintiff's basement represent "an imminent and substantial endangerment."[108] The plaintiffs sought a preliminary injunction to require the defendants to conduct response actions to address the contamination.[109] In presenting their case, the defendants introduced an extraordinary amount of expert testimony that attempted to establish that indoor air contamination found at the church was not attributable to releases from the gas station.[110] Conversely, the plaintiff had experts of its own establishing that such a link did indeed exist.[111] In this battle of the expert witnesses, the court sided with the defendants, concluding that because "the plaintiff has not established that there is a complete exposure pathway from any gasoline vapors in the sub-slab under the Grace basement (or the utility trench) to the Grace building," there was no imminent and substantial endangerment.[112] Therefore, the court denied the plaintiff's motion for a preliminary injunction.[113]

RCRA remains an imperfect regulatory mechanism for addressing vapor intrusion. While courts have ruled in favor of plaintiffs at some RCRA sites, the burden for establishing "imminent and substantial endangerment" remains high and is difficult for plaintiffs to demonstrate, often requiring years of assessment and monitoring in addition to copious expert testimony. Furthermore, RCRA precludes certain types of sites from being regulated. The cleanup programs under RCRA only address releases where "the defendant was or is a generator or transporter of solid or hazardous waste or owner or operator of a solid or hazardous waste treatment, storage or disposal [TSD] facility."[114] Therefore, by virtue of not fitting EPA's definition of a TSD facility, many vapor intrusion sites could not be regulated by RCRA. Moreover, unlike sites regulated under

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106. *See, e.g.*, Grace Christian Fellowship v. KJG Inv. Inc., No. 07-C-0348, 2009 WL 2460990 (E.D. Wis. Aug. 7, 2009).

107. *Id.* at *1.

108. *Id.* at *6, 10 (citing 42 U.S.C. § 6972(a)(1)(B) (2006)).

109. *Id.* at *3.

110. *Id.* at *10–12.

111. *Id.* at *10.

112. *Id.* at *12.

113. *Id.*

114. Prisco v. A & D Carting Corp., 168 F.3d 593, 608 (2d Cir. 1999) (citing 42 U.S.C. §§ 6972–6973 (2006)).

CERCLA, RCRA sites do not have the benefit of a fund to pay for clean-up in the event that a potentially responsible party cannot be found or is insolvent. Because of the high burden of "imminent and substantial endangerment," the eligibility restrictions, and the lack of a cleanup fund, RCRA is an imperfect statutory tool for addressing vapor intrusion.

III. PROPOSED KEY ELEMENTS OF A SUCCESSFUL RULE INCORPORATING VAPOR INTRUSION INTO THE HAZARD RANKING SYSTEM

EPA has taken the important step of drafting a vapor intrusion component to the HRS; however, for the Agency to make this addition meaningful, it must consider a few key criteria. First, EPA must rescore certain sites that have previously scored below the HRS threshold. Second, the scoring system should incorporate a rebuttable presumption for the existence of vapor intrusion when there is inadequate data. Third, those sites evaluated during the HRS process that present an imminent hazard to human health should be "fast-tracked" in order to mitigate any human health concerns as soon as possible. While the success of the vapor intrusion component to the HRS will be measured over time, including these three mechanisms in the proposed rule will ensure that the NPL program encompasses many sites deserving of federal attention and funds.

A. EPA Should Evaluate "Legacy" Sites

Because EPA did not consider inhalation of indoor air as an exposure pathway when it determined whether sites warrant inclusion on the NPL, many sites that scored below the NPL threshold of 28.5[115] may pose a significant risk to human health through vapor intrusion. By looking back at sites that have previously scored less than 28.5, EPA may be able to incorporate these potentially hazardous sites into the NPL program. Several states, including New York and Massachusetts, have established programs to reevaluate previously closed sites in order to account for the recent developments in our understanding of vapor intrusion.[116] EPA should consider these programs when establishing a similar system of site reevaluation for CERCLA sites.

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115. See Section II.B.1, *supra*, for a discussion of the HRS and the 28.5 threshold.

116. *Priority Area: Healthy Environment–Hazardous Waste Sites*, N.Y STATE DEP'T. OF HEALTH, http://www.health.ny.gov/prevention/prevention_agenda/healthy_environment/hazardous_waste _sites.htm [hereinafter *Priority Area*] (last revised Feb. 2011); *Vapor Intrusion Audits: Identifying and Mitigating Unacceptable Impacts to Indoor Air,* MASS. DEP'T OF ENVTL. PROT.*,* http://www.mass.gov/dep/cleanup/laws/viaud.htm [hereinafter *Vapor Intrusion Audits*] (last visited Nov. 17, 2012).

1. New York's Legacy Program

In 2006, New York reevaluated a number of previously closed sites through what it called its "legacy" program.[117] In a policy notice, the NYDEC stated that it will evaluate "all Resource Conservation and Recovery Act (RCRA) Corrective Action sites, inactive hazardous waste disposal sites (State Superfund), Voluntary Cleanup Program sites, Brownfield Cleanup Program sites, and Environmental Restoration Program sites" for vapor intrusion.[118] New York stated that it would assess past sites "in the same manner that ongoing sites are evaluated."[119] The State first targeted sites exhibiting certain types of chemicals that are prone to emit vapors.[120] NYDEC then developed a method of prioritization that involved, first, a screening process, and then a ranking system that prioritized sites based on four criteria: concentrations of the chemical in question, "depth to contamination," "soil characteristics," and "land use at and adjacent to the site above impacted soil or groundwater."[121]

In all, New York has identified 421 previously closed sites that warranted a second look.[122] As of January 2009, the legacy sites program has overseen the installation of 405 mitigation systems at 55 legacy sites. [123] Furthermore, 156 building structures are currently being monitored at 24 legacy sites as part of New York's program.[124] The New York State Department of Health aspires to "minimize or eliminate the risks to human health via inhalation of contaminated air from soil vapor intrusion" at these sites by 2012.[125]

2. Massachusetts' Reevaluation Program

Massachusetts has also implemented an official policy of reevaluating certain previously closed hazardous waste sites. Massachusetts took this step in 2006 when the State's environmental agency, MassDEP, lowered many of

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117. *Priority Area*, *supra* note 116; DER-13, *supra* note 72, at 1.

118. DER-13, *supra* note 72, at 1.

119. *Id.* at 4.

120. *Id.* (noting the State targeted sites with chlorinated volatile organic compounds (CVOC) contamination because "they are found at the vast majority of contaminated sites, they do not readily biodegrade, and they may accumulate indoors without being noticed by the occupant because of their high odor threshold").

121. *Id.* at 4–5.

122. *Priority Area*, *supra* note 116 (stating the objective of evaluating 421 legacy sites).

123. *Id.*

124. *Id.*

125. *Id.*

the standards it uses to screen hazardous waste sites.[126] When instituting the reevaluation policy, MassDEP focused on one contaminant in particular: tetrachloroethylene (PCE), which is one of the most troublesome chemicals associated with vapor intrusion. [127] PCE is used in a variety of processes including dry-cleaning and industrial degreasing.[128] After the 2006 amendments, MassDEP lowered the screening value of PCE from 3,000 to 50 parts per billion.[129] Because some sites that had been closed prior to 2006 may have concentrations of chemicals that exceed the post-2006 screening value of 50 parts per billion, MassDEP reviewed those sites that had achieved Response Action Outcome (RAO) status, which signifies the closure of a site. MassDEP has not indicated that it will expand its audit program to other contaminants; however, because MassDEP has the ability to audit any site within five years of the submittal of regulatory closure documents, it has the ability to audit sites with other chemicals on a discretionary basis.[130]

Like New York, Massachusetts has prioritized the closed sites that it has evaluated. First, from a total of approximately 32,000 RAOs filed before 2006, MassDEP identified 600 RAOs in which PCE had been detected.[131] MassDEP then evaluated those 600 sites and determined that most of the sites did not warrant additional evaluation.[132] However, MassDEP identified 96 sites that required additional evaluation.[133] Of the 96 sites identified, MassDEP determined that 18 sites must be reopened, 12 sites required immediate actions to abate imminent hazards to human health, and 57 buildings were potentially affected by vapor intrusion.[134] In the town of Salem, for example, eight apartment buildings, which had been developed on a former industrial property, exhibited concentrations of PCE in indoor air from vapor intrusion that not only reopened the site, but also triggered an "Imminent Hazard," Massachusetts' emergency reporting mechanism for conditions that pose an immediate risk to human health.[135] Other sites that MassDEP reopened included a Head Start preschool, several residences, and a number of commercial properties.[136]

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126. *Vapor Intrusion Audits, supra* note 116.

127. *Id.*

128. *Tetrachloroethylene ToxFAQs*, CTR. FOR DISEASE CONTROL, AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY 1 (Sept. 1997), http://www.atsdr.cdc.gov/tfacts18.pdf.

129. *Vapor Intrusion Audits, supra* note 116.

130. *Id.*

131. Lisa Alexander, *PCE – A Dark Alchemy*, MASS. DEP'T OF ENVTL. PROT., http://www.mass.gov/dep/cleanup/compliance/ce511.pdf (last visited Nov. 17, 2012).

132. *Id.*

133. *Id.*

134. *Id.*

135. *Id.* at 4.

136. *Id.* at 4–6.

For now, MassDEP has officially limited its reevaluation process to sites affected by PCE. The agency may determine that sites contaminated with other commonly-used chemicals that emit vapors, such as TCE, may warrant an official policy of reevaluation. In the Massachusetts Contingency Plan—the regulations that govern releases of hazardous materials—MassDEP is authorized to audit RAOs at any site within five years of submittal.[137] Therefore, MassDEP may also use its existing authority to audit sites affected by TCE and other troublesome chemicals.

3. Proposed Method of Review

Reassessing all sites that have scored below 28.5 on the HRS may sound like a daunting task. However, because vapor intrusion only involves certain types of chemicals in specific situations, EPA could devise an efficient method, similar to the processes used in New York or Massachusetts, to evaluate only those sites that exhibit a vapor intrusion risk. First, EPA should only reevaluate those sites where releases of volatile chemicals—those chemicals exhibiting chemical characteristics that enable the substance in question to move readily from the liquid to gas form[138]—have been found. Many groups of chemicals, such as heavy metals, most pesticides, and dioxin, do not present vapor intrusion risks.[139] Therefore, those sites exhibiting contamination without volatile chemicals need not be considered for reevaluation.

Second, EPA should screen out those sites where no buildings or building occupants are present. If the site is unoccupied, no vapor intrusion can occur. However, the rule should note that EPA reserves the right to re-score the site in the event that it becomes occupied in the future. The rule should also require that a deed restriction be added to unoccupied sites referring to the HRS scoring and to the possibility of rescoring in the event that a site's occupancy status changes. By screening previously assessed sites using both of the methods described above, EPA would be able to efficiently and effectively identify those sites that have escaped due scrutiny under the previous HRS scoring system.

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137. 310 MASS. CODE REGS. § 40.1110(4)(b) (2008).

138. INTERSTATE TECH. REGULATORY COUNCIL, *supra* note 9, at 16.

139. *Compare* 310 Mass. Code Regs. § 40.0982 (explaining that MassDEP has generated GW-2 standards, which are used to "model potential volatilization of oil and/or hazardous materials to indoor air"), *with* 310 Mass. Code Regs. § 40.0974(2) (listing a table of contaminants noting that most heavy metals, including lead, cadmium, and arsenic, pesticides, including DDT, and dioxins, including 2,3,7,8-tetrachlorodibenzodioxin, are listed as "NA" or "not applicable" in the GW-2 category).

B. EPA Should Use a Rebuttable Presumption Approach When Data Gaps Exist

Regulators and consultants evaluating vapor intrusion must consider multiple lines of evidence and several iterations of sampling in order to confirm or refute the presence of vapor intrusion.[140] Many sites evaluated by regulators, particularly at the preliminary investigation stage, have a limited amount of data.[141] Therefore, regulators must make important regulatory decisions with imperfect data sets. When incorporating a vapor intrusion component into the HRS, EPA should implement a rebuttable presumption that vapor intrusion is occurring at sites scored under the HRS in certain circumstances. The presumption should be rebutted only when data collected at the sites refutes the occurrence of vapor intrusion.

The rebuttable presumption is a key element of any vapor intrusion regulation. First, the use of the rebuttable presumption ensures that any sites with the potential to pose a vapor intrusion risk are assessed thoroughly and do not escape regulatory oversight. Second, the rebuttable presumption encourages potentially responsible parties to collect more data to confirm or refute the presence of vapor intrusion. With more data comes a better understanding of the presence of contamination. Not only would a better understanding of contamination at the site aid in addressing vapor intrusion, but a more robust pool of data will typically result in a more effective remedy of other problems, such as soil and groundwater contamination.

1. Massachusetts' Rebuttable Presumption

Currently Massachusetts uses a rebuttable presumption for those sites exhibiting evidence of vapor intrusion. Massachusetts regulates its hazardous waste sites through the Massachusetts Contingency Plan (MCP).[142] The MCP uses a risk-based approach to evaluate hazardous waste sites. Sites achieve regulatory closure only when a risk assessment finds that a condition of "No Significant Risk" to human health and the

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140. *Id.* at 5–6.

141. *See Preliminary Assessment/Site Inspection*, U.S. ENVTL. PROT. AGENCY, http://epa.gov/superfund/cleanup/pasi.htm (last updated Sept. 28, 2011) (noting that preliminary assessments are "designed to distinguish, based on limited data, between sites that pose little or no threat to human health and the environment and sites that may pose a threat and require further investigation").

142. 310 Mass. Code Regs. § 40.0000 (2008). The MCP, a part of Massachusetts's privatized site cleanup program, sets forth a program for consultants to follow when evaluating and remediating a site. Fact Sheet: *Massachusetts's Approach to Waste Site Cleanup: Chapter 21E and the Massachusetts Contingency Plan*, MASS. DEP'T OF ENVTL. PROT. 1–2 (last revised Feb. 4, 2001), http://www.mass.gov/dep/cleanup/laws/msfs.pdf. Sites are periodically audited by the MassDEP. *Id.* at 5.

environment exists.[143] The risk assessment compares the concentrations of chemicals detected in soil and groundwater at the site to standards set forth by MassDEP.[144] The standards set forth by MassDEP consider vapor intrusion as an exposure pathway.[145] If concentrations of chemicals in soil and groundwater at a site exceed these standards, there is a rebuttable presumption that vapor intrusion presents a risk at the site in question.[146] The presumption may be rebutted only by collecting additional data such as measurements of chemicals in indoor air or further site-specific information such as important hydrogeological or building conditions.[147] Once the investigator rebuts the presumption of vapor intrusion, a risk assessor then compares the concentrations of chemicals in soil and groundwater to different standards, which are typically more lenient, that do not take vapor intrusion into account.[148] The rebuttable presumption as used by Massachusetts should be a key element to the new rule regarding vapor intrusion in the Superfund program.

2. Proposed Method of Inclusion

EPA should use a two-part test to determine whether or not to apply the rebuttable presumption. The first and most important step would be to determine what type of chemical has been released into the environment. Because volatile chemicals most often present vapor intrusion risks, EPA's first inquiry should be whether the chemicals of concern at the site in question are volatile.[149] If the chemicals at the site in question are not volatile, then the vapor intrusion pathway need not be considered.

However, if the chemicals found at the site are volatile, EPA should move to the second step, which would involve considering a number of site-specific characteristics. Factors to be weighed in this step would be the vertical and horizontal distance between the contamination and occupied indoor spaces, the type of indoor space (a residence or school versus a warehouse or an unoccupied building), geology at the site, and the age, condition, as well as construction of on-site buildings.[150] If the chemicals at the site are volatile and if the factors listed above suggest that vapor

143. *Id.* § 40.1003.

144. *Id.* § 40.0902(2)(a).

145. *Id.* § 40.0922(6). These standards model potential migration of chemicals from soil and groundwater into indoor air. *Id.* § 40.0982(3)(c).

146. *Id.* § 40.0986(1).

147. *Id.* § 40.0986(2).

148. *Id.*

149. USE OF RISK ASSESSMENT, *supra* note 48, at 16.

150. *Id.* at 2–11.

intrusion may be a concern, EPA should assume that vapor intrusion is occurring unless other lines of evidence rebut this presumption. This requirement would not only be protective of human health and the environment, but it would also encourage a more robust characterization of the site in question.

C. EPA Should Establish an Immediate Response Mechanism for Some Vapor Intrusion Sites

Several of the comments during the notice-and-comment period argue that CERCLA's long and winding road of regulatory compliance may not adequately address the acute health risks posed by vapor intrusion.[151] Indeed, several years often pass before EPA identifies an appropriate long-term remedy for a site, by which time many people could suffer life-altering exposure to contamination that could have been avoided had EPA acted faster.[152] To address the acute health risk that vapor intrusion poses, EPA must use a fast-track response program to address these hazards.

In order to address those sites exhibiting immediate risk, EPA can link its assessment of vapor intrusion during the HRS to one of its existing mechanisms: removal actions under section 104 of CERCLA.[153] Section 104 enables EPA to act when "there is a release or substantial threat of release into the environment of any pollutant or contaminant which may present an imminent and substantial danger to the public health or welfare."[154] EPA can use its authority under section 104 to "take any . . . response measure . . . necessary to protect the public health or welfare."[155] Furthermore, EPA can "undertake such investigations, monitoring, surveys, testing, and other information gathering . . . deem[ed] necessary or appropriate to identify the existence and extent of the release or threat thereof . . . ."[156] While EPA may undertake actions under section 104, the statute also permits an owner or operator to perform the actions necessary to

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151. Letter from RCRA Corrective Action Project to U.S. Envtl. Prot. Agency, EPA Docket Ctr., Superfund Docket 4 (Apr. 6, 2011) (on file with author) [hereinafter RCRA Corrective Action Project].

152. CONG. BUDGET OFFICE, ANALYZING THE DURATION OF CLEANUP AT SITES ON SUPERFUND'S NATIONAL PRIORITY LIST 2 (1994), *available at* http://www.cbo.gov/sites/default/files/cbofiles/ftpdocs/48xx/doc4889/doc14.pdf (finding that the "true average" of time between the proposed listing on the NPL and the "construction completion" is likely between 13 and 15 years).

153. 42 U.S.C. § 9604 (2006).

154. *Id.* § 9604(a)(1).

155. *Id.*

156. *Id.* § 9604(b)(1).

address or evaluate the imminent and substantial endangerment if EPA deems such involvement to be appropriate.[157]

The proposed rule should develop a risk assessment that evaluates risk based on information gathered during assessment activities. The guidelines of the risk assessment should be established by toxicologists, risk assessors, and other experts who would determine a threshold, above which a significant risk exists to public health. For example, such a risk assessment would give added weight to certain types of sensitive locations, such as day-care facilities, and would take into account how much time individuals spend in the building in question. At each site evaluated under the HRS, EPA would run existing information through the risk assessment to determine if the threshold is triggered. For any information that is missing, EPA would implement the rebuttable presumption suggested *supra* in Part III.B to assume that the worst-case conditions exist. If the risk assessment reveals that risk exists above the predetermined threshold, EPA or potentially responsible parties could be required to take response action under section 104 of CERCLA to abate the significant risk. EPA would also have the ability to merely collect more data to fill in data gaps.

By incorporating a threshold such as the one I suggest here, EPA would have an affirmative requirement to address conditions that impose imminent health risks to human occupants. Therefore, EPA would largely avoid the uncertainty about what constitutes an "imminent and substantial endangerment."

IV. CHALLENGES AND CRITICISMS TO REGULATING AND ADDRESSING VAPOR INTRUSION

In early 2011, EPA initiated a notice-and-comment period in preparation for a potential rulemaking regarding the addition of a vapor intrusion component to the HRS.[158] The vast majority of comments received during EPA's notice-and-comment period supported including vapor intrusion as a component to the HRS.[159] However, several comments did not support such an inclusion.[160] Two of the most prominent objectors to the proposed rule were the RCRA Corrective Action Project, which describes itself as a conglomeration of "companies from diverse sectors of American business and industry that have extensive experience operating hazardous

157. *Id.* § 9604(a)(1).

158. Potential Addition, *supra* note 83, at 5372–73.

159. *Addition of Subsurface Component*, *supra* note 6.

160. *See, e.g.*, RCRA Corrective Action Project, *supra* note 151, at 4 (offering reasons why reopening the HRS to include vapor intrusion is ill-advised).

waste facilities and cleaning up contaminated sites"[161] and the Superfund Settlements Project, "an association of major companies from many different sectors of American Industry."[162] This Part identifies why the RCRA Corrective Action Project and the Superfund Settlement Project object to EPA's inclusion of vapor intrusion into the HRS and how the three elements proposed *supra* in Section III would address these concerns.

A. CERCLA is an Inappropriate Vehicle for Regulating Vapor Intrusion

Both the RCRA Corrective Action Project and the Superfund Settlement Project claim that the NPL would be a "poor fit" for vapor intrusion sites.[163] These comments point out that vapor intrusion may impose imminent health risks to affected populations that cannot be left in place for the long period of time in which it takes EPA to craft a remedy.[164] Furthermore, the comments note that, unlike most CERCLA remedies that require years of EPA oversight to identify the appropriate remedial strategies, "response actions typically taken to mitigate vapor intrusion concerns are relatively straightforward."[165] These comments conclude that the NPL is poorly suited to address vapor intrusion and that "most vapor intrusion sites should be dealt with by state and local governments, not by EPA."[166]

The element proposed in Part III.C—instituting a threshold that would trigger an "imminent and substantial endangerment" action under section 104 of CERCLA—would allay the "poor fit" concerns identified in the comments. EPA already has the ability to address "imminent and substantial danger[s] to the public health."[167] If EPA considers certain vapor intrusion conditions to be "imminent and substantial danger[s]," then EPA would have the authority to take immediate action to mitigate the vapor intrusion under section 104 of CERCLA.[168] While EPA would initially bear the financial burden for these actions, it could incorporate the removal costs into any settlement. Alternatively, EPA could sue the potentially

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161. *Id.* at 1.

162. Letter from Superfund Settlements Project to U.S. Envtl. Prot. Agency, EPA Docket Ctr., Superfund Docket 1 (Mar. 15, 2011) (on file with author) [hereinafter Superfund Settlements Project].

163. *Id.* at 5; RCRA Corrective Action Project, *supra* note 151, at 4.

164. Superfund Settlements Project, *supra* note 162, at 5.

165. *Id.* While mitigation to vapor intrusion may be more straightforward than many strategies for remediating soil and groundwater, remediation of soil and groundwater via the traditional non-straightforward methods are necessary to permanently redress vapor intrusion as source material, contaminated soil and groundwater, will continue to emit vapors until that source material is eradicated.

166. *Id.* at 6.

167. 42 U.S.C § 9604(a)(1) (2006).

168. *Id.*

responsible party under section 107 to recover any costs spent.[169] Furthermore, as both the RCRA Corrective Action Project and the Superfund Settlement Project note in their comments, necessary mitigation measures often are less expensive and are "limited in nature and duration"; therefore, the important measures would not draw significant amounts of funds or oversight from EPA or potentially responsible parties.[170] If EPA incorporates section 104 into the new HRS rule as suggested in Part III.C, addressing vapor intrusion sites will be an excellent fit for the Superfund program.

B. Scientific Uncertainty

Critics of vapor intrusion regulation argue that the scientific uncertainty inherent in many vapor intrusion investigations would justify its exclusion from the HRS.[171] Indeed, uncertainties abound in the assessment of vapor intrusion. The pathway leading from the contaminated soil or groundwater to an individual's lungs is complicated and can be affected by many variables.[172] First, the source of the vapors must be found.[173] This can be complicated by geologic conditions as well as the chemical characteristics of the substances that have been released into the environment.[174] Then, one assessing the presence of vapor intrusion must evaluate the movement of the vapors from the source to the individual.[175] This process can be affected by soil characteristics, building construction, heating systems, and meteorological conditions.[176] Lastly, an assessor must evaluate the nature of how an individual is exposed, which will vary depending on the concentration of the chemical, the number of hours an individual breathes the air, the number of years over which the individual is exposed, and the type of individual (e.g., child, adult, pregnant woman).[177]

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169. *Id.* § 9607.

170. RCRA Corrective Action Project, *supra* note 151, at 5.

171. *See* Superfund Settlements Project, *supra* note 162, at 6–7 (noting "that sampling of vapor intrusion is particularly difficult due to the extremely wide variety of building structures, consumer products, and lifestyle choices that can cause or contribute to contamination of indoor air with hazardous substances").

172. USE OF RISK ASSESSMENT, *supra* note 48, at 4.

173. *Id.* at 3.

174. *Id.* at 8.

175. *Id.* at 4.

176. U.S. POSTAL SERVICE, VAPOR INTRUSION GUIDANCE 11 (2009), *available at* http://www.optexcorp.com/uspsess/Documents/Vapor%20Intrusion%20Doc.pdf.

177. *See, e.g.*, 310 MASS. CODE REGS. §§ 40.0900–40.0995 (2008) (stating the variables that are used by risk assessors to determine if site conditions are believed to present risk to human health and the environment).

Once these factors are taken into consideration, risk assessors will determine if there is a risk to human health.[178]

Because indoor air measurements are expensive, intrusive, and prone to extensive swings in temporal variance, confirming that a vapor intrusion pathway exists will typically require multiple lines of evidence indicating the presence or absence of vapor intrusion.[179] For instance, once investigators detect elevated levels of volatile chemicals in site soil or groundwater, they may collect samples from the air beneath the slab of the building, known as a soil gas or soil vapor sample. They may also collect a sample of the indoor air to confirm that there is an exposure pathway leading from the pool of contaminants in the subsurface into the occupied space.[180] Even with multiple lines of evidence, there is likely to be some uncertainty regarding the pathway.[181]

Hazardous material found in household goods or in the ambient air can also complicate vapor intrusion investigations.[182] The types of chemicals found at vapor intrusion sites are also found in a variety of consumer products such as cleaning products, paints, solvents, and cigarette smoke.[183] Furthermore, fumes from gas stations, dry cleaners, and smokestacks emit many of the same chemicals found at vapor intrusion sites.[184] The presence of these chemicals in the ambient air can confound any vapor intrusion analysis because determining what percentage of chemicals in the indoor air is attributable to vapor intrusion and what percentage is attributable to other ambient sources can prove difficult.[185] Pre-sampling inventories of chemicals at a site and the collection of outdoor air samples in conjunction with indoor air samples, while more expensive, can mitigate concerns regarding ambient sources of chemicals.[186]

An HRS rule that includes a rebuttable presumption as summarized *supra* in Part III.B would encourage potentially responsible parties to seek greater certainty when assessing vapor intrusion risks. No potentially responsible party wants vapor intrusion to be found at his or her site. Therefore, if a potentially responsible party were to find evidence of vapor

178. *Id.*

179. USE OF RISK ASSESSMENT, *supra* note 48, at 5–6. Lines of evidence include soil gas data, groundwater data, background concentrations of the chemicals of concern, buildings construction, indoor air data, and outdoor air data. *Id.*

180. *Id.* at 6.

181. *Id.*

182. BROWNFIELDS, *supra* note 28, at 16.

183. *Id.*

184. *Id.*

185. *Id.*

186. *Id.*

intrusion, he or she would do anything possible to rebut the presumption of vapor intrusion including collecting other types of data to create multiple lines of evidence and identifying sources of chemicals that may be affecting indoor air data. While the vapor intrusion pathway has many variables, each data set collected will add certainty to a vapor intrusion assessment, thereby reducing concerns about confounding sources or confusion regarding temporal variations in data.

The extra analysis may be expensive initially; however, a larger data set may actually benefit potentially responsible parties in several ways. First, the additional data collected by a responsible party may reveal that no vapor intrusion exists or that a relatively simple solution—such as enhancing an existing ventilation system—could abate any risk caused by vapor intrusion. Second, a more robust data set would more accurately depict the nature and extent of contamination, leading to a more efficient deployment of response actions.[187] Third, from a public relations perspective, thorough characterization of vapor intrusion shows care and attention towards those who may be affected by contamination. Therefore, while the use of the rebuttable presumption in the new HRS rule will not eliminate uncertainties regarding vapor intrusion, it will promote more certainty and may save potentially responsible parties money, time, and goodwill.

C. CERCLA Cannot Support Additional Expenditures

Opponents of including a vapor intrusion component into the HRS have stated that the already cash-strapped Superfund program cannot afford to expand.[188] These same critics would likely note that section 104 actions, imposed under the HRS rule, would further burden the Superfund program. While EPA would certainly expend additional Superfund money carrying out section 104 actions, the mitigation measures EPA would take likely pale in comparison to the costly remediation measures normally employed for the long-term. Mitigation measures can be as simple as sealing cracks in building foundations or altering the ventilation of a building to change indoor pressure gradients.[189] These additional costs—whether borne by EPA, owners, or other potentially responsible parties—would not be significant, especially given that the purpose of these mitigation measures

187. *Using the Triad Approach to Streamline Brownfields Site Assessment and Cleanup*, U.S. ENVTL. PROT. AGENCY, BROWNFIELDS TECH. SUPPORT CTR. 1 (June 2003), http://www.epa.gov/tio/download/misc/triadprimer.pdf.

188. RCRA Corrective Action Project, *supra* note 151, at 1.

189. BROWNFIELDS, *supra* note 28, at 20.

would be to reduce risk for populations exposed to hazardous materials in their homes and workplaces.

CONCLUSION

Vapor intrusion presents a number of risks at sites not yet discovered, at sites currently being evaluated by regulators, and at sites where EPA has concluded that there are no risks to human health and the environment. Regulators must change the way in which they evaluate vapor intrusion in order to adequately address this widespread and dangerous problem. By incorporating a vapor intrusion component in the HRS, EPA is making substantial progress towards a better regulatory framework. A rule that includes a reevaluation of sites that have scored below the HRS threshold, a rebuttable presumption that vapor intrusion exists when there are any data gaps, and a mechanism that enables for fast-track mitigation for certain sites would all advance EPA's objective of addressing this dangerous problem and further its overall goal of protecting human health.

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