The Dissertation Committee for Eric Lane Marsh certifies that this is the approved version of the following dissertation:

The Role of Collaborative Planning

in Contaminated Site Redevelopment and Plan Implementation

Committee:

____

Robert G. Paterson, Supervisor

____

Michael Oden

____

Elizabeth Mueller

____

Danny Reible

____

Kris Wernstedt

The Role of Collaborative Planning

in Contaminated Site Redevelopment and Plan Implementation

by

Eric Lane Marsh, B.A.; M.S.

Dissertation

Presented by the Faculty of the Graduate School of

The University of Texas at Austin

in Partial Fulfillment

of the Requirements

Doctor of Philosophy

The University of Texas at Austin

May 2010

To my wife Betsy

To my sons Deric and Mason and daughter Casey

To my mom Nola, sister Mendy, and brother-in-law Josh

To the Boatner family

In memory of Dr. James T. Marsh

ACKNOWLEDGEMENTS

This dissertation is the product of a number of amazing and wonderful people. In fact, there are too many to mention as I look back to the beginning of my dissertation efforts in the fall 2005. This dissertation is first and foremost built upon an absolutely amazing foundation of support from my wife. Second, this dissertation exists because of the wisdom and dedicated support of my dissertation advisor, Dr. Robert G. Paterson. He helped me transform a basic research idea into a series of robust testable hypotheses, guided me through the pitfalls of data collection, and seriously considered my issues and concerns as they arose. Most importantly, along the way, Dr. Paterson treated me as a research partner and colleague as opposed to mere student. I am grateful to my other dissertation committee members as well and the input, critique, and suggestions provided through the years, including Dr. Michael Oden, Dr. Elizabeth Mueller, Dr. Danny Reible, and Dr. Kris Wernstedt. In particular I want to thank Dr. Oden for helping shape my literature review several years ago, Dr. Wernstedt for his valued support and suggestions as I crossed through a few rough patches during the dissertation process, and Dr. Mueller who encouraged me to consider more thoroughly the implications of my dissertation case studies. I also want to especially thank Dr. Marc A. Musick who provided me with the skills necessary to analyze and test survey data. Third, my dissertation exists because of a number of other people outside of academia extremely knowledgeable about the Superfund program that made critical contributions along the way. These include Frank Avvisato, Tom Bloom, Bill Denman, Bruce Engelbert, Melissa Friedland, Humberto Guzman, Michael Hancox, John Harris, Charlie Landman, Ray Limb, Jack O'Dell, Ian

Penn, David Slutzky, Michael Torres, James Wilkinson, Kristin Winterson Sprinkle, and Louis Zicari. There are many others. In particular, however, I want to thank John Harris. Fourth, I must thank the Lincoln Institute of Land Policy for providing significant dissertation support. Finally, I must thank my family, friends, and neighbors for their support. I especially thank my wife's family, the Boatners, for allowing my wife and children to take refuge in Decatur, Keller, and Southlake during the many "dissertation storms" that I navigated through. I thank my mom, especially, for traveling from New Mexico for extended stays and always being ready to provide support during this long process. Finally, I must again thank my wife who endured more than a few trying times as I struggled to keep this dissertation moving. With patience and great humor, she cheered me up every time I was down and clarified that completing this dissertation was our only option. Thank you, Betsy. Despite being blessed with a great foundation of support, all subsequent errors or omissions in this dissertation are strictly my own.

The Role of Collaborative Planning

in Contaminated Site Redevelopment and Plan Implementation

Eric Lane Marsh, Ph.D.

The University of Texas at Austin, 2010

Supervisor: Robert G. Paterson

The following dissertation examines the role of collaborative planning in the redevelopment of National Priorities List Superfund sites and the implementation of Superfund site redevelopment plans. To examine the effect of collaborative planning, two models were constructed: one to predict Superfund site redevelopment and one to predict implementation of Superfund site redevelopment plans. Two test the two models, data was collected primarily from a survey of federal cleanup managers conducted between August 2008 and April 2009. Variables were then constructed and tested using bivariate and multivariate regression analysis. Results from the statistical analysis suggest that use of collaborative planning is positively and significantly associated with Superfund site redevelopment. Collaborative planning's effect on Superfund site redevelopment plan implementation was inconclusive. To further explore the role of collaborative planning on Superfund site redevelopment and plan implementation, four case studies were developed that describe redevelopment planning at four Superfund sites. Overall, results suggest that collaborative planning is an important tool for the facilitation of Superfund site redevelopment. The effect of collaborative planning on plan implementation is somewhat ambiguous. Additional research is necessary, however, to draw firmer conclusions regarding both phenomena.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1. Introduction

Does collaborative planning generate long-term, positive outcomes? Are collaboratively-derived plans more likely to be implemented than plans formulated without any meaningful community involvement? These two broad questions served as the guide for this dissertation. These questions merit consideration for a number of reasons. First, collaborative land use planning – defined here as the use of dialogue and discourse between representatives of multiple stakeholder groups for the purpose of forging land use plans – has emerged as a dominant paradigm for urban and environmental planning. Judith Innes (1996), for example, has argued that collaborative planning represents *the answer* to Alan Altshuler's (1965) long-standing critique that traditional comprehensive planning is simply unworkable. Not only have other prominent urban scholars embraced collaborative planning (e.g., see Forester, 1999; Healey, 1993), it has become *de rigueur* in cities across the U.S. in contexts as diverse as small-scale neighborhood planning to multi-county regional planning. Many of the recent comprehensive planning efforts for the city of New Orleans and Southern Louisiana, launched in the wake of Hurricanes Katrina and Rita, are highly participatory. At the federal level, in the 1990s and 2000s, it was championed by agencies as a means to address persistent localized environmental justice issues (Federal Interagency Working Group on Environmental Justice, 2002) and to more effectively manage watersheds (Leach, Pelkey, & Sabatier, 2002) as well as public lands (Gunton & Day, 2003).

Scholars have even explored the use of collaborative planning as a means for addressing the global environmental crisis (e.g. see, Brulle, 2000; Prugh, Costanza, & Daly, 2000)

Despite its endorsement by many scholars and practitioners across varied planning contexts, a close examination of the literature on collaborative planning reveals problematic gaps. First, collaborative planning lacks a unified literature base. Scholars who seek to study collaborative planning frequently must draw from the larger literatures on public involvement, mediation, alternative dispute resolution, consensus building, and others. Although scholars regularly overcome this obstacle, collaborative planning's literary foundation presents problems in terms of defining collaborative planning as well as identifying a body of evidence that genuinely reflects its merits and shortcomings. A related gap for urban scholars is that much of the empirical work on collaborative planning is centered in the environmental management context. Scholarly treatment of collaborative planning in the setting of urban land use has tended to limit itself to innovative, large-scale planning efforts such as Helling's examination of the Atlanta 2020 visioning project (1998), McCann's analysis of the Lexington, Kentucky New Century visioning project (2001), Innes and Gruber's analysis of the San Francisco Bay Area Partnership (2005), and Margerum's analysis of the South East Queensland [Australia] 2001 regional growth management effort (2002). Academic efforts to examine the utility of smaller-scale collaborative planning in urban planning contexts are few. This last point, in particular, is highly relevant for the topic area that my research will address – the redevelopment of contaminated land.

The collaborative planning and related literature is also vulnerable to methodological critique. Identifying a causal link between a planning process – collaborative or not – and outcomes potentially resulting from such a process is a difficult task. As a result, much of the literature on collaborative planning, not surprisingly, focuses on its procedural aspects as well as participants' perspectives on the process' likely outcomes, causing some scholars to call for more long-term evaluations (e.g., see Innes & Booher, 1999a). Second, many studies of collaborative planning are limited to single cases, reducing the chances that substantive findings can be generalized. Even studies that attempt to look across multiple projects tend to rely on descriptive statistics and do not incorporate control variables into their research designs or employ the use of counterfactuals. Notable strides are being made, however, as a number of scholars in the late 1990s and early 2000 began using more rigorous frameworks to identify the effects of collaborative planning and related processes (see Andrew, 2001; Beierle & Cayford, 2002; Burby, 2003; Leach, Pelkey, & Sabatier, 2002; Margerum, 2002).

Despite these improvements and continued enthusiasm for collaborative planning, the literature has not yet advanced to such a point that planners and scholars can fully appreciate its strengths and weaknesses and under what conditions collaborative planning is best applied. Without additional study, planners, agency officials, and scholars run the risk of advocating for processes that may not be appropriate or generate the types of results desired given the circumstances in which they are undertaken. By carefully examining the role of collaborative planning in the context of contaminated site redevelopment, I attempt to address some of the gaps identified above.

One area that presents a unique opportunity to study the effects of collaborative planning on long-term outcomes is the realm of contaminated site redevelopment, and in particular Superfund site redevelopment. Superfund sites include many of the nation's most contaminated hazardous and (typically) abandoned waste sites. In the 1980s, Congress enacted legislation to begin cleaning the nation's most contaminated sites, commonly referred to as Superfund sites. Although significant cleanup progress has been made, a programmatic criticism that emerged in the early 1990s was that many of these sites once cleaned remain unused, contributing nothing to the local tax base (Wernstedt & Hersh, 1998b) or civic culture, and often serving as a continual reminder of these sites' previous contamination.

Starting in the mid-to-late 1990s the U.S. Environmental Protection Agency (EPA) – the agency responsible for overseeing the Superfund program – began encouraging site managers to craft cleanup plans in a manner that is consistent with, and may actually facilitate, the likely reuse of these sites. Between 1999 and 2002, EPA underscored its emphasis on Superfund site redevelopment by identifying 69 pilot projects and allocating approximately $6 million to local government officials over a four-year period to help them conduct future land use assessments and community-based reuse planning processes. Since then, EPA has issued in-kind contractor services on a case-by-case basis to other sites it perceives could benefit from such action. As suggested above, EPA's recent actions in support of locally-based Superfund site reuse planning to facilitate Superfund site redevelopment presents a rich opportunity to investigate critical questions pertaining to collaborative planning and the implementation of land use plans.

In the following chapters I attempt to provide answers to key questions about collaborative planning and its effects on long-term outcomes. Chapter 2 describes Superfund sites in more detail and places them in the broader context of abandoned and other contaminated land. In addition, I describe use of collaborative reuse planning within the Superfund program. Chapter 3 summarizes the literature reviewed that relates to factors influential in Superfund site reuse and the implementation of land use plans more generally. I also summarize what the literature says about collaborative planning and its effectiveness in achieving long-term outcomes. Chapter 4 outlines my research questions and introduces the two predictive models I employ to test them. Chapter 5 describes the methodological approach I applied in order to test my predictive models, including data collection, case selection, and analytic techniques. It also includes descriptions of the independent and dependent variables tested and procedures for variable measurement. Chapter 6 presents the empirical results of my efforts to answer my overarching research questions and hypotheses through the application of statistical methods. Chapter 7 presents four case studies and the results of a cross-case study analysis undertaken to further illuminate the phenomenon of collaborative planning and its role in facilitating Superfund site reuse. Chapter 8 attempts to more clearly answer this study’s key research questions by pulling together findings from the survey, statistical analysis, and case study analysis. This final chapter also discusses the shortcomings of this study, recommendations for further study, and opportunities for policy change.

2. The Superfund Program in Context

2.1. Historical and Technical Perspective

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) – enacted through federal legislation in 1980 and amended and expanded in 1986 –represents the core federal program for remedying hazardous waste sites to limit risk to human and ecological health (Congressional Research Service, 2004). CERCLA operates by forcing potentially responsible parties (PRPs) to pay for cleanup costs due to hazardous substance releases and for damages to natural resources owned by the public. CERCLA imposes a complex and far-reaching liability scheme (Congressional Research Service, 2004). As succinctly explained by Farrell (2007)

> Liability can extend to site owners, facility operators, waste transporters, or anyone who generates hazardous substances that contaminate other sites. This liability is strict, joint, and several, with no requirement that a PRP's hazardous substance be the sole cause for a response action. Legal proof of negligence is not required, and conducting activities consistent with standard industry practices is not considered an adequate defense (p. 41).

A second key component of CERCLA was the establishment of a trust fund – the Superfund – financed principally through a tax on businesses and petroleum products, which, until recently, funded EPA's implementation of the program, as well as cleanup of sites lacking viable PRPs. A failure to reauthorize these taxes in late 1995, however, has forced the Superfund program to become almost entirely reliant on general revenues allocated under the annual federal budget (Congressional Research Service, 2004).

The Superfund program is essentially a means for identifying the nation's most contaminated waste sites, prioritizing them for cleanup, providing federal oversight, and ensuring sufficient funding for remediation. After a site has been reported to EPA because of a potentially threatening hazardous substance release, a preliminary assessment is performed to ascertain if a more detailed investigation as well as immediate emergency action may be required. If such an investigation is warranted, a site assessment is performed to determine whether a site will be listed on the National Priorities List (NPL). If such a listing is granted, an in-depth site analysis is conducted to identify the extent of the contamination problem and the range of possibilities for remedying it (Congressional Research Service, 2004).

Once a site has been officially listed on the NPL, a set of nine criteria are considered by EPA before approving the most appropriate remedial strategy. First and foremost, the potential remedy must ensure that human and ecological threats will be addressed and that all other federal or state "applicable or relevant and appropriate requirements", or ARARs, are met unless exemptions are obtained. Second, the potential remedy must be considered in light of five "balancing criteria" such as cost. And finally, input from local residents, state officials, PRPs, and other relevant parties are also considered (Hersh, Probst, Wernstedt, & Mazurek, 1997). At "fund-lead" sites where remedial implementation falls mainly to EPA or the appropriate state environmental agency, all actions regarding cleanup will remain within the control of environmental agencies. However, at "PRP-lead" sites, the PRPs may implement all aspects related to site cleanup "*except* the actual selection of a remedy" (Hersh, Probst, Wernstedt, & Mazurek, 1997, p. 22). EPA's application of these criteria then ultimately determine the extent to which sites or portions of sites will support unrestricted use or restricted uses following remedial action.

After a remedy has been officially cleared by EPA, and what is referred to as the Record of Decision, or ROD, has been signed, the remedial design/remedial action (RD/RA) phase of the cleanup process follows. This involves more specifically outlining how the chosen remedy will be implemented and then officially undertaking cleanup activity. EPA designates a site as officially reaching the "construction complete" phase of the cleanup process after all components of the cleanup have been installed (Hersh, Probst, Wernstedt, & Mazurek, 1997). Some sites are deleted from the NPL during the same year or soon after being designated construction complete. Others may remain on the NPL for several years following this designation while long-term cleanup activities (typically groundwater treatment) ensue. Moreover, many sites – even after they have been officially deleted from the NPL – will retain institutional controls such as restrictive covenants – often indefinitely – that limit types of activities that may occur on the site.

Since its inception, over 1,600 sites have been listed as final on the NPL. Just over 1,000 of these sites, meanwhile, have reached the construction completion stage –a milestone indicating that all major remediation elements have been implemented (although, as noted above, some remediation may still be on-going) (U.S. EPA, 2009c). Nearly 350 of these sites have been deleted from the NPL (U.S. EPA, 2009c). Between fiscal year 2000 and 2009 nearly 200 sites were listed as final on the NPL, averaging 20 new site listings per year. Early studies predicted that the ultimate number of contaminated sites listed on the NPL would remain below 4,0000 through roughly 2030

(U.S. General Accounting Office, 1994). A more recent EPA report, however, predicted that over 350,000 sites may require Superfund-level cleanups over the next 30 years (Janofsky, 2004).

2.2. Situating Superfund Sites in the Broader Context of Contaminated Land in the U.S.: Superfund, Brownfields, Leaking Underground Storage Tanks, and RCRA Brownfields

Superfund sites – although the most contaminated (and most dramatized by the media) – represent only a small fraction of the total number of contaminated or potentially contaminated properties spread across the U.S. Brownfields, according to the 2002 federal Brownfields law, are “real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant where redevelopment is inhibited because of real or perceived contamination” ("Small Business Liability Relief and Brownfields Revitalization Act"). According to different estimates, the total number of brownfields in the U.S. may range from more than 450,000 (U.S. EPA, n.d.-a) to approximately one million (USEPA, 2005), although the first estimate is more commonly referenced. Many brownfields are located in the central cores of older industrial cities. While EPA oversees cleanups of all Superfund sites and undertakes cleanup itself if a viable responsible party cannot be identified, state environmental agencies – with funding support from EPA – typically play the lead oversight role in brownfields cleanups. Through voluntary cleanup programs, private entities can voluntarily undertake cleanup of contaminated sites to state cleanup standards in exchange for state assurances that it will not hold the parties responsible for the pollution on site. Such assurances have traditionally not restricted EPA from undertaking enforcement actions. However, since 1995 EPA has begun to provide assurances to states that it would not investigate sites remediated to state levels or cleaned in accordance with the requirements of a state's voluntary cleanup program. With the passage of the 2002 Brownfields law, EPA has further clarified how prospective purchasers can acquire brownfields without taking on liability for any contamination on that site (Runyon & Morandi, 2003).

Leaking underground storage tanks (or USTs) represent another large fraction of the universe of contaminated sites. EPA estimates that roughly one-half of the estimated 450,000 brownfields across the U.S. – frequently abandoned gas stations – are affected by leaking USTs or various forms of petroleum contamination. Authorized by the Solid Waste Disposal Act of 1984, and subsequent amendments, cleanup of leaking USTs are typically overseen by state environmental agencies with guidance and partial funding provided by EPA. A national leaking UST trust fund, similar to the Superfund Trust, provides funding to force parties to cleanup sites or take appropriate actions when viable parties cannot be found (U.S. EPA, 2006f). Because of a petroleum exclusion in the Superfund law, until recent passage of the Brownfields law, leaking UST sites could not access EPA-allocated brownfields funding (U.S. EPA, n.d.-c).

Whereas the Superfund law applies most frequently to abandoned facility sites[1], the Resource Conservation and Recovery Act (RCRA), authorized in 1976 with

[1] Even though it is typically the case that most sites addressed by the Superfund program are abandoned or simply no longer operational, EPA also take Superfund enforcement actions at active facilities.

subsequent amendments, was designed by Congress to, among other goals, take enforcement actions against currently operating facilities that mishandle the disposal of hazardous waste generated as part of the regular operations. EPA and states with authorized RCRA programs are required to implement the RCRA Corrective Action program. Currently, roughly 4,000 sites have been subject to RCRA corrective action (U.S. EPA, n.d.-f). Beyond simply bringing these facilities in compliance with nation's hazardous waste management law, some active facility sites, or portions of these sites, could be converted into different uses, but have been at least partially-prevented by brownfield-like concerns about the presence of real or perceived contamination. In response, since 1998 EPA has undertaken a number of actions to facilitate the cleanup and reuse of these sites which has included involving nearby residents in planning for their reuse (U.S. EPA, n.d.-l).

2.3. Superfund Sites in the Broader Context of Vacant Land

Superfund sites are classified as such because of their levels of contamination and the threats they pose to human health and ecological systems. To the eyes of the public, however, these sites may be viewed first and foremost as simply abandoned, vacant, or underutilized spaces contributing nothing to the local economy, or worse, abandoned spaces that are aesthetically offensive, unsafe, and may negatively impact their neighborhood, the local economy, or both depending upon its location. Undoubtedly, many properties that eventually became Superfund sites were abandoned because of the high cost of new regulations imposed on firms resulting from passage of the Superfund law and related environmental bills in the 1970s and 1980s. Many and perhaps most other sites were ultimately abandoned because of other forces spurring land abandonment and vacancy in the 1970s and 1980s. Although complex and contested, Kivell (1993) cites four general factors as causes of land abandonment and vacancy: 1) the major restructuring of Europe and North America's industrial economies beginning in the 1970s during which manufacturers' watched their markets evaporate or were forced out by more efficient overseas competitors as one major factor; 2) inappropriately functioning land markets; 3) "ownership constraints" which includes the unwillingness of an owner to sell; and "fragmented or multiple ownership of a site" (p. 163); and 4) local government policies which Kivell concedes have contributed more to vacancy issues in British cities than elsewhere. Pagano and Bowman (2004), found that, "Disinvestment in the city and the flight to the suburbs are the leading causes, according to city officials" (p. 26).

Despite its importance as an issue, vacant land in U.S. cities has not been systematically accounted for and tracked. Findings from a survey by Pagano and Bowman (2004) sent to city officials in 70 cities of 50,000 or more in 1997-1998 sheds helpful light on this phenomenon. Utilizing a definition of vacant land that included unused or abandoned land as well as derelict land, the authors found that on average vacant land comprised roughly 15 percent of cities' total land area. This represented a five percent reduction in comparison to a study conducted in 1960. An interesting finding was that fast-growing cities tended to have considerably more vacant land than cities with declining populations. Further analysis suggested that cities with greater amounts of vacant land tended to be newer and have higher rates of land area expansion than cities with lesser amounts. In terms of abandoned structures, Pagano and Bowman found that, of the 60 cities reporting, “[n]ortheastern cities average more than 10 times the number of abandoned structures per 1,000 residents in the West, and about two to three times more than cities in the South and Midwest” (p. 23).

Pagano and Bowman’s survey also asked city officials to clarify characteristics that typified their cities’ vacant land. Results suggested that vacant land in U.S. cities were characterized as small, oddly-shaped, or poorly located. Sixty cities did identify their vacant land as having “other” conditions, which included land kept vacant because of real estate speculation, concerns about perceived or real contamination, topography, infrastructure, or wetlands. Interestingly, Pagano and Bowman also found that, while city officials in most cities considered vacant land to be an issue, concerns about undersupply of vacant land exceeded concerns about oversupply, and that, moreover, vacant land tended to be “recycled at an acceptable pace in most places” (p. 24).

Finally, as noted earlier, no consensus exists regarding the meaning of vacant land. Various entities have attempted to define vacant land with different definitions and categorization schemes. Some focus solely on derelict land, while others view vacant land more inclusively to include everything from abandoned industrial properties to unused open space. Pagano and Bowman (2004) , building off Northam (1971), describe five types of vacant land ranging from small, irregularly-shaped parcels to derelict land, which comprise brownfields, each with different probabilities of development.

Similarly, others have developed categorization schemes that center on various types of brownfields which is instructive. Describing the work of Wright and Davlin (1998), Gardner (2004) suggests that brownfields can be placed into one of three tiers. Tier I sites are typically large, industrial or commercial properties, whose value exceeds cleanup costs and are frequently located along major transportation corridors in edge cities or suburbs. Tier II sites have uncertain market value, are more expensive to cleanup and frequently found near major transportation routes of urban or commercial areas. Finally, Tier III sites are typically small properties within urban locations, based within or near residential areas, and have cleanup costs that do not justify investment returns. According to Gardner, "The market model of redevelopment fails these sites, and without public intervention and subsidy, they have no redevelopment prospects" (p. 141).

Figure 1. Potential brownfield site near downtown Chicago.

2.4. Facilitating the Reuse of Superfund Sites

2.4.1. Background

Prior to cleanup, most Superfund sites would fall into Pagano and Bowman's (2004) derelict land category. Whether it could be classified by Gardner (2004) as a Tier I, II, or III contaminated site, however, is less relevant, because, unlike most brownfields sites, once designated as a Superfund site, the site *will* be cleaned up to certain federal and state standards, irrespective of its development potential. After cleanup, a Superfund site, depending upon its site, location, and ownership characteristics may fall into any one of Pagano and Bowman's vacant land type categories. Superfund sites could even remain classified as derelict land if concerns persist about any contamination left in place as part of the remedy or contamination that has not been identified. Irrespective of the causes, the conventional wisdom in the 1990s was that once Superfund sites were cleaned to certain standards they remained vacant.

According to EPA the primary reason that Superfund sites often stay vacant is because they represent special cases of land development that do not readily respond to traditional market forces, even after cleanup. EPA (n.d.-i) argues that:

> Some [Superfund] sites are so favored by their location or other economic factors that use is inevitable. But in most instances, use is not inevitable. Developers often look elsewhere before even considering a Superfund site. Those responsible for the contamination may not be able, or may not wish, to use the site they have contaminated. Developers may not readily step forward to support recreational or ecological projects that communities identify.

One factor believed to be inhibiting the redevelopment of Superfund sites centers on developer liability fears. Once a site has been cleaned according to agency requirements, developers and lenders may still be held liable for remaining hidden contamination (if found), or contamination left on site if agency cleanups standards are later made more stringent. While no systematic studies in the Superfund context have been conducted to identify the extent of these fears, the flurry of Congressional activity to encourage economic development of Superfund sites starting in the early 1990s (Wernstedt, Hersh, & Probst, 1999) as well as anecdotal evidence suggests there is likely some merit to this claim. A related concern centers simply on the perceived stigma that often remains attached to a Superfund site even after it has been cleaned (Hammett, 2006; Larson, 2005; Navarro, 2009).

2.4.2. EPA's Response

In response to the criticism that Superfund sites often remained abandoned once cleaned, EPA's *Land Use Directive*, issued in 1995, provided guidance which encouraged site managers to incorporate "realistic assumptions regarding future land use and clarif[y] how these assumptions fit in and influence the baseline risk assessment, the development of [remedy] alternatives, and the CERCLA remedy selection process" (1995, p. 4). Although CERCLA fails to specifically clarify how land use assumptions should be incorporated into the selection of site remedies, the statute, with its broad cleanup goals, nevertheless provides "justification for remedies that do not use permanent solutions, including land use-based remedies designed for restricted uses" (Hersh, Probst, Wernstedt, & Mazurek, 1997, p. 18).

In subsequent years following issuance of the *Land Use Directive*, EPA began encouraging site managers to factor in the realistic potential reuse of these sites to not only ensure that the remedy would be *consistent* with the expected uses, but to potentially utilize a remedy, or modify an existing remedy already in place, that would *promote* a site's redevelopment. As part of this process, EPA outlined two approaches for identifying the likely reuse of Superfund sites: reuse assessments and reuse planning. In reuse assessments site managers are expected to engage in discussions with local officials, consult relevant planning-related documents and statistics, and to identify general categories for how a site may be reused such as industrial or recreational. Such assessments typically take place during the remedial investigation/feasibility study (RI/FS) stage of the cleanup process. According to more recent EPA guidance (2001), data collected from reuse assessments centered on "reasonably anticipated future use" can be assessed as a component of :

> •The baseline risk assessment when estimating potential future risks;
> •The development of remedial/removal action objectives and the development and evaluation of response alternatives; and
> •The selection of the appropriate response action required for the protection of human health and the environment. (p. 3)

Reuse planning represents a much more expansive approach to identifying the intended use of a site and involves a broader range of community representatives in discussion.

Although site managers have conducted reuse assessments since at least the mid-1990s following issuance of EPA's *Land Use Directive* (1995), the practice of utilizing reuse planning to inform the selection or design of remedies to facilitate Superfund site redevelopment was not practiced significantly until the late 1990s, when the Superfund Redevelopment Initiative – a program aimed at ensuring that all EPA cleanup personnel and other stakeholders were aware of steps for considering the future use of these sites and had access to information and tools to enable future use consideration before remedy implementation (Smith & Garcia, 2002) – first began allocating money to Superfund sites to conduct reuse planning processes.

Since the start of the 2000s, EPA's Superfund program has regularly emphasized the ongoing reuse of Superfund sites, suggesting that the initial effort by EPA Superfund program managers to facilitate reuse of sites is having an organizational impact. For example, according to the Superfund program Frequently Asked Questions, "The goal of any Superfund cleanup is to turn dangerous, useless land into safe and productive land" (U.S. EPA, n.d.-m)

2.4.3. Local Involvement in the Redevelopment of Superfund Sites

As implied above, an EPA site manager may take a number of steps to identify the preferred reuse of a Superfund site. He, or she, may undertake research on his own, consult with local officials, or recommend, and provide support for, community-based reuse planning processes. However, because local governments typically retain control over land use issues, they can become a critical factor in efforts to redevelop Superfund sites. How and when local officials will be become involved in and/or support a land use planning process will depend upon several factors, including site operational status, ownership, cleanup responsibility, local government preferences and capacity, site physical characteristics, and plan implementation commitment. These are discussed in more detail below.

Superfund site operational status: As mentioned above, a waste management or other industrial facility may be fully operational throughout the cleanup process. Similarly, in some instances, sites will only shut down temporarily while the major cleanup operations ensue. In both instances, the utility of planning for the alternative use of such sites is minimal unless there are indications that the facility may cease operations in the near future.

Site ownership: Sites held, or acquired by local government, the state, or EPA should theoretically allow for more wide-open planning discussions to occur regarding the preferred reuse of a site. That a site is held by a private owner does not necessarily preclude local governments from launching or supporting planning processes to identify preferred future uses of these sites, however. In some instances, property owners plan on selling or simply turning the property over to the city following cleanup; so while they may not directly participate in such processes, in these instances, such property owners have little to lose by opposing such a planning process. In other instances, however, a property owner may look to sell his or her or her property post-cleanup, which depending upon the probable buyer – city or private – may impact the efficacy of certain types of planning processes.

Cleanup responsibility: Some Superfund sites are cleaned entirely by EPA or state agency counterparts and designated cleanup contractors; others are cleaned by potentially responsible parties (PRP). In many cases both EPA and PRPs may be directly involved in the cleanup. PRP-led cleanups present complications for local-driven reuse planning as PRPs may not be willing to tailor their preferred remedy in a manner conducive to community-driven reuse plans. Nevertheless, EPA has supported community-based planning processes at PRP-led sites (U.S. EPA, 2005).

Local government planning preferences and capacity: When a local government has a realistic opportunity to plan for the reuse of a Superfund site, the scope of the planning process will depend upon local officials' preferences and their means to implement such processes. For instance, some local

Figure 2. A residential neighborhood is located across the street from the Oeser Co. Superfund site in Bellingham, Washington.

officials' prefer large-scale community-based planning processes, while others prefer to develop plans themselves and then only afterward open them up for public comment. Some officials may simply inform local residents how they expect a particular site will be redeveloped without any real form of public consultation. Finally, irrespective of preferences, local governments may be limited in their capacity to undertake site redevelopment planning unless EPA or the PRP make funding for reuse planning or assessments available.

Site physical characteristics: There is great variability in terms of properties that have been classified as Superfund sites. Many are the classic shutdown manufacturing-type facility sites. Others are primarily or solely contaminated groundwater sites that may exist underneath existing homes and business. Additionally, some sites are located in all industrial zones where redevelopment may be of some interest to local government and nearby businesses owners for economic development reasons, but less of a concern to the broader community. The sociological "presence" of a Superfund site within a city or town also likely influences whether planning processes – either led or supported by local officials – are undertaken. Similarly, the size of a site may affect a local government's desire to plan for redevelopment.

Plan implementation commitment: If a redevelopment plan has been developed for a non-privately-held site, EPA typically looks to local officials for clarification regarding their willingness to implement the plan, or see that it is carried out by developers. Irrespective of whether the plan has clear implications for how EPA designs and implements the remedy, local officials will likely maintain the responsibility for overseeing implementation of the plan. This may involve seeking grants for trails and recreational areas, passing bonds, authorizing special financial incentives, etc. Even when a community-based plan is developed for a PRP-led and owned site, both PRPs and EPA may look to local officials for affirmation that they will carry out or support certain aspects of the plan.

2.4.4. Characterizing the Extent of Superfund Site Redevelopment and Site Reuse Planning

Although reviews of EPA redevelopment case studies, project summaries, and related publications provide some insight into when local officials may choose to become involved with or sponsor a community-based collaborative planning effort, without additional detail related to the number of Superfund sites that have been redeveloped and used redevelopment planning processes, it is difficult to convey the extent to which collaborative planning plays a prominent role in Superfund site redevelopment. Table 1 presents data on the number of sites that have reached various stages of reuse as indicated by EPA's Superfund Redevelopment database relative to all Superfund sites.

Before discussing the implications of these results, additional clarification is warranted. First, regarding the classification of types of uses, *new use* indicates sites that have been redeveloped according to a use different from the use of the site prior to cleanup. *Continued use* indicates sites that are operating in the same capacity after cleanup as they were before and throughout the cleanup process. *Definite planned* indicates sites that are close to redevelopment (e.g., construction will begin soon or a developer contract has been signed with finances in place). *Early stages of planning* indicate sites for which a site-specific reuse plan is completed or will soon be completed, and that EPA has approved basic elements of the plan.

Table 1. Superfund Sites by Stage of Reuse and Stage of Cleanup Reached

Stage of Reuse	Deleted NPL sites	Percent of all deleted NPL sites	Active NPL sites	Percent of all active NPL sites	Active NPL sites at construction complete	Percent of all active construction complete NPL sites	Total (deleted and active) NPL sites	Percent of total NPL sites
New Use	52	17	130	10	69	10	182	27
Continued Use	32	10	132	11	61	9	164	21
Definite planned	8	3	69	6	25	4	77	8
Early stages of planning	0	0	5	0.4	1	0.1	5	0.4
Monitoring	5	2	57	5	23	3	62	6
Sites with no reuse activity	215	69	848	68	489	73	1,063	68

Source: (1) U.S. EPA. Superfund Redevelopment (SURE) Database. Accessed October 15, 2006 courtesy of the Superfund Redevelopment Program. (2) U.S. EPA. Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS). Accessed October 15, 2006. from http://cfpub.epa.gov/supercpad/cursites/srchsites.cfm. Figures calculated by author.

Monitoring indicates sites showing indicators that options for reusing the sites are being discussed (U.S. EPA, 2006e). Second, in regards to the stages of cleanup completion, *deleted NPL sites* refer to sites where "all response actions are complete and all cleanup goals have been achieved." *Active NPL sites* refer to all sites that are undergoing the required steps of the cleanup process. *Active NPL construction completion sites* represent a subset of *active NPL sites* and refer to all sites where "physical construction of all cleanup actions are complete, all immediate threats have been addressed, and all long-term threats are under control." *Total (deleted and active) site*s refer to all *deleted NPL* and *active NPL sites* (U.S. EPA, n.d.-d). Sites that have only been proposed to the NPL have not been included in any of the above figures. Federal facilities are included in the figures above and represent 11 percent (172 sites) of all active and deleted sites. The table only represents an *approximation* of sites in reuse as the two databases used to construct the table are updated at different points in time.

The figures in Table 1 provide a basis for beginning to understand the potential role for Superfund site redevelopment planning. It indicates that the redevelopment of Superfund sites is not common, as nearly 70 percent of deleted NPL sites – the sites that theoretically are in the best position to be reused because cleanup activity is completed – are not being reused. This finding also holds for sites that are in the next best position to be redeveloped – active construction complete sites.

Neither of EPA's databases supply data on the prevalence of types of planning processes used to plan for the redevelopment of Superfund sites. In an attempt to better understand this phenomenon, two steps were undertaken. First, approximately 170 project briefs, one-page summaries, or brief case studies posted in 1999 by the Superfund Redevelopment Program describing Superfund sites that had been redeveloped were reviewed. Once it was determined that a site was developed as a new, as opposed to continued, use the available material was then reviewed and a determination made as to whether a particular redeveloped project likely included a significant community involvement or collaborative planning as part of efforts to plan for redevelopment. Detail on these sites is included in Appendix A. Results shown in Table 3 below indicate that approximately 25 percent of all new use sites redeveloped by 1999 or earlier utilized some element of community involvement or collaborative planning.

Table 2. Approximate Number of All *New Use* Sites Reused as of or Prior to 1999 that Likely Used Some Form of Community Involvement as Part of the Reuse Planning Process

New Use sites as of 1999	108
New Use sites as of 1999 that likely used some form of community involvement as part of reuse planning process	27
Percent of *new use* sites as of 1999 that likely used some form of community involvement as part of reuse planning process	25
New Use sites as of 1999 as percent of all active and deleted new use NPL sites as of 2006	59

Source: U.S. EPA. (1999). *Sites in Reuse*. Retrieved October 13, 2006. from http://www.epa.gov/superfund/programs/recycles/success/index.htm. Figures calculated by author.

The figures in this table provide some indication that community involvement or collaborative planning was included a part of at least some efforts centered on the redevelopment of Superfund sites. Given that most of these occurred before EPA issued funding to support collaborative planning processes or provided guidance on such processes it is likely that the use of community involvement or collaborative planning became more prominent in 1999 and later.

Insight regarding the prevalence of community involvement or collaborative planning was also developed by reviewing information on the roughly 69 pilot projects, which comprise 80 separate Superfund sites, EPA sponsored between 1999 and 2002. Just as EPA does not track the role of community involvement or collaborative planning in Superfund site redevelopment more generally, EPA does not specifically track this phenomenon within the context of its pilot projects. However, by reviewing EPA's summaries available for each of its pilots, as well as progress reports included within the Superfund Redevelopment database, a rough determination could be made regarding the extent to which community involvement and/or collaborative planning was used at various pilot project sites. Results are shown in Table 3 below.

Table 3. Approximation of Prevalence and Type of Community Involvement and Collaborative Planning in Superfund Redevelopment Pilot Projects

	Number of Sites	Percent of all pilot sites
Extent of Involvement		
Community involvement	38	48%
No discernible involvement	34	43%
Involvement unclear	8	10%
Total	*80*	*100%*
Type of Planning Process		
Consultant with committee	22	28%
City only with committee	13	16%
Workshop visioning	2	3%
Consultant with community involvement	1	1%
City only, no committee	28	35%
Consultant only, no committee	6	8%
Unclear	8	10%
Total	*80*	*100%*

Source: Source: (1) U.S. EPA. Superfund Redevelopment (SURE) Database. Accessed October 15, 2006 courtesy of the Superfund Redevelopment Program. (2) U.S. EPA. (n.d.). *Pilot Program.* Retrieved March 2006. from http://www.epa.gov/superfund/programs/recycle/pilot/index.htm.htm. Figures calculated by author.

Figures in this table suggests that community involvement or collaborative planning was likely a component in roughly half of all sites that were included as part of the pilot process. These figures are likely smaller than they should be as data provided for several projects was extremely limited. Figures also suggest that the types of planning processes used to plan for Superfund site redevelopment varied moderately across projects and that just over 40 percent of the sites likely used some form of collaborative planning. Although not conclusive, taken together, the results in Tables 2 and 3 suggest that community involvement and collaborative planning is an important component of many Superfund site redevelopment efforts. Other EPA fact sheets and studies have indicated that community involvement and/or collaborative planning has or is playing an important role in more recent projects as well. This research effort should shed additional light on the extent to which the type of planning processes used to inform the redevelopment of a Superfund site matter – both in terms of the extent to which Superfund site reuse plans are implemented and the extent to which Superfund sites are redeveloped. Chapter 3 more extensively summarizes what the literatures have to say on these topics.

3. Literature Review

3.1. Introduction

The following literature review attempts to summarize the relevant research literature pertinent to better understanding the extent to which collaborative planning impacts Superfund site redevelopment and plan implementation. The first section of the literature review draws on work that provides insight into factors that may be influential in the land redevelopment process. I focus primarily on the Superfund and brownfields literature, but I begin by discussing research centered on urban land development more generally. While the review focuses on the myriad of factors that scholars and agencies suggest affect land redevelopment, I also emphasize what this literature says about community involvement and collaborative planning in and its influence on land development outcomes. The second literature review focuses on plan implementation and factors that shape its effectiveness. As opposed to the first literature review which gives special emphasis to the Superfund and brownfields literatures, the plan implementation review draws from a wide-range of contexts, as the current Superfund and brownfields literatures have little to say on the topic. Finally, I provide an overview of the literature on collaborative planning and discuss findings from the literature regarding collaborative and related planning efforts and their influences on various outcomes.

3.2. Urban and Contaminated Land Redevelopment

3.2.1. Urban Land Development

Scholars have approached the study of urban land redevelopment from various vantage points. Some emphasize forces shaping the overall development process, often starting with bid-rent theory. Others have developed frameworks that can be used to predict whether a specific type of development will occur (e.g., industrial, commercial, or residential) in particular locations. Although the literature suggests there is some variation in terms of certain factors being more important in predicting one type of development over another, generally the development of urban land appears to be driven by geography, general market conditions, and nearby neighborhood conditions. Each of these broad factors, in turn, encompasses several dimensions and characteristics. A related and less-emphasized factor in the land redevelopment process centers on the role of public intervention, particularly relevant in the Superfund context. Public intervention is manifest in government land ownership, regulatory policies such as zoning ordinances and building codes, and fiscal policies such as property taxes (Kivell, 1993). The role of public involvement and collaborative planning, however, are essentially not discussed in the context of macro-theories regarding land use development. However, at the site-specific level, literature on social movements and community development frequently emphasize the role of various groups (often homeowners) in resisting or shaping certain types of development.

Apart from providing an overarching framework for considering the broader forces on land use development, the literature on land development is only marginally helpful in developing predictive models related to Superfund site redevelopment. Some scholars frequently test frameworks that apply to broad categories of development within certain locations. For instance, Smersh, Smith, and Schwartz (2003) test factors influencing county-wide residential location in the county containing Gainesville, Florida while Archer and Smith (2003) develop a predictive model to test the location of office buildings in Houston, Texas. Scholars have also developed models that test factors influencing generalized development across the U.S. (Alig, Kline, & Lichtenstein, 2004). While somewhat instructive, few models outside of the contaminated land context attempt to predict individual parcel development in a cross-section of cities.

Nevertheless, some insight can still be drawn from these studies. In their residential location study, Smersh et al. (2003) found the extent of pre-existing development, proximity to central business district, proximity to major employment centers, and the presence of a new large-scale subdivision development to all be positively correlated with new residential development, while proximity to low-income areas and distance from a new large-scale development to be negatively correlated. In a similar study examining residential location trends in the Portland, Oregon area, Ding (2001) found proximity to other developed land, level of district tax rate, and location within an urban growth boundary to be positively associated with residential development, whereas parcel size was found to have a negative relationship. In their study predicting urbanized land development nationwide, Alig et al. (2004) found population density, per capita income, location within a metropolitan area, and location within the South (comprised of ten states) to all be significant predictors of the portion of land developed within a county.

3.2.2. Brownfields Redevelopment

The literature on brownfields provides the most robust literature base from which to draw upon in order to develop models that can examine the effect of collaborative planning in Superfund site redevelopment. As opposed to the urban development literature, since the mid-1990s the role of community involvement in the brownfields redevelopment process is frequently mentioned. The literature includes arguments for why community involvement should be an integral component for almost any brownfields redevelopment, which comprise both normative and pragmatic rationales (Bartsch, 2003; Greenberg & Lewis, 2000; ICMA & NEMW, 2001; Ruiz-Esquide, 2004; U.S. EPA, 1999r) The literature also points out, however, that agency officials and developers have been somewhat hesitant to fully embrace public involvement beyond simply informing them about the redevelopment. For instance, some developers argue that if the public is involved in making decisions about the future use of a site, they may make inappropriate choices and retard its development (Greenberg & Lewis, 2000). Similarly, some private sector stakeholders have indicated that local residents cannot be expected to be involved in redevelopment planning since they do not understand the land redevelopment process and lack a financial stake in it (ICMA & NEMW, 2001). Nevertheless, professional associations and policy institutes have concluded that public involvement, especially involvement that is early in the process is essential for most brownfields projects (ICMA, 2002; NALGEP & NEMW, 2004). Similarly, evaluation researchers of EPA-sponsored brownfields projects from the mid-1990s argued that, "public involvement is more than the right thing to do; it is actually a mechanism for faster, better, cleanup and redevelopment (IRM, 1999, p. 2, qtd. in Greenberg & Lewis, 2000, p. 2502). An informal review of roughly 60 summaries of brownfields projects made available from a range of sources indicated a range of public involvement in brownfields redevelopment. Whereas several projects had no substantive public involvement, public involvement was an important component in many others, including several that used collaborative planning processes to engage the public.

Not surprisingly findings regarding community involvement from studies looking broadly at factors influencing redevelopment, or successful redevelopment of brownfields, were mixed. While two studies indicated that community involvement improves the chances that a site will be redeveloped or that a particular development will be successful (Lange & McNeil, 2004b; Pepper, 1997), two others suggest that community involvement does not improve brownfields redevelopment prospects (Howland, 2003; Wernstedt, Meyer, & Alberini, 2006). Pepper (1997), whose research is case study-based, notes that in nearly every project, efforts to obtain community support were essential. The findings of other researchers present a more complex picture, however. Lange & McNeil's (2004b) survey of those closely involved in (primarily) EPA brownfields pilot projects revealed that nearly all respondents agreed or strongly agreed that community support was essential for the success of a brownfields project (99.7 percent) and that the project should be consistent with the community's master plan

(94.9 percent). Only 80 percent agreed or strongly agreed with the third most important factor – minimizing site development costs. In contrast, in the second part of Lange and McNeil's research – which focused more on factual as opposed to opinion-based data – community involvement did not emerge as a distinguishing factor between successful and unsuccessful redevelopment projects. The analysis by Wernstedt, Meyer, & Alberini (2006) – also survey-based – similarly revealed findings that were in juxtaposition. Using survey data based on conjoint choice experiments – that allows respondents to select between different hypothetical brownfields redevelopment projects – multivariate statistical analysis based upon the respondents' preferences indicated that participants (who were mainly private developers) strongly disproved of government requirements for public hearings. Results from a related question (not used in the statistical analyses), in contrast, indicated that "nearly one-half of the respondents expressed the belief that developers always or almost always 'gain if they involve community members in their environmental response planning process'" (p. 359). Howland's case study of a redevelopment project in Baltimore, however, found that community involvement led to a poorly-designed brownfields project that was ultimately delayed for years because the desired end use advocated for by local residents was one that that could not be supported by the local market.

Obviously, community involvement is not the sole component of brownfields redevelopment, and since the 1990s scholars have placed increasing attention on factors that prohibit their redevelopment. In the mid-to-late 1990s, for instance, the role of contamination in prohibiting brownfields development was frequently a focus (U.S.

General Accounting Office, 1995; Urban Institute et al., 1997). Researchers began to discover that contamination was often less an issue than expected (Urban Institute et al., 1997) or simply not an issue (Schoenbaum, 2002). Instead, the point was frequently made that market demand was the real driver of brownfields redevelopment. If in fact the conditions were amenable, brownfields would be redeveloped, even if contamination levels were high (Howland, 2003; Meyer & Lyons, 2000; Pepper, 1997; Urban Institute et al., 1997). Interestingly, some researchers found that a major factor prohibiting brownfields was that sellers simply did not offer prices reflecting the true value of their properties (Deason, Sherk, & Carroll, 2001; Howland, 2004), reflecting another facet of the urban land market.

Not surprisingly, the term "market demand" is an embodiment of many different factors – one of these being site-specific characteristics of the site itself. The Urban Institute et al. (1997) writes that market demand for brownfield redevelopments may be impacted by: 1) the overall demand for developable property across a region; 2) regional desirability for brownfield over greenfield projects; and 3) site-specific or deal-specific factors. In terms of regional demand, Urban Institute et al. found that "the variation in economic conditions between different metropolitan areas (or the shift in one metropolitan area's economic conditions over time), can have a dramatic effect in terms of the feasibility of brownfield redevelopment" (p. 35). A region's desirability for formerly-used sites will also be influenced by the volume and location of brownfields in comparison with greenfields in addition to state and local policies affecting land use and economic development. Irrespective of these former two influences, however, Urban

Institute et al. argues that the site-specific conditions will influence a project's ultimate desirability – which may or may not be environmental.

Other studies reveal that site-specific factors beyond the contamination issue are important. Researchers consistently have found that brownfield sites' on-site infrastructure, or access to infrastructure, to be a critical driver of development (Deason, Sherk, & Carroll, 2001; Howland, 2004; Lange & McNeil, 2004a; U.S. General Accounting Office, 1994). Similarly, the geographic location of brownfields sites has been a consistently strong redevelopment predictor (Alberini, Longo, Tonin, Trombetta, & Turvani, 2005; DeSousa, 2004; Hill, 2000; Pepper, 1997). Lange and McNeil's (2004b) research on factors constituting successful brownfields redevelopment projects, however, found that location was not significant. Findings regarding site size have been inconsistent.

Other factors found to advance, or stall, brownfields redevelopment center on the developer's expertise (Howland, 2003; Meyer & Lyons, 2000; Urban Institute et al., 1997); the choices a developer makes regarding the type of cleanup approach used (Lange & McNeil, 2004b; Pepper, 1997) the type of project developed (Howland, 2003, 2004; Lange & McNeil, 2004b); and the extent to which a developer can undertake a project within a reasonable budget (DeSousa, 2004; Lange & McNeil, 2004b; Urban Institute et al., 1997). Several researchers also found that fear of liability for developing a contaminated site tended to have little effect on a developer's decision to move forward with a project (Deason, Sherk, & Carroll, 2001; Urban Institute et al., 1997). Given that brownfields typically have low levels of contamination in comparison with federal

Superfund sites, this finding is perhaps not that surprising. Ironically, both older and more recent studies, however, suggested that developers do in fact, however, value various forms of liability relief (Alberini, Longo, Tonin, Trombetta, & Turvani, 2005; Pepper, 1997; Wernstedt, Meyer, & Alberini, 2006).

Table 4. Factors Influencing the Redevelopment or Successful Redevelopment of Brownfields

Category	Variables	Research Evidence
Local/Regional Market	Market demand (+)	(Meyer & Lyons, 2000) [b]; (Howland, 2003)[c]; (Urban Institute et al., 1997)[c]; (Pepper, 1997)[c]
	Parcel price (-)	(Howland, 2004)[d,b]; (Deason, Sherk, & Carroll, 2001) [b]
Site-Specific	Contamination (+/-/NE*)	(Meyer & Lyons, 2000)[b] (+); (Schoenbaum, 2002)[a] (NE);(Howland, 2003)[c] (-); (Alberini et al., 2005)[a] (-);(Urban Institute et al., 1997) [c] (NE/-); (Hansen, 2004)[a] (-);U.S. General Accounting Office (1995)[b] (-); (Deason, Sherk, & Carroll, 2001; Howland, 2004) [d] (NE)
	Site size (+/-/NE)	Lange & McNeil (2004b)[h] (NE);(Howland, 2004)[d] (-); (Meyer & Lyons, 2000) [b] (+);(Deason, Sherk, & Carroll, 2001)[b] (+);
	Site infrastructure capacity/services (+)	U.S. General Accounting Office (1995)[b]; Lange & McNeil (2004b)[d, h]; (Howland, 2004)[b]; (Deason, Sherk, & Carroll, 2001) [b];(Lange & McNeil, 2004a)[a]
	Favorable location (+/NE)	Lange & McNeil (2004b)[h] (NE); (Alberini et al., 2005)[a] (+); (Pepper, 1997)[c] (+); (Hill, 2000)[c] (+); (DeSousa, 2004)[d] (+);
	Obsolete on-site structures that must be removed/addressed (-)	(Howland, 2004)[b];(Howland, 2003)[c]; (Deason, Sherk, & Carroll, 2001)[b]
Neighborhood -Level	Crime (perceived and/or real) (-)	U.S. General Accounting Office (1995)[b]; (Deason, Sherk, & Carroll, 2001)[b]
	Blight (on-site/neighborhood) (-)	U.S. General Accounting Office (1996)[b]; (Pepper, 1997)[c]
Developer-Specific	Developer expertise (with local market and brownfields) (+)	(Howland, 2003)[c]; (Urban Institute et al., 1997) [c]; (Meyer & Lyons, 2000)[b]
	Risk-based cleanup level (+)	Lange & McNeil (2004b)[d]; (Pepper, 1997)[c]
	Liability fear (NE/-)	(Urban Institute et al., 1997)[c] (NE); (Deason, Sherk, & Carroll, 2001)[b] (NE); U.S. General Accounting Office (1995)[b] (-)
	Appropriate end use/end use compatible with surrounding area (+)	(Howland, 2003)[c]; (Howland, 2004)[b]; Lange & McNeil (2004b)[d,e,f,h]
	Cost (-)	Lange & McNeil (2004b)[e,f]; (Urban Institute et al., 1997) [c]; (DeSousa, 2004)[d]
Public Intervention	Public or private incentives (+/NE)	Lange & McNeil (2004b)[d, h,] (+); (Meyer & Lyons, 2000) [b] (NE); (Alberini et al., 2005)[a] (+);(Urban Institute et al., 1997)[c] (+); (Hansen, 2004)[a] (+);(Pepper, 1997)[c] (+); (Hill, 2000)[c (+)]
	Liability relief (+)	(Alberini et al., 2005)[a] ; (Pepper, 1997)[c];(Wernstedt, Meyer, & Alberini, 2006)[a]

Category	Variables	Research Evidence
	Government involvement (+)	(Pepper, 1997)[c]; (Urban Institute et al., 1997) (+);(DeSousa, 2004)[d];(Habisreutinger & Gunderson, 2006)[c]; Lange & McNeil (2004b)[h]
	Community involvement (+/-)	(Pepper, 1997)[c] (+); (Wernstedt, Meyer, & Alberini, 2006)[a] (-); (Howland, 2003)[c] (-); Lange & McNeil (2004b)[f] (+)

Findings based upon: [a] multivariate statistical analysis; [b] qualitative analysis/review of literature; [c] single or multiple case studies; [d] descriptive statistics; [e] exploratory factor analysis, [f] exploratory data analysis; [h] independent sample t-testing, chi-square testing, or Wilcoxon rank sum testing.
*Indicates No Effect (NE) was found.

Similarly, additional support from outside parties either in the form of direct government involvement or public or private incentives generally appeared to improve the chances that a brownfields site would be redeveloped or be considered successful (Alberini, Longo, Tonin, Trombetta, & Turvani, 2005; DeSousa, 2004; Habisreutinger & Gunderson, 2006; Lange & McNeil, 2004b; Pepper, 1997; Urban Institute et al., 1997). The full list of factors identified in the literature as being positively or negatively associated with brownfield redevelopment or successful redevelopment is included in Table 4 above.

3.2.3. Superfund Redevelopment

Studies which examine the role of community involvement and collaborative planning in Superfund site redevelopment are limited. Although community involvement in the Superfund cleanup process has received a fair level of academic and agency-led scrutiny (e.g., see Ashford & Rest, 1999; Laurian, 2004), research related to the role of community involvement and collaborative planning in the redevelopment process has been mostly limited to discussions within individual case studies (Bromm & Lofton, 2002; Hersh, Probst, Wernstedt, & Mazurek, 1997; Smith & Garcia, 2002). While providing useful insights, the involvement processes were typically not the primary focus of the articles.

The most valuable piece for understanding this phenomenon is a cross-case study analysis sponsored by EPA that examines the role of various forms of community involvement in planning for the redevelopment of eight Superfund sites (U.S. EPA, 2005). Interviews with roughly 40 stakeholders that included EPA personnel, PRPs, nearby residents, and city and state officials, shed light on the extent to which these processes impacted the redevelopment process roughly one year after the process had ended as well as factors that influenced the perceived success of these processes. Because relatively little time had elapsed when most of the interviews took place and the formal planning processes concluded not much was expected in terms of resultant on-the-ground process changes. Nevertheless, EPA and state officials noted that "at four of the six sites where the reuse planning process is complete, RPMs, state project managers or Superfund Redevelopment Initiative Coordinators (SRICs) report that the process has informed remedial decision-making — including risk assessments, remedial investigations and feasibility studies" (p. ii). Moreover, most participants looked very favorably on the process. Areas of disagreement did arise. For instance, some interviewees were concerned about whether certain plans could be realistically implemented either due to lack of tax-base implications or ambitious goals. Concerns were also raised in regards to why there had been no formal follow-up to begin implementing certain plans. Factors influencing procedural effectiveness were also identified, with the two most regularly identified ones being the competency of the facilitators/planners and the diversity of individuals participating within the planning process.

As with brownfields, however, community involvement and collaborative planning are not the only factor that may potentially influence whether a Superfund site will be redeveloped. In the late 1990s researchers at Resources for the Future (RFF), a non-partisan research institute in Washington, D.C., began laying a foundation for understanding Superfund site redevelopment more broadly by examining the practice of incorporating future land use assumptions in Superfund site remediation. Much of their work was theoretical and exploratory in nature and rooted in one or more of three case studies looking in-depth at Superfund sites conducted as part of a larger RFF study (Hersh, Probst, Wernstedt, & Mazurek, 1997; Wernstedt & Hersh, 1998a, 1998b; Wernstedt, Hersh, & Probst, 1999). However, in one of their related works, Wernstedt, Hersh, and Probst (1999) utilized a large database compiled from multiple sources to explore the economic development potential of 1,000 non-federal Superfund sites. Assessing these sites in terms of location (urban or rural), population over 20,000 residing five kilometers or less from the site (yes or no), and site size where larger sites (e.g., 100 hectares) are better suited for redevelopment, the authors concluded that in economic development terms most Superfund sites did not make strong economic development candidates. However, lacking the data to identify whether the specified future use of these had occurred, the authors were unable to discern whether these factors were indeed influential.

Another informative and more recent EPA report attempts to characterize quantitatively various characteristics of Superfund sites that have been, or are in the process of being, redeveloped, and then identify statistically significant differences between reused Superfund sites and all Superfund sites (U.S. EPA, 2004a). The study found that of the 335 sites classified as being in reuse in 2004, roughly 40 percent were redeveloped for commercial uses, 20 percent for recreational, 17 percent for industrial, 13 percent for ecological, and ten percent for residential. In the limited comparison between reused and all Superfund sites, a few statistically significant differences did emerge. Although no difference was found between reused sites and all Superfund sites in terms of the most frequently identified contaminants at these sites, some statistically significant differences in terms of the type of prior use of sites were identified. For instance, reused sites were significantly more likely to have prior uses that were either manufacturing plants or federal facilities and less likely to have prior uses consisting of industrial waste treatment, landfill, military-related, and other uses, in comparison to the general universe of all sites.

Because the published literature was limited, I also turned to EPA's case studies and fact sheets produced for several redeveloped Superfund sites for additional insight. The most notable finding from this review was EPA's emphasis on partnerships. Clearly the term partnership is broad and has different connotations to different people, but essentially what partnerships seem to reflect in the context of Superfund site redevelopment is an intense level of cooperation between EPA, the appropriate state agency, the PRP and/or prospective purchaser of a site, and local officials to identify and overcome technical and legal reuse obstacles frequently present. Cooperation with the community residents is also frequently mentioned. This suggests that the more intensively and cooperatively developers choose to work with federal, state, and local officials and PRPs (if playing the lead role in cleanup) the more likely developers will be in returning sites to productive use.

Other variables related to public intervention were also identified as important. These included community involvement, government involvement, liability relief, and public or private incentives. The form of community involvement was not always specified but it could include resident participation in the planning process as in the case of the Pepe Field Superfund site redevelopment in Boonton, New Jersey (U.S. EPA, n.d.-b). Government involvement frequently reflected specific involvement of local officials in helping to catalyze or ensure that redevelopment would occur, such as the specialized agreement between local officials and the PRP (who was also the landowner) that allowed for the development of a publicly-owned golf course on top of a Superfund site (U.S. EPA, 1999o). Liability clarification – which often takes the form of a prospective purchaser agreement –outlines the circumstances under which developers will not be held responsible for any remaining on-site contamination, such as the one issued as part of the Trans Circuit Superfund site redevelopment in Florida (U.S. EPA, 2004e), was also regularly identified as important. Public incentives were also regularly used and seen as important in several redevelopment projects. Types of incentives ranged considerably and included impact fee discounts (U.S. EPA, 2004c) and federal contract preferences as a result of location (U.S. EPA, 2004e).

Table 5. Factors Influencing the Redevelopment of Superfund Sites

Category	Variables	Research Evidence
Local/Regional Market	Market demand (+)	(U.S. EPA, 2004c)[c]
Site-Level	Contamination (+/-/NE)	
	Site size (+)	(Wernstedt & Hersh, 1998b)[c]; (U.S. EPA, 2004d)[c]
	Site infrastructure capacity/services (+)	(U.S. EPA, 2004c)[c];(U.S. EPA, 1999h)[c]
	Suitable on-site building infrastructure	(U.S. EPA, 2004e) [c]; (U.S. EPA, 1999h)[c]
	Type of prior use (+/-)	manufacturing plants or federal facilities (+);industrial waste treatment, landfill, military-related, and “other uses” (-) USEPA (2004)
	Favorable location (+)	(U.S. EPA, 1999g)[c]; (Wernstedt & Hersh, 1998b)[c]; (U.S. EPA, 2004c)[c]; (U.S. EPA, 2004d)[c]; (U.S. EPA, 1999h) [c]; (U.S. EPA, 1999p)[c] (+); (U.S. EPA, 2004e)[c]
Developer-Level	PRP engagement in reuse	(U.S. EPA, n.d.-j)[c]
	Incorporating reuse into remedy design	(U.S. EPA, n.d.-j)[c]; (U.S. EPA, 1999g)[c];
Public intervention	Public or private incentives (+)	(U.S. EPA, 2004d)[c]; (U.S. EPA, 2004e)[c]; (U.S. EPA, 1999h)[c]; (U.S. EPA, n.d.-j)[c]; (U.S. EPA, 2004c)[c]
	Liability relief (+)	(U.S. EPA, 2004d)[c]; (U.S. EPA, 2004e)[c]; (U.S. EPA, 1999j)[c]; (U.S. EPA, 1999p)[c]; (U.S. EPA, 1999g)[c]; (U.S. EPA, 1999m)[c]; (U.S. EPA, 1999k)[c];
	Government involvement (+)	Smith & Garcia (2002)[c]; (U.S. EPA, 2004c)[c]; (U.S. EPA, 2004d)[c]; (U.S. EPA, n.d.-j)[c]; (U.S. EPA, 1999o)[c];
	Community involvement (+)	Bromm & Lofton (2002)[c];(U.S. EPA, n.d.-b)[c]; (U.S. EPA, n.d.-j)[c]; (U.S. EPA, 1999c)[c]; (U.S. EPA, 1999g)[c]; (U.S. EPA, 1999m)[c]; (U.S. EPA, 1999b)[c]; (U.S. EPA, 1999l)[c]; (U.S. EPA, 1999e)[c];
	Federal-local partnerships (cooperation)	Bromm & Lofton (2002)[c];(U.S. EPA, n.d.-k)[c]; (U.S. EPA, 2004c)[c]; (U.S. EPA, 1999h)[c]; (U.S. EPA, 1999j) [c]; (U.S. EPA, 1999a)[c]; (U.S. EPA, 1999p)[c]; (U.S. EPA, 1999e)[c]; (U.S. EPA, 1999f)[c]; (U.S. EPA, n.d.-j)[c]; (U.S. EPA, 1999c)[c]; (U.S. EPA, 1999g)[c]; (U.S. EPA, 1999o)[c]; (U.S. EPA, 1999d)[c]; (U.S. EPA, 1999i)[c]; (U.S. EPA, 1999m)[c]; (U.S. EPA, 1999b)[c]; (U.S. EPA, 1999l)[c]; (U.S. EPA, 1999s)[c]; (U.S. EPA, 1999a)[c]; (U.S. EPA, 1999k)[c]; (U.S. EPA, 1999n)[c];

Findings based upon: [a] multivariate statistical analysis; [b] qualitative analysis/review of literature; [c] single or multiple case studies; [d] descriptive statistics; [e] exploratory factor analysis, [f] exploratory data analysis; [h] independent sample t-testing, chi-square testing, or Wilcoxon rank sum testing.
*Indicates No Effect (NE) was found.

Several site-level variables were also identified as important; the one that emerged as influential most consistently centered on the site’s location. The benefit of the location varied by site and included rail accessibility (U.S. EPA, 1999g), proximity to workforce (U.S. EPA, 2004e), and proximity to the central city (U.S. EPA, 1999g). A site's infrastructure, including the availability of useable on-site buildings, was also identified as important. Market demand was less frequently mentioned, but according to one case study the regional demand for undeveloped land in one area was a critical factor leading to a site's redevelopment (U.S. EPA, 2004c). Finally, in two cases the explicit attempt to factor the planned reuse into the remedy of a site proved to be an important determinant of redevelopment (U.S. EPA, 1999g, n.d.-j). The full list of factors identified from the literature and EPA's case studies of Superfund site redevelopment are included above in Table 5.

In summary, the review of both the brownfields and Superfund redevelopment literatures suggest that market forces and related factors such as site location and specific on-site characteristics are important determinants of contaminated site redevelopment. The literature also indicates that public intervention plays a critical role in redevelopment for both types of sites. This likely reflects that other factors beyond contamination-related issues, such as many of these sites' poor location or lack of regional market demand, make public or private incentives much more important in terms of leveling the playing between such sites and greenfields. As one component of public intervention, community involvement is regularly an issue in brownfields and Superfund site redevelopment. Whereas community involvement's impact and desirability from a developer standpoint are clearly mixed in the brownfields context, its influence emerges as a relatively positive one in the Superfund context. Nevertheless, the studies are too few and lack sufficient comparisons between developed and non-developed sites to draw any broad conclusions about collaborative planning's impact on site redevelopment and plan implementation.

3.3. Plan Implementation

The literature on plan implementation is wide-ranging, and scholars regularly switch back and forth between policy and planning-related disciplines to forge coherent discussions and criteria that can be used for evaluating plans. Analyses of plan implementation, moreover, are quite diverse and have centered on natural hazard mitigation (Burby & Dalton, 1994), regional growth management (Margerum, 2002), farmland preservation (Koontz, 2005), private development comformance with comprehensive plans (Laurian et al., 2004), public park distribution and accessibility (Talen, 1996a), and natural resources management (Albert, Gunton, & Day, 2003). Studies related to plan implementation in the Superfund and brownfields redevelopment context are minimal; although one study referenced earlier (U.S. EPA, 2005), partly focuses on plan implementation at Superfund sites and will be discussed more below.

In the 2000s scholars have shown increasing interest in the debates centering on the extent to which plans are implemented, how implementation should be measured, and what factors influence implementation success. Brody and Highfield (2005) ask, “How can planners validate the importance of plan making if they cannot determine if their plans have an impact on the community after they are adopted?" (p. 159). Brody and Highfield's concern hearkens back to Talen's (1996b) who similarly questioned the legitimacy of planning if planners cannot identify if their plans were implemented.

One critical area of debate raised by Talen (1996b) and explored by others that must be considered in the context of Superfund site redevelopment, centers on how the effect of plan implementation should be considered. On the one hand, Talen summarizes, there are theorists who argue that plans should be should be judged according to their degree of implementation; while on the other there are some theorists who argue that a mere review of a plan is tantamount to implementation success. Expanding on this perspective, Mastop and Faludi (1997) usefully distinguish between two types of plans: project and strategic. According to the authors, project plans carefully describe how redevelopment is expected to take place at a particular site; whereas strategic plans are much less prescriptive and serve as a means to continually reflect upon and negotiate the future use of a site. The authors further point out that whereas measurement of project plans may be challenging, the theory regarding what constitutes success is not. The logic behind, as well as how to evaluate, strategic plans, however, is complicated since an inability to directly meet the goals of a plan doesn't necessarily imply the plan was ineffective. Talen (1996b) cautions against centering on the *process* of implementation since it draws attention away from how the plan was actually implemented.

Not surprisingly, scholars have utilized varying approaches for conducting plan implementation evaluation. Whereas some have focused on levels of conformance between the plan objectives and the plan as physically implemented (e.g., Brody & Highfield, 2005; Talen, 1996a), others (e.g., Margerum, 2002; Norton, 2005) have focused more on policy adoption and behavioral changes resulting from plans. See Table 6 below for more detail.

Implied by the types of studies listed, no studies were identified that examine the extent of implementation of plans derived for specific land use development independent of their correspondence with local comprehensive plans; hence, these studies' utility as guidance for considering how to measure the extent of plan implementation in the Superfund site redevelopment context is somewhat limited. Nevertheless, together they suggest the importance of determining the purpose of land use redevelopment plans before attempting to estimate the

Table 6. In-Depth Studies of Land Use Plan Implementation

Study	Type of Plan Evaluated	Evaluation based on…	Implementation Measured by Extent to Which…
(Brody & Highfield, 2005)	City / county comprehensive plans	Conformance	…pattern of wetland development permits granted after completion of state-mandated comprehensive planning conformed with the future land use maps adopted as part of state-mandated comprehensive plans for all cities and county jurisdictions in the state of Florida.
(Talen, 1996a)	City comprehensive plan	Conformance	…post-comprehensive plan spatial distribution of public parks in Pueblo, Colorado, in terms of accessibility to specific subgroups, matched the comprehensive plan goals for park distribution.
(Albert, Gunton, & Day, 2003)	Public lands management plan	Conformance	…the extent to which plan recommendations were implemented and specific objectives were achieved, using both objective and subjective indicators.
(Koontz, 2005)	County farmland preservation plans	Policy adoption	…local officials adopted policies recommended in farmland preservation plans for 16 counties in Ohio.
(Norton, 2005)	County / community coastal management plans	Policy adoption	…local officials representing 36 county and community jurisdictions in North Carolina used state-mandated coastal management plans as guides for policy decision making related to local land use.
(Laurian et al., 2004)	City comprehensive plans	Policy adoption	…local comprehensive plan policies for cities in New Zealand were incorporated into building permits granted by planning agencies.
(Burby & Dalton, 1994)	City / county comprehensive plans	Policy adoption	…local elected officials passed hazard mitigation policies recommended in local comprehensive plans
(Margerum,	Regional growth	Policy adoption	…behavioral changes and policies were

Study	Type of Plan Evaluated	Evaluation based on…	Implementation Measured by Extent to Which…
2002)	management plan		adopted consistent with a large-scale regional growth management plan in Southeast Queensland Australia

extent of implementation. At first glance, most plan implementation scholars would likely consider Superfund redevelopment plans to be what Mastop and Faludi (1997) define as "project" plans and thus, should be measured simply on the extent to which the actual development conforms with the actual plan. However, I would argue that in many cases Superfund reuse plans represent strategic plans, which – although not aimed at encouraging the adoption of new local land use policies – act as a guide rather than as a blueprint for site redevelopment. Plan supporters likely recognize that reuse plans are somewhat "works in progress" and are subject to modification given new developments regarding site contamination and the effectiveness of various remedial approaches in use. As such, I would argue that most Superfund reuse plans should likely be thought of as falling somewhere between Mastop and Faludi's "project" plan and "strategic" plan – not as prescriptive as a blueprint but more precise than a set of broad redevelopment goals.

A related and equally relevant issue for assessing Superfund site redevelopment plan implementation centers on those factors that best predict land use plan implementation. In the mid-1990s, Talen (1996b; , 1997) argued that planners should simply focus on whether or not a plan was implemented and avoid worrying about the complex array of factors that may have been influential in its implementation. If the focus of the evaluation is centered specifically on the connection between plan prescription and plan outcome, Talen suggests evaluators need not concern themselves with causal factors. Not surprisingly Mastop and Faludi (1997) disagree, arguing instead that determination of the effects of plans must be broadly construed. Since these debates scholars have continued to place attention on the issue, utilizing a range of different frameworks to consider plan implementation, all of which are helpful to varying degrees for conceptualizing factors potentially influential in the implementation of Superfund site redevelopment plans.

In his examination of factors influencing the successful redevelopment of former military bases, Hansen (2004) refers to “complex implementation” which is achieved through “elements of strategic planning, grant writing, incentives, and the like” (p. 56). He further notes that factors that can influence the complex implementation process can be influenced by factors such as strong grassroots organizations and powerful elites in opposition to specific development types. Drawing from Melcher and Kerzner (1983), Hansen also specifies that strategic plans may not be realized for various reasons including: lack of attention on development goals and lack of flexibility to achieve them; assuming that current or past trends will be maintained in the future; and falsely assuming that recent successes related to redevelopment will carry over into the future. Koontz (2005) meanwhile considered implementation of collaboratively-derived farmland preservation plans using what is called the Institutional and Analysis Development framework, developed in part by Elinor Ostrom, which considers policy implementation in the context of physical land use characteristics, socio-economic and other characteristics in which planning occurs, rules that influence particular behaviors, relationships between individuals, and individual value preferences. Finally, Laurian et al. (2004) tested a framework that assesses factors influential in the implementation of local comprehensive plans in New Zealand – as expressed by the extent to which development permits include requirements that are consistent with comprehensive plans. They argue that that plan implementation is a function of plan quality, planning agency capacity and commitment, developer willingness to implement, ability to implement the comprehensive plan, the level of cooperation between the enforcement agency and the developer, and the scale of the project.

Apart of from considering frameworks for implementation, it is useful to consider the findings of scholars who have attempted to test empirically factors that influence plan implementation. Given the great diversity of emphases and plans evaluated in each of these studies caution is clearly warranted before drawing any firm conclusions about consistent predictors of plan implementation, nevertheless, such analysis serves as useful starting point. Perhaps because of the different planning contexts and small number of studies reviewed, few consistent predictors potentially relevant in the Superfund context were identified. Of the seven reviewed, the quality of the plan, local officials' concern about the planning topic, the type of process (e.g., whether or not it was cooperative or collaborative), and whether sanctions were specified for instances of failed implementation were all consistently significant and positive. Planning staff resources and capacity to implement plans were statistically and positively associated with plan implementation in three studies; surprisingly, however, one study revealed a significant and negative association. Findings regarding the role of staff resources and commitment for implementing plans were similarly inconsistent. Only Brody and Highfield (2005), however, found a negative correlation between staff resources and plan implementation. Likewise, Brody and Highfield found a negative association between monitoring requirements for implementation and level of spatial conformity with the land use plan. No explanation for these curious findings was provided. The findings from these studies are included below in Table 7.

Table 7. Findings from Review of Seven Studies on Plan Implementation Potentially Relevant in Superfund Context

Category	Variables	Research Evidence
Consistent Predictors	Level of plan sophistication/high quality plan (+)	(Koontz, 2005)[c]; (Laurian et al., 2004)[a]
	Local officials' concern about planning topic (+)	(Koontz, 2005)[c]; (Burby & Dalton, 1994)[a]
	"Cooperative/Collaborative planning" (p. 77) (+)	(Calbick, Day, & Gunton, 2003)[d]; (Albert, Gunton, & Day, 2003)[d]; (Burby, 2003)[h]
	Sanctions specified for failure to implement plans (+)	(Brody & Highfield, 2005)[h] (+);(Calbick, Day, & Gunton, 2003)[d](+)
Inconsistent Predictors	Staff resources / capacity / commitment (+/-)	(Brody & Highfield, 2005)[h] (-);(Calbick, Day, & Gunton, 2003)[d] (+); (Laurian et al., 2004)[a] (+); (Burby & Dalton, 1994) [a](+)
	Demand for land in areas addressed by plan (+/ NE)	(Burby & Dalton, 1994) [a]; (Koontz, 2005)[c]; (Burby, 2003)[a] (NE)
	Monitoring requirement for implementation (+/-)	(Brody & Highfield, 2005)[h] (-);(Calbick, Day, & Gunton, 2003)[d](+)
	Population (+/NE)	(Burby & Dalton, 1994) [a]; (Burby, 2003)[a] (NE)
	Income level (+/NE)	(Koontz, 2005)[c]; (Burby, 2003)[a] (NE)

Findings based upon: [a] multivariate statistical analysis; [b] qualitative analysis/review of literature; [c] single or multiple case studies; [d] descriptive statistics;
[e] exploratory factor analysis, [f] exploratory data analysis; [h] independent sample t-testing, chi-square testing, or Wilcoxon rank sum testing.
*Indicates No Effect (NE) was found.

Unlike most topics on which the above studies focus, the hazard mitigation literature has developed a relatively robust literature centered on factors influencing the implementation of plans and policies related to hazard mitigation. Although planning for natural hazard mitigation is typically focused on impacting broad swaths of future development within a community or region, and hence is fundamentally different from the implementation of site-specific Superfund redevelopment plans, several factors that could be potentially influential in hazard mitigation plan implementation may also be relevant in the Superfund context because of the potential involvement of multiple layers of government, planning officials, and different stakeholders groups in the planning process. From a comprehensive review of the literature, Jung (2005) identified several consistent predictors influential in plan implementation and policy adoption in the hazard mitigation context that could theoretically predict implementation of Superfund reuse plans. These include political culture, linkage to conventional issues (such as major capital investment decisions), the presence of advocates (or politically supportive groups), and participant interaction and coordination. Whereas Jung's review also found staff resources and capacity as well development pressure to be consistent predictors, my more limited but wider review found these factors to be inconsistent predictors. In contrast, both our reviews identified socio-economic conditions to be inconsistent predictors of plan implementation. Additionally, Jung identified past experience to be an inconsistent implementation predictor.

Finally, insight can be drawn by reviewing the set of factors identified by the U.S. EPA (2005) as being predictive of redevelopment planning success through interviews with numerous stakeholders involved in reuse planning processes as well as reviews of related planning documents. Four factors were identified from a larger set of 11 factors that could be potentially influential in the implementation of site redevelopment plans: technical expertise, support and commitment (from various stakeholders), site reuse potential, and relevancy of plan over time.

Technical expertise refers to the ability of the lead planning authority to provide sufficient and credible data and analyses upon which land use planning recommendations can be made. The more proficient the lead planners are in making available, and communicating, information critical to land use planning decision making the more realistic – and by extension more implementable – future land use plan recommendations should be.

Support and commitment refers to support for any recommendations that may emerge out of a Superfund reuse planning process. However, this notion of support and commitment refers to support from several different stakeholder groups. One level refers to support for the process from the agencies overseeing the cleanup, which may be EPA or its state counterparts. Their support will be particularly important if the site developer's intention is to integrate a particular reuse plan with the main remedy for the site, before the remedy is underway. Another important level of support comes from local government, who in many instances, will need to take necessary follow-up actions to ensure sufficient funding is available to develop a site – particularly when the site will be developed primarily for public uses — or when provision of public incentives to encourage certain types of private development is perceived as critical. Other levels of support were also deemed important – including support from the broader community and PRPs/site owners. The level of support from various entities may potentially vary depending upon the types of redevelopments proposed and the types of process which inspired such redevelopment proposals.

Site reuse potential was also identified as a critical component of plan implementation. Ultimately a strongly supported plan will be less likely to be implemented if the location of the site is poorly suited to support those particular uses. Although "site reuse potential" is not clearly defined, EPA's treatment of the topic suggests that sites located near "population centers" or "growth centers" will be more likely to see their plan recommendations than sites located in more rural areas with abundant supplies of undeveloped land. Similarly, EPA's discussion suggests that plans which call for uses that will boost the local tax base will receive greater support from local officials.

Finally, the *relevancy of the plan over time* indicates that plans that are durable will be more likely to be implemented than plans which are not. Although somewhat obvious, factors that may impact a plan's relevancy include: the length of time that elapses between when a plan is actually finalized and when the site is cleaned up to such a level that all or a portion of a plan can actually be implemented; the extent to which an individual or entity is identified following the conclusion of the planning process to ensure continued support for the plan; the extent to which efforts are made to regularly update the plan to accommodate new site developments related to the cleanup; and the extent to which the key entities who are most responsible for developing the site continue to support the plan.

Although the literature base related to the implementation of Superfund redevelopment plans is insufficient, the studies of plan implementation from other areas of planning provide useful theoretical and empirical guidance to inform how the redevelopment of Superfund sites might be evaluated (e.g., as project plans or strategic plans) and factors that influence Superfund site redevelopment. In particular, an examination of the empirical studies on factors influencing plan implementation within the areas of hazard mitigation and other areas of land use planning more generally, coupled with the lone Superfund study providing insights into plan implementation, suggests approximately six factors that could be reasonably considered as potentially affecting Superfund site plan implementation. These include plan quality, support of local officials other advocates (e.g., agency responsible for cleanup, PRP/site owners, etc.), collaborative planning processes/stakeholder involvement, staff resources and capacity, and site suitability (influenced by such factors as development pressure).

3.4. Collaborative Planning

As with the literature on plan implementation, the collaborative planning literature is diverse, focusing on its effectiveness in several different contexts. Approaches to the analysis of collaborative planning have relied heavily on case studies and interviews. However, recently researchers have begun utilizing more intricate methodologies to assess its impact. Before discussing the literature pertinent to collaborative planning – including theoretical works about and empirical analyses of collaborative planning’s potential and actual effectiveness – it is important to first attempt to more thoroughly define the concept, and second situate collaborative planning in the broader literatures that inform the phenomenon.

Collaborative planning is the process whereby a range of different interests and/or citizens are brought together for the purposes of identifying a set of future actions to address a particular issue through the act of dialogue and deliberation, and making decisions together. It represents a reaction to modernity's inability to substantively improve society through adherence to scientific principles and rationality (Healey, 1993). Similarly, Innes and Booher (1999) note that consensus-based approaches represent a response to a growing, networked distribution of knowledge and power.

In the context of planning for the redevelopment of contaminated, abandoned, or other underutilized sites, it stands in contrast to decisions about future uses that are made amongst only a small, elite group (Hansen, 2004). Innes and Booher (2004), Healey (1997) and others have clarified and widely elaborated upon collaborative planning. This model has roots in "a wide range of collaborative, communicative forms of planning with which both government and private players have been experiencing since the early 1970s" (Innes & Booher, 1999b, p. 412). Cormick et al. (1996) note that such processes "are designed to find the common ground and a mutually acceptable decision that can be implemented or recommended for implementation" (p. 5). In describing its key features, Daniels and Walker (2001) note that collaborative processes focus less on competition and more on inclusion. Information is obtained and used to benefit the collaborative participants collectively instead of participants individually. It emphasizes interests over positions, and a range of parties are expected to play implementation roles. In addition, decisions are arrived at through deep dialogue, and the process will require more than a single event. Finally, the process should improve participants' as well as the community's ability to functionally address challenges. In the context of environmental and land use planning, collaborative planning has been frequently utilized to address issues of public lands management and watershed basin protection; it is has also been employed in the redevelopment of contaminated and other abandoned or underutilized sites, long-range community visioning, regional growth management, transportation planning, lead poisoning reduction, revitalization of depressed neighborhoods, and other areas.

Given the numerous contexts in which collaborative planning has been applied, it is not surprising that a range of different theories could reasonably be, or have been invoked, to explain collaborative planning in the context of the redevelopment of contaminated sites, both in terms of its main components and its historical roots, and how it resembles – as well as differs – from similar processes. These diverse but related theoretical strands include theories of public participation, participatory and deliberative democracy, alternative dispute resolution and negotiation, communicative action or discourse, citizen advisory councils, and visioning. In addition, scholars have drawn more specifically from the work of scholars that include John Dewey, Paulo Freire, Don Schon, Jurgen Habermas and others (Forester, 1999) to explain how dialogue within groups can result in enhanced social learning and potentially better decisions. In reference to Schon and Rein (1994), Innes (1999b) notes, for instance, that "dialogue can lead to… 'frame reflection,' or the ability to act from one perspective while in the back of our minds we hold onto an awareness of other possible perspectives, in a sort of double vision" (p. 13).

Proponents of collaborative processes point to a range of benefits that theoretically should result from such efforts. Fundamentally, collaborative planning should promote a greater understanding of the problem under focus by drawing upon a number of different perspectives to consider the problem, and hence result in more thoughtful solutions (Gray, 1989). Similarly, by deriving solutions based upon the inclusion, as opposed to exclusion, of a broad range of perspectives, solutions to problems should be more likely to be implemented (Gray, 1989; Innes & Booher, 1999a; National Civic League, 2000). Resulting solutions and proposals are also expected to be more likely to serve the common good (Innes & Booher, 1999a). Related to this notion, collaborative planning advocates suggest that the process can: transform understandings of issues, instead of merely serving as a forum for the exchange of ideas (Forester, 1999; Healey, 1993); surface community issues not previously identified (Myers & Kituse, 2000); and substantively alter social conditions and existing networks of power through on-going efforts to scrutinize and efforts to make such networks understandable (Healey, 1993). Additionally, proponents note that collaborative planning can result in creative solutions by drawing on multidisciplinary expertise as well as knowledge of lay persons (Chaskin, 2005; Gray, 1989; Scher, 1999), and similarly produce mutual-gains type solutions that exceed what participants could have achieved acting through more traditional channels (Innes & Gruber, 2005).

As with broader debates surrounding public involvement, scholars have also challenged the use of collaborative and consensus-based decision making processes. Gregory and McDaniels (2000) argue that it is not necessarily appropriate for government agencies charged with improving social welfare to make new decision making structures outside of the formalized institutions that are dependent upon the whims of a limited number of group participants. Second, from a social psychological perspective they argue that participants lacking knowledge about the realistic outcomes regarding the issue understudy before participating in the processes, the participants will likely shape their opinion during the discussion itself. Finally, they argue, processes such as these frequently fall prey to discussions *about process* rather than on the substantive issues. Proponents of the process are also quick to point out that if consensus-based processes are used at inappropriate times they could exacerbate problems between participants and diminish trust felt towards the convener (Cormick et al., 1996). Other concerns include the potential for interests of group to dominate over interests of the public good (Gregory & McDaniels, 2000; Sager, 2001), an over-emphasis on solving conflict rather than crafting effective policy (Gregory & McDaniels, 2000) and a tendency for groups to be incapable of moving past positional bargaining (Innes & Gruber, 2005; Mascarenhas & Scarce, 2004; McGuirk, 2001). Similarly, tensions have been noted in deliberations between technical and lay-persons (Chaskin, 2005; Leach, Pelkey, & Sabatier, 2002; Mascarenhas & Scarce, 2004) as well as over the need for consensus versus the need to efficiently arrive at a decision (Chaskin, 2005).

Finally, several authors comment on the issues of fairness and power. Lowry, Adler, and Milner (1997) comment that assumed fair procedures in group involvement processes may not be fair. Flyvbjerg, based on his case study of a collaborative planning project in Aalborg, Denmark (Flyvbjerg, 2001), concludes that such processes are incapable of reconciling power inequalities between parties. Chaskin (2005), in his study of community–based collaborative processes in inner cities, also found issues of power to be very prominent. Selin, Schuett, and Carr (2000) found that “having an equitable distribution of power approached significance and may be relevant to discussions of how to facilitate effective collaboration” (p. 743). Similarly, Mascarenhas and Scarce (2004) found power inequities to be significant in a large-scale collaborative forest planning process in British Columbia. Likewise, in their study of the same process, Frame, Gunton, and Day (2004) found that “all criteria [for success] were met or partially met except for one: equal opportunity.” They concluded, however, that “inequality in power among stakeholders is not necessarily a fatal flaw undermining the process” (p. 75).

In addition to more fundamental critiques of collaborative planning and related collaborative efforts, such processes have been critiqued for evaluations overly reliant upon case studies or assessments by individuals (Andrew, 2001; Sipe & Stiftel, 1995), such as facilitators, who have a self-interest in promoting such techniques. Additionally, collaborative planning processes have been critiqued for a lack of evaluations that focus on the processes’ long-term outcomes (Frame, Gunton, & Day, 2004; Innes & Booher, 1999a; Margerum, 2002). Given these critiques, it is worthwhile to consider the evidence for collaborative planning, particularly in reference to long-term outcomes. Table 8 below represents an attempt to characterize how various scholars have judged the effectiveness of collaborative planning and related collaborative planning-type processes. The list is not meant to be representative of all the works centered on collaborative planning; it does, however, include several works that are considered by some scholars to be central in advancing scholarly understanding of collaborative planning (Gunton & Day, 2003). It is important to note that the works discussed have as their focus collaborative planning and its effects. These stand in contrast to many of the studies discussed earlier of which, community involvement and/or collaborative planning were considered as one of a number of potential factors that may be contributing to redevelopment and plan implementation.

Table 8. Studies of Collaborative Planning and Related Collaborative Efforts

Authors	Study Focus	Research Approach	Outcomes	Explanation
(Nelson, 1990)	Mediation between environment group coalition, shipping interests, and local officials regarding development adjacent to Mississippi River in St. Paul, Minnesota	Case study	Limited	Interests failed to reach mediation agreement
(Lynn & Busenberg, 1995)	Citizen advisory councils (CACs) developed to affect local land use policy, local environmental policy, and/or national environmental policy	Meta-analysis of 14 studies of citizen advisory committees between 1976 and 1993	Mixed	Some CACs had very high impact on policy outcomes, others less so
(Sipe & Stiftel, 1995)	Environmental enforcement disputes within the state of Florida	Analysis of 19 cases using a participant survey, case file review, and when applicable observation	High	Mediation proved to be an effective tool for resolving environmental enforcement disputes (over 70 percent of mediated cases resolved), and participants were very satisfied with final agreement resulting from process
(Innes, 1996)	Cases involving consensus building related to environmental management and consensus building in state of California	Analysis of eight cases using case study development, in-depth participant interviews, observation, and document review	High	All cases obtained agreements, and most had significant implications for the physical development of their focus areas; oversight bodies(e.g., legislature) adopted significant portions of the proposal submitted by all groups
(Moote, McClaran, & Chickering, 1997)	Participatory planning process centered on federal Bureau of Land Management's effort to acquire land along riparian areas in southern Arizona	Observation; document review; informal interviews with key participant; comprehensive survey of all participants	Limited	Planning group failed to reach consensus on plan and eventually discontinued planning process, 40 percent of respondents indicated that process failed in resolving their concerns; some participants did note that effort improved BLM's position on land acquisition
(Helling, 1998)	Atlanta Vision 2020 Project – a large multi-stakeholder effort to envision how the Atlanta 10-county metro region should develop	Survey of random sample of participants and interviews with 35 participants	Limited	Process did not effectively link process with action
(Sipe, 1998)	Environmental enforcement actions with a focus on mediation in the state of Florida	Logistic regression utilizing data collected on 47 cases	Mixed	Cases involving mediation are more likely to settle than cases not involving mediation, but mediated cases do not generate higher rates of compliance
(Chess & Purcell, 1999)	Public meetings, workshops, and community advisory committees used for addressing national or local environmental policy-related issues	Meta-analysis of community advisory committees included a review of eight studies between 1982 and 1997	Mixed	Results suggests that some advisory committees had positive effects on outcomes, others had only moderate or negative effects
(Moore, Longo, & Palmer, 1999)	Collaborative effort to determine future use of a soon-to-be vacated large refinery site	Case study	High	Process resulted in consensus-based vision that helped speed remediation of site
(Paterson, 1999)	Analysis of two prominent cases of	Case study	Mixed	In first case negotiated development

Authors	Study Focus	Research Approach	Outcomes	Explanation
	negotiated development (planned mixed use development in Austin, Texas; planned mall development in Montgomery County, Maryland)			succeeded, in the second negotiations failed
Potapchuk & Crocker (1999)	Assessment of impact of several consensus-based decision making projects	Multiple case review	Mixed	Long-term visioning framework for Chattanooga, Tennessee (Vision 2000) (successful implementation action plan); growth management framework for Loudon County, Virginia (failed); land use work group recommendations for San Francisco Estuary Project (unanimously adopted); Atlanta, Georgia regional visioning (failed)
(Scher, 1999)	Collaborative group charged with developing cleanup plans for contaminated groundwater plume at Massachusetts Military Reservation Superfund site	Case study	High	Cleanup plan developed through consensus
(Selin, Schuett, & Carr, 2000)	Natural resources collaborative planning efforts involving U.S. Forest Service	Survey of nearly 700 participants in 30 collaborative projects	Mixed	Participants perceived collaboratives to be having somewhat high affect, but a multi-item index of effectiveness indicates these were falling somewhat short of participant expectations
(Andrew, 2001)	Waste management conflicts utilizing formalized alternative dispute resolution techniques in Ontario and Massachusetts	Document review of 54 cases and 100+ interviews with participants in randomly selected sub-set of cases	High	81 percent cases reached final settlement; nearly 75 percent of cases were deemed more appropriate than the best alternative to resolving conflict
(McCann, 2001)	Community-wide visioning process for Lexington, Kentucky (New Century)	Ethnography	Limited	Follow-up actions to implement vision recommendations not acted upon; proposal itself, according to author, reflected desire of established city elites more so than desires of participants
Beierle and Cayford (2002)	Public participation in environmental decisions since the 1970s, focused on a range of local and national issues including regulation design, policy development, facility siting, and the investigation and cleanup of hazardous wastes; public participation processes that were assessed included: 1) public meetings and hearings, 2) advisory committees not seeking consensus; 3) advisory committees seeking consensus; and 4) negotiations and mediations	Analysis and coding of 239 cases of public involvement in environmental; use of multivariate regression to identify various public participation processes' affects on five social goals[2]	Mixed	As the level of intensity of the process increased (e.g., from public meeting to negotiation) the five social goals were more likely to be achieved; however, the more intensive the process, the less successful it would be in obtaining a wide-array of community views; only mixed evidence that effective public involvement results in implementation; authors note that, "Overall the record of implementation looks rather good, but it worsens as the stage of implementation moves from the realm of law, regulation, and policy to actions on the ground" (pp. 57-58).
(Leach, Pelkey, & Sabatier, 2002)	Watershed partnerships in California and Washington	Randomly sampled selection of 44 cases, interviews with 3-6 participants of each	Mixed	Interviewees' perceptions indicated partnerships made the situation somewhat better, or actually slightly exacerbated it; however, partnerships

[2] As described by Beierle and Cayford (2002) the five social goals include: integrating public values into decisions, enhancing the substantive quality of decisions, resolving conflict between interest groups, generating trust in institutions, and informing and educating the public (p.6).

Authors	Study Focus	Research Approach	Outcomes	Explanation
		partnership, document review, participant survey		older than four years had achieved several benchmarks of success, including project implementation
(Margerum, 2002)	Collaboratively developed regional growth management plan for Southeast Queensland Australia	Document reviews, interviews, participant written evaluations	Mixed	Several positive outcomes but did not fundamentally transform growth management practices
(Albert, Gunton, & Day, 2003)	Large-scale public lands and natural resources management plan for a region in northern British Columbia	Review of five-year monitoring report that tracked implementation and achievement of objectives; survey of participants	High	Successfully implemented numerous actions; is achieving long-term objectives; satisfied participants' expectations regarding implementation
(Brody, 2003)	Citizen participation in comprehensive planning efforts in the state of Florida with emphasis on ecosystem management	Sample of town and cities from across Florida; scoring of local plans for quality regarding ecosystem management; surveys and interviews with planning participants; multivariate regression used for analysis	Mixed	Broad stakeholder representation had no effect on plan quality; participation of specific stakeholder groups (industry and NGOs) had a positive effect on plan quality; only presence of industry had positive effect on plan quality when controlling for factors such as population
(Burby, 2003)	Citizen participation in comprehensive planning efforts in cities and counties in the states of Florida and Washington with emphasis on hazard mitigation	Random sample of local governments from 60 towns and cities; content analysis of plans; interviews with local government planners; use of secondary data; multivariate regression used for analysis	High	Broad stakeholder involvement resulted in local comprehensive plans and policies with stronger hazard mitigation components more so than limited participation; when stakeholders propose plans both the strength of plans and implementation success improve markedly..." (p. 39)
(T. Koontz, 2003)	Citizen participation in farmland preservation planning in Ohio counties	Comparative case study analysis of 15 community-based advisory task forces	Limited	Procedural characteristics of the task forces (e.g., type of interests participating, number of members, and decision making process such as consensus versus majority rules) tended not to correlate with plan sophistication
(Frame, Gunton, & Day, 2004)	Large-scale public land and resources management plans developed for most of British Columbia completed primarily between 1995 and 2001	Comprehensive survey of participants in 17 land use plans; document review	Mixed	Nearly all planning processes reached agreement; only 56 percent of respondents indicated satisfaction with the process' outcome
(Chaskin, 2005)	High profile Ford Foundation initiative designed to strengthen distressed inner-city neighborhoods through comprehensive and collaborative planning	Observation, interviews, document review with nearly all participants as well as with key informants spanning 10-year period	Mixed	Quality of process very uneven, but process, for at least some participating neighborhoods, is credited for bringing about action and the implementation of some plans
(Innes & Gruber, 2005)	San Francisco Bay Area Metropolitan Transportation Commission's Bay Area Partnership	Based on earlier five-year interpretative study of the Metropolitan Transportation Commission	Limited	Initial successes produced from collaborative planning, but a later attempt to focus on achieving regional-based objectives as opposed to funding allocation led to demise of planning process
(Koontz, 2005)	Collaboratively developed plans for growth management in Ohio counties	Comparative case study analysis	Mixed	Advisory councils in exhibiting certain characteristics (e.g., location in higher income counties) tended to have their proposals adopted by local officials more so than other advisory councils

The review of these and other works indicate, perhaps not unexpectedly, the results of collaborative planning efforts to be somewhat mixed. Of the studies indicating that collaborative planning had a positive effect on key outcomes, only one study, by Albert, Gunton, & Day (2003),which centered on collaborative plans for large-scale public lands and natural resources management, focused on long-term outcomes. In other studies that judged the collaborative processes positively, the measures of success typically centered on whether agreements resulting from collaborative processes were reached and ultimately adopted. Two of these were directed at contaminated sites: one focusing on the complex collaborative processes used to develop a plan for the cleanup of a Superfund site (Scher, 1999) and another on the collaborative process used to develop a vision for the redevelopment of a soon-to-be-vacated oil refinery in Casper, Wyoming (Moore, Longo, & Palmer, 1999). Of particular interest, however, is the work of Burby (2003), who – using analytical techniques involving multivariate regression – found that broad stakeholder involvement resulted in local comprehensive plans and policies with stronger hazard mitigation components more so than planning efforts that had more limited stakeholder involvement. Similarly, Burby found that, “When stakeholders propose plans both the strength of plans and implementation success improved markedly..." (p. 39).

Most studies reviewed indicated mixed success regarding collaborative planning processes and their effect on outcomes. Of these, several attempted to identify whether longer-term outcomes resulted from such processes, including whether policies were adopted, plans were implemented, and/or how well certain plans or policies were being implemented. Within particular studies of same-type processes, researchers frequently found a wide degree of variability in terms of their effectiveness. For instance, in their review of the implementation of collaboratively-derived plans or policies centered primarily on land use, Potapchuk and Crocker (1999) found two projects where plans were widely implemented and two projects where implementation failed completely. Similarly, Koontz (2005) found that farmland preservation proposals submitted by advisory councils were more likely to be adopted by local officials depending upon the contextual characteristics of the advisory councils. Other studies indicated mixed levels of success within processes. In his study of 47 cases of environmental enforcement in the state of Florida where mediation was used to resolve the dispute, Sipe (1998) found that cases involving mediation were more likely to settle than cases not involving mediation. However, Sipe also found that that the mediated cases did not necessarily generate higher rates of compliance with environmental regulations. In one of the most comprehensive studies of local collaborative policy-making, Leach, Pelkey, & Sabatier (2002) likewise produced evidence of uneven effectiveness. Some researchers sought to isolate the more immediate effects on plan quality. These studies too suggested the collaborative processes had mixed impacts. Brody (2003), for example, found that broad stakeholder representation had no effect on the quality of comprehensive plans centered on growth management in towns and cities across Florida. In his multivariate regression, however, he did find that participation of industry groups in the planning process significantly improved plan quality. Finally, it is worth mentioning briefly one of the most comprehensive studies of public involvement in the environmental policy and planning contexts conducted. Beierle and Cayford (2002) analyzed 239 completed case studies dating back to the 1970s to determine the extent to which the public participation processes used in such cases achieved five social goals. The researchers found that as the level of intensity of the public participation process increased (e.g., from public meeting to negotiation) the five social goals were more likely to be achieved. Only mixed evidence, however, was identified that effective public involvement resulted in policy or plan implementation. In particular, they note that, “Overall the record of implementation looks rather good, but it worsens as the stage of implementation moves from the realm of law, regulation, and policy to actions on the ground" (pp. 57-58).

Five studies indicated only limited or no success in achieving certain outcomes. In one case of disputed development near the Mississippi River, participants simply failed to reach an agreement. In two other cases of collaborative planning, the processes simply disintegrated as a result of differences between planning participants. In another case involving a community-wide visioning process for the city of Lexington, Kentucky, the researcher found no evidence that any community-derived proposals would be implemented. Lastly, Koontz (2003) found no evidence that the group characteristics of certain planning process, such as the type of decision making process used or the breadth of stakeholder representation, correlated with the level of sophistication of farmland preservation plans.

In addition to these published studies it is worth to touch upon the EPA (2005) study which focuses specifically on collaborative planning for Superfund site redevelopment as well as an evaluation of six cases facilitated by EPA that used various forms of collaborative planning (2003). In the first study, EPA reported that five sites which had utilized collaborative planning approaches had generated consensus-based strategies on how these sites should be reused. Although EPA reported that it was premature to identify the effect of most of the collaborative processes used to plan for Superfund site redevelopment, at four the six sites studied where the reuse planning process had concluded, site cleanup managers and EPA Superfund Redevelopment Initiative Coordinators did indicate that the results from the collaborative processes had been used in their site's risk assessments, remedial investigations, and feasibility studies. In the second study of six sites using collaborative processes to address a variety of local environmental problems and redevelopment issues, U.S. EPA (2003) reported that "a number of interviewees citied the *implementation* of environmental and other activities as a direct outcome of partnership efforts" (p. 34). Further, a majority of interviewees noted that the issues these communities were facing would not have been addressed to the same extent if at all without use of such partnerships.

Taken together, the research specifically focused on collaborative planning and related collaborative planning-type efforts suggests that one should be cautious about collaborative planning's effects on tangible outcomes centered on environmental and land use planning and related policy making. At a minimum, it is clear that collaborative planning-type processes can generate agreements amongst a wide-set of stakeholders, and that some of these processes have successfully seen their recommended plans or portions of them, adopted and/or implemented. At the same time, the literature provides several examples where such proposals were never adopted. Furthermore, some collaborative planning processes ultimately failed to even generate recommendations as the cooperative spirit required for collaborative processes failed to either emerge or sustain itself. Likewise, apart from studies by Sipe (1998), Sipe and Stiftel (1995), Andrew (2001), and Burby (2003), the literature discussed above does not present a clear picture regarding whether such plans and policies derived through collaborative processes would have been generated had it not been for the collaborative planning process. This counterfactual issue is rarely addressed, in part because of the many challenges that researchers must overcome to address it. Nevertheless, some studies related specifically to contaminated land redevelopment as well as plan implementation indicate that collaborative processes may exert some positive influence on these outcomes. Moreover, both the theoretical rationale as well as the experiences of practitioners, and to a more limited extent the empirical-based literature, suggests that collaborative planning should positively affect the extent to which contaminated sites are redeveloped, and more particularly, the extent to which land use redevelopment plans are implemented. In the following section I attempt to develop my research questions more fully and articulate arguments why, in the context of Superfund redevelopment, one could expect collaborative planning to be influential.

4. Research Hypotheses

4.1. Research Hypotheses

The overarching question of this study focuses on the extent to which collaborative planning affects long-term outcomes, manifest here in terms of the extent to which collaborative planning affects the redevelopment of Superfund sites and the extent to which it influences the implementation of specific reuse plans. Addressing this question is expected to fill a gap in the collaborative planning literature, which lacks studies that examine collaborative planning's long-term impacts as well as studies that examine how variations in planning processes may affect outcomes. Furthermore, this research should add to the growing body of literature on contaminated site redevelopment that has thus far – apart from case studies – largely ignored empirical tests of the role of collaborative planning in site redevelopment. Finally, this research should provide greater insight into the role of collaborative planning in Superfund site redevelopment and plan implementation, and secondarily, the role of other factors.

Apart from a few government studies which are limited in their scope, the literature on Superfund site redevelopment has not tested the extent to which hypothesized factors explain Superfund site redevelopment.

My first argument, stated here as Hypothesis 1, suggests that under certain conditions, Superfund sites will be more likely to be redeveloped permanently if a collaborative planning process is used to plan for their redevelopment than if less intensive planning processes, or none at all, are used.

Hypothesis 1: All Superfund sites, or portions thereof, that are located in areas that could realistically generate interest in reuse, and that use collaborative planning processes to plan for site redevelopment, before physical implementation of the long-term remedy begins, will be more likely to be redeveloped permanently (or be "on track" for redevelopment) within a reasonable period of time, than sites located in similar-type areas that use less intensive forms of public involvement in the planning process.

There are several reasons to expect why this might be the case. Before exploring these, however, multiple aspects of this hypothesis must be elaborated upon. First, the phrase, "all Superfund sites or portions thereof," refers to the fact that some sites are redeveloped fully, while other sites are redeveloped only partially. Hence, planning processes may focus on entire sites or only portions thereof. Second, the phrase, "located in areas that could realistically generate interest in reuse," refers to a set of specific Superfund site attributes. These include:

(1) Sites capable of being reused. Reuse is not possible at sites where daily facility operations never ceased, or were only halted temporarily during the cleanup process. Similarly, site redevelopment is not possible for Superfund sites lacking surface area that could be redeveloped, such as ground water contamination sites in dense urban areas.

(2) Sites located in areas that are likely to generate widespread interest in reuse. Sites located in active heavily industrialized zones are expected to be reused again only in an industrial capacity, and consequently, are likely to arouse little public interest. In contrast, sites located in or near residential areas, mixed use districts, prominent commercial districts, downtown areas, etc. could reasonably generate public interest in reuse.

"Collaborative planning," in the context of this research, refers to planning processes that use techniques involving dialogue and deliberation, to gather input from a range of stakeholders, including nearby residents, and use this input to develop plans or strategic recommendations for reusing all or a portion of a Superfund site. Under this definition, community-based planning charrettes, community-wide land use planning committees, or similar advisory committees centered on both cleanup and redevelopment, would all be classified as collaborative planning processes. Planning processes led by the city, site owner, or prospective purchaser, and/or supported by EPA, that only obtain public input through public hearings, would not be considered collaborative planning processes.

"Before physical implementation of the long-term remedy begins" refers to planning processes initiated before EPA or the site-cleanup lead has begun construction of the long-term or permanent remedy for a site. If collaborative planning processes genuinely are to increase the likelihood that a Superfund site will be redeveloped, the assumption here is that the site redevelopment plan should be developed before the long-term or permanent remedy has been implemented. This is due to the fact that before the long-term or permanent remedy is designed, EPA or the site cleanup-lead still has an opportunity to substantively modify the remedy in ways that can more easily accommodate the planned reuse of a site, as long as there will be no negative effect on the required remedial action objectives. If a reuse plan is developed after this point, EPA or the site cleanup lead can make only very minor modifications to the remedy to accommodate reuse.

"Redeveloped permanently" refers to the long-term, productive development of a Superfund site, such as where the site is being reused as an industrial or commercial facility, ecological preserve, park, residential development, or mixed-use development. Superfund sites that serve as temporary storage facilities or waste collection areas would not be classified as permanent redevelopments. Additionally, “redeveloped permanently (or *‘on track’* for permanent redevelopment)” simply refers to the state of progress at a site; a site is either redeveloped, ‘on track’ for redevelopment, or not ‘on track’ to be redeveloped, i.e. actions to redevelop a site are not underway.

Once again, a key question related to Hypothesis 1 is why collaborative planning could increase the chances that a Superfund site would be redeveloped. Here both academic and practitioner-oriented researchers provide some guidance. Most notably, researchers within the brownfields as well as Superfund contexts have indicated that decisions about future uses of contaminated sites will be blocked if decisions do not substantively involve members of the public sectors (Deason, Sherk, & Carroll, 2001; English, Gibson, Feldman, & Tonn, 1993; Greenberg & Lewis, 2000; , 2004). For instance, English et al., who perhaps provided the earliest scholarly insight into this issue, argue that “stakeholder involvement appears to be requisite to exploring alternatives concerning the decisions that undergird site cleanups…because the outcomes of less open approaches often have been met with resistance, rejected as unacceptable by a number of stakeholders" (p. xii). Other researchers, speaking from outside the contaminated site context, have made similar arguments (National Civic League, 2000; Paterson, 1999). Deason, Sherk, and Carroll (2001), for instance, suggest that local residents may oppose brownfields projects if they perceive that: property values in their neighborhood will decline; the proposed use will be incompatible with existing local land uses; the proposed reuse would affect the neighborhood’s racial composition; or the proposed reuse would generate heightened traffic, notably truck and heavy equipment usage during construction phases.

Speaking from the Superfund context more specifically, there are other possibilities why sites located in areas that would likely generate significant community interest in their reuse and that utilize collaborative planning processes to produce redevelopment plans, may be more likely to be redeveloped than similar-type sites that do not undergo similar processes.

First, EPA may be more likely to grant support for a proposed reuse plan that has been collaboratively designed than for a reuse plan simply identified by the site owner and/or the prospective purchaser. This logic is somewhat in line with Hansen (2004) who, speaking from the context of the military base redevelopment, suggests that collaborative planning processes should be more likely to engender federal grants if there is the of the perception that there is community agreement behind a proposed reuse. Because the Superfund program has a long-history of involving nearby residents in deliberations regarding cleanup – underscored by EPA's recent re-issued and updated *Public Involvement Policy* (2002c) – and, more recently in decisions regarding future uses, EPA site managers are likely to be leery of subsequent public outcry if a proposed reuse has had minimal public input.

Second, collaborative planning processes, by their very nature, should go much further in generating interest in, and support for, redevelopment of Superfund sites than less intense planning processes. Even if plans derived from existing processes fail to produce plans – or plans that are implemented – such processes could theoretically generate momentum for the redevelopment of the site that likely would not have existed otherwise. If a developer who is not directly affiliated with a collaborative planning process, later attempts to redevelop the site, he/she should experience a smoother implementation process because major concerns of local residents as well as broader community interests should have already been aired through the prior collaborative process. Moreover, the developer should be more knowledgeable about which groups believe they have a stake in development of the site and would like a chance to discuss their concerns with the developer before the new project proceeds. Finally, collaborative planning processes may improve the chances that a Superfund site will be redeveloped by simply drawing a greater level of media and political attention to the project than would realistically be generated by less-intensive involvement processes.

My second argument, stated as Hypothesis 2 below, is that reuse plans for all Superfund sites, or portions thereof, which are developed through collaborative planning processes, should be more likely to be implemented than reuse plans that are developed through less intensive public planning processes or none at all.

> *Hypothesis 2: Redevelopment plans for all Superfund sites, or portions thereof, that are located in areas that could realistically generate interest in reuse, and that use collaborative planning or "consensus seeking" public involvement processes to plan for site redevelopment, before physical implementation of the long-term remedy begins, will be more likely to be implemented (or be "on track" to be implemented) than redevelopment plans for sites located in similar-type areas that use less intensive forms of public involvement in the planning process.*

This hypothesis is supported by some of the same logic developed to support Hypothesis 1. However, collaborative planning theory suggests more specific reasons why land use plans derived through collaborative-type planning processes should be more likely to be redeveloped than land use plans developed with less intense, or no, public planning processes. Before describing these arguments, however, it is important to first underscore basic differences between the two hypotheses. Whereas Hypothesis 1 focuses on a subset of all Superfund sites, Hypothesis 2 focuses on an even more refined subset – only those sites where reuse plans were developed before implementation of the site's final, or long-term, remedy. Some sites undergoing cleanup will not have undertaken processes to plan for the future use of these sites. As one EPA Superfund Redevelopment Initiative Coordinator explained, echoing in part the justification for EPA's concerted effort since the mid-1990s to return Superfund sites to productive use – it is more often the case than not that those responsible for contaminating, and subsequently remediating Superfund sites, are often interested solely in the cleanup of their sites and hold no desires for them site beyond cleanup. A working assumption then is that several sites to be analyzed will lack any reuse plan, and hence cannot be analyzed in terms of "extent of implementation."

Obviously, a second main difference between the hypotheses is the second one's emphasis on the reuse *plan* as opposed to *redevelopment*. Here "reuse plan" is intended to mean any formal or informal set of specifications developed by either the city, site owner, PRP, or prospective purchaser, either individually or with varying levels of public input, that a) clarifies how a site or a portion of a Superfund site will be redeveloped, and b) is considered to be the main guide for redeveloping all or a portion of a site.

A third and final difference is the second hypothesis' emphasis on the likelihood that a reuse plan will be *implemented (or be "on track" to be implemented)* as opposed to the extent to which a site is redeveloped (or "on track" for redevelopment). The differences are quite obvious, but as with extent to redevelopment, a key assumption regarding the extent of plan implementation is that there are degrees of plan implementation ranging from no implementation to full implementation, and that these differences can be measured. These will be elaborated upon in the discussion of key dependent variables below.

Returning once again to why it is reasonable to expect collaboratively-derived plans to be more likely to be implemented than plans derived with less intensive forms of public involvement, collaborative planning theory provides several rationales. Notably, according to the literature, collaborative planning processes can draw upon the far-ranging expertise of their participants to develop more sophisticated plans (Innes & Booher, 1999b; Scher, 1999), and consequently, better supported and more implementable plans. Similarly, by gaining insight from diverse perspectives, generally more thoughtful plans should result (Gray, 1989). Arguably this notion of "wide wisdom" may be particularly applicable in the context of Superfund site redevelopment, given the history and complexity of these sites. Having a broad range of expertise in the planning process may be particularly beneficial for sites where waste remains in place, long-term groundwater monitoring is required, numerous institutional controls have been implemented, and the cleanup process has generated a significant amount of local outcry and/or fear. Likewise, collaborative planning theory suggests that collaboratively-derived plans should better match the public interest (Innes & Booher, 1999a), produce results that are perceived to benefit a larger set of interests (Innes & Booher, 1999a; Innes & Gruber, 2005), and that are more likely to receive local and – in reference to Hansen (2004) above – federal support because of a perception that such redevelopment plans had been derived through a community consensus. Additionally, collaborative-type processes are theoretically more likely to generate innovative solutions to problems than traditional planning processes (Gray, 1989), which may be especially important in the context of Superfund sites because many lack local or regional market forces to help spur their redevelopment (Wernstedt, Hersh, & Probst, 1999). Similarly, collaborative planning processes can help clarify how local leaders can take action to be supportive. In the words of Moore, Longo, & Palmer (1999) – who reference community-visioning processes in particular –"A vision identifies what a constituency prefers, so those responsible for acting in the interests of the community, such as elected leaders, know how to act"" (p. 580).

In addition to the main two hypotheses, I test a few additional sub-hypotheses related to each of my main hypotheses. These are discussed along with the presentation of the models in the following chapter.

4.2. Overview of Predictive Models

To test whether the hypotheses outlined in the previous chapter may be true, two predictive models were developed that are grounded in the academic and professional literatures discussed previously as well as my professional experience. The two predictive models essentially reflect the belief that a site's redevelopment progress and plan implementation progress are impacted by a range of site-specific, neighborhood, regional, and redevelopment-related factors. Several of the same variables are used across both models; although some variables are unique.

Site-specific factors that should influence Superfund site redevelopment include, I argue, the desirability of the site's location, presence of desirable physical characteristics at the site (e.g., usable buildings), degree of original site contamination, and the ownership situation (i.e., public versus private). Neighborhood and regional factors that should impact a site's reuse include the strength of local and regional economies, the local availability of developable land, and the planning culture of the area. Redevelopment-related factors that should affect site redevelopment include the availability of incentives, support of the site owner for redeveloping the site, the use of site redevelopment planning, and the timing of the site redevelopment planning process (e.g., before or after selection of the long-term remedy for the site). To test the affect of collaborative planning, several interactions were constructed using the planning variable. Because Superfund sites are highly variable both in terms of location, physical characteristics and progress towards cleanup and reuse, several control variables were also incorporated into the model. These reflect the extent to which a site is currently capable of supporting reuse, the actual or planned level of cleanup, population of the area in which the site is located, the length of time that a site has been on the Superfund NPL, site acreage, and whether a site is located is the South/West or not. Specific descriptions, measurement procedures, data sources, and the hypothesized direction for each of these variables comprising the model are presented in the following chapter.

The primary site-specific factor that should influence implementation of Superfund site reuse plans is, I argue, the desirability of a site's location. The neighborhood and regional factors affecting these reuse plans should include the strength of local and regional economies, the local availability of developable land, and the planning culture of the area. Redevelopment-related factors that should affect site redevelopment include the availability of incentives, local political support for plan implementation, the type of planning process used, and the timing of the site redevelopment planning process (e.g., before or after selection of the long-term remedy for the site). In addition, I test how other factors moderate the effect of planning type through use of multiple interaction terms. Because Superfund sites are highly variable both in terms of location and progress towards cleanup and plan implementation, several control variables were also incorporated into the model. These reflect the extent to which a site is currently capable of supporting reuse, the population of the area in which the site is located, and the length of time that a site has been on the Superfund NPL. Specific descriptions, measurement procedures, data sources, and the hypothesized direction for each of these variables comprising the model are presented in the following chapter.

5. An Application of the Models Using Quantitative Methods

5.1. Research Design Overview

To test the hypotheses outlined in the previous chapter, I first employed a predominantly quantitative approach using statistical techniques. I used data primarily collected from a survey of EPA cleanup officials, also referred to as remedial project managers (RPMs), and secondary data sources, including the U.S. Census. The unit of analysis for my study was the Superfund site. Data collected reflected various characteristics of the site, the area surrounding area and related redevelopment planning processes undertaken specifically for the site. Univariate, bivariate, and multivariate regression techniques were then initiated to examine how a range of factors influenced the redevelopment of individual Superfund sites and the implementation of related redevelopment plans. My overarching motivation for employing statistical techniques was to develop an enhanced understanding of collaborative planning on redevelopment and plan implementation outcomes by controlling for other factors theorized to have equal or greater effects on site redevelopment and plan implementation. In doing so, I hoped to overcome a limitation of many studies focused on collaborative planning that rely primarily on interviews, case studies, and limited survey data. Ultimately, due to limitations faced in data collection, a case study research approach was later incorporated as part of my research design. The quantitative research design is discussed in more detail below. Results are presented in Chapter 6. The case study research design and results are presented in Chapter 7.

5.2. Initial Approach to Data and Case Selection

Initially, a subset of National Priorities List (NPL) sites was to be identified for analysis based upon several criteria. In particular, I had intended to collect data on two separate, but overlapping sets of sites. First I intended to collect data on all sites 80 sites – subject to certain collaborative planning criteria – that EPA selected between 1999 and 2002 to receive funding to support planning-related activities to help facilitate the reuse of these sites. In addition, I intended to collect data on a larger universe of Superfund cases – meeting certain criteria – that could have realistically been selected for federal planning support during roughly the same time that EPA awarded funding to the 80 pilot sites. I then intended to conduct two parallel sets of analyses for each group of sites. After identifying the two sets of sites, I intended to administer the survey to the RPMs affiliated with each of the sites selected. After additional preliminary research and discussion with colleagues, however, two likely obstacles to efficient data collection based upon my planned initial approach were identified: RPMs would likely be very reluctant to participate in an academic survey hence new strategies would be needed to ensure a sufficient response rate. Second, under this data collection approach, several RPMs would likely be asked to respond to the survey more than once, because most RPMs are responsible for multiple sites. Anticipating that RPMs would be reluctant to respond to a survey for even one site, it was further assumed that it would be very unlikely that RPMs would complete survey for more than one site.

As a result of these potential problems, in 2007 I made a fundamental change to my data collection strategy based upon a nonprobability sampling approach. Instead of first identifying sites (cases) and then asking RPMs to respond to surveys for each of these sites, I chose to allow RPMs to choose the sites for which they wished to respond to the survey questions. RPMs were only asked to choose an NPL site for which they were currently a cleanup manager (or were until recently), and preferably a site that met one of the following two criteria:

- All or a portion of the site was reused or redeveloped after 1995 *or*
- All or a portion of the site can now, or soon, accommodate reuse or redevelopment activity that is consistent with site cleanup activities.

My final data set then was based upon the sites that RPMs chose to respond to questions about in the survey, subject to certain criteria. I first administered the RPM survey in August 2008. After I identified the final set of sites (cases), I then collected secondary data for each of these cases. Below I discuss my data collection strategy in more detail along with my approach to selecting my final set of cases.[3]

[3] After completing the RPM survey, in March 2009, I administered a shortened survey of the RPM survey to non-EPA contacts (primarily local government officials) representing each of the sites for which RPMs had answered questions about in the RPM survey. Where applicable, I intended to average federal and local responses in order to construct variables not solely based upon a single stakeholder perspective. Originally, this shortened survey was intended only for local government officials. However, I also administered the survey to corresponding military cleanup managers, state cleanup managers, community advisory board members, or developers/property owners for corresponding site in instances where contact information for representatives of these groups was readily available. In doing so, I hoped to obtain at least one non-EPA response for each of the same Superfund sites addressed by RPMs in the RPM survey. This was done because: 1) in many instances, appropriate local officials could not be identified; and

5.3. Data and Data Collection

5.3.1. Developing and Administering the RPM Survey

The bulk of the data used to test my predictive models was drawn from the RPM survey. Although the introduction of a new survey instruments creates problems of reliability and validity, I believed that an RPM survey was essential because the data I needed to test my models – apart from the data that could be collected from secondary sources – was not available elsewhere. I first began developing the RPM survey October 2006. I first pre-tested the instrument in November that same year. I contacted 16 EPA staff that had been directly involved in the redevelopment of contaminated sites, and had eight substantive discussions with the following: EPA Region 4 Brownfields Coordinator, Superfund Redevelopment Initiative Coordinators for Regions 1, 3, 4, and 5, RPMs based in Regions 1 and 2, and a former RPM still working in Region 4.[4] Although most individuals provided suggestions for improving the wording of specific questions, the general sentiment was that my overall research project made sense and that the questions were understandable and logical.

While continuing to pre-test the content of the survey instrument, I also transformed the instrument from a written survey to an online survey in 2006. My rationale for doing so was that RPMs would find it less burdensome to respond to an online survey than a written one, especially since all RPMs have computers and regularly

2) even when local officials could be identified, they often chose not to respond. Ultimately, because of extraordinary difficulty faced in locating non-EPA representatives familiar with the same sites that EPA RPMs had selected, and difficulty in obtaining a sufficient response rate from those non-EPA representatives I was able to successfully identify, I discontinued to the follow-up survey in March 2009.

[4] Some Superfund Redevelopment Initiative Coordinators are also typically site cleanup managers.

use e-mail. While developing the online survey I modified the survey to reflect the input received from EPA officials. I pre-tested the online survey version in December 2006 with non-EPA colleagues familiar with the Superfund program. As a result of this input, the survey was again revised and then re-administered in January 2007 to the same colleagues who responded to the survey initially. In addition, a version of the revised survey was administered to a former RPM still with EPA. After additional revisions, the survey was re-administered to a Superfund Redevelopment Coordinator in June 2007. Following this, no significant revisions to the survey were made.

Prior to distributing the survey, in late July 2008, I officially notified EPA's Superfund Redevelopment Coordinators (based in each of EPA's ten regional offices) of my plans to administer the survey to RPMs in August 2008. In this letter, I specifically asked the coordinators to let me know if they had any concerns about the survey effort. EPA Region 6 responded that it planned on forwarding email exchanges concerning the RPM survey held between EPA Headquarters, EPA Office of General Counsel, and EPA Region 3 to RPMs in Region 6 as guidance for responding to academic surveys. Presumably, much of this same guidance was shared with RPMs in EPA Region 3 and possibly other regions.

Prior to distributing the survey, I also developed a database that included contact information for all RPMs across the nation. To construct this database, I went through the online site profiles available for each of the approximately 1,600 NPL sites and copied the names and email addresses into a spreadsheet using EPA's national database of Superfund sites. In total, name and email information was available and collected for approximately 450 RPMs.

I administered the online survey to RPMs in early August 2008. Using the automated online survey system, I created a personalized email for each RPM. The email contained a few brief introductory remarks as well as a longer formal message, which included the Institutional Review Board study approach number. The email contained a link to the survey. The email also explained that I was a consultant on Superfund reuse activities, but that this effort was being undertaken for academic purposes only. After administering the survey, Region 9 contacted me expressing concern over the survey and the wording of my email. As a result of discussions with Region 9, I temporarily halted the survey while I modified my introductory email based upon Region 9 suggestions. I then reactivated the on-line survey. Because of a poor response rate, I then transformed the on-line survey into written format which I sent to non-respondent RPMs in December. In an effort to further boost participation, I spoke directly to, or left voice messages with, over 130 RPMs requesting they take the survey. I kept the survey open until April 2009 in order to boost the response rate.

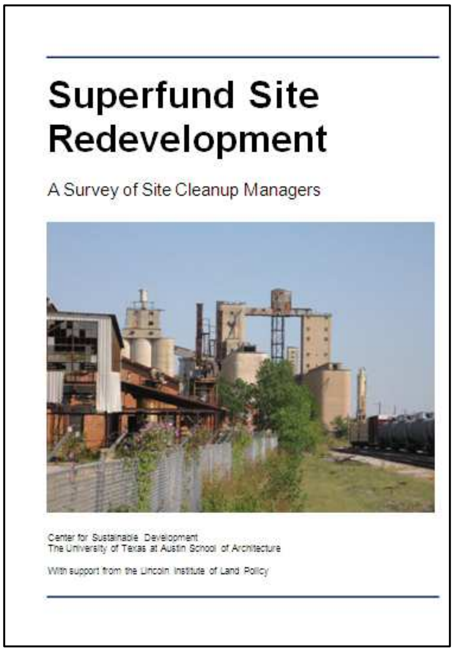


Figure 3. Written form of survey sent to RPMs in December 2008.

5.3.2. Overview of the Survey Instrument

The RPM survey was ultimately comprised of questions to generate both fact- and opinion-based data about specific sites selected by RPMs. The majority of the questions relied upon response sets that paralleled 5- or 6-point Likert-type response scales; phrasing instead of numbers were used, however, to better clarify what was meant by a "1" or "6", for example. Several questions also allowed participants to select more than one option. In addition, nearly all questions allowed RPMs to mark "other" as well as to type or write-in clarifying remarks.

> **FURTHER DEFINING THE SITE**
>
> Please read the following three statements to help you decide whether to refer to the ENTIRE SITE or a SUBSET of the site throughout the survey.
>
> - *If planning/redevelopment activity has already occurred at the site, or is underway*, please refer only to the portion of the site that was/is the focus of the planning/redevelopment activity. This may be the entire site or a subset of the site.
>
> - *If the site has been subject to multiple, non-related planning/redevelopment activities*, please refer to the portion of the site subject to only ONE of the planning/redevelopment activities (preferably the activity that is most complete). This may be the entire site or a subset of the site.
>
> - *If the site has not yet been subject to any planning/redevelopment activity*, please refer only to the portion of the site that you would consider most amenable to planning/redevelopment activity (following sufficient cleanup). This may be the entire site or a subset of the site.

To begin the survey, RPMs were asked to select a site and then answer the survey questions in response to this site. RPMs were then asked to decide and indicate whether they intended to respond to questions for the entire site or portion thereof (i.e., a subset of the site). Guidelines were included to help RPMs make their decision. An excerpt from this portion of the survey is included above.

After defining the site area to be addressed, including acreage, RPMs were asked questions about the site's redevelopment status and background, general site characteristics, site cleanup characteristics, site ownership, general redevelopment planning efforts, most recent redevelopment planning efforts, and specific characteristics of the most recent redevelopment planning process initiated for the site that resulted or was expected to result in a completed plan by the end of 2008. RPMs were also asked to identify other benefits of Superfund site redevelopment planning. They were also given the opportunity to write-in any general comments they wished to make about Superfund site redevelopment and plan implementation. Skip logic was embedded in questions throughout the survey. If responses provided by RPMs suggested that they would not have any additional data that would support research goals, RPMs were immediately directed to the end of the survey. The survey was designed to take between 15-30 minutes to complete. A total of 52 questions were included.

A key assumption underlying the structure of the survey was that Superfund site redevelopment planning is often perceived not as a single event but rather as an ongoing process that unfolds over a series of many years with many plan iterations. For example, while considering the potential remedies for a site, a reuse plan may be generated for the site. While in some cases, the initial reuse plan may include a very detailed description of how a the site should be used, the initial plan may serve as a more of a general (i.e., strategic) plan for the site that will be further refined through additional plans as more is learned about the site, market, and community conditions that could support various site reuses. To capture this, survey questions were structured to clarify the overall type of planning process used at a particular site as well as the most recent planning process for the site that had resulted in or was expected to result in a completed reuse plan for the site by the end of 2008. This resulted in a lengthier survey document than originally envisioned.

5.3.3. Secondary Data

In addition to collecting and using data generated from the RPM survey. Secondary data was also collected from the Census Bureau, EPA, and the U.S. Agency for Toxic Substances and Disease Registry and used in the analysis. Academic data made available through journal articles or publicly-available databases was also used. I assumed that use of secondary data for my analysis would yield a more accurate, objective, and reliable characterization of some local and regional conditions than data collected solely from EPA site managers. In addition, use of secondary data enabled me to reduce the overall number of questions included in the RPM survey. Moreover, Census data in particular is frequently used in the study of urban development and to a lesser extent in the analysis of stakeholder involvement in plan implementation (e.g., see Alig, Kline, & Lichtenstein, 2004; Brody, 2003; Burby, 2003).

5.4. Case Selection

RPMs and Superfund Redevelopment Coordinators provided usable data for 93 sites. A few provided data for more than one site. Roughly 60 percent of the responses were collected via the online survey; 20 percent were collected via the hard copy survey, and 20 percent were collected over the phone using the online survey as the interview guide. In essence, these sites represent the “cases” or sample I initially had to draw upon for subsequent analytical work. Since RPMs could choose to respond to questions about any site they wished, one could argue that my final set of cases are potentially biased, as RPMs could have selected sites more likely to be reused or that were already in reuse. However, as noted above, I only encouraged RPMs to choose NPL sites for which they were currently a cleanup manager (or were until recently), and preferably a site that was reused or redeveloped after 1995 *or* could soon accommodate reuse or redevelopment activity. They were *not* encouraged to select sites that were reused or “on track” for reuse *and* that had reuse plans rooted in collaborative processes. Moreover, I further screened sites to ensure that cases comprising my final case set were at least roughly comparable.

Of my initial set of 93, survey responses corresponding to 13 sites were initially screened out because these sites were not capable currently of being reused (e.g., original site operations were continuing). In addition, I screened out survey responses corresponding to another 10 sites using additional criteria. First, responses for a particular site had to be in reference to either the entire site or specific portion thereof (i.e., a subset of the site). If a respondent indicated that responses were in reference to multiple portions within a site but not the *entire* site, the site was screened out. Second, if reuse planning took place at a site, it had to have begun in1993 or after; otherwise the responses for the entire site were screened out.

After applying all criteria, my final data set, or sample, consisted of 70 cases. These included 68 sites listed on the National Priorities List, and two sites that were being addressed by EPA in roughly the same manner that it addresses sites on the NPL, but without actually placing them on the NPL, known as the Superfund Alternative Approach. No data is available that would indicate the extent to which the sites I identified as my final sample are representative of all NPL sites meeting these same criteria. However, I attempt to place the sites, or cases, comprising my final sample into some context below and highlight the sample's similarities and differences with all NPL sites.

The 68 NPL sites included in my final case set represent 4.3 percent of all NPL sites located in the fifty states and the District of Columbia. Although the proportion of my cases across the 10 EPA Regions are far from a perfect match in comparison with all NPL sites, the differences in the two distributions are not radically different, as shown in Table 9.

Table 9. Comparison of All NPL Sites and Sample Sites by EPA Region

EPA Region	Total NPL sites	Percent of Total NPL Sites	Total Sample Sites∞	Percent of Total Sample Sites
1	112	7.1	0	0.0
2	249	15.7	6	8.6
3	211	13.3	4	5.7
4	217	13.7	15∞	21.4
5	299	18.9	13	18.6
6	122	7.7	7	10.0
7	86	5.4	1	1.4
8	64	4.0	8∞	11.4
9	123	7.8	10	14.3
10	98	6.2	6	8.6
Total	1581		70	

Note: Total NPL sites reflect total number of NPL sites listed in EPA's CERCLIS database on October 17, 2009. NPL sites located in U.S. territories are not included above. Results calculated by author. Only NPL study sites are included.
∞ These figures include two non-NPL sites being overseen by EPA in a manner similar to how EPA oversees NPL sites.

Notably, however, my sample contains no sites from EPA New England (Region 1). I also have an underrepresentation of sites from Regions 2, 3, and 7, and an overrepresentation of cases from Regions 4, 6, 8, 9, and 10. However, my proportion of cases for Region 5 – the EPA region with the highest number of NPL sites – is essentially equivalent to the proportion of all NPL sites in Region 5.

Cases in my sample fall across 30 states – far from perfect representation, as shown in Table 10. Of the states with sites included in the sample, I typically have an equal or higher proportion of sites in these states than in comparison with NPL sites across all states. The differences are modest, expect for noticeable overrepresentations of sites in my sample from South Carolina, Montana, and California. Similarly, I have a noticeable underrepresentation of sites for New Jersey and Pennsylvania in comparison with the proportion of all NPL sites in these states. In addition, my final sample has a higher proportion of military facility sites (16 percent) in comparison with all military sites which is only near 10 percent.[5] Of the 11 military sites included in my sample, six are classified as Base Realignment and Closure Act (BRAC) sites suggesting they had federal support to plan for the transition of these military facilities to alternative non-military uses. Similarly, 13 percent of sites in my sample – nine sites total, all non-federal – were selected as one of EPA's reuse planning pilot sites in 1999, 2001, or 2002. As a result, up to $100,000 of federal money were allocated to support reuse planning at these

[5] Note: The figure 10 percent is calculated by the author and reflects all military and Department of Energy federal facilities NPL sites listed in EPA's CERCLIS database. Categorizing a site as a military/DOE installation was based upon my review of the official names of each NPL site included in the full list of federal facilities NPL sites available on October 17, 2009.

sites. Even if sites were not identified as BRAC sites or EPA reuse pilot sites, money could have been made available by EPA, the Department of Defense or other entity to support some type of reuse planning effort. A list indicating whether this had been the case was not available.

Table 10. Comparison of All NPL Sites and Sample Sites by EPA Region and State

EPA Region and State		Total NPL sites	Percent of Total NPL Sites	Total NPL Sample Sites	Percent of Total Sample Sites
1		112	7.1	0	0.0
	CT	17	1.1	0	0.0
	MA	35	2.2	0	0.0
	ME	14	0.9	0	0.0
	NH	20	1.3	0	0.0
	RI	13	0.8	0	0.0
	VT	13	0.8	0	0.0
2		249	15.7	6	8.8
	NJ*	140	8.9	1	1.5
	NY*	109	6.9	5	7.4
3		211	13.3	4	5.9
	DE*	20	1.3	2	2.9
	MD	22	1.4	0	0.0
	PA*	123	7.8	2	2.9
	VA	34	2.2	0	0.0
	WV	11	0.7	0	0.0
4		217	13.7	14	20.6
	AL*	14	0.9	1	1.5
	FL*	73	4.6	4	5.9
	GA*	19	1.2	2	2.9
	KY	20	1.3	0	0.0
	MS*	7	0.4	1	1.5
	NC	35	2.2	0	0.0
	SC*	30	1.9	4	5.9
	TN*	19	1.2	2	2.9
5		299	18.9	13	19.1
	IL*	45	2.8	2	2.9
	IN*	41	2.6	1	1.5

EPA Region and State	Total NPL sites	Percent of Total NPL Sites	Total NPL Sample Sites	Percent of Total Sample Sites
MI*	82	5.2	4	5.9
MN*	46	2.9	2	2.9
OH*	41	2.6	2	2.9
WI*	44	2.8	1	1.5
6	122	7.7	7	10.3
AR	15	0.9	0	0.0
LA*	20	1.3	1	1.5
NM*	17	1.1	1	1.5
OK*	13	0.8	2	2.9
TX*	57	3.6	3	4.4
7	86	5.4	1	1.5
IA	21	1.3	0	0.0
KS	16	1.0	0	0.0
MO*	35	2.2	1	1.5
NE	14	0.9	0	0.0
8	64	4.0	7	10.3
CO*	21	1.3	1	1.5
MT*	15	0.9	4	5.9
ND	2	0.1	0	0.0
SD	4	0.3	0	0.0
UT*	19	1.2	2	2.9
9	123	7.8	10	14.7
AZ*	12	0.8	1	1.5
CA*	106	6.7	8	11.8
HI	4	0.3	0	0.0
NV	1	0.1	0	0.0
10	98	6.2	6	8.8
AK*	8	0.5	1	1.5
ID*	9	0.6	2	2.9
OR*	16	1.0	2	2.9
WA*	65	4.1	3	4.4

Note: States that have sites included with the NPL study sites are marked with a *. Total NPL sites reflect total number of NPL sites listed in EPA's CERCLIS database on October 17, 2009. NPL sites located in U.S. territories are not included above. Results calculated by author. Only NPL study sites are included.

∞ These figure include two non-NPL sites being overseen by EPA in a manner similar to how EPA oversees NPL sites.

In terms of site ownership at the time of NPL listing shown in Table 11, the sites in my final sample roughly parallel the site ownership classification for all NPL sites, as classified at the time of site NPL listing. Some divergences do stand out, however. For example, my sample contains considerably fewer sites classified as privately held than all NPL sites. Moreover, my sample contains a higher percent of sites classified as federally-owned than all NPL sites.

Table 11. Comparison of All NPL Sites and Sample Sites by Site Ownership Classification

Site Ownership Classification	Total NPL sites	Percent of Total NPL Sites	Total Sample Sites[∞]	Percent of Total Sample Sites
Municipality	54	3.5	0	0.0
Private	473	30.3	15	21.4
Other	654	41.8	31	44.3
Federal	163	10.4	12	17.1
Unknown	66	4.2	4	5.7
Mixed Ownership	63	4.0	3	4.3
County	14	0.9	0	0.0
Formerly Federally Owned or Operated	5	0.3	0	0.0
Indian Lands	10	0.6	1	1.4
State	10	0.6	1	1.4
Government Owned/ Contractor Operated	1	0.1	0	0.0
Trustee, Federal	1	0.1	0	0.0
Information on site not available	49	3.1	3	4.3
Total	1563		70	

Note: Total NPL sites reflect total number of NPL sites made available through an ATSDR data query made October 13, 2007 ultimately derived from EPA's CERCLIS database. NPL sites located in U.S. territories are not included above. Results calculated by author. Only NPL study sites are included.
∞ These figures include two non-NPL sites being overseen by EPA in a manner similar to how EPA oversees NPL sites.

Comparisons between my sample and all NPL sites in terms of site type classification provide a similar picture, as shown in Table 12. The sample sites exhibit some characteristics in terms of site classification similar with all NPL sites, but some noticeable divergences do exist. For example, the proportion of sample sites classified as "An Affected Area/Natural Resource" is lower in my sample in comparison with all NPL sites. Moreover, the proportion of sample sites classified as "Waste Storage/Treatment/Disposal" sites is much lower in comparison with all NPL sites placed in this category. In contrast, the proportion of sample sites classified as "Manufacturing/Industrial" is considerably higher than the proportion of all NPL sites similarly classified. Similarly, the proportion of sample sites classified as "Mining/Extracting/Processing" is higher than for all NPL sites.

Table 12. Comparison of All NPL Sites and Sample Sites by Site Type Classification

Site Type Classification	Total NPL sites	Percent of Total NPL Sites	Total Sample Sites∞	Percent of Total NPL Sample Sites
An Affected Area/Natural Resource	91	5.8	1	1.4
Government	152	9.7	8	11.4
Manufacturing/Industrial	472	30.2	28	40.0
Mining/Extracting/Processing	98	6.3	7	10.0
Other (50 character limit)	37	2.4	0	0.0
Residential	16	1.0	0	0.0
Waste Recycling	112	7.2	5	7.1
Waste Storage/Treatment/Disposal	501	32.1	17	24.3
Information on site not available	84	5.4	4	5.7
Total	1563		70	

Note: Total NPL sites reflect total number of NPL sites made available through an ATSDR data query made October 13, 2007 ultimately derived from EPA's CERCLIS database. NPL sites located in U.S. territories are not included above. Results calculated by author. Only NPL study sites are included.
∞ These figures include two non-NPL sites being overseen by EPA in a manner similar to how EPA oversees NPL sites.

In summary, the various distribution breakouts show that while the survey responses are not fully representative, there is no evidence of severe bias or highly skewed concentrations.

5.5. Data Cleaning and Preparation

While determining what sites should constitute my final set of cases, I simultaneously cleaned and coded data for all potential sites. This involved standard techniques of ensuring that data had been properly entered into a master spreadsheet, determining how best to address questions left blank, and re-ordering Likert-type scale response sets to ensure that all response sets reflected similar directions (e.g., making sure that more favorable outcomes reflected higher levels of the Likert-type scales) to prepare the data for analysis using Statistical Application Systems (SAS) statistical software. In instances of missing acreage data, for example, acreage was determined by reviewing site reports or contacting the RPM. If a respondent chose to respond to questions about a subset of a site, but the subset acreage could not be identified, the full acreage of the site was used. Similarly, some respondents simply failed to indicate whether their responses were in reference to either the entire site or a subset of the site. Before screening data for these sites out completely, typically I would seek verbal clarification from the RPM that questions references the entire site or portion thereof. The cleaning process was challenging because data on key variables were left blank in multiple instances. A central part of the cleaning process involved reviewing all question-specific written comments and then recoding responses to best match the responses given depending upon the comments. For example, on occasion I reclassified a respondent's selection of "other" to one of the primary Likert-type scale options in the response set depending upon the comment. Respondents could provide clarifying comments for any survey question; therefore I examined all written responses for each question used in the statistical analyses.

In addition, data for several questions had to undergo significant recoding to be usable for statistical analysis. For example, several questions allowed respondents to provide multiple responses to a single question. In these instances, decisions had to be made to determine how the responses could best be used and then ultimately transformed. Finally, a key part of the cleaning process centered on properly preparing and then reviewing the complete set of responses for each question. As part of this, results questions were then reviewed to determine if the responses simply made sense. In instances where issues were identified, I would return to the original data to determine whether there a systemic problem stemming from the data input or recoding process. To bolster my understanding of the data, I also organized data to view responses for all sites only, for non-military sites only, and for military sites only.

5.6. Analytic Techniques

After cleaning and coding the data, I then conducted a series of statistical analyses to begin assessing the potential effect of collaborative planning and other variables on redevelopment and plan implementation outcomes. All data was analyzed using a spreadsheet program and Statistical Application Systems (SAS) statistical software. As a first step, I calculated univariate statistics for each of the variables to be tested. Distributions were examined to identify outliers and departures from normality. When applicable, univariate results for each variable were reviewed to identify issues of skewness and kurtosis.[6] Variables indicating serious problems with skewness or kurtosis typically stemmed from outliers. In most instances, variables were transformed from continuous-level variables to scaled variables based on quartiles (e.g., 0-25 percent quartile, 26-50 percent quartile).[7]

Following univariate analyses, I performed series of bivariate analyses to determine whether statistically significant relationships exist between independent and dependent variables included in each of my models using Pearson and other appropriate correlation coefficients. Although limited because such a technique does not employ the use of statistical controls, non-directional significance testing has been used in analyses of brownfields redevelopment, plan implementation, and collaborative planning or related techniques either because of data limitations, or as a starting point for subsequent regression analyses (e.g., see Andrew, 2001; Beierle & Cayford, 2002; Brody & Highfield, 2005; Burby, 2003; Hansen, 2004).

Finally, I applied multivariate regression and related techniques to variables included as part of the Superfund site redevelopment model. Multivariate regression was not used to test the plan implementation model, however, since I had insufficient number

[6] Because kurtosis and skewness indicators are less relevant for three-level and dichotomous variables, I do not include kurtosis and skewness discussions for such variables in the following empirical results chapter.
[7] I selected quartile transformations rather than the popular logarithmic transformations often undertaken to correct for skewness. While logarithmic transformation utilizes more of the existing information available for each variable than transformations based upon a quartile approach, this latter approach is more intuitive when interpreting and explaining the results. Ultimately I transformed seven continuous variables using the quartile approach. For five variables of these variables I also transformed them using the natural log approach. Appendix I shows the results of both these different transformations alongside the results of these variables prior to transformation. Results do not suggest use of the quartile approach resulted in consistently higher levels of statistical significant associations with the four dependent variables in comparison with the log approach based upon Pearson correlation coefficients.

of cases on which to perform the analysis. A regression framework can be critical because it allows one to estimate the effects of an independent variable on the dependent variable while simultaneously controlling for the effects of other independent variables included in a model that may be influencing variation on the dependent variable. Multiple regression analysis represents an important alternative for researchers who study real world phenomena and typically cannot conduct controlled experiments whereby the researcher can manipulate a key independent variable while simultaneously controlling for other potentially influential variables through use of experimental and control groups. The most common form of multiple regression techniques relies upon Ordinary Least Squares (OLS) estimation techniques. OLS is frequently employed because, if the Gauss-Markov assumptions are met, it should produce coefficient estimates that are unbiased and the most precise. The basic equation used to test the Superfund site redevelopment model is below:

$$\beta_i = \beta_0 + \beta_1 + \beta_2 X_i + \beta_3 X_i + u_i$$

A critical assumption in OLS is that the dependent variable must be quantitative, continuous, and unbounded. As part of efforts to test my model, I treated my Superfund site redevelopment variables as proxies for continuous level variables. However, because my dependent variables are not quantitative, continuous, and unbounded, I also transformed one of my dependent variables into a dichotomous dependent variable and then tested my model using binary logit modeling. In binary logit modeling, independent variables are tested to identify the effect they will have on the log of the odds of an event occurring (odds ratio). This is estimated using maximum likelihood estimation procedures, using the equation below:

$$L_i = [P_i/(1-P_i)] = \beta_1+\beta_2 X_i + \beta_3 X_i + u_i$$

The resulting variable coefficients can then be used to estimate the effect of the variable on the log of the odds ratio assuming all other variables are held constant. To make such a coefficient more interpretable then, the antilog of the independent variables' coefficients are also calculated. The resulting figure indicates the percentage by which a one unit increase on a particular independent variable, holding all other variables constant, will affect the odds of the occurrence of a particular event (i.e., the dependent variable).

I then compared results from multivariate regression modeling with the results from binary logit modeling. I also considered simply leaving my dependent variables in their original form and applying ordered logit modeling or multinomial logit modeling, however, as I discuss in greater detail below, my limited number of cases made doing so problematic.

Two fundamental issues complicated my efforts to test the Superfund site redevelopment model using statistical techniques: 1) low number of observations and 2) missing data. As I noted earlier, my sample contained 70 cases, or sites. Sample size is important since it impacts statistical power, and hence the ability of a statistical test to identify whether the variables tested actually impact the dependent variable. My Superfund site redevelopment model consists of 18 independent variables. A general rule of thumb when using multivariate regression is that your independent variables should be limited to no more one independent variable per 10 cases. By applying this rule, I was limited to testing no more than seven independent variables. An even more restrictive rule applies to binary logit modeling. To make decisions about which seven variables to test, I carefully reviewed the results of the bivariate analysis, scrutinized Pearson's and related correlation coefficients for levels of significance and to identify issues of multicollinearity, and factored in my professional experiences regarding factors influential in Superfund site redevelopment. I discuss this further in Chapter 6.

The second problem centered on missing data. Presumably because of general concerns RPMs had about responding to academic surveys, not all RPMs answered all appropriate questions. As a result, even though I had data for 70 sites, data for some of these sites was missing. Although this did not complicate the bivariate analysis since pair wise deletion techniques are employed, in multivariate regression, the statistical test is only conducted on those cases that have complete data for all the variables included in the analysis. If one variable is missing five data points, each of these *cases* with missing data is then excluded entirely from the regression analysis. This then reduces the statistical power of the tests. To overcome this, I imputed the mean for this missing data on variables where only five or fewer observations were missing. Finally, to draw robust conclusions in the multivariate context, I paid special attention to how the variables did or did not maintain significance levels across different forms of the dependent variables tested.

5.7. Variable Description, Data and Measure: Superfund Site Redevelopment Model

As described briefly in Chapter 4, I argue that the extent to which a Superfund NPL site, or portion thereof, has been redeveloped *or* – in instances where the site has not been redeveloped – the extent to which the site, or portion thereof, is on track for redevelopment, is a function of range of factors including site-specific, neighborhood, regional, and redevelopment factors. The exact model is specified as follows:

Figure 4. Model for Predicting Superfund Site Redevelopment

	REUSE ON TRACK$_{1, 2, \text{ or } 3}$ =		
	B0	+	
Site-specific	*B1*	SITE REDEVELOPMENT SUITABILITY	
	B2	SITE LOCATION SUITABILITY$_{1, 2, \text{ or } 3}$	
	B3	SITE CONTAMINATION$_{1 \text{ or } 2}$	
	B4	SITE OWNERSHIP	
Neighborhood	*B5*	NEIGHBORHOOD MARKET STRENGTH$_{1 \text{ or } 2}$	
	B6	NEIGHBORHOOD LAND AVAILABILITY	
Regional	*B7*	PLANNING CULTURE$_{1, 2, \text{ or } 3}$	
	B8	REGIONAL MARKET STRENGTH$_{1 \text{ or } 2}$	
Redevelopment	*B9*	INCENTIVES$_{1 \text{ or } 2}$	
	B10	SITE-OWNER SUPPORT	
	B11	PLANNING TYPE$_{1, 2, 3, 4, 5}$	
		x LAND USE COMMERCIAL/RESIDENTIAL	*Variables for Testing Moderating Effects on Planning Type*
		x COLLABORATIVE PLANNING PROCESS LEGITIMACY	
		x COLLABORATIVE PLANNING PROCESS DURATION	
	B12	PLANNING TIMING	
Controls	*B13*	SITE READINESS FOR REUSE$_{1 \text{ or } 2}$	
	B14	CLEANUP INTENSITY	
	B15	COUNTY POPULATION	
	B16	SITE SIZE	
	B17	REDEVELOPMENT YEARS	
	B18	SOUTH/WEST	

The above variables are briefly defined in the Table 13 below along with a general description of how they were measured, the scale of measure, and the source of data for each measure. The definition, logic, and approaches for measurement of each of these variables are then elaborated upon in Appendix B.

Table 13. Variable Description, Logic, and Sources for Superfund Site Redevelopment Model

No.*	Category	Name	Code Name	Measurement	Scale	Source¥	Logic
RD_1	**Dependent**	REUSE ON $TRACK_1$	ROT_1 / v016	Extent to which a Superfund site has been redeveloped or is on track for redevelopment based upon selection from one of several statements indicating level of redevelopment.	Ordinal (1 – 6)	Survey (A006)	NA
RD_2	**Dependent**	REUSE ON $TRACK_2$	ROT_2_08 / v017	Extent to which a Superfund site has been redeveloped or will be by 2008, ranging from "not at all likely" to "extremely likely/already developed."	Ordinal (1 – 6)	Survey (A009)	NA
R_3	**Dependent**	REUSE ON $TRACK_3$	ROT_3_12 / v018	Extent to which a Superfund site has been redeveloped or will be by 2012, ranging from "not at all likely" to "extremely likely/already developed."	Ordinal (1 – 6)	Survey (A010)	NA
R1	**Site-specific**	SITE REDEVELOPMENT SUITABILITY	SRS / v025	Extent to which site exhibits on-site physical features, such as flat topography, that make site suitable for redevelopment, ranging from “not at all” to “a very high extent”	Ordinal (1 – 5)	Survey (A020)	+
$R2_1$	**Site-specific**	SITE LOCATION $SUITABILITY_1$§	SLS_1 / v022	Extent to which the *location* of site makes the site suitable for redevelopment, ranging from "not at all suitable" to "extremely suitably."	Ordinal (1 – 5)	Survey (A018)	+
$R2_2$	**Site-specific**	SITE LOCATION $SUITABILITY_2$§	SLS_2 / v023	Indication of whether site is located near one or more features either prior to redevelopment or now (if not redeveloped), that made/make the location of the site appealing for redevelopment.	Dichotomous (1/0)	Survey (A019)	+
$R2_3$	**Site-specific**	SITE LOCATION $SUITABILITY_3$§	SLS_3 / v024	Number of features the site is located near either prior to redevelopment or now (if not redeveloped), that made/make the location of the site appealing for redevelopment.	Summated index (0-12)	Survey (A019)	+
$R3_1$	**Site-specific**	SITE $CONTAMINATION_1$	SC_1 / v028	Indicates level of site’s approximate level of threat to public health when first discovered, ranging from “none” to "extremely high."	Ordinal (1 – 5)	Survey (A023)	-
$R3_2$	**Site-specific**	SITE $CONTAMINATION_2$	SC_2 / v001	Indicates total number listed in EPA’s Superfund Site Progress Profile available for each NPL site. The same contaminant of concern may be counted more than once if it is listed multiple times for separate media (e.g., groundwater, soil, etc.).	Continuous	EPA CERCLIS	-
R4	**Site-specific**	SITE OWNERSHIP	SITE_OWN / v033	Indicates whether site was publicly or privately held during efforts to plan for redevelopment of the site or now, if no redevelopment planning took place.	Dichotomous (1/0)	Survey (A026)	+

No.*	Category	Name	Code Name	Measurement	Scale	Source¥	Logic
$R5_1$	**Neighborhood**	NEIGHBORHOOD MARKET STRENGTH$_1$§	NMS_1 / v007	Indicates number of businesses operating per 100 persons residing in zip code containing site	Continuous	2000. Census – Zip Bus. Patterns	+
$R5_2$	**Neighborhood**	NEIGHBORHOOD MARKET STRENGTH$_2$§	NMS_2 / v026	Indicates level of development pressure around the site (within roughly one mile from the site boundary) either prior to redevelopment (or now) if not redeveloped, ranging from “no development pressure at all” to “extremely high development pressure.”	Ordinal (1 – 5)	Survey (A021)	+
R6	**Neighborhood**	NEIGHBORHOOD LAND AVAILABILITY§	N_LNDAV / v027	Indicates amount of undeveloped/vacant property around the site (within roughly one mile from the site boundary), either prior to redevelopment or now (if not redeveloped), ranging from “no undeveloped/vacant property at all” to “extremely high amount of undeveloped/vacant property.”	Ordinal (1 – 5)	Survey (A022)	-
$R7_1$	**Regional**	PLANNING CULTURE$_1$§	PC_1 / v002-5	Composite index of social capital for each county developed by Rupasingha, Goetz, & Freshwater (2006).	Continuous	Rupasingha, Goetz, & Freshwater (2006)	+
$R7_2$	**Neighborhood / Regional**	PLANNING CULTURE$_2$§	PC_2 / v019	Indicates knowledge of neighborhood, city, or regional land use plans that included/include recommendations for redeveloping the site, either prior to redevelopment or now (if not redeveloped).	Dichotomous (0/1)	Survey (A014)	+
$R7_3$	**Regional**	PLANNING CULTURE$_3$§	PC_3 / v006	Indicates whether state is a growth management state as classified by Yin and Sun (2007)	Dichotomous (1/0)	Yin and Sun (2007)	+
$R8_1$	**Regional**	REGIONAL MARKET STRENGTH$_1$§	RMS_1 / v008	Indicates median household income for county containing site	Continuous	2000 U.S. Census	+
$R8_2$	**Regional**	REGIONAL MARKET STRENGTH$_2$§	RMS_2 / v009	Indicates percentage change in population for counties containing sites between 1990 and 2005	Continuous	1990 U.S. Census, 2005 U.S. Census	+
$R9_1$	**Redevelopment**	INCENTIVES$_1$§	INCENT_1 / v052	Indicates whether the developer was/will be granted public-sector financial incentives (e.g., lien waivers, tax exemptions, tax deductions, low-interest loans) to redevelop the site.	Dichotomous (1/0)	Survey (A015)	+
$R9_2$	**Redevelopment**	INCENTIVES$_2$§	INCENT_2 / v020	Indicates whether the developer was/will be granted public-sector financial incentives (e.g., lien waivers, tax	Dichotomous (1/0)	Survey (A015,	+

No.*	Category	Name	Code Name	Measurement	Scale	Source¥	Logic
				exemptions, tax deductions, low-interest loans) to redevelop the site, whether the site was/is located in any economic development districts, either prior to redevelopment or now (if not redeveloped), or neither.		A016)	
10	**Redevelopment**	SITE-OWNER SUPPORT	SO_SPRT / v032	Indicates level of interest expressed by the site owner/s in returning the site to productive use, ranging from "no interest at all" to "extremely high."	Ordinal (1 – 5)	Survey (A027)	**+**
11_1	**Redevelopment**	PLANNING $TYPE_1$	PLAN / v034	Indicates whether there were/are specific efforts (being) undertaken to plan for the redevelopment of the site, ranging from "not at all" to "a very high extent."	Ordinal (1 – 5)	Survey (B001)	+
11_2	**Redevelopment**	PLANNING $TYPE_2$	PLN_EXT / v037	Indicates extent to which a wide-range of stakeholders was/is being consistently involved in efforts to plan for the redevelopment of the site, ranging from "not at all" to "a very high extent."	Ordinal (1 – 5)	Survey (B006)	+
11_3	**Redevelopment**	PLANNING $TYPE_3$	PLN_EXTH/ v050	Indicates whether a wide range of stakeholders was/is being involved in efforts to plan for the redevelopment of the site at a level marked as "very high"/"high" or not.	Dichotomous (1/0)	Survey (B018)	+
11_4	**Redevelopment**	PLANNING $TYPE_4$	PLN_NUM / v036	Indicates number of stakeholders were/are (being) consistently involved in efforts to plan for the redevelopment of the site.	Ordinal (0-11)	Survey (B005)	+
11_5	**Redevelopment**	PLANNING $TYPE_5$¤	MRP_F2F / v047	Indicates whether an interactive, face-to-face, multi-stakeholder decision making process was used to generate recommendations for reusing the site.	Dichotomous (1/0)	Survey (B018)	+
Rx_1	**Redevelopment**	LAND USE COMMERCIAL/ RESIDENTIAL	LU_C_R / v021	Indicates if site is surrounded by residential and/or commercial uses or otherwise. Applied here as an interaction variable with the PLANNING x PLANNING $TYPE_{1,2,3,\ 4,\ or\ 5}$ variables.	Dichotomous (1/0)	Survey (A013)	+
Rx_2	**Redevelopment**	COLLABORATIVE PLAN PROCESS LEGITIMACY§	F2F_LEGI	Mean index variable (combining three COLLABORATIVE PLAN PROCESS variables: INVOLVEMENT, CONSENSUS, and IMPLEMENTATION) indicating legitimacy of the collaborative planning process. Applied here as an interaction variable with the PLANNING $TYPE_5$ variable.	Continuous	Survey (B020, 21, 22)	+
Rx_3	**Redevelopment**	COLLABORATIVE PLAN PROCESS DURATION§	F2F_DUR / v048	Indicates the DURATION of the multi-stakeholder decision-making process, ranging from "one meeting/workshop (0-4 hours)" to "several meetings over the course of several years Several meetings over	Ordinal (1-8)	Survey (B019)	+

No.*	Category	Name	Code Name	Measurement	Scale	Source¥	Logic
				the course of several years (24 months+)." Applied here as an interaction variable with the PLANNING $TYPE_5$ variable.			
R12	**Redevelopment**	PLANNING TIMING	PLN_TME / v035	Indicates whether efforts to plan for the redevelopment of the site took/are taking place prior to or during key decisions about site remedies, or otherwise.	Dichotomous (1/0)	Survey (B003)	+
R13 1	**Control**	SITE READINESS FOR $REUSE_1$§	RFR_O8 / v029	Indicates whether ANY redevelopment activity be permitted at the site that is consistent with cleanup activities by the end of 2008.	Dichotomous (0/1)	Survey (A024)	+
R13 2	**Control**	SITE READINESS FOR $REUSE_2$§	RFR_12 / v030	Indicates whether ANY redevelopment activity be permitted at the site that is consistent with cleanup activities by the end of 2012.	Dichotomous (0/1)	Survey (A024)	+
R14	**Control**	CLEANUP INTENSITY	CU_INTEN / v031	Indicates whether the completed/planned cleanup activities for the site will allow for unrestricted use, ranging from "no", "partial only", and "yes."	Ordinal (1-3)	Survey (A025)	+
R15	**Control**	COUNTY POPULATION§	CNTY_POP / v010	Indicates population of incorporated area or county containing site.	Continuous	2000 U.S. Census	+
R16	**Control**	SITE SIZE	ACRES / v015	Indicates the size of the site (in acres). The site could be the entire site, or a subset of the site, depending upon how the respondent specifies at the beginning of the survey.	Continuous	Survey (A005)	+/-
R17	**Control**	SUPERFUND SITE AGE	SF_AGE / v066	Indicates number of years between when site was listed as final on NPL and 2008.	Continuous	EPA CERCLIS	+
R18	**Control**	SOUTH/WEST	SOUTHWST / v012	Indicates (1) if county-containing site is located in the Census-defined West or South and (0) if not	Dichotomous (0/1)	2000 U.S. Census	+

*Indicates number of variable in Superfund Site Redevelopment Model

§ Indicates variable is also used in Superfund Site Redevelopment Plan Implementation Model

¥If variable is derived from a survey question, the survey question number is included in parenthesis.

R - Superfund Site Redevelopment Model

RD – Dependent variable for Superfund Site Redevelopment Model.

*All ordinal level variables shown are treated here as proxies for continuous level variables.

¤Note: The PLANNING $TYPE_5$ variable is the same as the variable MRP PLANNING $TYPE_3$ (See Superfund Site Redevelopment Plan Implementation Model). MRP refers to the most recent [redevelopment] plan developed, or that would be completed by the end of 2008.

5.8. Variable Description, Data and Measure: Superfund Site Redevelopment Plan Implementation Model

As described briefly in Chapter 4, I argue that the extent to which a plan for the redevelopment of a Superfund site, or applicable portion, has been implemented or is on track for implementation is a function of range of factors including site-specific, neighborhood, regional and redevelopment factors. The exact model is specified in the figure below.

The variables are briefly are defined in Table 14 along with a general description of how they were measured, the scale of measure, and the source of data for each measure. The definition, logic, and approaches for measurement of each of these variables are then elaborated upon in Appendix C. Because there is considerable overlap between the Superfund Site Redevelopment and Plan Implementation Models, in instances where the same variables explanations for these variables are not repeated.

PLAN IMPLEMENTATION ON TRACK$_{1\ or\ 2}$ =

B0 +

Site-specific — *B1* **SITE LOCATION SUITABILITY**$_{1\ or\ 2}$

Neighborhood — *B2* **NEIGHBORHOOD MARKET STRENGTH**$_{1\ or\ 2}$; *B3* **NEIGHBORHOOD LAND AVAILABILITY**; *B4* **PLANNING CULTURE**$_{1,2,\ or\ 3}$

Regional — *B4* **PLANNING CULTURE**$_{1,2,\ or\ 3}$; *B5* **REGIONAL MARKET STRENGTH**$_{1\ or\ 2}$

Redevelopment —
B6 **INCENTIVES**$_{1\ or\ 2}$
B7 **MRP**° **LOCAL POLITICAL SUPPORT**
B8 **MRP PLAN QUALITY**
B9 **MRP PLANNING TYPE**$_{2\ or\ 3}$°°
x LAND USE COMMERCIAL/RESIDENTIAL
x COLLABORATIVE PLANNING PROCESS LEGITIMACY
x COLLABORATIVE PLANNING PROCESS DURATION
— *Variables for Testing Moderating Effects on MRP Planning Type*
B10 **MRP PLANNING TIMING**

Controls —
B11 **SITE READINESS FOR REUSE**
B12 **COUNTY POPULATION**
B13 **SUPERFUND SITE AGE**

°Note: MRP refers to most recent [redevelopment] plan developed, or that would be completed by the end of 2008. For example, "MRP LOCAL POLITICAL SUPPORT" refers to local political support for the most recent [redevelopment] plan completed, or that would be completed by the end of 2008.
°°This variable is the same as the variable PLANNING TYPE$_5$ (See Superfund Site Redevelopment Model).

Figure 5. Model for Predicting Superfund Site Redevelopment Plan Implementation

Table 14. Variable Description, Logic, and Sources for Superfund Site Plan Implementation Model

No.	Category	Variable Name	Code Name/ ID No.	Measurement	Scale	Source¥	Logic
PD_1	**Dependent**	PLAN IMPLEMENTATION ON $TRACK_1$	PIOT_IMP / v039	Indicates extent to which a Superfund site redevelopment plan is being implemented.	Ordinal	Survey (B010)	NA
PD_2	**Dependent**	PLAN IMPLEMENTATION ON $TRACK_2$	PIOT_CON / v040	Indicates extent to which redevelopment matches or will match what is required by plan, ranging from "not consistent with plan at all" to "matches plan exactly."	Ordinal (1 – 7)	(B011)	NA
$P1_1$	**Site-specific**	SITE LOCATION $SUITABILITY_1$§	SLS_1 / v022	Extent to which the *location* of site makes the site suitable for redevelopment, ranging from "not at all suitable" to "extremely suitably."	Ordinal (1 – 5)	Survey (A018)	+
$P1_2$	**Site-specific**	SITE LOCATION $SUITABILITY_2$§	SLS_2 / v023	Indication of whether site is located near one or more features either prior to redevelopment or now (if not redeveloped), that made/make the location of the site appealing for redevelopment.	Dichotomous (0/1)	Survey (A019)	+
$P1_3$	**Site-specific**	SITE LOCATION $SUITABILITY_3$§	SLS_3 / v024	Number of features the site is located near either prior to redevelopment or now (if not redeveloped), that made/make the location of the site appealing for redevelopment.	Summated index (0-12)	Survey (A019)	+
$P2_1$	**Neighborhood**	NEIGHBORHOOD MARKET $STRENGTH_1$§	NMS_1 / v007	Indicates number of businesses operating per 100 persons residing in zip code containing site	Continuous	2000 Census – Zip Bus. Patterns	+
$P2_2$	**Neighborhood**	NEIGHBORHOOD MARKET $STRENGTH_2$§	NMS_2 / v026	Indicates level of development pressure around the site (within roughly one mile from the site boundary) either prior to redevelopment (or now) if not redeveloped, ranging from "no development pressure at all" to "extremely high development pressure."	Ordinal (1 – 5)	Survey (A021)	+
P3	**Neighborhood**	NEIGHBORHOOD LAND AVAILABILITY§	N_LNDAV / v027	Indicates amount of undeveloped/vacant property around the site (within roughly one mile from the site boundary), either prior to redevelopment or now (if not redeveloped), ranging from "no undeveloped/vacant property at all" to "extremely high amount of undeveloped/vacant property."	Ordinal (1 – 5)	Survey (A022)	-
$P4_1$	**Regional**	PLANNING $CULTURE_1$§	PC_1 / v002-5	Composite index of social capital for each county developed by Rupasingha, Goetz, & Freshwater (2006).	Continuous	Rupasingha, Goetz, & Freshwater (2006)	+
$P4_2$	**Neighborhood / Regional**	PLANNING $CULTURE_2$§	PC_2 / v019	Indicates knowledge of neighborhood, city, or regional land use plans that included/include recommendations for redeveloping the site, either prior to redevelopment or now (if	Dichotomous (0/1)	Survey (A014)	+

No.	Category	Variable Name	Code Name/ ID No.	Measurement	Scale	Source[¥]	Logic
				not redeveloped).			
$P4_3$	**Regional**	PLANNING CULTURE$_3$[§]	PC_3 / v006	Indicates whether state is a growth management state as classified by Yin and Sun (2007)	Dichotomous (1/0)	Yin and Sun (2007)	+
$P5_1$	**Regional**	REGIONAL MARKET STRENGTH$_1$[§]	RMS_1 / v008	Indicates median household income for county containing site	Continuous	2000 U.S. Census	+
$P5_2$	**Regional**	REGIONAL MARKET STRENGTH$_2$[§]	RMS_2 / v009	Indicates percentage change in population for counties containing sites between 1990 and 2005	Continuous	1990 U.S. Census, 2005 U.S. Census	+
$P6_1$	**Redevelopment**	INCENTIVES$_1$[§]	INCENT_1 / v052	Indicates whether the developer was/will be granted public-sector financial incentives (e.g., lien waivers, tax exemptions, tax deductions, low-interest loans) to redevelop the site.	Dichotomous (1/0)	Survey (A015)	+
$P6_2$	**Redevelopment**	INCENTIVES$_2$[§]	INCENT_2 / v020	Indicates whether the developer was/will be granted public-sector financial incentives (e.g., lien waivers, tax exemptions, tax deductions, low-interest loans) to redevelop the site, and/or whether the site was/is located in any economic development districts, either prior to redevelopment or now (if not redeveloped).	Dichotomous (1/0)	Survey (A015, A016)	+
P7	**Redevelopment**	MRP LOCAL POLITICAL SUPPORT[¤]	MRP_LPS / v046	Mean index variable (combining STAKEHOLDER SUPPORT and LOCAL GOVERNMENT SUPPORT variables) indicating political support for the most recent redevelopment plan.	Continuous	Survey (B016, B017)	+
P8	**Redevelopment**	MRP PLAN QUALITY[¤]	MRP_PQ / v042	Indicates extent to which redevelopment plan is considered a high quality plan, ranging from “extremely low quality” to “extremely high quality.”	Ordinal (proxy for continuous) (1 – 5)	Survey (B013)	+
$P9_2$	**Redevelopment**	MRP PLANNING TYPE$_2$	MRP_NUM / v043	Indicates number of stakeholders were/are (being) consistently involved in efforts to plan for the redevelopment of the site.	Ordinal (0-11)	Survey (B015)	+
$P9_3$	**Redevelopment**	MRP PLANNING TYPE$_3$[§¤¤]	MRP_F2F / v047	Indicates whether an interactive, face-to-face, multi-stakeholder decision making process was used to generate recommendations for reusing the site.	Dichotomous (1/0)	Survey (B018)	**+**
Px_1	**Moderating**	LAND USE COMMERCIAL/ RESIDENTIAL[§]	LU_C_R / v021	Indicates if site is surrounded by residential and/or commercial uses or otherwise. Applied here as an interaction variable with the PLANNING TYPE$_{2\text{ OR }3}$ variables.	Dichotomous (1/0)	Survey (A017)	**+**
Px_2	**Moderating**	COLLABORATIVE PLAN PROCESS LEGITIMACY[§]	F2F_LEGI / v053	Mean index variable (combining three COLLABORATIVE PLAN PROCESS variables: INVOLVEMENT, CONSENSUS, and IMPLEMENTATION) indicating legitimacy of the	Continuous	Survey (B020, B021, B022)	**+**

No.	Category	Variable Name	Code Name/ ID No.	Measurement	Scale	Source[¥]	Logic
				collaborative planning process. Applied here as an interaction variable with the PLANNING $TYPE_3$ variables.			
Px_3	**Moderating**	COLLABORATIVE PLAN PROCESS DURATION[§]	F2F_DUR / v048	Indicates the DURATION of the multi-stakeholder decision-making process, ranging from "one meeting/workshop (0-4 hours)" to "several meetings over the course of several years Several meetings over the course of several years (24 months+)." Applied here as an interaction variable with the PLANNING $TYPE_3$ variables.	Ordinal (1-8)	Survey (B019)	**+**
P11	**Redevelopment**	MRP PLANNING TIMING	MRP_TM / v038	Indicates whether key decisions about site remedies took/are taking place prior to or during key decisions about site remedies, or otherwise.	Dichotom ous (1/0)	Survey (B009)	**+**
$P12_1$	**Redevelopment**	SITE READINESS FOR $REUSE_1$[§]	RFR_O8 / v029	Indicates whether ANY redevelopment activity be permitted at the site that is consistent with cleanup activities by the end of 2008.	Dichotom ous (1/0)	Survey (A024)	+
$P12_2$	**Redevelopment**	SITE READINESS FOR $REUSE_2$[§]	RFR_12 / v030	Indicates whether ANY redevelopment activity be permitted at the site that is consistent with cleanup activities by the end of 2012.	Dichotom ous (1/0)	Survey (A024)	+
P13	**Control**	COUNTY POPULATION[§]	CNTY_POP / v010	Indicates population of incorporated area or county containing site.	Continuou s	2000 U.S. Census	+
P14	**Control**	SUPERFUND SITE AGE	SF_AGE / v066	Indicates number of years between when site was listed as final on NPL and 2008.	Continuou s	EPA CERCLIS	+

[*]Indicates number of variable in Superfund Site Redevelopment Plan Implementation Model
§ Indicates variable is also used in Superfund Site Redevelopment Model.
¥If variable is derived from a survey question, the survey question number is included in parenthesis.
P - Superfund Site Plan Implementation Model
RD – Dependent variable for Superfund Site Redevelopment Plan Implementation Model
¤ MRP refers to most recent [redevelopment] plan developed, or that would be completed by the end of 2008. For example, "MRP LOCAL POLITICAL SUPPORT" refers to local political support for the most recent [redevelopment] plan completed, or that would be completed by the end of 2008.
¤¤ The MRP PLANNING $TYPE_3$ variable is the same as the variable PLANNING $TYPE_5$ (See Superfund Site Redevelopment Model).

6. Empirical Results

This chapter is separated into three main sections. The first section discusses the effects of the hypothesized factors on Superfund site redevelopment, looking first at the results of the univariate and bivariate analyses (descriptive statistics) and second at the results of regression analysis. The second section describes the results of the hypothesized factors on Superfund site redevelopment plan implementation. Here only the results of univariate and bivariate analyses (descriptive statistics) are discussed as the limited number of sites with plans in place included in the sample, prohibited multivariate regression analysis. Finally, the third section discusses overall what was learned about the effectiveness of collaborative planning on Superfund site redevelopment and plan implementation in relation to the original hypotheses, based upon the statistical analyses.

6.1. Superfund Site Redevelopment Model Analysis

6.1.1. Descriptive Statistics

Results from the univariate and bivariate analyses (descriptive statistics) for each of the control variables are presented in Table 15. In instances where variables were transformed to correct for problems of skewness or kurtosis, [8] only the transformed versions of the original variables are shown.

[8] Skewness indicates "the tendency of the deviations [in a probability distribution] to be larger in one direction than in the other." Kurtosis is an indicator of "tail heaviness" (SAS Institute Inc., 2009, see "SAS Elementary Statistics Procedures"). Both are important for understanding the extent to which variables follow normal distributions. According to Gujarati (2003), measures of skewness and kurtosis in normal probability distributions are zero and three respectively.

6.1.1.1. The Dependent Variables: Reuse on Track, Reuse on Track by 2008, Reuse on Track by 2012

As noted earlier, an important goal for EPA is to enable Superfund sites to return to productive use once sufficiently remediated. Sample statistics reveal mixed progress regarding reuse. Regarding the REUSE ON TRACK_1 dependent variable, the average response for the state of site redevelopment at the time the survey was administered, was 3.4 out of six, indicating that over half the sites in the sample had at least reached the stage where redevelopment was currently being planned when the survey was taken. Results indicate that redevelopment is "complete and being used by customers" at 18 sites, redevelopment is "near completion" at four sites, redevelopment has been planned and will be implemented once necessary resources are secured at nine sites, efforts are "currently underway to plan for redevelopment" at 12 sites, "no substantive redevelopment" has been undertaken at 17 sites, and four sites have finalized redevelopment plans but "no serious efforts to implement the plan" have been undertaken.

Results for the REUSE ON TRACK_2 (by 2008) dependent variable indicate that sites on average were either unlikely or somewhat unlikely to be redeveloped by the end of 2008, with an average response of 2.5 out of 6. Fifty (50) sites were either "not at all likely," "unlikely," or "somewhat unlikely" to be redeveloped by the end of 2008 in comparison with only 19 sites that were either "already redeveloped," "extremely likely," or "likely" to be redeveloped by the end of 2008.

Not surprisingly, results for the REUSE ON $TRACK_3$ (by 2012) dependent variable suggest that sites on average would be much more likely to be redeveloped by the end of 2012 with an average response of 4.1 out of 6. Only 21 sites were either "not all likely," "unlikely," or "somewhat unlikely" to be redeveloped by the end of 2012 in comparison with 47 sites that were "already redeveloped" or presumed by respondents to be "extremely likely" or "likely" to be redeveloped by the end of 2012.

As evident from the discussion, results for each of the dependent variables are not normally distributed, however, only REUSE ON $TRACK_2$ (by 2008) showed signs of skewness. However, because the skewness level was only slightly above the rule-of-thumb threshold level (absolute value greater than 0.8 (Lewis-Beck, 1995)) indicating skewness problems I did not transform this variable. I did however, develop a corresponding dichotomous version of REUSE ON $TRACK_1$ (REUSE ON $TRACK_{1\text{-}D}$); sites where redevelopment was already complete or near completion, efforts were underway to implement the plan, or redevelopment planning was underway were classified as "on track" for redevelopment; sites where no efforts to implement the plan or no redevelopment planning had been undertaken were classified on "not on track" for redevelopment. By these criteria, nearly 70 percent of sites (43) were classified as "on track, and nearly 30 percent of sites (20) were classified as "not on track" for redevelopment. As shown in Table 15 (for Pearson r correlations) and Appendix D (for Kendall's tau-b correlations) all four dependent variables highly correlated with each other based upon both Pearson's and Kendall tau-b correlation coefficients.

6.1.1.2. Independent Variables: Control Variables

Control variables included SITE READINESS FOR REUSE, CLEANUP INTENSITY, COUNTY POPULATION, SITE SIZE, SUPERFUND AGE, and SOUTH/WEST. The two SITE READINESS FOR REUSE variables were derived from survey data and split into two dichotomous (ordinal-scale) variables – one indicating the site would be ready for reuse by the end of 2008 (SITE READINESS FOR REUSE (by '08)) and the other indicating the site would be ready for reuse by the end of 2012 (SITE READINESS FOR REUSE (by '12)). Although neither variable exhibited problems with skewness, kurtosis was evident in the univariate analysis for SITE READINESS FOR REUSE (by '12), exceeding the rule-of-thumb threshold level (absolute values greater than two (Garson, 2009)). This is likely attributable to the large portion of sites in the sample that RPMs perceived would be ready for reuse by 2012. Because this variable was already structured as a dichotomous (ordinal) variable no additional efforts were taken to further transform it. According to the univariate analysis, nearly 70 percent of the sites were to be ready for reuse by the end of 2008 and nearly 94 percent of sites would be ready for ready for reuse by the end of 2012. Bivariate analysis revealed a positive and highly significant association between three out of the four REUSE ON TRACK dependent variables and SITE READINESS FOR REUSE (by '08) based upon Pearson correlation coefficients. Results based on Kendall's tau-b correlations were similar. Not surprisingly, SITE READINESS FOR REUSE (by '12) did not significantly correlate with the dependent variable REUSE ON $TRACK_3$ (by 2008); however, it did exhibit a positive and statistically significant association with three out of the four REUSE ON

TRACK dependent variables based upon Pearson's and Kendall's tau- correlation measures. The estimated direction of the relationship between both RFR variables and the dependent variables matched the direction hypothesized across all Pearson's and Kendall's correlation measures. Overall, results from these correlations suggest, not surprisingly, that in order for sites to be redeveloped it is important that they be capable of being redeveloped.

The original CLEANUP INTENSITY variable is a 1-3 ordinal-scale variable based on survey data indicating no unrestricted use, partial unrestricted use, or unrestricted use. To enable this variable's use in a regression context, I transformed it into a dichotomous (ordinal-scale) variable (CLEANUP INTENSITY_D) reflecting either unrestricted use (1) or not (0).[9]. No additional transformations were performed. Univariate analysis of the CLEANUP INTENSITY_D indicated that most sites (78 percent) in the sample have not or will not be cleaned to unrestricted use standards. Bivariate results revealed no statistically significant relationship between CLEANUP INTENSITY_D and any of the dependent variables using either Pearson's or Kendall's correlation measures. The estimated direction varied across the dependent variables. Overall, this analysis suggests that the level of cleanup may not impact the likelihood of redevelopment. However, lack of variation on the dependent variable based upon the sample may have masked any potential effect.

[9] Because kurtosis and skewness indicators are less relevant for three-level and dichotomous variables, I do not include kurtosis and skewness discussions for such variables.

The original COUNTY POPULATION variable, based upon 2000 Census data, exhibited problems with both skewness and kurtosis. The skewness in particular was likely largely driven by a few extremely populous counties containing Superfund sites in the sample. For example, county population data for at least one site was over nine million, even though the mean county population data was just below 80,000. As a result, this variable was transformed (COUNTY POPULATION $_B$) based upon quartile results (1-4) of the original variable. The first quartile (1) reflects the 25 percent least populous counties containing sites in the sample; the last quartile (4) reflects the 25 percent most populous counties containing sites in the sample (4). Results for the transformed variable revealed a statistically significant and positive relationship with two of the four dependent variables based upon Pearson correlation coefficients. Using Kendall's Tau-B correlations, only the relationship between COUNTY POPULATION $_B$ and REUSE ON TRACK$_1$ was statistically significant. The direction of all correlation coefficients – using both Pearson's and Kendall's – were in the anticipated direction. Results overall suggest that Superfund sites *may* be more likely to be reused or "on track" for reuse in more highly populous counties, consistent with the hypothesized direction.

The original Superfund SITE SIZE variable exhibited problems with both kurtosis and skewness driven likely in part from the widely variable sizes of Superfund sites in the sample averaging 480 acres, but ranging from 1-7,000 acres. As a result, this variable – similar to the COUNTY POPULATION$_B$ – was transformed along quartile results of the original variable; the first quartile reflected the 25 percent smallest sites in the sample and the fourth quartile represented the 25 percent highest. Bivariate results for the transformed SITE $SIZE_B$ variable revealed no statistically significant relationship between any of the four dependent variables, using either Pearson's r or Kendall's tau-b measures of association. No relationship direction was predicted, given the ambiguity of this variable's importance in the literature. The estimated direction of the coefficients varied. Results overall suggest that Superfund site size does not impact Superfund redevelopment which runs against findings in the Superfund context (e.g., see Wernstedt & Hersh, 1998b) but is in unison with the inconsistent findings in the brownfields redevelopment literature (e.g., see Howland, 2004; Meyer & Lyons, 2000).

Results for the SUPERFUND SITE AGE control variable indicate that, on average, the time between when sites were listed as final on the National Priorities List (NPL) and 2008 was approximately 19 years. No statistically significant relationships between this and any of the dependent variables were identified based upon Pearson correlations.[10] Moreover, the estimated relationships between this and the REUSE ON TRACK dependent variables were mostly negative, counter to my hypothesis that the longer the time elapsed between when a site was placed on the final NPL and 2008, the more likely the site would be redeveloped or be "on track" for redeveloped. It may be the case that sites listed on the NPL prior to EPA's emphasis on reusing Superfund sites did not receive the type of support and thinking about reuse that other more recent NPL sites have more recently benefited from.

The SOUTH/WEST dichotomous (ordinal-scale) variable reflects whether a site is located in the South or the West (1), or not (0). Results indicate that 70 percent of the

[10] As a continuous level variable, Kendall's tau-b measure of association was not calculated here.

sites included in the sample are located either in the Census-defined South or West. No statistically significant relationships were identified between any of the dependent variables based upon either Pearson or Kendall's tau-b correlations. All correlations but one, however, were estimated in the positive direction, consistent with my hypothesized direction. Overall, the evidence here suggests that large-scale regional influences do not affect site redevelopment outcomes.

6.1.1.3. Independent Variables: Site-Specific Factors

Variables categorized as site-specific predictive factors included SITE REDEVELOPMENT SUITABILITY, SITE LOCATION SUITABILITY, SITE CONTAMINATION, and SITE OWNERSHIP. Bivariate results for SITE REDEVELOPMENT SUITABILITY, a 1-5 ordinal-scale variable based on survey data, indicate that RPMs on average perceived their sites to have between a moderate and high extent of features that make their sites suitable for redevelopment. Bivariate results suggest a positive and highly significant relationship with three of the four dependent variables (and a moderate statistically significant level of association with one of the dependent variables, based upon both Pearson's r and Kendall's tau-b correlation measures). Together, these results suggest that a site's physical characteristics prior to redevelopment positively impact a site's reuse chances.

Three variables indicating SITE LOCATION SUITABILITY were tested. SITE LOCATION SUITABILITY $_1$, a 1-5 ordinal-scale variable based on survey data, reflects the extent to which the location of the site make the site suitable for redevelopment; SITE LOCATION SUITABILITY$_2$, a dichotomous (ordinal-scale) variable based on survey data, indicates whether a site is located near one or more features that make the site appealing for redevelopment, and SITE LOCATION SUITABILITY$_{3,}$ a summated index variable, reflects the total number of features a site is located near that make the site appealing for redevelopment. . Univariate analysis for SITE LOCATION SUITABILITY$_1$ revealed that RPMs on average perceive the locations of the sample sites to be very suitable for redevelopment. Univariate results for SITE LOCATION SUITABILITY$_2$ indicate that 90 percent of the sites are located next to at least one feature that makes the site appealing for redevelopment. Univariate results for SITE LOCATION SUITABILITY$_3$ indicate that on average RPMs perceive their sites to be located next between two and three features that make the site appealing for redevelopment. Bivariate results revealed a positive and statistically significant levels of association between all three SLS variables and all four dependent variables based upon both Pearson's r and Kendall's tau-b correlation measures, with one exception: SITE LOCATION SUITABILITY$_2$ did not correlate at a statistically significant level with either REUSE ON TRACK$_2$ (by 2008) or REUSE ON TRACK$_2$ (by 2012). The variable SITE LOCATION SUITABILITY$_1$ exhibited the strongest relationship of all SITE LOCATION SUITABILITY variables with the REUSE ON TRACK dependent variables. Together the significance of these variables lends support to the idea that "location matters" when it comes to whether or not a site is likely to be redeveloped.

Two SITE CONTAMINATION variables were examined: SITE CONTAMINATION$_1$, a 1-5 ordinal-scale variable based on survey data, indicates a site's approximate level of threat to public health when first discovered by EPA. SITE

CONTAMINATION$_2$, a continuous variable, indicates that the total number of chemicals of concern identified at site, in all media (e.g., a chemical of concern found in groundwater and soil is counted twice). Univariate results for SITE CONTAMINATION$_1$ indicate that on average RPMs perceived the risk of their site's at the time of site discovery to be between moderate and high. The average number of total chemicals of concern for sample sites as reflected in SITE CONTAMINATION$_2$ was 45, with a range of from 3-232. Due to problems with skewness and kurtosis likely stemming from great variability in total contaminants as well as outliers, SITE CONTAMINATION$_2$, was transformed using quartiles of the original (SITE CONTAMINATION $_{2\text{-B}}$). The first quartile indicates the 25 percent of sites with the lowest number of total chemicals of concern; the fourth quartile represents the 25 percent of sites with the highest number of total chemicals of concern. Bivariate results revealed an inconsistent relationship, in some cases positive and in some cases negative, between both SITE CONTAMINATION variables and the REUSE ON TRACK dependent variables. No association was statistically significant, however. Overall, there is no evidence suggesting that degree of human health risk at the time of site discovery or total number of contaminants at a site impacts a site's reuse chances. However, it may be the case that these are simply poor measures of contamination severity and cleanup complexity and other measures revealing site contamination or site cleanup complexity may indeed show a consistent statistically significant and negative effect between contamination and reuse outcomes.

SITE OWNERSHIP is a dichotomous (ordinal-scale) variable based on survey data indicating whether a site was publicly (1) or privately held (0) prior to or during efforts to plan for redevelopment of the site or in 2008 if the site was not redeveloped when survey data was collected. Univariate analyses show that nearly 60 percent of the sample sites were publicly held during efforts to plan for redevelopment of the site. P-values derived from Pearson's or Kendall's measures of association reveal no statistically significant association with any of the dependent variables except REUSE ON TRACK$_3$ (by 2012), where the association was only marginally significant ($p<.10$, one-tailed test). Interestingly, the estimated negative direction of this statistically significant level of association was opposite the relationship hypothesized. Overall, results suggest there is little evidence to support the theory that publicly-owned sites are more likely to be redeveloped than privately-held sites.

Table 15. Descriptive Statistics and Pearson Correlation Coefficients for Control and Reuse on Track Variables

					REUSE ON TRACK$_1$			REUSE ON TRACK$_{1\text{-}D}$			REUSE ON TRACK$_2$			REUSE ON TRACK$_3$			Hyp.	Est.
	N	Range	Mean	S.D.	R	1-t	2-t	R	1-t	2-t	R	1-t	2-t	R	1-t	2-t		
Reuse On Track$_1$	63	1-6	3.46	1.97	---	---	---	0.86	***	***	0.78	***	***	0.74	***	***	--	--
Reuse On Track$_{1\text{-}D}$	63	0-1	0.65	0.48	0.86	***	***	---	---	---	0.48	***	***	0.62	***	***	--	--
Reuse On Track$_2$ (By 2008)	69	1-6	2.54	2.11	0.78	***	***	0.48	***	***	---	---	---	0.71	***	***	--	--
Reuse On Track$_3$ (By 2012)	68	1-6	4.15	1.72	0.74	***	***	0.62	***	***	0.71	***	***	---	---	---	--	--
Site Redevelopment Suitability	70	1-5	3.41	1.07	0.40	***	**	0.47	***	***	0.26	*	*	0.43	***	***	+	+
Site Location Suitability$_1$	70	2-5	4.00	0.99	0.43	***	***	0.34	**	**	0.34	**	**	0.53	***	***	+	+
Site Location Suitability$_2$	70	0-1	0.90	0.30	0.21	*	†	0.27	*	*	-0.01			0.20	†		+	+
Site Location Suitability$_3$	70	0-7	2.46	1.67	0.25	*	*	0.29	*	*	0.13			0.31	**	*	+	+
Site Contamination$_1$	70	1-5	3.72	0.81	-0.09			-0.08			-0.04			0.06			-	-
Site Contamination$_{2\text{-}B}$	70	1-4	2.39	1.16	0.04			0.10			-0.01			-0.04			-	+
Site Ownership	56	0-1	0.59	0.50	-0.11			-0.03			-0.03			-0.21	†		+	-
Neighborhood Market Strength$_{1\text{-}B}$	70	1-4	2.50	1.11	0.20	†		0.21	†		0.21	*	†	0.33	**	**	+	+
Neighborhood Market Strength$_2$	70	1-5	2.52	0.97	0.37	**	**	0.35	**	**	0.28	*	*	0.46	***	***	+	+
Neighborhood Land Availability	70	1-5	2.69	0.87	-0.24	*	†	-0.18	†		-0.02			-0.24	*	*	-	-
Planning Culture$_{1\text{-}B}$	70	1-4	2.49	1.13	-0.07			-0.01			-0.11			-0.07			+	-
Planning Culture$_2$	56	0-1	0.52	0.50	0.13			0.31	*	*	0.02			0.04			+	+
Planning Culture$_3$	70	0-1	0.34	0.48	0.11			0.02			0.12			-0.01			+	+
Regional Market Strength$_{1\text{-}B}$	70	1-4	2.51	1.13	0.18	†		0.12			0.00			-0.03			+	+
Regional Market Strength$_{2\text{-}B}$	70	1-4	2.50	1.11	0.05			0.02			0.01			0.11			+	+

Incentives$_2$	44	0-1	0.36	0.49	0.41	**	**	0.44	**	**	0.22	†		0.35	*	*	+	+
Site-Owner Support	63	1-5	3.06	1.57	0.22	*	†	0.35	**	**	-0.02			0.30	**	*	+	+
Planning Type$_1$	70	1-5	3.37	1.20	0.64	***	***	0.71	***	***	0.27	*	*	0.52	***	***	+	+
Planning Type$_2$	70	1-5	2.91	1.26	0.45	***	***	0.52	***	***	0.22	*	†	0.39	***	**	+	+
Planning Type$_3$	70	0-1	0.11	0.32	0.20	†		0.26	*	*	0.04			0.11			+	+
Planning Type$_4$	67	0-9	3.45	1.94	0.47	***	***	0.46	***	***	0.20	*	†	0.34	**	**	+	+
Planning Type$_5$	33	0-1	0.82	0.39	0.03			0.05			0.02			0.18			+	+
Planning Timing	64	0-1	0.64	0.48	0.26	*	*	0.26	*	*	0.11			0.11			+	+
Site Readiness For Reuse$_1$ (by '08)	70	0-1	0.69	0.45	0.48	***	***	0.40	***	**	0.35	**	**	0.13			--	--
Site Readiness For Reuse$_2$ (by '12)	70	0-1	0.94	0.23	0.29	**	*	0.36	**	**	0.03			0.20	*	†	+	+
Cleanup Intensity$_D$	64	0-1	0.22	0.42	0.00			0.03			-0.04			0.02			-	+
County Population$_B$	70	1-4	2.51	1.13	0.30	**	*	0.16			0.20	*	†	0.12			+	+
Site Size$_B$	70	1-4	2.54	1.13	0.00			0.05			-0.14			-0.13			+	-
Superfund Site Age	70	4-25	18.89	5.76	-0.10			0.04			-0.15			-0.10			-	-
South/West	70	0-1	0.70	0.46	0.00			0.03			0.04			0.05			+	-
Planning Type$_1$ x LU_C_R^x	70	0-5	3.07	1.59	0.56	***	***	0.59	***	***	0.22	*	†	0.41	***	***	+	+
Planning Type$_2$ x LU_C_R^x	70	0-5	2.59	1.54	0.47	***	***	0.51	***	***	0.16			0.34	**	**	+	+
Planning Type$_3$ x LU_C_R^x	70	0-1	0.11	0.32	0.20	†		0.26	*	*	0.04			0.11			+	+
Planning Type$_4$ x LU_C_R^x	67	0-9	3.07	2.14	0.50	***	***	0.46	***	***	0.21	*	†	0.35	**	**	+	+
Planning Type$_5$ x LU_C_R^x	33	0-1	0.70	0.47	0.21			0.11			-0.02			0.06			+	+
LU_C_R^i	70	0-1	0.87	0.34	0.28	*	*	0.27	*	*	0.04			0.19	†		+	+

1. The first four variables listed are the four dependent variables assessed as part of this analysis.

2. 1-t/2-t denotes significance derived from p-value for one-tailed/two-tailed significance test
3. †p<.10; *p<.05; **p<.01;***p<.001
4. D – indicates the variable has been transformed as a dichotomous (ordinal) variable.
5. B – indicates the variable has been transformed based upon quartiles.
6. LU_C_R stands for "Land Use Commercial/Residential"
7. Hyp. / Est. Hyp. indicates the Hypothesized direction of the relationship between the independent variable and the dependent variable. Est. refers to the estimated direction of the relation. Only the estimated relationship for REUSE ON $TRACK_1$ is shown here.
8. [x]Interaction terms.
9. [i]Indicates variable tested as part of an interaction term.

6.1.1.4. Independent Variables: Neighborhood/Regional Factors

Four types of variables representing neighborhood/regional factors theorized to impact Superfund site redevelopment were also tested: NEIGHBORHOOD MARKET STRENGTH, NEIGHBORHOOD LAND AVAILABILITY, PLANNING CULTURE and REGIONAL MARKET STRENGTH. Two types of variables were tested that represent NEIGHBORHOOD MARKET STRENGTH. The first is a continuous-level variable that indicates the number of business operating per 100 persons residing in zip codes containing the sample sites (NEIGHBORHOOD MARKET $STRENGTH_1$). The second is a 1-5 ordinal-scale variable based on survey data indicating the level of development pressure around the site (NEIGHBORHOOD MARKET $STRENGTH_2$). Univariate results for NEIGHBORHOOD MARKET $STRENGTH_1$ revealed that the average number of business operating per 100 persons in zip codes containing sample sites was 2.8, with a range between 0.6-15. Due to problems with skewness and kurtosis, NEIGHBORHOOD MARKET $STRENGTH_1$ was transformed into a quartile version based on the original variable where the first quartile represent sites in zip codes with the fewest number of businesses operating per 100 persons, while the fourth quartile represented the sites with the highest number. Univariate results for NEIGHBORHOOD MARKET $STRENGTH_2$ suggest that on average development pressure around these sample sites was between minimum and moderate. Bivariate analyses revealed positive and statistically significant levels of association between NEIGHBORHOOD MARKET $STRENGTH_{1-B}$ and the dependent variables based upon both Pearson's r and Kendall's tau-b correlation measures ranging from marginal ($p<.10$, one-tailed test) to high ($p<.01$, two-tailed test), all in the hypothesized direction. NEIGHBORHOOD MARKET STRENGTH$_{1\text{-}B}$'s association between REUSE ON TRACK$_2$ (by 2012) was strongest ($p<.01$, two-tailed test) and weakest between REUSE ON TRACK$_1$ ($p<.10$, one-tailed test, based on Pearson's r only).[11] Bivariate results for NEIGHBORHOOD MARKET STRENGTH$_2$ were even stronger, revealing a positive and statistically significant level of association that ranged from moderate ($p<.10$, two-tailed test) to very high ($p<.001$, two-tailed test) based upon both Pearson's r and Kendall's tau-b measures, consistent with my hypothesized direction. Together results strongly suggest that location has a positive and statistically significant impact on redevelopment.

NEIGHBORHOOD LAND AVAILABILITY is a 1-5 ordinal-scale variable based upon survey data indicating the amount of undeveloped land around the site, either prior to development, or at the time survey data was collected if the site was not redeveloped. Univariate results suggest that the average amount of undeveloped land around the study sites was between minimal and moderate. Bivariate results using the Pearson Correlation Coefficient reflect a negative and statistically significant association across three of the four dependent variables ranging from marginal ($p<.10$, one-tailed test) to moderate ($p<.05$, one-tailed test, based upon Pearson's r only). The variable correlated most significantly with REUSE ON TRACK$_3$ (by 2012) ($p<.05$, 2-tailed test) based on Pearson's r; the correlation based on Kendall's tau-b was not statistically significant. Overall, results suggest there is some evidence that larger amount of vacant

[11] The association between NMS_1$_B$ and ROT_1 was actually stronger based upon Kendall's tau-b ($p<.10$, two-tailed test).

land around sites reduce the likelihood that sites will be redeveloped. Although consistent with theory, the relationship was not as strong as expected. A possible reason for this is that sites that become the object of federal attention (e.g., that receive a Superfund designation) eventually become more attractive redevelopment candidates in comparison with surrounding vacant, abandoned or underutilized properties possibly driven by the cleanup solely or efforts to plan for the site's reuse.

Three different PLANNING CULTURE variables were tested. PLANNING $CULTURE_1$ represents a 1997 composite index of social capital for each county in the U.S. made available by Rupasingha and Goetz (2008b). PLANNING $CULTURE_2$ is a dichotomous (ordinal-scale) measure based on survey data, indicating whether there had been any neighborhood, city, or regional land use plans that included/include recommendations for redeveloping the site. PLANNING $CULTURE_3$ is a dichotomous (ordinal-scale) measure based upon the work of Yin and Sun (2007) which identified states as growth management states. Univariate results for the PLANNING $CULTURE_1$ variable indicated that counties containing sites in the study set averaged a county social capital index score of -0.04, ranging from -1.9 to 4.1. Due to problems with skewness and kurtosis, however, PLANNING $CULTURE_1$was transformed into a quartile version based on the original variable where the first quartile represent sites located in counties with the lowest social capital index scores and, while the fourth quartile represented the sites located in counties with the highest (PLANNING $CULTURE_{1\text{-}B}$). Bivariate results for PLANNING $CULTURE_{1\text{-}B}$ exhibited no statistically significant correlations with any of the dependent variables based upon Pearson's r or Kendall's tau-b measures of association, with one exception. PLANNING $CULTURE_{1\text{-}B}$ exhibited a marginal statistically significant level of association with REUSE ON $TRACK_2$ (by 2008) based upon Kendall's tau-b ($p<.10$, one-tailed test), however the relationship was negative, opposite the hypothesized direction.

Univariate results for PLANNING $CULTURE_2$ indicated that various neighborhood, areas, or regional plans containing recommendations for Superfund site redevelopment had been developed for approximately half of the study sites. Bivariate results based upon Pearson's r and Kendall's tau-b measures of association indicated a positive and modest statistically significant level of association with only one of the dependent variables, REUSE ON $TRACK\_1_D$ ($p<.05$, two-tailed test), matching the hypothesized direction. This suggests that sites located in areas that have neighborhood, area, or regional plans in place are more likely to be redeveloped, or on track for redevelopment than sites which do not. However, the overall evidence suggests that larger-scale (e.g., neighborhood, area, or regional) planning efforts that include recommendations for redeveloping the site has a limited impact at most on site redevelopment. This may be because such plans do not provide the level of detail needed to facilitate site redevelopment.

Univariate results for PLANNING $CULTURE_3$ indicated that about one-third of the sites in the sample were located in states classified by Yin and Sun (2007) as growth management states. Bivariate results for PLANNING $CULTURE_3$ based upon Pearson and Kendall correlations indicated no statistically significant level of association between PLANNING $CULTURE_3$ and any of the dependent variables. Although the estimated directions of the coefficients were generally positive, consistent with the hypothesized direction, in one instance, a negative relationship was revealed. Overall, evidence that the effect of PLANNING CULTURE is marginal at best, irrespective of planning culture exhibited at the neighborhood/area/regional, county, or state level as identified through the three PLANNING CULTURE variables. Only PLANNING CULTURE$_2$ exhibited a positive and statistically significant effect, but its affect did not persist across the different dependent variables.

Two variables were tested that reflect REGIONAL MARKET STRENGTH. The first is a continuous ratio measure based on 2000 U.S. Census data that reflects the median household income for counties containing study sites (REGIONAL MARKET STRENGTH$_1$). The second is also a continuous ratio measure based on 2000 U.S Census data indicating the percentage population change for counties containing selected sites over a period of 15 years (1990-2005) (REGIONAL MARKET STRENGTH$_2$). Univariate results for REGIONAL MARKET STRENGTH$_1$ revealed that the average median household income for counties containing sites in the study set was $42,000, ranging from a low of $26,500 to a high of $74,300. Due to problems with skewness and kurtosis, however, the variable was transformed into a quartile version based on the original variable where the first quartile represents counties containing study set sites with the lowest median household incomes and the fourth quartile represents counties containing study set sites with the highest (REGIONAL MARKET STRENGTH$_{1\text{-}B}$). Bivariate results based upon Pearson's r and Kendall's tau-b measures of association demonstrated a positive and marginal statistically significant level of association with only one of the four REUSE ON TRACK dependent variables, REUSE ON $TRACK_1$ ($p<.10$, one-tailed test), consistent with the hypothesized direction. Univariate results for REUSE ON $TRACK_2$ showed that the average population change for counties containing sites in the sample was 20.3 percent, ranging from -7.7 percent to 82 percent. Due to problems with skewness, however, the variable was transformed into a quartile version based on the original variable where the first quartile represents counties containing sites in the sample with the lowest percentage population change and the fourth quartile represents counties containing sites in the sample with the highest (REGIONAL MARKET $STRENGTH_{2\text{-}B}$). Bivariate results based upon both Pearson and Kendall correlations did not reveal statistically significant levels of association with any of the REUSE ON TRACK dependent variables. However, the estimated directions of the relationship across all four dependent variables matched the hypothesized direction. Results from both variables provide little evidence that REGIONAL MARKET STRENGTH has a positive, statistically significant, and persistent effect on Superfund site redevelopment.

6.1.1.5. Independent Variables: Redevelopment Factors

Four types of variables representing redevelopment factors theorized to impact Superfund site redevelopment were also tested: INCENTIVES, SITE-OWNER SUPPORT, PLANNING TIMING, and PLANNING TYPE. Two INCENTIVES variables were developed, however, only the results from the second INCENTIVES variable ($INCENTIVES_2$) are presented due to the low number of valid responses for the first. $INCENTIVES_2$ is a dichotomous (ordinal-level) variable that incorporates results that form the basis for the first variable. To be classified as a “1,” the RPM had to indicate that a developer of a particular site was/will be granted public-sector financial incentives (e.g., lien waivers, tax exemptions, tax deductions, low-interest loans) to redevelop the site *or* that the site was/is located in any economic development districts, either prior to redevelopment or at the time of the survey (if the site was not already redeveloped); otherwise it was marked as a “0.” Univariate results indicate that about 36 percent of the sites were classified as a “1.” Bivariate results based upon both Pearson’s r and Kendall’s tau-b indicated positive and statistically significant levels of association across all four dependent variables ranging from marginal ($p<.10$, one-tailed test) to high ($p<.01$, two-tailed test), consistent with the hypothesized direction. INCENTIVES_2’s level of association was strongest with REUSE ON $\text{TRACK}_{1\text{-D}}$ ($p<.01$, 2-tailed test) and weakest with REUSE ON TRACK_2 (by 2008) ($p<.10$, 1-tailed test). Results here suggest that economic development incentives do have a positive, significant, and persistent effect on the chances that Superfund sites will be redeveloped.

SITE-OWNER SUPPORT is a 1-5 ordinal-scale variable based on survey data indicating the level of interest expressed by the site owner(s) in returning the site to productive use. Univariate results indicate that sites on average had moderate support from owners for reuse. Bivariate results based upon Pearson’s r correlation coefficients indicated positive and statistically significant levels of association between all dependent variables except REUSE ON TRACK_2 (by 2008) ranging from marginal ($p<.10$, two-tailed test) to high ($p<.01$, two-tailed test), consistent with the hypothesized direction. Results based upon Kendall’s tau-b measure were similar, but the levels of statistical significance were slightly less. Results here provide evidence that the support of site owners is important for helping facilitate redevelopment of Superfund sites.

PLANNING TIMING is a dichotomous (ordinal-scale) variable based on survey data indicating whether efforts to plan for the redevelopment of the site took/are taking place prior to or during key decisions about site remedies, or otherwise. Univariate results indicated that about 64 percent of sites engaged in pre-remedy implementation reuse planning. Bivariate results based upon both Pearson's r and Kendall's tau-b indicated positive and statistically significant levels of association ranging from marginal ($p<.10$, one-tailed test) to moderate ($p<.05$, two-tailed test) with two of the dependent variables: REUSE ON TRACK$_1$ and REUSE ON TRACK$_{2\text{-}D}$. Overall, results here provide some evidence that reuse planning prior to or during remedy design positively impacts redevelopment opportunities.

Five PLANNING TYPE variables were tested. PLANNING TYPE$_1$ is a 1-5 ordinal-scale variable based on survey data indicating the extent to which there were/are specific efforts being undertaken to plan for the redevelopment of the site. Univariate analysis indicated that the average extent to which efforts were undertaken to plan for the redevelopment of the site was between "some" and "high." Bivariate results based upon Pearson's and Kendall's tau-b measures of association indicated positive and very high statistically significant levels of association with three of the dependent variables ($p<.001$, two-tailed test), and a moderate level of association ($p<.05$, 2-tailed test) with one – REUSE ON TRACK$_2$ (by 2008).

PLANNING $TYPE_2$ is a 1-5 ordinal variable based on survey data indicating the extent to which a wide-range of stakeholders was/were being consistently involved in efforts to plan for the redevelopment of the site. Univariate analysis indicated that the average extent of consistent stakeholder involvement was perceived as "some." Bivariate results based upon both Pearson's and Kendall's correlation coefficients revealed positive and high and very high statistically significant levels of association with three of the dependent variables, and a moderate level of association ($p<.10$, 2-tailed test, for Pearson's r only)[12] with REUSE ON $TRACK_2$ (by 2008).

PLANNING $TYPE_3$ is a dichotomous version of PLANNING $TYPE_2$ indicating whether a wide range of stakeholders was/is being involved in efforts to plan for the redevelopment of the site at a high/very high extent or not. Univariate analysis revealed that only 11 percent of sites in the sample consistently involved stakeholders at a high or very high extent. Bivariate results based upon Pearson's r and Kendall's tau-b measures of association revealed positive and marginal to moderate levels of statistically significance between two of the dependent variables: REUSE ON $TRACK_1$ and REUSE ON $TRACK_{1\text{-}D}$.

PLANNING $TYPE_4$ is a summated index variable based on survey data indicating the number of stakeholders that were/were (being) consistently involved in efforts to plan for the redevelopment of the site. Univariate analysis indicated that on average nearly four types of stakeholders were consistently involved, with a low of zero and a high of

[12] The level of statistical significance for the correlation between PLANNING $TYPE_2$ and ROT_2 (by 2008) based on Kendall's tau-b was slightly higher ($p<.05$, two-tailed test).

nine. Bivariate results based upon Pearson's and Kendall's correlation coefficients indicated positive and high to very high statistically significant levels of association with three of the dependent variables, and a moderate level of association ($p<.05$, 1-tailed test) with one (REUSE ON $TRACK_2$ (by 2008)).

PLANNING $TYPE_5$ is a dichotomous (ordinal-scale) variable based on survey data indicating whether an interactive, face-to-face, multi-stakeholder decision making process was used to generate recommendations for reusing the site for the most recently completed plan for the site. Unlike nearly all other variables discussed so far, this variable had only 33 valid responses. It is discussed here because it is such an import overall variable for this study. Univariate analysis indicated that of the sites that had completed reuse plans, approximately 80 percent engaged in some form of face-to-face, multi-stakeholder decision making process. Bivariate results based upon Pearson's r and Kendall's tau-b measures of association did not reveal any statistically significant level of association with any of the dependent variables, although the estimated directions of the relationship were positive across all coefficients. Overall, results from the bivariate analyses of the PLANING TYPE variables provide evidence in support of the theory that collaborative planning has positive, significant, and persistent effect on the likelihood that Superfund sites will be redeveloped.

In addition to examining correlations between each of the PLANNING TYPE variables and the dependent variables, I also examined correlations between each of the PLANNNG TYPE variables specifically (see Table 16). Bivariate results based upon Pearson's r and Kendall's tau-b correlation measures indicated positive and very high statistically significant levels of association between the PLANNING $TYPE_{1\text{-}4}$ variables. PLANNING $TYPE_5$ exhibited statistically significant correlations with PLANNING $TYPE_{1\text{-}2}$, but exhibited no such levels of association with PLANNING $TYPE_{3\text{-}4}$. Overall, these results suggest that it is difficult to separate out collaboration from the act of planning itself; planning may be inherently collaborative to some degree, particularly in the Superfund land use planning context.

Table 16. Descriptive Statistics and Correlation Coefficients for PLANNING TYPE Variables

Results based on Pearson's r

					PLANNING $TYPE_1$		**PLANNING $TYPE_2$**		**PLANNING $TYPE_3$**		**PLANNING $TYPE_4$**		**PLANNING $TYPE_5$**	
	N	Range	Mean	S.D.	R	2-t	R	2-t	R	2-t	R	2-t	R	2-t
PLANNING $TYPE_1$	70	1-5	3.37	1.20	1.00	---	0.61	***	0.38	**	0.67	***	0.51	**
PLANNING $TYPE_2$	70	1-5	2.91	1.26	0.61	***	1.00	---	0.60	***	0.56	***	0.42	*
PLANNING $TYPE_3$	70	0-1	0.11	0.32	0.38	**	0.60	***	1.00	---	0.42	***	0.24	---
PLANNING $TYPE_4$	67	0-9	3.45	1.94	0.67	***	0.56	***	0.42	***	1.00	---	0.27	---
PLANNING $TYPE_5$	33	0-1	0.82	0.39	0.51	**	0.42	*	0.24	---	0.27	---	1.00	---

Results based on Kendall's Tau-b

					PLANNING $TYPE_1$		**PLANNING $TYPE_2$**		**PLANNING $TYPE_3$**		**PLANNING $TYPE_4$**		**PLAN. $TYPE_5$**	
	N	Range	Mean	S.D.	R	2-t	R	2-t	R	2-t	R	2-t	R	2-t
PLANNING $TYPE_1$	70	1-5	3.37	1.20	1.00	---	0.51	***	0.35	**	0.55	***	0.46	**
PLANNING $TYPE_2$	70	1-5	2.91	1.26	0.51	***	1.00	---	0.50	***	0.45	***	0.43	**
PLANNING $TYPE_3$	70	0-1	0.11	0.32	0.35	**	0.50	***	1.00	---	0.30	**	0.24	---
PLANNING $TYPE_4$	67	0-9	3.45	1.94	0.55	***	0.45	***	0.30	**	1.00	---	0.25	---
PLANNING $TYPE_5$	33	0-1	0.82	0.39	0.46	**	0.43	**	0.24	---	0.25	---	1.00	---

1. †p<.10; *p<.05; **p<.01;***p<.001
2. 2-t denotes significance derived from p-value for two-tailed significance test.

6.1.1.6. Independent Variables: Moderating Effects

Finally, I examined the impact of interacting the dichotomous variable LAND USE COMMERCIAL/RESIDENTIAL (L_U_CR) based upon survey data indicating whether or not land uses immediately surrounding sites in the sample included commercial or residential land uses with each of the PLANNING TYPE variables. The theory behind this is that planning, and collaborative planning in particular, should show a greater effect on the dependent variables if the site is located in a commercial or residential setting. Univariate analysis indicated that 87 percent of the sites were at least partially surrounded by residential or commercial uses. Bivariate results of the interaction term based upon Pearson correlation coefficients indicated marginal to very high positive and statistically significant levels of association between the PLANNING $\text{TYPE}_{1\text{-}4}$ variables. Results based upon Kendall's tau-b correlations were nearly identical. At first glance, this may suggest that surrounding land use does moderate planning's impact on reuse outcomes. However, an examination of the Pearson correlation coefficients and statistical significance levels for each of PLANNING TYPE variables and the dependent variables with coefficients for each of the interaction terms and the dependent variables do not suggest that surrounding land use has any effect as the correlations and levels of significance are essentially identical between the two. This should not be that surprising given the high number of sites indicating in the sample at least partially surrounded by commercial or residential land uses. However, a larger sample size may reveal that surrounding land use does affect collaborative planning effect on reuse.

6.1.2. Regression Analysis of the Superfund Site Redevelopment Model

Although a high number of variables correlated with many of the dependent variables, and the PLANNING TYPE variables proved to be particularly robust, bivariate analysis does not permit testing of individual variables of interest on the dependent variables while simultaneously controlling for other independent variables that could also be exerting an impact on the dependent variables. Ideally I could have applied the full model in a multiple regression framework. The limited size of my sample required me to make some difficult decisions about the variables I could test using regression analysis.

To do this, I first spent considerable time examining patterns of significance across the different independent and dependent variables. Close examination of the Pearson correlation coefficients and corresponding Kendall tau-b measures of association indicated that at least one predictive variable within each of the three major sets of predictive factors (e.g., site-specific, neighborhood/regional, redevelopment) plus controls exhibited a statistically significant relationship with one or more of the dependent variables. Moreover, of the 18 factors included in the model, 12 of the 18 factors exhibited a statistically significant impact on at least one of the dependent variables. However, the levels of significance fluctuated from marginal to very high levels of statistical significance, and in a few instances the direction of the estimated correlation measures fell in the unanticipated direction (e.g., SITE OWNERSHIP).

The factors included as part of the control variables exhibited mixed results in the bivariate analysis. Three of the six predictors correlated at a statistically significant level with one or more of the REUSE ON TRACK dependent variables; whereas SITE SIZE, SUPERFUND SITE YEARS, and SOUTH/WEST did not show any statistically significant levels of association. Of the six control variables, SITE READINESS FOR REUSE_1 (by 2008) and SITE READINESS FOR REUSE_2 (by 2012) most consistently correlated with the dependent variables. Of the site-specific factors tested, SITE REDEVELOPMENT SUITABILTIY and SITE LOCATION $\text{SUITABILITY}_{1,2,\text{and } 3}$ all consistently correlated with the REUSE ON TRACK dependent variables at a statistically significant level. In contrast, SITE $\text{CONTAMINATION}_{1 \text{ and } 2}$ did not correlate with the dependent variables to any statistically significant degree.

Among the neighborhood/regional factors theorized to impact reuse, at least one variable representing each of the four predictive factors showed a statistically significant association with the REUSE ON TRACK variables in the bivariate analysis. The impact of REGIONAL MARKET $\text{STRENGTH}_{1\text{-B and }2\text{-B}}$ and PLANNING $\text{CULTURE}_{1\text{-B, }2\text{, and }3}$ were not consistent, in contrast with the consistent statistically significant correlations between NEIGHBORHOOD MARKET $\text{STRENGTH}_{1\text{-B and }2}$, NEIGHBORHOOD LAND AVAILABILITY and the dependent variables.

Of the four redevelopment factors assessed in the bivariate analysis, each exhibited statistically significant correlations with two or more of the dependent variables. Of these, PLANNING TIMING exhibited the least consistent pattern of correlation (correlating at a statistically significant level with only two of the REUSE ON TRACK dependent variables). In contrast, at least three of the five PLANNING TYPE variables correlated with every dependent variable. Table 17 summarizes the results of the bivariate analysis from a simplified perspective.

Table 17. Significance of Variables included as Part of Superfund Site Redevelopment Model, using Pearson's R and Kendall's Tau-b Measures of Association

	REUSE ON TRACK$_1$			REUSE ON TRACK$_{1\text{-}D}$			REUSE ON TRACK$_2$ (by 2008)			REUSE ON TRACK$_2$ (by 2012)			
	1-t	2-t	H=E?	1-t	2-t	H=E?	1-t	2-t	H=E?	1-t	2-t	H=E?	
Site-Specific Factors													
Site Redevelopment Suitability	***	**	+ = +	***	***	+ = +	*	*	+ = +	***	***	+ = +	P
	**	**	+ = +	***	***	+ = +	*	*	+ = +	***	***	+ = +	K
Site Location Suitability$_{1, 2, 3}^{\infty}$	*** / * / *	*** / † / *	+ = +++	** / * / *	** / * / *	+ = +++	** / - / -	** / - / -	+ = +-+	***/ †/ **	*** / - / *	+ = +++	P
	*** / * / *	** / † / *	+ = +++	** / * / *	* / * / *	+ = +++	** / - / †	* / - / -	+ = +++	***/† / **	*** / - / *	+ = +++	K
Site Contamination$_{1, 2\text{-}B}^{\infty}$	- / -	- / -	- = -+	- / -	- / -	- = -+	- / -	- / -	- = --	- / -	- / -	- = +-	P
	- / -	- / -	- = ++	- / -	- / -	- = -+	- / -	- / -	- = --	- / -	- / -	- = +-	K
Site Ownership$^{\infty}$	-	-	+ = -	-	-	+ = -	-	-	+ = -	†	-	+ = -	P
	-	-	+ = +	-	-	+ = -	-	-	+ = -	†	-	+ = -	K
Neighborhood/ Regional Factors													
Neighborhood Market Strength$_{1\text{-}B, 2}$	† / **	- / **	+ = ++	† / **	- / **	+ = ++	* / *	† / *	+ = ++	** / ***	** / ***	+ = ++	P
	* / **	† / **	+ = ++	† / **	- / **	+ = ++	* / **	* / *	+ = ++	** / ***	** / ***	+ = ++	K
Neighborhood Land Availability	*	†	- = -	†	-	- = -	-	-	- = -	*	*	- = -	P
	*	†	- = +	†	-	- = -	-	-	- = -	†	-	- = -	K
Planning Culture$_{1\text{-}B, 2, 3}^{\infty}$	- / - / -	- / - / -	+ = -++	- / * / -	- / * / -	+ = -++	- / - / -	- / - / -	+ = -++	- / - / -	- / - / -	+ = -+-	P
	- / - / -	- / - / -	+ = +++	- / * / -	- / * / -	+ = -++	+ / - / -	- / - / -	+ = -++	- / - / -	- / - / -	+ = -++	K
Regional Market Strength$_{1\text{-}B\ \text{Or}\ 2\text{-}B}^{\infty}$	† / -	- / -	+ = ++	- / -	- / -	+ = ++	- / -	- / -	+ = -+	- / -	- / -	+ = -+	P
	† / -	- / -	+ = ++	- / -	- / -	+ = ++	- / -	- / -	+ = -+	- / -	- / -	+ = -+	K
Redevelopment Factors													
Incentives$_2$	**	**	+ = +	**	**	+ = +	†	-	+ = +	*	*	+ = +	P
	**	*	+ = +	**	**	+ = +	†	-	+ = +	**	*	+ = +	K
Site-Owner Support$^{\infty}$	*	†	+ = +	**	**	+ = +	-	-	+ = -	**	*	+ = +	P
	†	-	+ = +	**	*	+ = +	-	-	+ = +	*	*	+ = +	K
Planning Type$_{1\text{-}2}^{\infty}$	*** / ***	*** / ***	+ = ++	*** / ***	*** / ***	+ = ++	* / *	* / †	+ = ++	*** / ***	*** / **	+ = ++	P
	*** / ***	*** / ***	+ = ++	*** / ***	*** / ***	+ = ++	** / *	* / *	+ = ++	*** / **	*** / **	+ = ++	K

Planning Type$_{3-4}$∞	† / ***	/ ***	+ = ++	* / ***	* / ***	+ = ++	- / *	- / †	+ = ++	- / **	- / **	+ = ++	P
	* / ***	† / ***	+ = ++	* / ***	* / ***	+ = ++	- / *	- / †	+ = -+	- / **	- / *	+ = ++	K
Planning Type$_5$∞	-	-	+ = +	-	-	+ = +	-	-	+ = +	-	-	+ = +	P
	-	-	+ = +	-	-	+ = +	-	-	+ = +	-	-	+ = +	K
Planning Timing	*	*	+ = +	*	*	+ = +	-	-	+ = +	-	-	+ = +	P
	*	†	+ = +	*	*	+ = +	-	-	+ = +	-	-	+ = +	K
Controls													
Site Readiness For Reuse$_{1,2}$∞	*** / **	*** / *	+ = ++	*** / **	** / **	+ = ++	** / -	** / -	+ = ++	- / *	- / †	+ = ++	P
	*** / †	*** / -	+ = ++	*** / *	** / *	+ = ++	** / -	** / -	+ = ++	† / -	- / -	+ = ++	K
Cleanup Intensity∞	-	-	+ = +	-	-	+ = +	-	-	+ = -	-	-	+ = +	P
	-		+ = +	-	-	+ = +	-	-	+ = -	-	-	+ = -	K
County Population$_b$	**	*	+ = +	-	-	+ = +	*	+	+ = +	-	-	+ = +	P
	**	*	+ = +	-	-	+ = +	-	-	+ = +	-	-	+ = +	K
Site Size	-	-	+- = -	-	-	+ - = +	-	-	+ - = -	-	-	+ - = -	P
	-	-	+- = +	-	-	+- = +	-	-	+ - = -	-	-	+ - = -	K
Superfund Site Age∞	-	-	+ = -	-	-	+ = +	-	-	+ = -	-	-	+ = -	P
	na	Na	na	na	na	na	na	na	na	na	Na	na	K
South/West∞	-	-	+ = -	-	-	+ = +	-	-	+ = +	-	-	+ = +	P
	-	-	+ = +	-	-	+ = +	-	-	+ = +	-	-	+ = +	K

1. †p<.10; *p<.05; **p<.01;***p<.001
2. In cells, figures on top refer to significance levels derived from Pearson correlation coefficients; figures on bottom row refer to Kendall's tau-b correlation coefficients. A "-" denotes no statistical significance.
3. "H=E?" denotes "Hypothesized direction of relationship equals estimated direction of relationship?" In cells, the top row refers to directions estimates from Pearson correlation coefficients, the bottom row refers to estimates derived from Kendall's tau-b coefficients. For example, "+ = + - -" indicates that the hypothesized direction of the association between the variable (or set of variables) in the corresponding row and the dependent variable is positive, and the estimated direction was positive (+) for the first variable, negative (-) for the second variable, and negative (-) for the third variable.
4. 1-t/2-t denotes significance derived from p-value for one-tailed/two-tailed significance test.

To further specify my model to test in the regression framework, I also examined correlations across all independent variables included as part of the full model to determine if any could be excluded because of a high level of linear association with each other. As stated, many of the correlations were significant, however, none approached an absolute value of .85 indicating multicollinearity. The Pearson correlation coefficient for SITE REDEVELOPMENT SUITABILITY and SITE LOCATION $SUITABILTIY_1$ was moderate, however, at .59 and highly significant ($p<.001$, two-tailed test). Other correlations that stood out included REGIONAL MARKET $STRENGTH_{1-B}$ with COUNTY $POPULATION_2$ ($r = .61$, $p<.001$, two-tailed test). NEIGHBORHOOD MARKET $STRENGTH_2$ exhibited a correlation with $INCENTIVE_2$ of 0.47 ($p<.01$, two-tailed test). I also examined the correlation between NEIGHBORHOOD LAND AVAILABILITY and NEIGHBORHOOD MARKET $STRENGTH_2$. Although considerably lower than the correlations discussed above at 0.23, this correlation was statistically significant ($p<.05$, two-tailed test), suggesting that as development pressure around the site increased, the amount of nearby available land around Superfund sites in the sample decreased.

Ultimately I chose a model based upon six independent variables comprised of three control variables and one variable from each of the three main predictive categories included in my Superfund site redevelopment model: site-specific, neighborhood/regional, and redevelopment. The three control variables include: SITE READINESS FOR $REUSE_{1 \text{ and } 2}$ (by 2008/2012), COUNTY $POPULATION_B$, and SUPERFUND SITE AGE. Three control variables were selected to account for the wide divergence of sites on key characteristics (e.g., the extent to which a site is ready for reuse now (or would be by 2012), the population of the county in which the site is located, and the years elapsed between 2008 and when the site was listed as final on the National Priorities List. Of the three controls variables selected, SITE READINESS FOR REUSE$_{1\text{ and }2}$ (by 2008/2012) exhibited a consistent and statistically significant association across each of the dependent variables; COUNTY POPULATION$_{B}$ demonstrated a statistically significant degree of association with two of the four dependent variables. SUPERFUND SITE AGE did not exhibit a statistically significant effect across any of the dependent variables; however, I felt strongly that a variable needed to be included to account for the differing ages of the sites. Apart from the need to exclude certain variables from the regression analysis because of sample size limitations, of the remaining two control variables, SITE SIZE was not included because the variable did not show any statistically significant level of association with any of the dependent variables in the bivariate analysis; moreover, I lacked confidence in the acreage data because, historically, collection of acreage data has been inconsistent. Lastly, SOUTH/WEST was excluded because it did not correlate to any statistically significant degree with any of the dependent variables, and moreover, the theory behind this variable – that sites in the Census-defined West or South would be more likely to be redeveloped than sites that are not – was not well-developed.

SITE LOCATION SUITABILITY$_{1}$ was selected as the variable to represent site-specific factors. SITE LOCATION SUITABILITY$_{1}$ demonstrated a consistent statistically significant effect across each of the dependent variables in the bivariate analysis. I debated at length however over whether SITE REDEVELOPMENT SUITABILITY – also consistently statistically significant in correlations with all four dependent variables – would be a better predictor, believing that perhaps SITE LOCATION SUITABILITY$_1$ is actually a proxy for NEIGHBORHOOD MARKET STRENGTH$_2$. In fact, SITE LOCATION SUITABILITY$_1$ does exhibit a marginal statistically significant degree of association with NEIGHBORHOOD MARKET STRENGTH$_2$ ($p<.10$, two-tailed test, Pearson's r). I also ran exact versions of regression models substituting SITE REDEVELOPMENT SUITABILITY for SITE LOCATION SUITABILITY$_1$, however, including SITE REDEVELOPMENT SUITABILITY over SITE LOCATION SUITABILITY$_1$ did not significantly improve the models. I ultimately chose to retain SITE LOCATION SUITABILITY$_1$ over SITE REDEVELOPMENT SUITABILITY feeling that well-suited sites with poor site-specific redevelopment characteristics (e.g., uneven topography) are likely more enticing for development than poorly-located sites with excellent site-specific redevelopment characteristics. Of the remaining site-specific factors not included, neither SITE CONTAMINATION correlated significantly with any of the dependent variables; moreover, I was not convinced that either SITE CONTAMINATION variable effectively measured the degree of contamination/health risk at each site. Finally, SITE OWNERSHIP was excluded because it correlated poorly with the dependent variables with the exception of one marginally statistically significant correlation with REUSE ON TRACK$_2$ (by 2012); furthermore, the large amount of missing observations on this variable significantly reduced my degrees of freedom when running regression analyses.

As alluded to above, NEIGHBORHOOD MARKET STRENGTH$_2$ was selected as the lone neighborhood/regional factor for the regression model. Although NEIGHBORHOOD MARKET STRENGTH$_1$ correlated at a statistically significant level with each of the four dependent variables, I preferred the NEIGHBORHOOD MARKET STRENGTH$_2$ since, as a measure based on survey data, I felt it better reflected actual conditions immediately around the site. Although NEIGHBORHOOD LAND AVAILABILITY correlated significantly with three of the four dependent variables, its significance tended to be moderate to marginal. Moreover, the statistically significant correlation between NEIGHBORHOOD LAND AVAILABILITY and NEIGHBORHOOD MARKET STRENGTH$_2$ suggested that it would be appropriate to exclude. PLANNING CULTURE predictors were excluded because they generally did not correlate significantly with the dependent variables. Only PLANNING CULTURE$_2$ correlated at levels that were statistically significant; however, it only correlated at a statistically significant level with only two of the four dependent variables and the correlations were marginal ($p<.10$, one-tailed test, Pearson's r). Finally, of the REGIONAL MARKET STRENGTH predictors, only REGIONAL MARKET STRENGTH$_{1\text{-}B}$ correlated with any of the dependent variables. However, it only correlated with one dependent variable and the strength of association was only marginally statistically significant level ($p<.10$, one-tailed test, Pearson's r). Moreover, REGIONAL MARKET STRENGTH$_{1\text{-}B}$ correlated somewhat strongly and at a significant level with COUNTY POPULATION$_2$ ($r=.61$, $p<.001$, two-tailed test), the control variable already selected for inclusion in the final model to be tested via OLS regression.

Of the redevelopment predictors, I chose to test four of the five PLANNING TYPE variables, as these represented the key variables of interest for this study. PLANNING $TYPE_5$ was not tested, however, because of the considerable missing data for this variable. Although correlations between $INCENTIVES_2$ and each of dependent variables were strong, this variable was similarly ruled out because of the large amount of missing data on this variable. SITE-OWNER SUPPORT was likewise excluded because of a high number of missing observations. Finally, PLANNING TIMING was kept aside because it correlated significantly with only two of the four dependent variables, and, moreover, the statistical strength of the association was marginal ($p<.10$, two-tailed test, Pearson's r).

To begin understanding whether the effect of PLANNING TYPE on redevelopment dependent variables remained persistent, positive, and statistically significant, I first ran a series of step-by-step regressions starting first with PLANNING TYPE variable (Step 1), then adding control variables (Step 2), the site-specific predictor (Step 3), and then the neighborhood/regional predictor (Step 4). In total, I ran four different regressions using PLANNING $TYPE_1$, starting first only with PLANNING $TYPE_1$ and then gradually adding more predictor variables to the model (Model 1). I then repeated this process with the PLANNING $TYPE_{2,\ 3,\ \text{and}\ 4}$ variables (Model 2, Model 3, and Model 4). Results of this analysis are presented in Table 18.

Table 18. Partial Correlation Coefficients for PLANNING TYPE and Other Predictors on Superfund Site Reuse on Track$_1$ Using Multi-Step Approach

Model 1	**Step 1**	**1-t**	**2-t**	**Step 2**	**1-t**	**2-t**	**Step 3**	**1-t**	**2-t**	**Step 4**	**1-t**	**2-t**
Planning Type$_1$	1.02	***	***	0.89	***	***	0.83	***	***	0.82	***	***
Site Read. for Reuse$_1$ (by '08)				1.69	***	***	1.62	***	***	1.59	***	***
County Population$_B$				0.24			0.24	†		0.15		
Superfund Site Age				-0.06	*	*	-0.06	*	*	-0.06	*	*
Site Location Suitabiltiy$_1$§							0.19			0.11		
Neighborhood Market Strength$_2$§										0.35	*	†
F-Value / d.f.	41.8 / 61			22.2 / 58			18.0 / 57			16.4 / 56		
Adj.R 2	0.40			0.58			0.58			0.60		

Model 2	**Step 1**	**1-t**	**2-t**	**Step 2**	**1-t**	**2-t**	**Step 3**	**1-t**	**2-t**	**Step 4**	**1-t**	**2-t**
Planning Type$_2$	0.68	***	***	0.58	***	***	0.48	**	**	0.46	**	**
Site Read. for Reuse$_1$(by '08)				1.83	***	***	1.64	***	***	1.61	***	***
County Population$_B$				0.33	*	†	0.32	*	†	0.23	†	
Superfund Site Age				-0.05	†		-0.05	†		-0.05	†	
Site Location Suitabiltiy$_1$§							0.46	*	*	0.38	*	†
Neighborhood Market Strength$_2$§										0.34	†	
F-Value / d.f.	15.4 / 61			11.7 / 58			11.02/ 57			9.9 / 56		
Adj.R 2	0.19			0.41			0.45			0.46		

Model 3	**Step 1**	**1-t**	**2-t**	**Step 2**	**1-t**	**2-t**	**Step 3**	**1-t**	**2-t**	**Step 4**	**1-t**	**2-t**
Planning Type$_3$	1.25	†		0.46			0.14			0.25		
Site Read. for Reuse$_1$ (by '08)				1.87	***	***	1.63	***	**	1.59	***	**
County Population$_B$				0.39	*	*	0.37	*	†	0.26	†	
Superfund Site Age				-0.07	*	†	-0.06	†		-0.06	†	
Site Location Suitabiltiy$_1$§							0.64	**	**	0.53	**	*
Neighborhood Market Strength$_2$§										0.40	*	†
F-Value / d.f.	2.6 / 61			6.5 / 58			7.7 / 57			7.2 / 56		
Adj.R 2	0.02			0.26			0.35			0.38		

Model 4	Step 1	1-t	2-t	Step 2	1-t	2-t	Step 3	1-t	2-t	Step 4	1-t	2-t
Planning Type$_4$	0.45	***	***	0.38	***	***	0.32	***	**	0.32	**	**
Site Readiness for Reuse$_1$ (by '08)				0.43	***	***	1.59	***	***	1.56	***	***
County Population$_B$				0.18	†		0.28	†		0.16		
Superfund Site Age				0.03	*	†	-0.06	*	†	-0.06	*	†
Site Location Suitabiltiy$_1$§							0.42	*	*	0.30	†	
Neighborhood Market Strength$_2$§										0.44	*	*
F-Value / d.f.	16.4 / 59			11.4 / 56			10.6/ 55			10.2 / 54		
Adj.R 2	0.20			0.41			0.44			0.48		

1. 1-t/2-t denotes significance derived from p-value for one-tailed/two-tailed significance test: †p<.10; *p<.05; **p<.01;***p<.001

The F-values for each of the full models tested were statistically significant, although the F-values varied considerably depending upon the PLANNING TYPE independent variable applied. The amount of variation explained on the regressand REUSE ON TRACK$_1$ in each of the four full models varied considerably depending upon the PLANNING TYPE variable applied. The amount of variation explained on the dependent variable REUSE ON TRACK$_1$ was highest in Model 1 using PLANNING TYPE$_1$ as the key independent variable. PLANNING TYPE$_1$ indicates the extent to which planning was used as part of efforts to redevelop the site. Although not a collaborative planning variable per se, as noted above, it strongly correlates with each of the other PLANNING TYPE (collaborative planning type) variables tested here.

At least four of the independent variables included in each version of the full models (Step 4) tested exhibited a statistically significant effect on the dependent variable (REUSE ON TRACK$_1$), and at least five independent variables exhibited a statistically significant effect on the dependent variable in three versions of the full model. Moreover, all six regressors exerted a statistically significant effect on the regressand (REUSE ON TRACK$_1$) in one model (Model 2).

Of the control variables tested, SITE READINESS FOR REUSE$_1$ (by 2008) exhibited a positive and highly statistically significant effect in all four full models (Step 4), consistent with the hypothesized direction, holding all other variables constant. This finding predictably underscores the importance of site readiness for redevelopment, and in taking the steps necessary to ensure that sites can accommodate redevelopment activity. The influence of COUNTY POPULATION$_B$ consistently diminished as more variables were added to each of the different model versions tested. However, it exerted a positive but only marginally statistically significant impact on the dependent variable ($p<.10$, one-tailed test), holding other variables constant, in two of the four models, consistent with the hypothesized direction. This suggests that the population of counties containing sites in the sample may have a modest impact on the extent to which sites are redeveloped. The final control variable tested – SUPERFUND SITE AGE (SF_AGE) – exerted a negative but statistically significant effect in each of the four models tested. Interestingly, results across each of the four models consistently show SF_AGE as reducing the extent to which a Superfund site is redeveloped or on track for redevelopment, holding all other variables constant, counter to my hypothesis. One explanation for this may be that sites placed on the National Priorities List more recently are more likely to be redeveloped because reuse is now regularly taken into account; whereas because reuse was not a consideration for older sites, these sites tend to remain unused for longer periods of time. During the course of this research, for example, a former long-time EPA Superfund official remarked that in one EPA region containing numerous Superfund sites, during the early days of the Superfund program, the cleanup plans for sites in the region regularly involved undertaking the necessary cleanup and placing a chain link fence around the site assuming that nothing would be done with property afterward.

SITE LOCATION SUITABILITY$_1$ – the only site-specific predictor tested – exerted a positive but uneven effect on the regressands depending upon the PLANNING TYPE variable applied, holding all other predictor variables constant. For example, SITE LOCATION SUITABILITY$_1$exerted its highest level of statistical significance in the third version of the model ($p<.05$, two-tailed test), which had the lowest adjusted R^2 value of the four models tested. Although the direction of SITE LOCATION SUITABILITY$_1$'s influence was positive and consistent with my hypothesis, its effect overall effect was more pronounced in the models where specific collaborative PLANNING TYPE variables were included (Models 2-4). In fact, in Model 1 where the more general PLANNING TYPE variable is tested, SITE LOCATION SUITABILITY$_1$ exhibits no statistically significant effect at all. Overall, findings here suggest that SITE LOCATION SUITABILITY$_1$ plays an important role but not dominant role in the extent to which sites are redeveloped, or "on track" for redevelopment.

The lone neighborhood/market predictor tested – NEIGHBORHOOD MARKET STRENGTH$_2$ – exerted a positive effect on the dependent variable (REUSE ON TRACK$_1$) in each of the four models tested, consistent with theory. NEIGHBORHOOD MARKET STRENGTH$_2$'s level of statistical significance was highest in Model 4 that included the PLANNING $TYPE_4$ collaborative planning variables ($p<.05$, two-tailed test); its effect was lowest in Model 2 involving the PLANNING $TYPE_2$ collaborative planning variables ($p<.10$, one-tailed test). Results based upon the four different models tested here suggest that the importance of the neighborhood market strength on Superfund site redevelopment cannot be ruled out.

Regarding the different PLANNING TYPE variables tested, three of four exerted a positive and high statistically significant effect on the REUSE ON $TRACK_1$ dependent variable, even after controlling for control, site-specific, and neighborhood/regional variables. Of the six predictors tested, only SITE READINESS FOR REUSE exerted a more consistent and generally higher effect on the regressand than the PLANNIG TYPE variables. PLANNING $TYPE_1$ exhibited a positive and very high statistically significant effect on the regressand ($p<.001$, two-tailed test, $p<.01$, two-tailed test); the effect of PLANNING TYPE $_{2\text{ and }4}$ on the regressand were similar, exhibiting a positive and high statistically significant effect ($p<.01$, two-tailed test). Results for each of the four full models tested suggest that higher levels of planning more generally (PLANNING $TYPE_1$), higher levels of consistent, widespread stakeholder involvement (PLANNING $TYPE_2$), and higher numbers of stakeholders consistently involved in the planning process (PLANNING $TYPE_4$) improve the chances that Superfund sites has been redeveloped or is on track for redevelopment, holding constant all other factors. The statistical non-significance of the PLANNING $TYPE_3$, however, suggests that a threshold level effect distinguishing between two levels of planning – very high/ high or not, does not result in a statistically significant effect on redevelopment. Use of planning, planning with consistent and widespread stakeholder involvement, and higher numbers of stakeholder involved appear to be important whereas intensive levels of consistent widespread stakeholder involvement does not emerge as critical here.

I also examined the effect of each of the four PLANNING TYPE variables tested above on each of the dependent variables tested. Results for this analysis are presented in Table 19. I tested the full models across each of the four dependent variables first with PLANNING $TYPE_1$ (Model 1) as the key redevelopment-related variable, then with PLANNING $TYPE_2$ (Model 2) etc. A total of 16 regressions were run. Although the F-values and adjusted r^2 values vary across each of the regressions run depending upon the dependent and PLANNING TYPE variables included as part of the predictive model, some general patterns stand out. The F-values for each of the models testing REUSE ON $TRACK_1$ tended to be the highest with the largest levels of variation on the dependent variable explained irrespective of the PLANNING TYPE variable included. The one exception to this is the regression run on the dependent variable REUSE ON $TRACK_{1-D}$ testing PLANNING $TYPE_1$ (Model 1, B). In this instance, the amount of variation explained here (adjusted r^2 0.6) was the same as the amount of variation explained for the regression also using PLANNING $TYPE_1$ run against the REUSE ON $TRACK_1$ dependent variable (Model 1, A).

Table 19. Partial Correlation Coefficients for PLANNING TYPE1 and Other Predictors on the Four Superfund Site Reuse D.V.s (REUSE ON TRACK$_{1,1\text{-}D,\ 2,\ \text{and}\ 3}$)

Model 1	*A*			*B*			*C*		*D*			
	ROT_1	**1-t**	**2-t**	**ROT_1$_D$**	**1-t**	**2-t**	**ROT_2**	**1-t**	**2-t**	**ROT_3**	**1-t**	**2-t**
Planning Type$_1$	0.82	***	***	0.27	***	***	0.19			0.46	**	**
Site Readiness for Reuse$_1$ (by '08/'12)	1.59	***	***	0.33	***	***	1.36	**	*	0.12		
County Population$_B$	0.15			-0.05			0.20			-0.05		
Superfund Site Age	-0.06	*	*	0.00			-0.08	*	†	-0.04	†	
Site Location Suitabiltiy$_1$§	0.11			-0.04			0.41	†		0.56	***	**
Neighborhood Market Strength$_2$§	0.35	*	†	0.11	**	*	0.32			0.55	**	**
F-Value / d.f.	16.37 / 56			16.81 / 56			4.29 / 62			9.94 / 61		
Adj.R 2	0.60			0.60			0.23			0.44		

Model 2	*A*			*B*			*C*		*D*			
	ROT_1	**1-t**	**2-t**	**ROT_1$_D$**	**1-t**	**2-t**	**ROT_2**	**1-t**	**2-t**	**ROT_3**	**1-t**	**2-t**
Planning Type$_2$	0.46	**	**	0.16	***	***	0.12			0.12		
Site Readiness for Reuse$_1$ (by '08/'12)	1.61	***	***	0.34	**	**	1.38	**	*	1.38	**	*
County Population$_B$	0.23	†		-0.02			0.21			0.21		
Superfund Site Age	-0.05	†		0.00			-0.07	*	†	-0.07	*	†
Site Location Suitabiltiy$_1$§	0.38	*	†	0.04			0.46	*	†	0.46	*	†
Neighborhood Market Strength$_2$§	0.34	†		0.10	*	†	0.33	†		0.33	†	
F-Value / d.f.	9.93 / 56			7.57 / 56			4.19 / 62			4.19 / 62		
Adj.R 2	0.46			0.39			0.22			0.22		

Model 3	*A*			*B*			*C*		*D*			
	ROT_1	**1-t**	**2-t**	**ROT_1$_D$**	**1-t**	**2-t**	**ROT_2**	**1-t**	**2-t**	**ROT_3**	**1-t**	**2-t**
Planning Type$_3$	0.25			0.24	†		0.12			0.27		
Site Readiness for Reuse$_1$ (by '08/'12)	1.59	***	**	0.31	**	*	1.38	**	*	0.54		
County Population$_B$	0.26	†		-0.01			0.21			-0.02		
Superfund Site Age	-0.06	†		0.00			-0.07	*	†	-0.03		
Site Location Suitabiltiy$_1$§	0.53	**	*	0.09	†		0.46	*	†	0.73	***	***
Neighborhood Market Strength$_2$§	0.40	*	†	0.13	*	*	0.33	†		0.63	***	**
F-Value / d.f.	7.2 / 56			4.05 / 56			4.19 / 62			7.23 / 61		
Adj.R 2	0.48			0.23			0.22			0.36		

Model 4	***A***			***B***			***C***			***D***		
	ROT_1	**1-t**	**2-t**	**ROT_1$_D$**	**1-t**	**2-t**	**ROT_2**	**1-t**	**2-t**	**ROT_3**	**1-t**	**2-t**
Planning Type$_4$	0.32	**	**	0.09	***	**	0.09			0.17	*	†
Site Readiness for Reuse$_1$ (by '08/'12)	1.56	***	***	0.33	**	**	1.41	**	**	0.50		
County Population$_B$	0.16			-0.03			0.10			-0.07		
Superfund Site Age	-0.06	*	†	0.00			-0.09	*	*	-0.04		
Site Location Suitabiltiy$_1$§	0.30	†		0.03			0.35			0.62	**	**
Neighborhood Market Strength$_2$§	0.44	*	*	0.13	*	*	0.49	*	†	0.64	***	**
F-Value / d.f.	10.16 / 54			6.23 / 54			4.35 / 59			7.79 / 58		
Adj.R 2	0.48			0.34			0.24			0.39		

1-t/2-t denotes significance derived from p-value for one-tailed/two-tailed significance test: †p<.10; *p<.05; **p<.01;***p<.001
The Site Readiness for Reuse$_1$ (2012) is used instead of Site Readiness for Reuse$_1$ (2008) when testing the model on the ROT$_3$ (by 2012) dependent variable.

Regarding the controls across each of the 16 regressions run, SITE READINESS FOR REUSE (by 2008/2012) exhibited a consistent, positive, and moderate to very high statistically significant effect on three of the four dependent variables irrespective of the PLANNING TYPE variable used. SITE READINESS FOR REUSE (by 2012) was always substituted for SITE READINESS FOR REUSE (by 2008) to test the effect of the predictors on REUSE ON TRACK$_3$ (by 2012). Of the four regressions run using REUSE ON TRACK$_3$ (by 2012) as the dependent variable, SITE READINESS FOR REUSE (by 2012) was only significant in one regression (Model 2, D), the model in which PLANNING TYPE$_2$ was included. Its effect in this instance was positive and moderately statistically significant (p<.05, two-tailed test).

In contrast, the COUNTY POPULATION$_B$ control variable exerted a positive and statistically significant effect in only two regressions, both in model versions with REUSE ON TRACK$_1$ as the dependent variable – one involving the PLANNING TYPE$_2$ and the other involving the PLANNING TYPE$_3$ (Model 2A, Model 3A). In both instances where COUNTY $POPULATION_B$ was significant, however, the level of statistical significance was marginal ($p<.10$, one-tailed test). Overall, results suggest there is modest evidence that county population size does impact redevelopment outcomes.[13]

The effect of the control variable SUPERFUND SITE AGE on the dependent variables was much more consistent across the regressions run irrespective of the PLANNING TYPE variables tested. It exhibited a negative but statistically significant effect in results for ten of the 16 regressions run, counter to my hypothesis, although the significance levels were never high. Moreover, SUPERFUND SITE AGE exerted no statistically significant effect on any of the regressions run against the REUSE ON $TRACK_{1\text{-}D}$ dependent variable. Overall, these results lend support to theory that older Superfund sites are less likely to be redeveloped than newer ones.

SITE LOCATION $SUITABILITY_1$'s patterns of statistical significance across the four dependent variables were somewhat uneven; in eleven of the 16 regressions run, however, it exerted a marginal to very high statistically significant level of influence on the various dependent variables, controlling for all other factors, irrespective of the

[13] It can be argued that in a low power situation, it may be inappropriate to use transformed variables that lose information in the process of transformation (e.g., use of quartile transformation). To assess whether the results of this series of regression analyses would have changed significantly by using the original (continuous) version of the COUNTY POPULATION independent control variable, I ran the same series of regressions substituting the continuous version of this variable and then comparing results. Both sets of results are shown in Appendix J for comparison. Overall, it does not appear that use of the quartile version of the COUNTY POPULATION variable resulted in significantly different results versus regressions based on models that included the continuous version of COUNTY POPULATION. The statistical significance patterns for almost all variables across each of the models tend to mirror each other. Similarly, the F-scores and adjusted-R^2 values tend to be very similar. However, whereas the quartile version of COUNTY $POPULATION_B$ exerted a positive and statistically significant effect on the dependent variable in one instance (see Model 3A), the continuous version of this variable had no statistically significant effect in this instance. Interestingly, in the same model, the statistical significance level of continuous COUNTY POPULATION variable's effect on the dependent variable was higher than the level resulting from the quartile version (see Model 3D).

PLANNING TYPE variables applied. Its most pronounced effect was on the dependent variable REUSE ON $TRACK_3$ (by 2012) when PLANNING $TYPE_3$ was tested ($p<.001$, two-tailed test). SITE LOCATION $SUITABILITY_1$ tended to have its lowest level of impact on the REUSE ON $TRACK_{1\text{-}D}$ variable, where its effect was only statistically significant in one regression involving, again, PLANNING $TYPE_3$ (Model 3A). Overall, results here suggest that site location has a moderate effect on Superfund site redevelopment success.

Regarding the PLANNING TYPE variables, overall, these variables exerted a positive and statistically significant level of influence on the dependent variables in nine of the 16 regressions run. The PLANNING TYPE variables exerted a positive and statistically significant effect on each one of the dependent variables tested at least once, except for REUSE ON $TRACK_2$ (by 2008). Generally the level of statistical significance of each of these variables on the dependent variables, holding all other variables constant, ranged from high to very high ($p<.01$ to $p<.001$, two-tailed test). In a few instances, however, the level of statistical significance was marginal to moderate ($p<.10$ to $p<.05$, one-tailed test). Of the four PLANNING TYPE independent variables tested, PLANNING $TYPE_3$ was the weakest, exerting a statistically significant level of influence on only one dependent variable (ROT_1_D). In contrast, PLANNING $TYPE_1$ and PLANNING $TYPE_4$ exerted high and the mostly consistent statistically significant levels of impact on three of four dependent variables. Overall, results here suggest that both planning generally and collaborative planning exert a marginal to high influence on Superfund site redevelopment outcomes.

Because REUSE ON $TRACK_{1\text{-}D}$ is a dichotomous variable, and it is arguably not appropriate to test the effect of predictors on dichotomous variables using Ordinary Least Squares (OLS) regression techniques, I tested the effect of each of the four PLANNING TYPE variables on REUSE ON $TRACK_{1\text{-}D}$ also using logistic regression, and then compared the significance levels of results from both types of tests in the Table 20.

Table 20. Comparison of Significance Levels between Results for PLANNING TYPE and Other Predictors on the ROT_1_D Dependent Variables Based on OLS Regression and Logistic Regression Techniques

Model 1

	Partial Coefficients (OLS Regression)			Odds Ratios (Logistic Regression)		
	ROT_1_D	1-t	2-t	ROT_1_D	1-t	2-t
Planning $Type_1$	0.27	***	***	10.38	***	***
Site Readiness for $Reuse_1$ (by'08)	0.33	***	***	14.22	**	*
County $Population_B$	-0.05			0.90		
Superfund Site Age	0.00			1.01		
Site Location $Suitabiltiy_1$§	-0.04			0.63		
Neighborhood Market $Strength_2$§	0.11	**	*	2.52	+	
F-Value / d.f.	16.81 / 56			51.7 / 56		χ^2/ d.f.
Adj.R 2	0.60			0.77		Pseudo R^2

Model 2

	Partial Coefficients (OLS Regression)			Odds Ratios (Logistic Regression)		
	ROT_1_D	1-t	2-t	ROT_1_D	1-t	2-t
Planning $Type_2$	0.16	***	***	3.47	***	**
Site Readiness for $Reuse_1$ (by'08)	0.34	**	**	11.26	**	**
County $Population_B$	-0.02			0.91		
Superfund Site Age	0.00			1.03		
Site Location $Suitabiltiy_1$§	0.04			1.25		
Neighborhood Market $Strength_2$§	0.10	*	+	1.70		
F-Value / d.f.	9.93 / 56			34.1 / 56		χ^2/ d.f.
Adj.R 2	0.46			0.00		Pseudo R^2

Model 3[14]

	Partial Coefficients (OLS Regression)			Odds Ratios (Logistic Regression)		
	ROT_1$_D$	1-t	2-t	ROT_1$_D$	1-t	2-t
Planning Type$_3$	0.24	+		>999.999		
Site Readiness for Reuse$_1$ (by'08)	0.31	**	*	4.36	*	*
County Population$_B$	-0.01			0.95		
Superfund Site Age	0.00			0.99		
Site Location Suitabiltiy$_1$§	0.09	+		1.57	+	
Neighborhood Market Strength$_2$§	0.13	*	*	1.96	*	+
F-Value / d.f.	4.05 / 56			21.9 / 56		χ^2/ d.f.
Adj.R 2	0.23			0.00		Pseudo R^2

Model 4

	Partial Coefficients (OLS Regression)			Odds Ratios (Logistic Regression)		
	ROT_1$_D$	1-t	2-t	ROT_1$_D$	1-t	2-t
Planning Type$_4$	0.09	***	**	2.10	**	**
Site Readiness for Reuse$_1$ (by'08)	0.33	**	**	8.02	**	*
County Population$_B$	-0.03			0.93		
Superfund Site Age	0.00			0.98		
Site Location Suitabiltiy$_1$§	0.03			1.26		
Neighborhood Market Strength$_2$§	0.13	*	*	2.07	*	+
F-Value / d.f.	6.23 / 54			30.4 / 56		χ^2/ d.f.
Adj.R 2	0.34			0.00		Pseudo R^2

1-t/2-t denotes significance derived from p-value for one-tailed/two-tailed significance test: †p<.10; *p<.05; **p<.01;***p<.001

[14] SAS output indicated that "Quasi-complete separation of data points detected", implying that the model convergence status had not been satisfied, and that "Validity of the model fit is questionable."

Although results from Model Three based on logistic regression are suspect because the convergence criterion for the model was not satisfied; overall the degree of impact exerted by the predictors on the dichotomous dependent variable (REUSE ON $TRACK_{1\text{-}D}$) closely parallel each other, lending confidence in the findings based upon OLS regression.

6.1.3. OLS Regression Diagnostics

While conducting analysis of regressors on the four regressands, I also considered and examined the extent to which my regression models violated key assumptions of OLS regression (i.e., the Gauss-Markov assumptions). First, as I noted earlier, my independent variables do not all satisfy the criterion of being either quantitative or dichotomous (Musick, 2006): one variable is continuous (SUPERFUND SITE AGE), one variable is dichotomous (SITE READINESS FOR REUSE (by 2008/2012), and three are qualitative variables are treated as proxies for continuous, quantitative variables (COUNTY $POPULATION_B$, SITE LOCATION $SUITABILITY_1$, and NEIGHBORHOOD MARKET $STRENGTH_2$. Ideally I would have used the continuous version of COUNTY $POPULATION_B$; however, I did not because of the original COUNTY POPULATION variable's problems with skewness and kurtosis. Given this, ideally I should have tested COUNTY $POPULATION_B$, SITE LOCATION $SUITABILITY_1$, and NEIGHBORHOOD MARKET $STRENGTH_2$ as a set of dummy variables since the differences across the potential responses (low, medium, high, highest) are not constant. However, doing so would have greatly reduced my degrees of freedom already limited because of the low sample size and missing observations on various variables. Similarly, my dependent variables were not quantitative, continuous, or unbounded (Musick, 2006); instead my dependent variables included one qualitative-based dichotomous variable and three qualitative variables that I treated as proxies for continuous-level variables. Ideally, I would have only employed logistic regression to examine the effect of these predictors on the dichotomous dependent variable and utilized either ordered logit or multinomial logit regression to examine the effect of the predictors on the three qualitative dependent variables. However, to apply ordered or multinomial logistic techniques, even more stringent criteria would have needed to have been met than what is required by OLS regression, which I could not meet given the limitations of my data and small sample size.

Another key assumption is that no perfect multicollinearity should exist between "two or more of the independent variables" (Musick, 2006). A violation of this can result in highly inconsistent coefficient values and lead to erroneous conclusions about the effect of the various independent variables on the regressand (Musick, 2006). As noted above, even prior to testing my model, I searched for instances of high collinearity among independent variables to assist in determining if certain variables could readily be excluded from the model. As a result, I did not expect to violate the assumption of no perfect collinearity. A review of Pearson correlation coefficients between each of my variables showed that no correlations exceeded .37.[15] Moreover, the variance inflation

[15] Note I only tested for instances of collinearity using PLANNING $TYPE_1$ and PLANNING $TYPE_{3.}$

factors for all independent variables barely exceeded 1.[16] However, a consistent condition index number of 17 across the four models tested suggested moderate multicollinearity between two variables. Results of my collinearity testing are included in Appendix F (excluding Pearson's correlation coefficients).

Another major assumption of OLS regression is that there should be constant variances of the error term for each value of the dependent variable upon the different values of each independent variable. If the variance of a site's reuse status (reflected in the REUSE ON TRACK dependent variables), for instance, fails to remain the same for each level of neighborhood market strength or site location suitability[17] this could inflate the standard errors of the coefficients and produce estimators that while unbiased are incorrect (Musick, 2006). Heteroscedasticity is typically assumed to be a potential problem when relying on cross-sectional research (Musick, 2006). Given the cross-sectional nature of my sample, heteroscedasticity was presumed to be a particular concern. I first tested for the presence of heteroscedasticity by using the Time-Honored Inspection Method (SAS Institute Inc., n.d.), examining graphs of the residuals values on the predicted values of Y as well as on the independent variables for models with REUSE ON $TRACK_1$ and REUSE ON $TRACK_3$ (by 2012) as the dependent variables. The plots of the residual values on the predicted values of Y (for both REUSE ON $TRACK_1$ and REUSE ON $TRACK_3$ (by 2012)) did not suggest heteroscedasticity. Evidence of

[16] Results for four different models were tested, two models using ROT_1 as the dependent variable and two using ROT_3_12 as the dependent variable. In each of these four versions, PLANNING $TYPE_1$ was tested once with ROT_1 as the dependent variable and once with ROT_3_12 as the dependent variable; PLANNING $TYPE_3$ was similarly tested across the two different dependent variables.

[17] Example based off another example (Gujarati, 2003).

heteroscedasticity from plots of residual values on the different observation levels of the independent variables similarly did not suggest any significant problems with heteroscedasticity.[18] To further consider the potential for heteroscedasticity, I performed a formal test for heteroscedasticity using White's test based on the two previous models.[19] Results suggested heteroscedasticity was not present in either of the two models. Graphs of the residual versus predicted values and the residuals against the independent variable values for the REUSE ON $TRACK_1$ and REUSE ON $TRACK_3$ (by 2012) models are included in Appendix G as well as the results from the White test for heteroscedasticity.[20]

Another key Gauss-Markov assumption when applying OLS is that error terms for different observations should be unrelated (i.e., no autocorrelation). The violation of no autocorrelation occurs when the error terms of subsequent observations are correlated. The primary problems resulting from the violation of this assumption is similar to that of multicollinearity whereby the coefficient estimates remain unbiased, but they no longer have minimum variance, curtailing the ability for rejecting null hypotheses (Marsh, 2006). Autocorrelation may occur in either time series data (serial autocorrelation) or cross-sectional data (spatial autocorrelation), however it is most prevalent in time series data. Since my data was not time-series based I considered the potential for spatial

---

[18] This finding is informed by statistics consultant Dr. Michael Mahometa as part of a consultation with the University of Texas at Austin's Division of Statistics & Scientific Computation Consulting Center, January 11, 2010.

[19] This version of the White test is from "Theorem 2 on page 823 of White (1980)" (SAS Institute Inc., n.d.).

[20] I examined the residual plots for all four models. I only used PLANNING $TYPE_2$ in the models examined. Only residual plots for the REUSE ON $TRACK_1$ model are shown in the appendix.

autocorrelation. The key question became whether there were spatial factors not already reflected in the model co-varying with observations related to sample sites that were spatially-based (Wikipedia, n.d.-a). For instance, it was theorized that reuse outcomes for a subset of sites within my sample could have been significantly influenced by an aggressive county or state redevelopment authority or by an EPA Region heavily committed to site redevelopment. To test for this I calculated Moran's I statistic for both the REUSE ON $TRACK_1$ and REUSE ON $TRACK_3$ (by 2012) models to test for "how related the values of a variable are based on the locations where they were measured" (UCLA: Academic Technology Services Statistical Consulting Group, 2009). None of the Moran's I statistics were statistically significant. Results are presented in Appendix H.

A final key Gauss-Markov assumption that should be met when applying OLS is the assumption that independent variables do not associate with the error term. Misspecification arises when the error term is significantly correlated with an explanatory variable. Depending upon the type of misspecification (e.g., omitted variables, wrong functional form, etc.) the estimators may be either inefficient, biased, or both (Marsh, 2006). My models suffer from misspecification as evident from examining the R^2 values for each of my models tested, which ranged from a low of.22 to a high of .60. I argue here that the model would be significantly improved at the very least with the inclusion of the SITE OWNERSHIP SUPPORT and INCENTIVES variables. However, limited sample size and a high number of missing values for each of these variables limited me from including them.

6.1.4. Summary of Superfund Site Redevelopment Model Results

Several variables predicted to have a significant and positive effect on Superfund site redevelopment were shown to be statistically significant in the bivariate analysis. At least one predictive variable within each of the three major sets of predictive factors (e.g., site-specific, neighborhood/regional, redevelopment) plus controls exhibited a statistically significant relationship with one or more of the dependent variables tested. Moreover, of the 18 factors included in the model, 12 of the 18 factors exhibited a statistically significant impact on at least one of the dependent variables. However, the levels of significance fluctuated from marginal to very high levels of statistical significance, and in a few instances the direction of the estimated correlation measures fell in the unanticipated direction (e.g., SITE OWNERSHIP). In the regression analysis, all variables predicted to have an effect on the dependent variables exerted a positive and statistically significant effect on the dependent variables tested (while holding the effects of all other independent variables constant) *at least once*. The consistency of the correlations varied considerably across the type of redevelopment dependent variable and the PLANNING TYPE independent variable tested.

Of the control variables tested – SITE READINESS FOR REUSE, CLEANUP INTENSITY, COUNTY POPULATION, SITE SIZE, SUPERFUND SITE AGE, and SOUTH/WEST – SITE READINESS FOR REUSE_1 (by 2008) exhibited the most consistent and positive statistically significant effect on the dependent variables tested in the bivariate analyses. Its importance was confirmed again in OLS regression examinations. This is not surprising given that sites should be capable of being redeveloped before they can accommodate reuse. Of the remaining control variables, only $COUNTY\_POPULATION_B$ exerted a statistically significant effect on the dependent variable in the bivariate analyses; however its association was not consistent. In the regression framework, $COUNTY\_POPULATION_B$ exerted a statistically significant effect in only a few instances, and its effect again was marginal. Although the literature on brownfields redevelopment suggests that the degree of cleanup, or use of risk-based cleanup levels, should exert a statistically significant effect on redevelopment (see Lange & McNeil, 2004b; Pepper, 1997), the CLEANUP $INTENSITY_D$ variable was not shown to be significant in the bivariate analyses. This may have been driven because such a small number of sites in the sample tested cleaned their sites to the maximum standard possible (unrestricted use/unlimited exposure) (i.e., 22 percent).

The role of site size – another control variable tested – on redevelopment is mixed in the brownfields context (e.g., see Howland, 2004; Meyer & Lyons, 2000) and positive in the Superfund redevelopment context (e.g., see Wernstedt & Hersh, 1998b). However, the SITE SIZE variable exerted no statistically significant effect in the bivariate analyses which is not surprising given the variable results in the literature. The age of Superfund sites was originally thought to exert a positive and statistically effect on redevelopment – older sites should be more likely to be redeveloped – however the SUPERFUND SITE AGE had no effect on redevelopment in bivariate analyses. Interestingly, in the multivariate regression framework, SUPERFUND SITE AGE exerted a statistically significant effect ranging from marginal to moderate, in multiple instances. In contrast to my theory, the effect of SUPERFUND SITE AGE was negative, suggesting that older sites are less likely to be redeveloped. Given that newer sites have received much more federal attention regarding potential reuse, this result is perhaps not surprising. Older sites may also be problematic sites for a variety of reasons. Finally, it was originally thought that a site's location in recently faster-growing areas of the country (i.e., the South and the West) would be more likely to be redeveloped than sites located elsewhere. Results from the bivariate analyses indicate that macro-regional location does not have an effect on redevelopment. In summary, of the controls tested, the SITE READINESS FOR $\text{REUSE}_{1\text{ and }2}$ (by 2008/2012) variables appear to be important controls, while the importance of the remaining controls is much less convincing.

Of the site-specific factors tested – SITE REDEVELOPENT SUITABILITY, SITE LOCATION SUITABILITY, SITE CONTAMINATION, and SITE OWNERSHIP – the SITE REDEVELOPENT SUITABILITY and SITE LOCATION SUITABILITY factors exhibited the strongest, statistically significant effect on the dependent variables in the bivariate analyses. In the regression analyses, the SITE LOCATION SUITABILITY_1 variable also demonstrated a statistically significant effect on the dependent variables, holding all other variables constant, although its effect was not consistent. Both the brownfields literature (e.g., see Alberini, Longo, Tonin, Trombetta, & Turvani, 2005; Lange & McNeil, 2004b) and Superfund redevelopment literatures (e.g., see U.S. EPA, 2004e; Wernstedt & Hersh, 1998b) suggest that both site redevelopment suitability and site location suitability factors should have a positive and statistically significant effect on redevelopment outcomes.

Among the other site-specific factors tested, the variable SITE OWNERSHIP variable exerted a statistically significant effect on only one dependent variable tested (REUSE ON TRACK$_3$ (by 2012), but it was opposite the hypothesized direction. Neither of the two SITE CONTAMINATION variables had any effect. However, given the mixed results regarding the effect of site contamination in both the brownfields literate (e.g., see Howland, 2003; Myers & Kituse, 2000; Schoenbaum, 2002) and Superfund literature on redevelopment, this results is perhaps not surprising. Moreover, as I suggest earlier, there are immense challenges in crafting variables that adequately reflect overall level of contamination at a site, particularly contamination that would impact development outcomes. Overall, the bivariate results suggest that the extent to which a site has on-site characteristics that make it suitable for redevelopment (site redevelopment suitability factors) and the extent to which a site is located in a favorable location (site location suitability factors) are important; whereas who owns the site prior to redevelopment and the degree of contamination are less so.

Of the neighborhood and regional factors theorized to be important for a site's reuse – NEIGHBORHOOD MARKET STRENGTH, NEIGHBORHOOD LAND AVAILABILITY, PLANNING CULTURE, and REGIONAL MARKET STRENGTH – bivariate results suggest NEIGHBORHOOD MARKET STRENGTH is a very important predictor. In contrast, REGIONAL MARKET STRENGTH's effect is weak to non-existent. In the regression framework, NEIGHBORHOOD MARKET STRENGTH again exerted a consistent, statistically significant effect on all the dependent variables tested, although its effect ranged from marginal to very high. Both the brownfields literature

(Howland, 2003; Meyer & Lyons, 2000) and Superfund literature on redevelopment suggest that market demand is critical predictor on reuse outcomes (Howland, 2003; U.S. EPA, 2004c). The effect of the amount of available land around a site (NEIGHBORHOOD LAND AVAILABILITY) also showed to have a statistically relationship with most of the dependent variables ranging from moderate to marginal. The effect of PLANNING CULTURE was very inconsistent, however. The existence of other plans that included recommendations for reuse of the site showed to have a moderate statistically significant effect on the dependent variable in a few instances. However, the other two planning culture variables – one focusing on county-level political capital and one focusing on state-mandated local smart growth planning – essentially had no effect on the dependent variables. In short, of the neighborhood/regional factors tested, neighborhood market strength appears to play an essential role in redevelopment outcomes and to a lesser degree, perhaps, the amount of undeveloped property around the site. The finding that NEIGHBORHOOD MARKET STRENGTH emerged as a consistently strong predictor is in line with Greenstein and Sungu-Eryilmaz who theorized that “the vitality of the local economy” may be the essential factor in the development of vacant land, including brownfields (2004, pp., 7-8).

Finally, of the redevelopment-related factors tested – PLANNING TYPE, INCENTIVES, SITE-OWNER SUPPORT, and PLANNING TIMING – the PLANNING TYPE variables, which reflect the role of planning as well as collaborative planning, correlated most consistently and at statistically significant levels with reuse outcomes in the bivariate analyses. The importance of PLANNING TYPE sustained throughout the regression analyses, although not all PLANNING TYPE variables tested had a statistically significant effect on all dependent variables tested. The role of planning and collaborative planning has not been explicitly tested for in either the brownfields or Superfund redevelopment contexts. The brownfields literature suggests that the effects of community involvement on redevelopment outcomes are mixed (e.g., see Pepper, 1997; Wernstedt & Hersh, 2006), but positive in the Superfund context (e.g., see Bromm & Lofton, 2002). Moreover, in the Superfund redevelopment context federal-local partnerships, which are related to collaborative planning, are also seen as important (e.g., see Bromm & Lofton, 2002). Similarly, government intervention is perceived as important on redevelopment outcomes in both the brownfields (e.g., see Lange & McNeil, 2004b) and Superfund redevelopment contexts (Smith & Garcia, 2002).

Among the other redevelopment factors tested, both INCENTIVES and SITE-OWNER SUPPORT exhibited statistically significant correlations with the dependent variables in the bivariate contexts. The influence of the INCENTIVES variable may have emerged as stronger had there been fewer non-responses to the financial incentive questions in the survey. The importance of INCENTIVES is reflected in both the brownfields literatures (e.g., see Lange & McNeil, 2004b) and the Superfund literatures on redevelopment (e.g., see U.S. EPA, 2004e). However, in these literatures site-owner support was not explicitly tested. Finally, the factor of PLANING TIMING emerged marginally to moderately statistically significant on two of the dependent variables, suggesting that planning for the reuse of a site prior to or during efforts by cleanup managers to choose site cleanup remedies is important but perhaps not critical. This aligns with literature on Superfund redevelopment (e.g., see U.S. EPA, n.d.-j).

Regarding moderating factors, I also examined the impact of interacting the dichotomous variable LAND USE COMMERCIAL/RESIDENTIAL with each of the PLANNING TYPE variables hypothesizing that planning, and collaborative planning in particular, should show a greater effect on the dependent variables if the site is located in a commercial or residential setting. Although the resulting interaction term revealed a statistically significant and positive association between the interaction terms and the redevelopment independent variables, an examination of the Pearson correlation coefficients and statistical significance levels for each of PLANNING TYPE variables and the dependent variables did not suggest that surrounding land use was not actually moderating the effect of PLANNING TYPE on the dependent variables.

In summary, several of the factors predicted to have a statistically significant association or effect on reuse outcomes were shown to be statistically significant in the hypothesized direction. Many of these findings align with the literature reviews on brownfields and Superfund redevelopment. Some factors emerged as more critical than others, however. PLANNING TYPE, including collaborative planning type variables in particular along with SITE READINESS FOR REUSE variables, produced consistently strong associations in both the bivariate and multivariate analyses. NEIGHBORHOOD MARKET STRENGTH and SITE LOCATION SUITABILITY also emerged as important predictors in the multivariate analysis, although their effects were not as strong. Not all variables tested using bivariate analyses could be fully tested using OLS regression, however, because of the strength of their association in the bivariate analyses, it assumed here that SITE REDEVELOPMENT SUITABILITY, INCENTIVES, and SITE OWNER SUPPORT would also emerge as critical factors if the full Superfund Site Redevelopment Model could be applied using OLS regression. Table 21 presents a summary of these findings. Variables that appeared particularly important for predicting reuse outcomes as determined by either bivariate analysis, multivariate analysis, or both, are bolded as an approach to suggest the robustness or strength of effect, keeping in mind low statistical power situation.

Table 21. Significance Summary of Variables included in Superfund Site Redevelopment Model

No.*	Category	Name (Code Name/No.)	Measurement	Bivariate	Multiv.	BF Lit.	SF Lit.
R1	**Site-specific**	**SITE REDEVELOPMENT SUITABILITY (SRS / v025)**	**Extent to which site exhibits on-site physical features, such as flat topography, that make site suitable for redevelopment, ranging from "not at all" to "a very high extent"**	**Y**	**Y**	**Y**	**Y**
$R2_1$	**Site-specific**	**SITE LOCATION SUITABILITY$_1$§ (SLS_1 / v022)**	**Extent to which the *location* of site makes the site suitable for redevelopment, ranging from "not at all suitable" to "extremely suitably."**	**Y**	**Y**	**Y**	**Y**
$R2_2$	Site-specific	SITE LOCATION SUITABILITY$_2$§ (SLS_2 / v023)	Indication of whether site is located near one or more features either prior to redevelopment or now (if not redeveloped), that made/make the location of the site appealing for redevelopment.	Y	-	Y	Y
$R2_3$	Site-specific	SITE LOCATION SUITABILITY$_3$§ (SLS_3 / v024)	Number of features the site is located near either prior to redevelopment or now (if not redeveloped), that made/make the location of the site appealing for redevelopment.	Y	-	Y	Y
$R3_1$	Site-specific	SITE CONTAMINATION$_1$ (SC_1 / v028)	Indicates level of site's approximate level of threat to public health when first discovered, ranging from	N	-	(+ / - / NE)	-

No.*	Category	Name (Code Name/No.)	Measurement	Bivariate	Multiv.	BF Lit.	SF Lit.
			"none" to "extremely high."				
$R3_2$	Site-specific	SITE CONTAMINATION$_2$ (SC_2 / v001)	Indicates total number listed in EPA's Superfund Site Progress Profile available for each NPL site. The same contaminant of concern may be counted more than once if it is listed multiple times for separate media (e.g., groundwater, soil, etc.).	N	-	(+ / - / NE)	-
R4	Site-specific	SITE OWNERSHIP (SITE_OWN / v033)	Indicates whether site was publicly or privately held during efforts to plan for redevelopment of the site or now, if no redevelopment planning took place.	Y (-)	-	-	-
$R5_1$	Neighborhood	NEIGHBORHOOD MARKET STRENGTH$_1$§ (NMS_1 / v007)	Indicates number of businesses operating per 100 persons residing in zip code containing site	Y	-	Y	Y
$R5_2$	**Neighborhood**	**NEIGHBORHOOD MARKET STRENGTH$_2$§ (NMS_2 / v026)**	**Indicates level of development pressure around the site (within roughly one mile from the site boundary) either prior to redevelopment (or now) if not redeveloped, ranging from "no development pressure at all" to "extremely high development pressure."**	**Y**	**Y**	**Y**	**Y**
R6	**Neighborhood**	**NEIGHBORHOOD LAND AVAILABILITY§ (N_LNDAV / v027)**	**Indicates amount of undeveloped/vacant property around the site (within roughly one mile from the site boundary), either prior to redevelopment or now (if not redeveloped), ranging from "no undeveloped/vacant property at all" to "extremely high amount of undeveloped/vacant property."**	**Y**	**-**	**-**	**-**
$R7_1$	Regional	PLANNING CULTURE$_1$§ (PC_1 / v002-5)	Composite index of social capital for each county developed by Rupasingha, Goetz, & Freshwater (2006).	Y (-)	-	-	-
$R7_2$	Neighborhood / Regional	PLANNING CULTURE$_2$§ (PC_2 / v019)	Indicates knowledge of neighborhood, city, or regional land use plans that included/include recommendations for redeveloping the site, either	Y	-	-	-

No.*	Category	Name (Code Name/No.)	Measurement	Bivariate	Multiv.	BF Lit.	SF Lit.
			prior to redevelopment or now (if not redeveloped).				
$R7_3$	Regional	PLANNING CULTURE$_3$§ (PC_3 / v006)	Indicates whether state is a growth management state as classified by Yin and Sun (2007)	N	-	-	-
$R8_1$	Regional	REGIONAL MARKET STRENGTH$_1$§ (RMS_1 / v008)	Indicates median household income for county containing site	Y[21]	-	See $R5_1$	See $R5_1$
$R8_2$	Regional	REGIONAL MARKET STRENGTH$_2$§ (RMS_2 / v009)	Indicates percentage change in population for counties containing sites between 1990 and 2005	N	-	See $R5_1$	See $R5_1$
$R9_2$	**Redevelopment**	**INCENTIVES$_2$§ (INCENT_2 / v020)**	**Indicates whether the developer was/will be granted public-sector financial incentives (e.g., lien waivers, tax exemptions, tax deductions, low-interest loans) to redevelop the site, whether the site was/is located in any economic development districts, either prior to redevelopment or now (if not redeveloped), or neither.**	**Y**	**-**	**Y**	**Y**
10	**Redevelopment**	**SITE-OWNER SUPPORT (SO_SPRT / v032)**	**Indicates level of interest expressed by the site owner/s in returning the site to productive use, ranging from "no interest at all" to "extremely high."**	**Y**	**-**	**-**	**-**
11_1	**Redevelopment**	**PLANNING TYPE$_1$ (PLAN / v034)**	**Indicates whether there were/are specific efforts (being) undertaken to plan for the redevelopment of the site, ranging from "not at all" to "a very high extent."**	**Y**	**Y**	**-**	**-**
11_2	**Redevelopment**	**PLANNING TYPE$_2$ (PLN_EXT / v037)**	**Indicates extent to which a wide-range of stakeholders was/is being consistently involved in efforts to plan for the redevelopment of the site, ranging from "not at all" to "a very high extent."**	**Y**	**Y**	**-**	**-**
11_3	Redevelop	PLANNING TYPE$_3$	Indicates whether a wide	Y	Y[22]	-	-

[21] This variable exerted a statistically significant association with the dependent variable tested only once, and level of significance was marginal (p<.10, one-tailed test).

No.*	Category	Name (Code Name/No.)	Measurement	Bivariate	Multiv.	BF Lit.	SF Lit.
	ment	(PLN_EXTH/ v050)	range of stakeholders was/is being involved in efforts to plan for the redevelopment of the site at a level marked as "very high"/"high" or not.				
11_4	**Redevelop ment**	**PLANNING TYPE$_4$ (PLN_NUM / v036)**	**Indicates number of stakeholders were/are (being) consistently involved in efforts to plan for the redevelopment of the site.**	**Y**	**Y**	**-**	**-**
11_5	Redevelop ment	PLANNING TYPE$_5$¤ (MRP_F2F / v047)	Indicates whether an interactive, face-to-face, multi-stakeholder decision making process was used to generate recommendations for reusing the site.	N	-	-	-
R12	Redevelop ment	PLANNING TIMING (PLN_TME/ v035)	Indicates whether key decisions about site remedies took/are taking place prior to or during key decisions about site remedies, or otherwise.	Y	-	-	+
R13$_1$	**Control**	**SITE READINESS FOR REUSE$_1$§(RFR_O8 / v029)**	**Indicates whether ANY redevelopment activity be permitted at the site that is consistent with cleanup activities by the end of 2008.**	**Y**	**Y**	**-**	**-**
R13$_2$	Control	SITE READINESS FOR REUSE$_2$§ (RFR_12 / v030)	Indicates whether ANY redevelopment activity be permitted at the site that is consistent with cleanup activities by the end of 2012.	Y	Y	-	-
R14	Control	CLEANUP INTENSITY (CU_INTEN / v031)	Indicates whether the completed/planned cleanup activities for the site will allow for unrestricted use, ranging from "no", "partial only", and "yes."	N	-	Y (-)	-
R15	Control	COUNTY POPULATION§ (CNTY_POP / v010)	Indicates population of incorporated area or county containing site.	Y	Y	-	-
R16	Control	SITE SIZE (ACRES / v015)	Indicates the size of the site (in acres). The site could be the entire site, or a subset of the site, depending upon how the respondent specifies at the beginning of the survey.	N	-	Y (+/- /NE)	Y
R17	Control	SUPERFUND SITE AGE (SF_AGE /	Indicates number of years between when site was listed	N	Y (-)	-	-

[22] This variable exerted a statistically significant association effect on the dependent variable tested only once, and the level of significance was marginal (p<.10, one-tailed test).

No.[*]	Category	Name (Code Name/No.)	Measurement	Bivariate	Multiv.	BF Lit.	SF Lit.
		v066)	as final on NPL and 2008.				
R18	Control	SOUTH/WEST (SOUTHWST / v012)	Indicates (1) if county-containing site is located in the Census-defined West or South and (0) if not	N	-	-	-

1. [*]Indicates number of variable in Superfund Site Redevelopment Model
2. § Indicates variable is also used in Superfund Site Redevelopment Plan Implementation Model
3. R - Superfund Site Redevelopment Model
4. If a variable correlated with at least one dependent variable in the bivariate analysis, this variable is marked with a “Y” in the Bivariate column. If a variable correlated exerted a statistically significant effect on at least one dependent variable in the multivariate analysis, holding all other variables constant, this variable is marked with a “Y” in the Multivariate column. If a variable association was statistically significant, but in the unanticipated direction, the unanticipated direction is included in parentheses. If the brownfields or Superfund redevelopment literatures suggested that these variables had a significant effect on redevelopment outcomes this is noted in the “BF Lit” or “SF Lit.” columns.

6.2. The Superfund Site Redevelopment Plan Implementation Model Analysis

6.2.1. Descriptive Statistics

Results from the univariate and bivariate analyses for each of the control variables are presented in Table 22 and Appendix E. In instances where variables were transformed to correct for problems of skewness or kurtosis, only the transformed versions of the original variables are shown.

6.2.1.1. The Dependent Variables: Plan Implementation on Track, Plan Conformance

The number of cases used to draw data on in order to examine the degree of association between independent variables on Superfund site redevelopment outcomes was 70. However, because some cases were missing data on some variables, the number of observations for every variable used fluctuated generally from 60 and 70. To examine different variables' association with plan implementation and plan conformance, only data for sites with a completed reuse plan (or plans that were to be completed by the end of 2008) were considered. This resulted in a considerable reduction in the number of available observations that could be used to perform statistical analyses.

Regarding the PLAN IMPLEMENATION ON TRACK_1 dependent variable, which reflects the extent to which Superfund site redevelopment plans are being implemented, the average response for a site regarding the level of plan implementation was 5.6 out of 7 suggesting that most sites had at least reached a point where steps were underway to obtain support/resources necessary to implement the plan. Results indicate that reuse plans had been fully implemented for 11 sites (33 percent), the plan was in the process of being implemented at 12 sites (36 percent), efforts were currently underway at five sites to obtain support/resources necessary to implement the plan, substantive efforts to implement the plan had been discontinued at one site (three percent), and no substantive efforts have been made to implement the plan at four sites (12 percent).

Regarding the PLAN IMPLEMENTATION ON TRACK$_2$ (CONFORMANCE) dependent variable, which indicates the extent to which redevelopment matches or will match what is required by the plan, the average response for a site regarding the state of plan conformance, was 5.1 out of six, indicating that on average the completed (or anticipated) physical redevelopment of the site is (or was expected to be) consistent with the type of development (being) proposed in the most recent redevelopment plan for the site. The completed (or anticipated) physical redevelopment of the site was perceived to have been (or was expected to be) entirely consistent with the type of development (being) proposed in the most recent redevelopment plan at ten sites (32 percent), mostly consistent at 17 sites (54 percent), somewhat consistent at three sites (10 percent), and somewhat inconsistent at one site (three percent). As shown in Table 22 and Appendix E, both the dependent variables highly correlated with each other based upon both Pearson and Kendall correlation coefficients.

Table 22. Descriptive Statistics and Pearson Correlation Coefficients for Control and Plan Implement. on Track Variables

					PLAN IMP. ON TRACK1			PLAN IMP. ON TRACK2 (CONF.)					
	N	Range	Mean	S.D.	R	1-t	2-t	R	1-t	2-t	Hyp.	Est. 1	Est.2
Plan Imp. On Track$_1$	33	2-7	5.61	1.62	1	---	---	0.63	***	***	--	--	--
Plan Imp. On Track$_2$ (Conf.)	31	3-6	5.16	0.73	0.64	***	***	1	---	---	--	--	--
Site Location Suitability$_1$§	70	2-5	4.00	0.99	0.47	**	**	0.31	+	+	+	+	+
Site Location Suitability$_2$§	70	0-1	0.90	0.30	-0.1			-0.12			+	-	-
Site Location Suitability$_3$§	70	0-7	2.46	1.67	0.26	+		-0.08			+	+	-
Neighborhood Market Strength$_{1\text{-}B}$	70	1-4	2.50	1.11	0.13			-0.02			+	+	-
Neighborhood Market Strength$_2$§	70	1-5	2.52	0.97	0.49	**	**	0.09			+	+	+
Neighborhood Land Availability§	70	1-5	2.69	0.87	-0.1			-0.06			-	-	-
Planning Culture$_{1\text{-}B}$	70	1-4	2.49	1.13	-0.1			0.14			+	-	+
Planning Culture$_2$	56	0-1	0.52	0.50	-0.2			-0.67	***	***	+	-	-
Planning Culture$_3$§	70	0-1	0.34	0.48	-0.1			0.02			+	-	+
Regional Market Strength$_{1\text{-}B}$	70	1-4	2.51	1.13	0.01			0.26			+	+	+
Regional Market Strength$_{2\text{-}B}$	70	1-4	2.50	1.11	-0.1			-0.01			+	-	-
Incentives$_2$§	44	0-1	0.36	0.49	0.41	*	*	0.18			+	+	+
MRP Local Political Support	33	1.5-5	4.14	0.80	0.46	**	*	0.45	*	*	+	+	+
MRP Plan Quality	28	3-5	4.18	0.61	0.19			0.21			+	+	+
MRP Planning Type$_2$	38	0-9	4.58	2.26	0.2			-0.03			+	+	-
Planning Type$_5$	33	0-1	0.82	0.39	0.26	+		-0.09			+	+	-
MRP Planning Timing	39	0-1	0.64	0.49	0			-0.28			+	+	-
Site Readiness For Reuse$_1$ (By	70	0-1	0.69	0.45	0.53	***	**	0.43	*	*	+	+	+

2008)													
Site Readiness For Reuse$_2$ (By 2012)	70	0-1	0.94	0.23	0.32	*	+	0.42	*	*	+	+	+
County Population$_2$	70	1-4	2.51	1.13	0.3	*	+	0.23			+	+	+
Superfund Site Age	70	4-25	18.89	5.76	0.08			0.332	+	+	+	+	+
MRP Planning Type2 x LU_C_R^x	38	0-9	4.11	2.50	0.14			-0.05			+	+	-
MRP Planning Type$_3$ x LU_C_R^x	33	0-1	0.70	0.47	0.19			-0.01			+	+	-
MRP Planning Type$_3$ x Collab. Planning Process Legitimacy^x	25	2.6-5	3.76	0.66	-0.4	*	*	-0.01			+	-	-
MRP Planning Type$_3$ x Collab. Planning Process Duration^x	27	3-8	6.15	1.81	0.09			-0.06			+	+	-
LU_C_R^i	70	0-1	0.87	0.34	0.16			0.219			+	+	+
Collaborative Plan Process Involvement^{ii}	24	3-5	4.08	0.72	-0.4	*	*	0			+	-	-
Collaborative Plan Process Consensus^{ii}	23	3-5	3.57	0.66	-0.3	+		-0.17			+	-	-
Collaborative Plan Process Implementation^{ii}	23	2-5	3.52	0.79	-0.2			0.089			+	-	+
Collaborative Plan Process Duration$^{\S i}$	27	3-8	6.15	1.81	0.09			-0.06			+	+	-
Stakeholder Support^{ii}	34	2-5	4.09	0.79	0.58	***	***	0.612	***	***	+	+	+
Local Government Support^{ii}	34	1-5	4.15	1.05	0.26	+		0.196			+	+	+

1. The first four variables listed are the four dependent variables assessed as part of this analysis.
2. 1-t/2-t denotes significance derived from p-value for one-tailed/two-tailed significance test.
3. †p<.10; *p<.05; **p<.01;***p<.001
4. D – indicates the variable has been transformed as a dichotomous (ordinal) variable.
5. B – indicates the variable has been transformed based upon quartiles.
6. LU_C_R stands for "Land Use Commercial/Residential"

7. Hyp. / Est. Hyp. indicates the Hypothesized direction of the relationship between the independent variable and the dependent variable. Est 1. refers to the estimated direction of the Plan Imp. On $Track_1$; Est. 2 refers to the estimated direction of the Plan Imp. On $Track_2$ (Conf.) variable.
8. [x]Interaction terms.
9. [i]Indicates variable tested as part of an interaction term.
10. [ii]Indicates variables used to construct indices. Collaborative plan process involvement, consensus, and implementation were used to construct the mean index variable Collaborative Planning Process Legitimacy. Stakeholder Support and Local Government Support were used to construct the mean index variable MRP Local Political Support.
11. MRP stands for "Most Recent Plan" completed.

6.2.1.1. Independent Variables: Control Variables

Controls variables include SITE READINESS FOR REUSE (by 2008 and by 2012), COUNTY POPULATION, and SUPERFUND SITE AGE.[23] Bivariate results for SITE READINESS FOR REUSE (by 2008) and the dependent variables based upon both Pearson's r and Kendall's tau-b exhibited a positive and statistically significant level of association with the PLAN IMPLEMENTATION ON $TRACK_{1 \text{ and } 2}$ dependent variables consistent with the hypothesized direction; however the levels of significance based on Kendall's tau-b were generally weaker. Bivariate results for SITE READINESS FOR REUSE (by 2012) and the dependent variables similarly exhibited positive and statistically significant levels of association with both dependent variables based on Pearson's r, again consistent with the hypothesized direction; however the strength of the associations were moderate (e.g., $p<.10$, one-tailed test for PLAN IMPLEMENTATION ON $TRACK_1$, and $p<.05$, two-tailed test, for PLAN IMPLEMENTATION ON $TRACK_2$); results based on Kendall's tau-b correlation measures were positive although not statistically significant. Results overall suggest that it was important for sites to be able to be reused by 2008 for plan implementation to be on track. Whether sites will be

[23] See Descriptive Statistics for Superfund Site Redevelopment Model for a discussion of results based upon univariate analysis and any related variable transformations.

ready to be reused by 2012 appears less important for plan implementation success; however the level of relationship between this version of the independent variable and the dependent variables may be in part due to the challenge in speculating whether a site will really be capable of being reused by 2012.

Bivariate results for the second control variable – COUNTY $POPULATION_B$[24] – revealed a positive and marginal statistically significant level of association with PLAN IMPLEMENTATION ON $TRACK_1$ based upon both Pearson and Kendall's Tau-B correlation coefficients ($p<.10$, two-tailed test), consistent with the hypothesized direction; however COUNTY $POPULATION_B$ did not associate with PLAN IMPLEMENTATION ON $TRACK_2$ at a statistically significant level. Overall, results suggest there is modest evidence that county population is associated with plan implementation.

Bivariate results based on both Pearson correlation coefficients for the third control variable – SUPERFUND SITE AGE – indicated a positive and marginally statistically significant relationship with PLAN IMPLEMENTATION ON $TRACK_2$ ($p<.10$, two-tailed test), consistent with the hypothesized direction. This suggests, perhaps, that with increases in time, completed plans may ultimately be implemented in a manner that is more consistent with what was envisioned by the most recently completed plan for the site. Why this logic does not apply to the extent of plan implementation more generally is unclear.

[24] See Descriptive Statistics for Superfund Site Redevelopment Model for a discussion of results based upon univariate analysis and any related variable transformations.

6.2.1.2. Independent Variables: Site-Specific Factors

Only one variable was included in the Plan Implementation Model classified as site-specific: SITE LOCATION SUITABILITY. However, three variables constructed to reflect SLS were tested: SITE LOCATION SUITABILITY$_{1,\ 2,\ \text{and}\ 3}$.[25] SITE LOCATION SUITABILITY$_1$, the 1-5 ordinal variable based upon survey data, showed a positive and statistically significant relationship with both dependent variables based on both Pearson and Kendall correlations, consistent with the hypothesized direction. The levels of significance ranged, however, from marginal (e.g., $p<.10$, two-tailed test for PIOT_2) to high (e.g., $p<.01$, two-tailed test for PLAN IMPLEMENTATION ON TRACK$_1$ based on Pearson's r only). SITE LOCATION SUITABILITY$_2$ exhibited a negative association with both dependent variables, counter to the hypothesized direction, but the association was not statistically significant based upon either Pearson's r or Kendall's tau-b measures. SITE LOCATION SUITABILITY$_3$ positively correlated with PLAN IMPLEMENTATION ON TRACK$_1$ in the hypothesized direction, however the significance level of modest ($p<.10$, one-tailed test) based upon both Pearson and Kendall correlations. The direction of the relationship between SITE LOCATION SUITABILITY$_3$ and PLAN IMPLEMENTATION ON TRACK$_2$ was negative, but not statistically significant. Together, results from the bivariate analysis lend some support to

[25] See Descriptive Statistics for Superfund Site Redevelopment Model for a discussion of results based upon univariate analysis and any related variable transformations.

the theory that plans for sites based in more suitable locations are more likely to be implemented, and are more likely to be implemented as specified in the plan.

6.2.1.3. Independent Variables: Neighborhood/Regional Factors

Four factors classified as neighborhood/regional factors were tested as part of the Plan Implementation Model: NEIGHBORHOOD MARKET STRENGTH, NEIGHBORHOOD LAND AVAILABILTIY, PLANNING CULTURE, and REGIONAL MARKET STRENGTH. Two NEIGHBORHOOD MARKET STRENGTH variables were tested. Bivariate results for NEIGHBORHOOD MARKET $STRENGTH_1$ based upon Pearson correlation coefficients indicated a positive association with the PLAN IMPLEMENTATION ON $TRACK_1$ dependent variable and a negative association with PLAN IMPLEMENTATION ON $TRACK_2$ – neither of which were statistically significant based on either Pearson's r or Kendall's tau-b. In contrast, NEIGHBORHOOD MARKET $STRENGTH_2$ exhibited a positive and high statistically significant level of association with PLAN IMPLEMENTATION ON $TRACK_1$ based upon Pearson correlation coefficients ($p<.01$, two-tailed test) and a positive and moderate level of association based upon Kendall Tau-B correlations ($p<.05$, two-tailed test), consistent with the hypothesized direction. The association with between NEIGHBORHOOD MARKET $STRENGTH_2$ and PLAN IMPLEMENTATION ON $TRACK_2$ was positive for Pearson correlations and negative for Kendall correlations, however neither correlation was statistically significant. Overall, bivariate results suggests there is modest evidence that the development pressure around sites positively impacts the likelihood that plans will be implemented, but this does not appear to affect the extent to which completed redevelopments actually match or are expected to match plan specifications.

The second variable tested in the bivariate context classified as a neighborhood/regional, NEIGHBORHOOD LAND AVAILABILTIY[26], exhibited a negative association with both PLAN IMPLEMENTATION ON $\text{TRACK}_{1 \text{ and } 2}$, consistent with the hypothesized direction, based upon both Pearson and Kendall tau-b correlations. Neither association was statistically significant, however, suggesting perhaps that once plans are in place, the existence of other nearby vacant land does not impact plan, or slow implementation, of redevelopment plans.

Of the three PLANNING CULTURE variables[27] examined using bivariate analysis (PLANNING $\text{CULTURE}_{1, 2, \text{ and } 3}$), only variable – PLANNING CULTURE_2 – demonstrated a statistically significant level of association with only one of the dependent variables PLAN IMPLEMENTATION ON TRACK_2. The level of significance was very high ($p<.001$, two-tailed test), based upon both Pearson and Kendall Tau-B correlations, however the estimated direction of the coefficients were negative, opposite the hypothesized direction, suggesting that the more likely that sites are located in areas where neighborhood, area, or regional plans have been crafted that incorporate recommendations for redeveloping the site, the less likely a site-specific plan will be implemented according to plan requirements. This may be in part because

[26] See Descriptive Statistics for Superfund Site Redevelopment Model for a discussion of results based upon univariate analysis and any related variable transformations.
[27] See Descriptive Statistics for Superfund Site Redevelopment Model for a discussion of results based upon univariate analysis and any related variable transformations.

recommendations included in neighborhood, area, or regional plans for sites that already have site-specific reuse plans are more likely to require some modifications to site-specific reuse plans. Overall, results here do not suggest that planning culture has a positive, significant, and persistent effect on either the implementation of Superfund site reuse plans or the extent to which redevelopments conform to reuse plan requirements.

Of the two REGIONAL MARKET STRENGTH variables[28] examined using bivariate analysis, REGIONAL MARKET $\text{STRENGTH}_{1\text{-B}}$ exhibited a positive but non-statistically significant association with PLAN IMPLEMENTATION ON $\text{TRACK}_{1 \text{ and } 2}$ consistent with the direction hypothesized. These results were consistent across both Pearson and Kendall correlation coefficients. REGIONAL MARKET $\text{STRENGTH}_{2\text{-B}}$ exhibited a negative but non-statistically significant association with PLAN IMPLEMENTATION ON TRACK_1 opposite the direction hypothesized based upon Pearson' and Kendall correlation coefficients. The direction of the association between REGIONAL MARKET $\text{STRENGTH}_{2\text{-B}}$ and PLAN IMPLEMENTATION ON TRACK_2 was negative based upon Pearson's r, however Kendall's tau-b indicated a positive association. Neither of these associations was statistically significant, however. Results overall here suggest that the strength of the regional impact does not increase the chances that site redevelopment plans will be implemented. This may be perhaps due to the possibility that many Superfund site redevelopment projects are not dependent upon regional-level funding, primarily, to initiate them.

---

[28] See Descriptive Statistics for Superfund Site Redevelopment Model for a discussion of results based upon univariate analysis and any related variable transformations.

6.2.1.4. Independent Variables: Redevelopment Factors

Five redevelopment factors were included as part of the Plan Implementation on Track Model: INCENTIVES, MOST RECENT PLAN (MRP) LOCAL POLITICAL SUPPORT, MRP PLAN QUALITY, MRP PLANNING TIMING, and MRP PLANNING TYPE. Of the two INCENTIVES (INCENT) variables only one INCENTIVE variable was tested (INCENTIVE_2).[29] Bivariate results for INCENTIVE_2 revealed a positive and marginal to moderate statistically significant level of association with both PLAN IMPLEMENTATION ON TRACK_1 based upon both Pearson's and Kendall's correlations, consistent with the hypothesized direction. However, the association between INCENTIVE_2 and PLAN IMPLEMENTATION ON TRACK_2, while positive, was not statistically significant. Overall, the findings here lend some support to the theory that the provision of incentives, the likely provision of incentives, or the location of a site within an economic development-type special zone, increases the chances that a site redevelopment plan will be implemented. However, the evidence here does not suggest that such incentives actually increase the likelihood that the completed or anticipated redevelopment will closely conform with plan specifications.

MRP LOCAL POLITICAL SUPPORT is a mean index variable comprised of two variables based upon survey data: STAKEHOLDER SUPPORT and LOCAL GOVERNMENT SUPPORT. Univariate analysis for STAKEHOLDER SUPPORT reveal that level of stakeholder support for the implementation of plans at sites in the

---

[29] See Descriptive Statistics for Superfund Site Redevelopment Model for a discussion of results based upon univariate analysis and any related variable transformations.

sample with completed plans was between high and very high (4.0 out of 5). This was also the case regarding local government support for plan implementation as revealed in the univariate analysis of LOCAL GOVERNMENT SUPPORT (4.1 out of 5). Univariate analysis for the index variable similarly reflected a high average level of political support for plan implementation (4.1 out of 5). The Chronbach's Alpha score indicating the suitability of combining these variables as an index measure was .65, indicating that the variables relate fairly well. Bivariate analysis MRP LOCAL POLITICAL SUPPORT revealed a positive and moderate to high level of statistical significance with the dependent variables PLAN IMPLEMENTATION ON TRACK$_{1\text{ and }2}$ based on Pearson's correlation coefficients, and marginal to moderate levels of statistical significance based on Kendall's tau-b ($p<.10$, one-tailed test), all consistent with the hypothesized direction. Overall, the results here suggest that local political support is important for plan implementation. However, based upon a comparison of the bivariate results for the two variables comprising MRP LOCAL POLITICAL SUPPORT, it could be reasonably argued that broad stakeholder support is considerably more important than support from local government. For example, examining both Pearson's and Kendall's correlations, STAKEHOLDER SUPPORT shows a positive and very high ($p<.001$, two-tailed test, Pearson's r) to high ($p<.01$, two-tailed test, Kendall's tau-b) statistically significant level of association with both dependent variables, and a high level of statistical association using Kendall's' tau-b measures. In contrast LOCAL GOVERNMENT SUPPORT shows a positive association with both dependent variables, but the only statistically significant association evident is between LOCAL GOVERNMENT SUPPORT and PLAN

IMPLEMENTATION ON $TRACK_1$ using Pearson's r, and this level of significance is marginal ($p<.10$, one-tailed test).

MRP PLAN QUALITY is a 1-5 ordinal-scale variable based upon survey data. Univariate analysis indicated that on average, RPMs tended to view completed plans for the site as high quality plans (4.1 out of 5). Bivariate analysis exhibited a positive association between MRP PLAN QUALITY and both dependent variables based upon both Pearson r and Kendall tau-b association measures, consistent with the predicted direction; however no association was statistically significant. Although, overall results here suggests that plan quality is perhaps not critical for the redevelopment of Superfund, it is difficult to draw any firm conclusions since the lowest rated plans in the sample were considered to be of "moderate quality."

MRP PLANNING TIMING is a dichotomous (ordinal-scale) variable based on survey data indicating whether key decisions regarding site cleanup took place or were taking place prior to or during the planning process for the most recently completed plan for the site. Univariate results indicated that about 64 percent of sites engaged in this pre-remedy implementation reuse planning for the most recently completed plans. Bivariate results revealed a positive association between the variable MRP PLANNING TIMING and PLAN IMPLEMENTATION ON $TRACK_1$, consistent with the hypothesized direction based upon Pearson's r, and a negative relationship based upon Kendall's tau-b; neither correlation measure is statistically significant, however. MRP PLANNING TIMING's association with PLAN IMPLEMENTATION ON $TRACK_2$ was negative, inconsistent with the predicted direction, and marginally statistically significant ($p<.10$, one-tailed test), suggesting that plans developed prior in advance of key decisions about site remedies are less likely to be implemented according to the exact specifications of the plan. Overall there is little to argue that plan implementation is dependent upon when planning takes place in relation to site cleanup decision-making; moreover, findings here suggest possibly that planning prior to or during when decisions about site remedies are being made may actual reduce the chances that a site's reuse plan will actually be implemented in accordance with the plan. One potential explanation for this is that plans done in advance of major remedial decision making are more likely to undergo some modification to adjust to external conditions and new information about the site that begins to emerge once cleanup begins.

Two PLANNING TYPE variables were tested. MRP PLANNING $TYPE_{2 \text{ and } 5}$. MRP PLANNING $TYPE_2$ is a summated index variable based on survey data indicating the number of stakeholders that were (being) consistently involved in efforts to plan for the redevelopment of the site. Univariate analysis indicated that on average nearly five types of stakeholders were consistently involved in planning efforts for sites' most recently completed plans, with a low of zero and a high of nine. Bivariate results for MRP PLANNING $TYPE_2$ revealed a positive association with PLAN IMPLEMENTATION ON $TRACK_1$ based upon Pearson's r, consistent with the hypothesized direction; however, this relationship was not statistically significant. The association between MRP PLANNING $TYPE_2$ and PLAN IMPLEMENTATION ON $TRACK_2$ was negative, counter to the predicted direction, but again not statistically significant. Overall, results here suggest that the number of the different type of stakeholders involved does not impact level of plan implementation. Bivariate results for PLANNING TYPE$_5$ based upon Pearson's r and Kendall's tau-b measures of association indicated a positive relationship with PLAN IMPLEMENTATION ON TRACK$_1$, consistent with the hypothesized direction, and a negative relationship with PLAN IMPLEMENTATION ON TRACK$_2$, inconsistent with the hypothesized direction; however, only the association between PLANNING TYPE$_5$ and PLAN IMPLEMENTATION ON TRACK$_1$ was statistically significant. [30] Moreover, the significance level was only marginal (p<.10, one-tailed test, Pearson's r). Together, findings regarding the PLANNING TYPE variables suggest that the type of planning process may have a marginal impact at best on the extent of plan implementation outcomes and no effect on the degree to which the actual physical redevelopment matches plan recommendations.

6.2.1.5. Independent Variables: Moderating Effects

Finally, I examined the impact of interaction terms on the redevelopment planning type variables MRP PLANNING TYPE$_2$ and PLANNING TYPE$_5$. First, both MRP PLANNING TYPE$_2$ and PLANNING TYPE$_5$were interacted with LAND USE RESIDENTIAL/ COMMERCIAL, theorizing that collaborative-type planning process (e.g., planning processes involving higher numbers of stakeholders, or process that used face-to-face collaborative planning processes) would have a positive and greater effect on plan implementation outcomes if the applicable Superfund sites were surrounded at least

[30] See Descriptive Statistics for Superfund Site Redevelopment Model for a discussion of results based upon univariate analysis and any related variable transformations.

partly by commercial or residential uses. Bivariate results show no evidence that this is the case, based upon both Pearson's r and Kendall's tau-b measures of association. Moreover, although the estimated positive association between MRP PLANNING TYPE$_2$ and PLANNING TYPE$_5$ with PLAN IMPLEMENTATION ON TRACK$_1$ is consistent with the hypothesized direction; the direction of the estimated association between MRP PLANNING TYPE$_2$ and PLANNING TYPE$_5$ with PLAN IMPLEMENTATION ON TRACK$_2$ is negative. These results suggest that surrounding land use may not be important; however, the low level of variability within LAND USE RESIDENTIAL/ COMMERCIAL may mask its moderating effect on the planning type variables.

PLANNING TYPE$_5$ was also interacted with COLLABORATIVE PLANNING PROCESS LEGITIMACY – a mean index variable comprised of three variables, based on the theory that face-to-face planning processes used to craft sites' most recently completed redevelopment plans would have a positive and greater effect on the plan implementation the more legitimate these processes were perceived to have been. COLLABORATIVE PLANNING PROCESS LEGITIMACY is comprised of the variables: INVOLVEMENT (F2F_EXP), CONSENSUS (F2F_CRE), and IMPLEMENTATION (F2F_IMP), all 1-5 ordinal-scale variables based upon survey data. INVOLVEMENT indicates the extent to which the collaborative process allows participates to fully explain their viewpoints. Univariate results for the INVOLVEMENT variable suggest that on average these processes allowed participants to express their viewpoints to a high extent (4.0 out of 5), as perceived by the survey respondents. Univariate results for CONSENSUS suggest that on average consensus recommendations were incorporated into the reuse plan between a moderate and high extent (3.5 out of 5). Univariate results for IMPLEMENTATION similarly indicate that on average participants expected that recommendations generated from the multi-stakeholder process would influence how the site would be redeveloped from between a moderate to high extent (3.5 out of 5). The Chronbach's Alpha score indicating the suitability of combining these variables as an index measure was .86, indicating that the variables relate very well. Recall that, based upon bivariate results, PLANNING $TYPE_5$'s effect on PLAN IMPLEMENTATION ON $TRACK_1$ without the interaction was positive and only marginally significant based upon Pearson's r; no statistical significance was evident based upon Kendall's tau-b. Bivariate results based on the interaction with PLANNING $TYPE_5$ and the index variable on revealed a marginal to moderate statistically significant level of association with PLAN IMPLEMENTATION ON $TRACK_1$, based upon both Pearson's r and Kendall's tau-b correlation measures. The relationship, however, is negative, inconsistent with theory. The interaction term's effect on PLAN IMPLEMENTATION ON $TRACK_2$ was negative based upon Pearson's r, inconsistent with theory and positive based on Kendall's tau-b; neither of these associations with PLAN IMPLEMENTATION ON $TRACK_2$ were statistically significant, however. Overall, these findings suggest that more legitimate planning processes may actually reduce the chances that plans will be implemented or have no effect at all. Examination of the bivariate results for each of the three independent variables comprising the index measure is illuminating. The direction of the estimated association between each of these variables and PLAN IMPLEMENTATION ON $TRACK_1$ are negative, inconsistent with theory. Moreover, the association between INVOLVEMENT and CONSENSUS with PLAN IMPLEMENTATION ON $TRACK_1$ are statistically significant, suggesting that the more face-to-face planning processes enabled participants to fully explain their viewpoints, and the more likely that consensus recommendations were incorporated into the redevelopment plan as part of these processes, the less likely related plans were to be implemented.

Finally, PLANNING $TYPE_5$ was interacted with COLLABORATIVE PLAN PROCES DURATION (F2F_DUR), based on the theory that face-to-face collaborative planning processes that meet over a longer period of time would have a greater effect on plan implementation outcomes than face-to-face collaborative planning processes that meet over a shorter period of time. COLLABORATIVE PLAN PROCES DURATION is a 1-8 ordinal variable based upon survey data. Univariate results for COLLABORATIVE PLAN PROCES DURATION indicate that face-to-face planning processes implemented to formulate Superfund sites' most recently completed redevelopment plans averaged several meetings over the course of one year. Bivariate results of the interaction term's impact of plan implementation outcomes do not lend support to the theory that more meetings over a greater period of time increase planning processes' impacts on redevelopment outcomes. Results based upon Pearson's r suggest that more meetings over a greater period of time result in a positive effect on PLAN IMPLEMENTATION ON $TRACK_1$, consistent with the theory; results based upon Kendall tau-b suggest the opposite. Neither result was statistically significant, however. Results of the interaction term on PLAN IMPLEMENTATION ON $TRACK_2$ suggest that more meetings over a greater period of time actually reduce the effect of planning processes on plan implementation conformance, based upon both Pearson's r and Kendall's Tau-b. Again, neither of these results was statistically significant, however. Table 23 summarizes the results of the bivariate analysis from a simplified perspective.

Table 23. Significance of Variables included as Part of Superfund Site Redevelopment Plan Implementation Model, using Pearson's R and Kendall's Tau-b Measures of Association

	Plan Implementation on Track$_1$			Plan Implementation on Track$_2$			
	1-t	**2-t**	**H=E?**	**1-t**	**2-t**	**H=E?**	
Site-Specific Factors							
Site Location Suitability$_{1, 2, \text{ or } 3}$	** / - / †	** / - / -	+ = + - +	† / - / -	† / - / -	+ = + - -	P
	* / - / †	* / - / -	+ = + - +	* / - / -	† / - / -	+ = + - -	K
Neighborhood/Regional Factors							
Neighborhood Market Strength$_{1\text{-B}, 2}$	- / **	- / **	+ = + +	- / -	- / -	+ = + -	P
	- / *	- / *	+ = + +	- / -	- / -	+ = - -	K
Neighborhood Land Availability	-	-	- = -	-	-	- = -	P
	-	-	- = -	-	-	- = -	K
Planning Culture$_{1\text{-B}, 2, 3}$	- / - / -	- / - / -	+ = + - +	- / *** / -	- / *** / -	+ = + - +	P
	- / - / -	- / - / -	+ = - + -	- / *** / -	- / *** / -	+ = - - +	K
Regional Market Strength$_{1\text{-B}, 2\text{-B}}$	- / -	- / -	+ = + -	- / -	- / -	+ = + -	P
	- / -	- / -	+ = - +	- / -	- / -	+ = + +	K
Redevelopment Factors							
Incentives$_2$	*	*	+ = +	-	-	+ = +	P
	†	-	+ = +	-	-	+ = +	K
MRP Local Political Support	**	*	+ = +	*	*	+ = +	P
	†	-	+ = +	*	†	+ = +	K
MRP Plan Quality	-	-	+ = +	-	-	+ = +	P
	-	-	+ = +	-	-	+ = +	K
MRP Planning Timing	-	-	+ = +	-	-	+ = -	P
	-	-	+ = -	†	-	+ = -	K
MRP Planning Type$_{2, 3}$	- / †	- / -	+ = + +	- / -	- / -	+ = - -	P
	- / -	- / -	+ = + +	- / -	- / -	+ = - -	K
Controls							
Site Readiness For Reuse$_{1 \text{ or } 2}$	*** / *	** / -	+ = + +	* / *	* / *	+ = + +	P
	* / -	* / -	+ = + +	* / -	† / -	+ = + +	K
County Population$_\text{B}$	*	†	+ = +	-	-	+ = +	P
	*	†	+ = +	-	-	+ = +	K
Superfund Site Years	-	-	+ = +	†	†	+ = + +	P
	na	na	na	na	na	na	K

1. †p<.10; *p<.05; **p<.01;***p<.001
2. In cells, figures on top refer to significance levels derived from Pearson correlation coefficients; figures on bottom row refer to Kendall's tau-b correlation coefficients. A "-" denotes no statistical significance.
3. "H=E?" denotes "Hypothesized direction of relationship equals estimated direction of relationship?" In cells, the top row refers to directions estimates from Pearson correlation coefficients; the bottom row refers to estimates derived from Kendall's tau-b

coefficients. For example, "+ = + - -" indicates that the hypothesized direction of the association between the variable (or set of variables) in the corresponding row and the dependent variable is positive, and the estimated direction was positive (+) for the first variable, negative (-) for the second variable, and negative (-) for the third variable.

4. 1-t/2-t denotes significance derived from p-value for one-tailed/two-tailed significance test

6.2.2. Summary of Superfund Site Plan Implementation Model Results

Close examination of the Pearson's r and Kendall's tau-b correlation coefficients indicate that at least one predictive factor falling within the four major sets of predictive factors (e.g., site-specific factors, neighborhood/regional factors, redevelopment factors, and controls) theorized to correlate with plan implementation dependent variables did exhibit a statistically significant level of association. Moreover, of the 13 factors included in the model, 10 factors exhibited a statistically significant level of association with at least one of the dependent variables. However, the levels of significance certainly fluctuated from extremely high levels of statistical significance to marginal levels. Moreover, in two instances, statistically significant associations fell in the unanticipated (negative) direction (i.e.., PLANNING CULTURE_2 and MRP PLANNING TIMING with PLAN IMPLEMENTATION ON TRACK_2). These finding must also be considered in light of limited statistical power afforded by a relatively small sample size.

The control variables with the most consistent statistically significant association with the two dependent variables were the SITE READINESS FOR REUSE variables. As with the Superfund Site Redevelopment Model, this result should not be surprising because in order to for plans to be implemented or on track for implementation, sites need to be sufficiently remediated to allow plan implementation to take place. Although statistically significant, the level of association between the independent variables COUNTY POPULATION_B and SUPERFUND SITE YEARS and the dependent variables were not consistent, and the level of statistical significance varied from none to moderate. COUNTY $POPULATION_B$ correlated with PLAN IMPLEMENTATION ON $TRACK_1$ at a statistically significant level ($p<.10$, two-tailed test) but not with PLAN IMPLEMENTATION ON $TRACK_2$. Interestingly, the literature on plan implementation potentially relevant in the Superfund site redevelopment context suggests that the effect of population is either positive or has no effect (Burby, 2003; Burby & Dalton, 1994).

The lone site-specific factor predicted to impact plan implementation outcomes – SITE LOCATION SUITABILITY – exhibited a marginal to moderate statistically significant level of association for two of the three SLS variables tested. Of the four neighborhood/regional factors theorized to impact plan implementation – NEIGHBORHOOD MARKET STRENGTH, NEIGHBORHOOD LAND AVAILABILITY, PLANNING CULTURE, and REGIONAL MARKET STRENGTH, only two factors – NEIGHBORHOOD MARKET STRENGTH and PLANNING CULTURE demonstrated a statistically significant level of association with the dependent variables. However, these factors' impact across both dependent variables was not consistent. The variable NEIGHBORHOOD MARKET $STRENGTH_2$'s association with PLAN IMPLEMENTATION ON $TRACK_1$ was highly significant ($p<.01$, two-tailed test); however it had no statistically significant impact on the second dependent variable PLAN IMPLEMENTATION ON $TRACK_{2.}$ This finding is somewhat consistent with the applicable planning implementation literature that has found that in some instances demand for land in the area being addressed by the plan correlates with plan implementation (Burby & Dalton, 1994; Koontz, 2005) and in other instances it has no effect (Burby, 2003). In contrast, the PLANNING CULTURE_2 variable's association with PLAN IMPLEMENTATION ON TRACK_2 was highly statistically significant ($p<.001$, two-tailed test) but not so with PIOT_1. Moreover, the statistically significant level of association between PLANNING CULTURE_2 and PLAN IMPLEMENTATION ON TRACK_1 was counter the hypothesized direction. Finally, of the five redevelopment factors assessed – INCENTIVES, MRP LOCAL POLITICAL SUPORT, MRP PLANNING TIMING, MRP PLAN QUALITY, and MRP PLANNING TYPE – only MRP LOCAL POLITICAL SUPPORT was consistently statistically significant across both dependent variables. In the literature, staff support for plan implementation generally emerges as a positive predictor of plan implementation (e.g., see Burby & Dalton, 1994). Only one of the two collaborative planning variables exerted a positive and statistically significant effect on plan implementation outcomes – PLANNING TYPE_5 – suggesting that importance of collaborative planning on Superfund site redevelopment plan implementation cannot be ruled out, consistent with the planning implementation literature (Albert, Gunton, & Day, 2003; Burby, 2003; Calbick, Day, & Gunton, 2003); however, PLANNING TYPE_5 only associated PLAN IMPLEMENTATION ON TRACK_1, and the effect was marginal ($p<.10$, one-tailed test). A positive and statistically significant relationship was detected between INCENTIVE_2 and PLAN IMPLEMENTATION ON TRACK_1, however, this degree of association was moderate ($p<.05$, two-tailed test, Pearson's r only). MRP PLANNING TYPE correlated with PLAN IMPLEMENTATION ON TRACK_2, in the hypothesized direction; however the degree of association was marginal ($p<.10$, one-tailed test, Kendall's tau-b only).

MRP PLAN QUALITY did not associate with either plan implementation dependent variable. Interestingly, this contrasts with applicable plan implementation literature suggesting that plan quality does significantly associate with plan implementation (Koontz, 2005; Laurian et al., 2004).

Regarding moderating effects, it was theorized that that collaborative-type planning process (e.g., planning processes involving higher numbers of stakeholders, or process that used face-to-face collaborative planning processes) would have a positive and greater effect on plan implementation outcomes if the applicable Superfund sites were surrounded at least partly by commercial or residential uses. Bivariate results show no evidence that this is the case. However, however, the low level of variability within LAND USE COMMERCIAL/RESIDENTIAL may mask its moderating effect on the planning type variables. It was also speculated that face-to-face planning processes used to craft sites' most recently completed redevelopment plans would have a positive and greater effect on the plan implementation the more legitimate these processes were perceived to have been. Results suggested that collaborative planning processes with higher levels of perceived legitimacy are marginally to moderately associated with reduced levels of plan implementation but no association with the extent to which completed redevelopments match or are expected to match plan redevelopment specifications.

What stands out, however, is the finding that collaborative planning is only marginally associated with only one of the dependent variables (PLAN IMPLEMENTATION ON TRACK_1). Why is this likely the case? First, it is important not to read too much into any of the plan implementation findings because of the low statistical power afforded by the moderate sample size. Given that, however, the collaborative planning variables' reduced importance in the plan implementation context may stem from a number of different possibilities. One possibility is that implementation may be dependent upon only one-two key stakeholders. If this is the case, it understandable why the collaborative planning variable based upon the number of stakeholders consistently involved. Similarly, it could be the case that while widespread stakeholder involvement may engender plans that have widespread support, for various reasons they may be challenging to implement. Put another way, plans that reflect the interests of multiple stakeholders may be more likely to be burdened with non-implementable aspects that were agreed to in order to advance the stakeholder process. Regarding the second collaborative planning variable – the extent to which a face-to-face meeting was used to derive the plan which positively but marginally associated with PLAN IMPLEMENTATION ON $TRACK_1$ – it may be the case that the lack of variability across the variable (82 percent utilized a face-to-face process) coupled with a low N make it more difficult to discern its actual impact. Similarly, the reasons applicable to the first collaborative planning variable mentioned above could also be applicable here. Table 24 presents a summary of these findings. Variables that appeared particularly important for predicting reuse outcomes as determined by either bivariate analysis, multivariate analysis, or both, are bolded.

Table 24. Significance Summary of Variables included in Superfund Site Plan Implementation Model

No.*	Category	Name (Code Name/No.)	Measurement	Bi-variate	Plan Impl. Lit.
P1$_1$	**Site-specific**	SITE LOCATION SUITABILITY$_1$§ (SLS_1 / v022)	Extent to which the *location* of site makes the site suitable for redevelopment, ranging from "not at all suitable" to "extremely suitably."	Y	-
P1$_2$	**Site-specific**	SITE LOCATION SUITABILITY$_2$§ (SLS_2 / v023)	Indication of whether site is located near one or more features either prior to redevelopment or now (if not redeveloped), that made/make the location of the site appealing for redevelopment.	N	-
P1$_3$	**Site-specific**	SITE LOCATION SUITABILITY$_3$§ (SLS_3 / v024)	Number of features the site is located near either prior to redevelopment or now (if not redeveloped), that made/make the location of the site appealing for redevelopment.	Y	-
P2$_1$	**Neighborhood**	NEIGHBORHOOD MARKET STRENGTH$_1$§ (NMS_1 / v007)	Indicates number of businesses operating per 100 persons residing in zip code containing site	N	-
P2$_2$	**Neighborhood**	NEIGHBORHOOD MARKET STRENGTH$_2$§ (NMS_2 / v026)	Indicates level of development pressure around the site (within roughly one mile from the site boundary) either prior to redevelopment (or now) if not redeveloped, ranging from "no development pressure at all" to "extremely high development pressure."	Y	-
P3	**Neighborhood**	NEIGHBORHOOD LAND AVAILABILITY§ (N_LNDAV / v027)	Indicates amount of undeveloped/vacant property around the site (within roughly one mile from the site boundary), either prior to redevelopment or now (if not redeveloped), ranging from "no undeveloped/vacant property at all" to "extremely high amount of undeveloped/vacant property."	N	Y
P4$_1$	**Regional**	PLANNING	Composite index of social	N	**-**

No.[*]	Category	Name (Code Name/No.)	Measurement	Bi-variate	Plan Impl. Lit.
		CULTURE$_1$[§] (PC_1 / v002-5)	capital for each county developed by Rupasingha, Goetz, & Freshwater (2006).		
P4$_2$	**Neighborhood / Regional**	PLANNING CULTURE$_2$[§] (PC_2 / v019)	Indicates knowledge of neighborhood, city, or regional land use plans that included/include recommendations for redeveloping the site, either prior to redevelopment or now (if not redeveloped).	Y (-)	**-**
P4$_3$	**Regional**	PLANNING CULTURE$_3$[§] (PC_3 / v006)	Indicates whether state is a growth management state as classified by Yin and Sun (2007)	N	-
P5$_1$	**Regional**	REGIONAL MARKET STRENGTH$_1$[§] (RMS_1 / v008)	Indicates median household income for county containing site	N	-
P5$_2$	**Regional**	REGIONAL MARKET STRENGTH$_2$[§] (RMS_2 / v009)	Indicates percentage change in population for counties containing sites between 1990 and 2005	N	-
P6$_2$	**Redevelopment**	INCENTIVES$_2$[§] (INCENT_2 / v020)	Indicates whether the developer was/will be granted public-sector financial incentives (e.g., lien waivers, tax exemptions, tax deductions, low-interest loans) to redevelop the site, and/or whether the site was/is located in any economic development districts, either prior to redevelopment or now (if not redeveloped).	Y	-
P7	**Redevelopment**	MRP LOCAL POLITICAL SUPPORT[¤] (MRP_LPS / v046)	Mean index variable (combining STAKEHOLDER SUPPORT and LOCAL GOVERNMENT SUPPORT variables) indicating political support for the most recent redevelopment plan.	Y	**Y (- / +)**
P8	**Redevelopment**	MRP PLAN QUALITY[¤] (MRP_PQ / v042)	Indicates extent to which redevelopment plan is considered a high quality plan, ranging from "extremely low quality" to "extremely high quality."	N	**Y**
P9$_2$	**Redevelopment**	MRP PLANNING	Indicates number of	N	**Y**

No.*	Category	Name (Code Name/No.)	Measurement	Bi-variate	Plan Impl. Lit.
		TYPE2 (MRP_NUM / v043)	stakeholders were/are (being) consistently involved in efforts to plan for the redevelopment of the site.		
P93	**Redevelopment**	MRP PLANNING TYPE5§¤¤ (MRP_F2F / v047)	Indicates whether an interactive, face-to-face, multi-stakeholder decision making process was used to generate recommendations for reusing the site.	Y	**Y**
P11	**Redevelopment**	MRP PLANNING TIMING (MRP_TM / v038)	Indicates whether key decisions about site remedies took/are taking place prior to or during key decisions about site remedies, or otherwise.	N	-
P121	**Redevelopment**	SITE READINESS FOR REUSE1§ (RFR_O8 / v029)	Indicates whether ANY redevelopment activity be permitted at the site that is consistent with cleanup activities by the end of 2008.	Y	-
P122	**Redevelopment**	SITE READINESS FOR REUSE2§ (RFR_12 / v030)	Indicates whether ANY redevelopment activity be permitted at the site that is consistent with cleanup activities by the end of 2012.	Y	-
P13	**Control**	COUNTY POPULATION§ (CNTY_POP / v010)	Indicates population of incorporated area or county containing site.	Y	-
P14	**Control**	SUPERFUND SITE AGE (SF_AGE / v066)	Indicates number of years between when site was listed as final on NPL and 2008.	Y	-

1. *Indicates number of variable in Superfund Site Redevelopment Model
2. § Indicates variable is also used in Superfund Site Redevelopment Plan Implementation Model
3. R - Superfund Site Redevelopment Model
4. If a variable correlated with at least one dependent variable in the bivariate analysis, this variable is marked with a "Y" in the Bivariate column. If a variable correlated exerted a statistically significant effect on at least one dependent variable in the multivariate analysis, holding all other variables constant, this variable is marked with a "Y" in the Multivariate column. If a variable association was statistically significant, but in the unanticipated direction, the unanticipated direction is included in parentheses. If the brownfields or Superfund redevelopment literatures suggested that these variables had a significant effect on redevelopment outcomes this is noted in the "BF Lit" or "SF Lit." columns.

SITE LOCATION SUITABILITY, MRP Local Political Support, and Site READINESS FOR REUSE are the factors that most consistently associate with both plan implementation dependent variables tested. From this, one could conclude that for

Superfund site redevelopment plans to be implemented generally, sites need to be favorably located, have considerable political support for plan implementation, and be ready to be reused. Considering the dependent variables separately, SITE LOCATION SUITABILTIY, NEIGHBORHOOD MARKET STRENGTH, INCENTIVES, MRP LOCAL POLITICAL SUPPORT, SITE READINESS FOR REUSE, and COUNTY POPUALTION most consistently associate with the extent to which plans are implemented (PLAN IMPLEMENTATION ON TRACK$_1$); whereas SITE LOCATION SUITABILTIY, PLANNING CULTURE, MRP LOCAL POLITICAL SUPPORT, SITE READINESS FOR REUSE, and SUPERFUND SITE AGE appear to most strongly associate with the extent to which completed redevelopments match or are expected to match plan redevelopment specifications (PLAN IMPLEMENTATION ON TRACK$_2$). Interestingly, however, as noted above, PLANNING CULTURE$_2$ correlates negatively with PLAN IMPLEMENTATION ON TRACK$_2$. A comparison of these different factors are included in Table 25.

Table 25. Variables included in Superfund Site Plan Implementation Model Factors that Correlate Most Consistently with Superfund Site Redevelopment Plan Implementation Dependent Variables

Name	Measurement	PIOT_1	PIOT_2
SITE LOCATION SUITABILITY$_1$§ (SLS_1 / v022)	**Extent to which the *location* of site makes the site suitable for redevelopment, ranging from "not at all suitable" to "extremely suitably."**	√	√
SITE LOCATION SUITABILITY$_2$§ (SLS_2 / v023)	Indication of whether site is located near one or more features either prior to redevelopment or now (if not redeveloped), that made/make the location of the site appealing for redevelopment.	-	-
SITE LOCATION SUITABILITY$_3$§ (SLS_3 / v024)	Number of features the site is located near either prior to redevelopment or now (if not redeveloped), that made/make the location of the site appealing for redevelopment.	-	-
NEIGHBORHOOD MARKET STRENGTH$_1$§ (NMS_1 / v007)	Indicates number of businesses operating per 100 persons residing in zip code containing site	-	-
NEIGHBORHOOD MARKET STRENGTH$_2$§	Indicates level of development pressure around the site (within roughly one mile from the site boundary) either prior to	√	-

Name	Measurement	PIOT_1	PIOT_2
(NMS_2 / v026)	redevelopment (or now) if not redeveloped, ranging from “no development pressure at all” to “extremely high development pressure.”		
NEIGHBORHOOD LAND AVAILABILITY§ (N_LNDAV / v027)	Indicates amount of undeveloped/vacant property around the site (within roughly one mile from the site boundary), either prior to redevelopment or now (if not redeveloped), ranging from “no undeveloped/vacant property at all” to “extremely high amount of undeveloped/vacant property.”	-	-
PLANNING CULTURE$_1$§ (PC_1 / v002-5)	Composite index of social capital for each county developed by Rupasingha, Goetz, & Freshwater (2006).	-	-
PLANNING CULTURE$_2$§ (PC_2 / v019)	Indicates knowledge of neighborhood, city, or regional land use plans that included/include recommendations for redeveloping the site, either prior to redevelopment or now (if not redeveloped).	-	√ (-)
PLANNING CULTURE$_3$§ (PC_3 / v006)	Indicates whether state is a growth management state as classified by Yin and Sun (2007)	-	-
REGIONAL MARKET STRENGTH$_1$§ (RMS_1 / v008)	Indicates median household income for county containing site	-	-
REGIONAL MARKET STRENGTH$_2$§ (RMS_2 / v009)	Indicates percentage change in population for counties containing sites between 1990 and 2005	-	-
INCENTIVES$_2$§ (INCENT_2 / v020)	Indicates whether the developer was/will be granted public-sector financial incentives (e.g., lien waivers, tax exemptions, tax deductions, low-interest loans) to redevelop the site, and/or whether the site was/is located in any economic development districts, either prior to redevelopment or now (if not redeveloped).	√	-
MRP LOCAL POLITICAL SUPPORT¤ (MRP_LPS / v046)	**Mean index variable (combining STAKEHOLDER SUPPORT and LOCAL GOVERNMENT SUPPORT variables) indicating political support for the most recent redevelopment plan.**	√	√
MRP PLAN QUALITY¤ (MRP_PQ / v042)	Indicates extent to which redevelopment plan is considered a high quality plan, ranging from “extremely low quality” to “extremely high quality.”	-	-
MRP PLANNING TYPE$_2$ (MRP_NUM / v043)	Indicates number of stakeholders were/are (being) consistently involved in efforts to plan for the redevelopment of the site.	-	-
MRP PLANNING TYPE$_5$§¤¤ (MRP_F2F / v047)	Indicates whether an interactive, face-to-face, multi-stakeholder decision making process was used to generate recommendations for reusing the site.	-	-
MRP PLANNING TIMING (MRP_TM / v038)	Indicates whether key decisions about site remedies took/are taking place prior to or during key decisions about site remedies, or otherwise.	-	-
SITE READINESS FOR REUSE$_1$§ (RFR_O8 / v029)	**Indicates whether ANY redevelopment activity be permitted at the site that is consistent with cleanup activities by the end of 2008.**	√	√
SITE READINESS FOR REUSE$_2$§ (RFR_12 / v030)	**Indicates whether ANY redevelopment activity be permitted at the site that is consistent with cleanup activities by the end of 2012.**	√	√
COUNTY	Indicates population of incorporated area or county containing	-	-

Name	Measurement	PIOT_1	PIOT_2
POPULATION§ (CNTY_POP / v010)	site.		
SUPERFUND SITE AGE (SF_AGE / v066)	Indicates number of years between when site was listed as final on NPL and 2008.	-	√

6.3. Hypotheses Results and Discussion

The overarching question of this study focuses on the extent to which collaborative planning affects long-term outcomes manifest in terms of the extent to which it affects the redevelopment of Superfund sites and the extent to which it influences the implementation of specific Superfund site reuse plans. To address this question, two main hypotheses were developed.

6.3.1. The Superfund Site Redevelopment Model

My first argument, stated here as Hypothesis 1, suggests that under certain conditions, Superfund sites will be more likely to be redeveloped permanently if a collaborative planning process is used to plan for their redevelopment than if less intensive planning processes, or none at all, are used.

> *Hypothesis 1: All Superfund sites, or portions thereof, that are located in areas that could realistically generate interest in reuse, and that use collaborative planning processes to plan for site redevelopment, before physical implementation of the long-term remedy begins, will be more likely to be redeveloped permanently (or be "on track" for redevelopment) within a reasonable period of time, than sites located in similar-type areas that use less intensive forms of public involvement in the planning process.*

Before discussing whether data lends support for my hypothesis, it is important to underscore the fact that nearly all the sample sites were located near residential or commercial areas. Therefore, because of the small size of my sample, I did not exclude sites that were not located next to residential or commercial areas. As a consequence of these limitations, the essence of my hypothesis is that:

> *All Superfund sites, or portions thereof that use collaborative planning processes to plan for site redevelopment, before physical implementation of the long-term remedy begins, will be more likely to be redeveloped permanently (or be "on track" for redevelopment) within a reasonable period of time, than sites located in similar-type areas that use less intensive forms of public involvement in the planning process.*

Results from the statistical analyses moderately support the hypothesis that collaborative planning does in fact result in sites being more likely to be redeveloped or "on track" for redevelopment than sites for which less intensive forms of public involvement in the planning process. Results from the bivariate analysis strongly suggest that collaborative planning is a necessary component of site redevelopment. Results of the multivariate analysis using OLS regression similarly provide strong evidence of collaborative planning's role in site redevelopment. However, the role of collaborative planning was not consistently positive and statistically significant across all models and all forms of the PLANNING TYPE independent variable tested. Notably, higher levels of consistent widespread stakeholder involvement and higher absolute numbers of stakeholders involved appear to positively and significantly affect reuse outcomes. Interestingly, however, there does not appear to be a threshold-level effect, based upon the data examined here, whereby high/very high levels of involvement have a greater effect on reuse outcomes than sites with moderate, low, or very low levels of stakeholder involvement. However, in spite of statistical evidence presented here which suggests that collaborative planning has a positive, key role on reuse outcomes, there is insufficient evidence to reject the hypothesis that collaborative planning is more important than the mere act of planning, since the one planning type variable simply indicating the degree of planning uses was similarly consistently statistically significant in both the bivariate and multivariate analyses. Moreover, in spite of the statistical evidence, results from the multivariate analyses must be viewed with caution, as the models tested are underspecified. It is not unreasonable that, under ideal conditions, the effect of collaborative planning in the multivariate context could dissipate if other key variables were added to the model. Finally, it is important to underscore that much of the data tested in both the bivariate and multivariate analyses was based on single, individual perspectives. Although I trust that federal cleanup managers have a unique vantage point and understanding of the sample sites and key related characteristics, it is possible that federal cleanup managers' perspectives on the extent of collaborative planning used was not in line with what other stakeholders may have viewed as such phenomena.

6.3.2. The Superfund Site Redevelopment Plan Implementation Model

My second main argument, stated as Hypothesis 2 below, is that reuse plans for all Superfund sites, or portions thereof, which are developed through collaborative planning processes, should be more likely to be implemented than reuse plans that are developed through less intensive public planning processes or none at all.

> *Hypothesis 2: Redevelopment plans for all Superfund sites, or portions thereof, that are located in areas that could realistically generate interest in reuse, and that use collaborative planning or "consensus seeking" public involvement processes to plan for site redevelopment, before physical implementation of the long-term remedy begins, will be more likely*

to be implemented (or be "on track" to be implemented) than redevelopment plans for sites located in similar-type areas that use less intensive forms of public involvement in the planning process.

As mentioned in the discussion above, it is important to underscore here the fact that nearly all the sample sites were located near residential or commercial areas. Therefore, because of my small sample size, I did not exclude sites as part of my sample that were not located next to residential or commercial areas. As a consequence of this limitation, the essence of my second hypothesis is that:

Hypothesis 2: Redevelopment plans for all Superfund sites, or portions thereof, that use collaborative planning or "consensus seeking" public involvement processes to plan for site redevelopment, before physical implementation of the long-term remedy begins, will be more likely to be implemented (or be "on track" to be implemented) than redevelopment plans for sites located in similar-type areas that use less intensive forms of public involvement in the planning process.

There is only weak statistical evidence to support the hypothesis that collaborative planning, or "consensus seeking" public involvement, processes result in plans for sites that will be more likely to be implemented than non-collaborative processes used for other sites. Only, one of the two collaborative planning variables exerted a positive and statistically significant effect on plan implementation outcomes in the bivariate analysis – PLANNING $TYPE_3$. Moreover, this collaborative planning variable exerted a statistically significant effect on only one dependent variable (PLAN IMPLEMENTATION ON $TRACK_1$), and the effect was marginal. In addition, this result was based on a very small sample, as only 33 sites had plans completed by the end of 2008. In addition, since multivariate regression analytic techniques could not be applied because of sample size limitations, there was no opportunity to draw firmer conclusions about the effect of the

PLANNING TYPE variables on the plan implementation dependent variables. Finally, again, although I trust that federal cleanup managers have a unique vantage point and understanding of the sample sites and key related characteristics, it is possible that federal cleanup managers' perspectives on the extent of collaborative planning used was not in line with how other stakeholders may have viewed as such phenomena.

7. An Empirical Application of the Models: The Comparative Case Study Approach

7.1. Case Study Research Design

Case studies enable researchers to carefully examine the contextual conditions surrounding a researcher's phenomenon of interest in order to better understand the phenomenon. Case studies are extremely valuable when the phenomenon of interest is comprised of and shaped by numerous factors not easily measurable (R. K. Yin, 2003). The reuse of Superfund sites is shaped by a wide-range of factors — physical, political, social, economic, and technical. Although quantitative tools can be employed in an attempt to isolate the effect of collaborative planning and other factors on Superfund site reuse — the numerous factors shaping Superfund site redevelopment – especially that of collaborative planning – are arguably better understood through case study analysis.

The purpose of conducting case studies as part of this dissertation is to more fully explore the role of collaborative planning in Superfund site redevelopment and plan implementation. In each case I provide context for why the particular case is unique and important. I then provide background information for the case study site describing the site's contamination history, cleanup actions, and current status. Next, I describe the collaborative planning process used. I then engage in a discussion about the collaborative planning processes used, their impact on long-term outcomes, and other related issues. Questions considered include: Why was the collaborative planning process successful or not? What key contextual factors influenced this outcome? How important was the structure and quality of the collaborative planning process? Did the collaborative planning process in fact help site plan implementation or site redevelopment? What were the reasons for this? Each case ends by proposing additional questions that could shed further light on the workings of this case in terms of its relevance for collaborative planning?

After concluding each case study, I then synthesize the information from across the four case studies. The goal of this synthesis is to "expand and generalize theories" related to the role of collaborative planning as well as to highlight important, unanswered questions. As a last step, I briefly revisit my Superfund site redevelopment and plan implementation predictive models in light of my case studies to further consider the relevance of the variables comprising these models as other variables I overlooked.

7.2. Case Study Selection and Background Information

To select my cases, I considered a number of potential criteria, including cases where collaborative planning was robust and ultimately successful (e.g., it appeared to significantly and positively impact Superfund site redevelopment); cases where collaborative planning was strong but ultimately did not lead to desired reuse outcomes; cases that reflect variation in the structure of the collaborative planning processes used; cases that reflect comparable market conditions; and cases of genuine interest to the researcher. Ultimately, I chose to select cases, or sites, where collaborative planning processes were used to select future land uses of Superfund sites but the success of these planning processes – in terms of their effect on reuse outcomes – varied from case to case. I selected one case where successful redevelopment at the site is underway (a former mining facility site just south of Salt Lake City, Utah); two cases where the sites appear to be "on track" for redevelopment (a former tannery site in central New York and a former wood-treating site in a western suburb of Jacksonville, Florida); and one case where the site does not appear to be "on track" for redevelopment (a former wood treating site in Portland, Oregon).

Each of the sites selected for case study research was chosen by the US EPA as a Superfund Redevelopment Initiative pilot project in either 1999 or 2001. As part of the pilot project, local governments hosting these sites were awarded approximately $100,000 each to conduct reuse assessments and related reuse planning processes. Table 26 below presents additional background information pertaining to each of the case study sites. Information used to fill in the table is based on a variety of different sources, including Census data, U.S. EPA data, data collected from my survey of federal cleanup managers, and my own best judgment based upon my review of government documents, newspaper articles and discussions with interviewees.[31][32]

[31] Information used to fill in the table is based on a variety of different sources, including Census data, U.S. EPA data, data collected from my survey of federal cleanup managers, and my own best judgment based upon a review of government documents, newspaper articles and discussions with interviewees.

[32] Data sources for the information presented in the first section of the table are included in each of the case studies, with two exceptions. Data regarding "NPL Listing (proposed), "NPL Listing (final), and "First cleanup action initiated" is derived from EPA's CERCLIS database. http://cfpub.epa.gov/supercpad/cursites/srchsites.cfm. Data regarding Metropolitan Statistical Areas is drawn from the Office of Management and Budget (2008), OMB BULLETIN NO. 09-01, "Update of Statistical Area Definitions and Guidance on Their Uses." http://www.whitehouse.gov/omb/assets/omb/bulletins/fy2009/09-01.pdf

Data sources used to develop each case study included survey data, if available; federal/local government documents including each site's foundational reuse plan[33]; and newspaper articles available on-line; and interviews with key stakeholders.[34] The perspectives of each of the respondents used to inform each case study collected from either interviews or surveys are included as a footnote at the beginning of each case study.

Table 26. Background Information on Case Study Sites

	Hiteman Leather	Midvale Slag	McCormick and Baxter Creosoting Company	Coleman-Evans Wood Preserving Company
GENERAL AREA AND SITE BACKGROUND INFORMATION				
Regional/site area characteristics				
State	NY	UT	OR	FL
General location	Central NY	North-central UT	West-northern OR	Northeastern FL
Metropolitan Statistical Area	Utica-Rome, NY	Salt Lake City, UT	Portland-Vancouver-Beaverton, OR-WA	Jacksonville, FL
County	Herkimer	Salt Lake	Multnomah	Duval
Pop. (2006-2008 est.)	62,200	1,022,651	714,567	850,962
Growth rate (1980-2008) (%)	-7 percent	65	27	49
Growth rate (2000-2008) (%)	-3 percent	14	8	9
City/Town	West Winfield	Midvale City	Portland	Jacksonville
Population[35]	862	30,766	551,226	804,536
Median Household Income ($) (1999)	33,947	40,130	40,146	40,316
Growth rate (1990-2008) (%)	0	160	27	27

[33] I was only able to obtain a copy of Chapter 4 of the reuse plan for Hiteman Leather.
[34] Given that federal attorneys have clarified that federal officials cannot disclose "non-public" information and that any public information disclosed by federal officials can only be done in their officials' private capacity, it is presumed that obtaining federal and even state cooperation for additional case study research may be extremely challenging.
[35] Population data for West Winfield is based upon the 2000 Census data. Population data for the remaining three cities is based upon the 2006-2008 3-year Census estimates.

	Hiteman Leather	Midvale Slag	McCormick and Baxter Creosoting Company	Coleman-Evans Wood Preserving Company
Unique location characteristics	Located 15 miles south of Utica in downtown	Located just south of Salt Lake City, near another large Superfund site	Located within the much larger Portland Harbor Superfund site	Located in western suburban area of Jacksonville referred to as Whitehouse
Site Characteristics				
Acreage	12	446	43 (surface) 23 (riverbed)	10
Historic site use	tannery	mining waste site	wood treating	wood treating
First cleanup action initiated	1994	1990	1995	1984
NPL Listing (proposed)	1998	1986	1993	1982
NPL Listing (final)	1999	1991	1994	1983
Primary cleanup funding	EPA	Private	EPA	EPA
Year reuse planning grant awarded	2001	1999	1999	2000
Bulk of cleanup activity completed by:	2008	2006	2005	2007
Current state of reuse	Mostly unused, some walking trails	Some commercial development completed	Unused	Unused
Reuse status	Awaiting ok from EPA to move forward with redevelopment, in accordance with plan	Physical redevelopment is underway	Remains unused	Currently unused, but City expects it will be redeveloped as a park
Primary reuse plan implementation status	See above	Being implementation	Not implemented	Awaiting implementation

7.3. Case Study 1: Hiteman Leather[36,37]

7.3.1. Introduction

The Hiteman Leather Superfund site is located in central New York near the center of West Winfield, a small incorporated village located within the small town of West Winfield.[38] These communities are located approximately 15 miles south of Utica and 50 miles east of Syracuse, and situated along two major roadways. Up until the late 1960s, a leather tannery located on the current Superfund site served as the main employment source for the village; since closing in the late 1960s, however, the village has become a bedroom community for one of the nearby cities (Hiteman Leather Survey Respondent 1, 2008). Since the 1980s, village leaders have been considering the possible reuse of the Hiteman Leather site. In 1998, the village undertook a reuse feasibility study of the Hiteman Leather Superfund site with the hope of redeveloping the site as a multi-faceted community center. In the 2000s, the Village of West Winfield continued its reuse

[36] In addition to using information from public records and newspaper articles, the Hiteman Leather case study is based on the perspectives of a local official, a federal official, and one of the site's planning consultants. Multiple efforts were made to interview the chairman of the West Winfield Redevelopment Committee as well as another local resident who participated in the EPA-funded planning process. In addition, efforts were also made to speak with another one of the village's planning consultants. Permission was granted by the federal and local official to use their survey data to inform the case study.

[37] In an effort to improve the validity of this case study, I emailed a previous version of this case study to the three primary respondents in February 2010, allowing for a three week review. One respondent commented briefly, noting that although he did not have time to provide an in-depth review, "It seems to be an extremely thorough piece of work." During the case study review process, I was informed that one of the respondents – the site's long-time EPA cleanup manager – had passed away in early February 2010.

[38] Note. A Wikipedia entry reports that the village of West Winfield is located within the town of Winfield (Wikipedia, n.d.-b). Similarly, the 2000 U.S. Census data includes separate entries for Winfield and West Winfield, but not separate entries for the village of West Winfield and the Town of West Winfield (U.S. Census Bureau, 2000). However, a report prepared by the Village of West Winfield refers to "the town and village governments of West Winfield" (Village of West Winfield, 2000).

planning efforts after being awarded funding from EPA to prepare a reuse assessment of the site and a corresponding redevelopment plan. To inform the reuse assessment and redevelopment plan, the village formed a Hiteman Leather community advisory board and undertook extensive community outreach. Although the site is currently not in use except for passive recreational purposes, the village is extremely optimistic that the site will be redeveloped in the near future.

The Hiteman Leather site case is important for a number of reasons. First, it is noteworthy for the considerable degree of multi-stakeholder collaboration directed toward the cleanup and reuse of the site that has been sustained for roughly a decade. In particular, the case stands out as an excellent example of deeply engaging with local residents and other stakeholders in discussions over the reuse of a contaminated site. Second, the case stands out given the high expectations that both local and regulatory officials have for the anticipated reuse of the site. Use of collaborative planning appears to have played an important role in generating this enthusiasm; however other factors appear to have been important as well. The case also raises important issues, however, about the use of collaborative planning, particularly when expectations regarding the reuse of a site have been made prior to the process. Moreover, the case presents a unique opportunity to consider the role of collaborative planning, especially in weak market cities when no clear sources of funding to implement reuse ideas have been identified.

7.3.2. Site Background, Cleanup, and Current Status

The Hiteman Leather site encompasses 12 acres near downtown West Winfield. It is surrounded by commercial buildings on one side, private residences on two sides, and a community cemetery on the remaining side (U.S. EPA, 2009b). The Unadilla River cuts through one portion. Leather tannery operations began at the site in 1820 and continued until the late-1960s (U.S. EPA, 2009b). By mid-century, the facility was discharging over 100,000 gallons of metal-contaminated wastewater daily into the unlined wastewater lagoons (U.S. EPA, 2009b). In 1959, improper lagoon management led to a nearby fish kill, as determined through a subsequent investigation. In the late 1960s, the facility was forced to close due its inability to comply with wastewater discharge requirements. Facility buildings were subsequently used for storage (U.S. EPA, 2009b).

In the early and mid-1990s, the state environmental agency and EPA began investigating the site. Significant contamination was found in the soil, including the wetlands, and in river sediment. Starting in the mid-1990s, EPA fenced the site, removed asbestos, demolished buildings determined to be structurally unsound, and stabilized the riverbank. EPA later had additional structures on site demolished. EPA selected its cleanup remedy for remaining site contamination in 2006, calling for a number of actions to address contamination on and near the site. These included removal of contaminated soil and sediments, solidification and consolidation of the excavated soil and sediments through concrete application on the site property, covering the solidified materials, treatment of contaminated groundwater, and use of institutional controls placing restrictions on site development activity and the use of groundwater for drinking (U.S. EPA, 2006c, 2009b).

While designing the remedy, EPA determined that applying concrete to the excavated soils would not be necessary and downstream sediments would not require remediation. In addition, it determined that groundwater cleanup would not be necessary since the disposal activities at the site did not contribute to the groundwater contamination (U.S. EPA, 2009b). EPA completed the cleanup of the site in September 2008 (U.S. EPA, 2009d), however long-term monitoring of the site continues. EPA paid for the cleanup of the site since viable potentially responsible parties could not be identified (U.S. EPA, 2009b).

The site has not been redeveloped; however, the site is open to the public and a walking trail was included on one portion of the site (Hiteman Leather Interviewee 2, 2010). Both a federal and local official consider the site to be on-track for redevelopment (Hiteman Leather Survey Respondent 1, 2008; Hiteman Leather Survey Respondent 2, 2009). According to one recent report, “The Village hopes to redevelop the site in phases and is now in the process of constructing a much needed sewer treatment system on part of the site to serve the downtown area” (U.S. EPA, 2009d). According to a local official, the site was recently seeded and full implementation of the town’s reuse plan will take place once “the green light is given” (Hiteman Leather Survey Respondent 2, 2009). The anticipated redeveloped is expected to conform very closely with what was originally proposed in the 2006 redevelopment plan submitted by the town (Hiteman Leather Survey Respondent 1, 2008; Hiteman Leather Survey Respondent 2, 2009). Moreover, according to one official, the planned reuse of the site will continue, irrespective of waste unit treatment location (Hiteman Leather Interviewee 1, 2009). Currently, EPA and the state are working with the village to put separate easements in place to limit certain on-site activities (Hiteman Leather Interviewee 1, 2009).

7.3.3. Reuse Planning Process

"'The Reuse Plan is probably what made redevelopment possible at this site; it jumpstarted the entire project. Without that plan, I think we'd still be looking at an old foundation and an overgrown jungle out there. The site went from a real mess to something that, hopefully, will become an area of real value to this community'" - West Winfield's Redevelopment Committee Chairman, Jim Murphy (qtd. in U.S. EPA, 2009d)

At least since the 1980s, residents and officials within the village and town of West Winfield had considered the possibility of redeveloping the Hiteman Leather site (Village of West Winfield, 2000). In 1997, the local village library examined the possibility of building a new library on a site adjacent to the Hiteman Leather site. Afterward, the Village of West Winfield and the town of Winfield funded a feasibility study to assess the possibility of developing the Hiteman Leather site "resulting in a combined village/town center" (Village of West Winfield, 2000, p. 8). The feasibility study was completed in 1998 and conceptual plans for the site's redevelopment were completed in 1999 (Village of West Winfield, 2000). During this time, local officials indicated that the effort to consider site reuse "has been an on-going effort on the part of the Town & Village Officials and they have involved the local electorate in various discussion and approval presentations" (Village of West Winfield, 2000).

In 2000, the Village of West Winfield applied to EPA for funding hoping to further develop "plans for the project taking them to the completion of the design development phase of the planning work" (Village of West Winfield, 2000, p. 4). The following year, EPA awarded West Winfield a $100,000 grant under EPA's Superfund Redevelopment Initiative to undertake additional planning steps. Essentially, the funding was used to prepare a reuse assessment and redevelopment plan for the site (U.S. EPA, 2008a). The reuse assessment involved examining the site's environmental and regulatory history, environmental and land use considerations, identifying potential land use preferences, and interacting with the community to obtain information on land use preferences and further refining these choices. The majority of these activities were undertaken by a redevelopment consultant hired from a nearby university (Hiteman Leather site respondent 1, 2008).

According to a respondent that helped initiate the reuse planning process funded by EPA, perhaps the most important part of the planning work centered on incorporating community involvement (Hiteman Leather Interviewee 2, 2010). In the reuse assessment/reuse plan, the position of village leaders regarding their intentions behind the solicitation of community input was explained:

> Village leaders, who were responsible for bringing the Superfund Redevelopment Initiative Grant to the community and managing the program while it was underway, were clear that they did not want to proscribe to the community how the site should be reused. Instead they actively reached out and sought the opinions/feedback of residents of the Village, and of the Greater West Winfield Area (all municipalities within the Mt. Markham School District) (Village of West Winfield, December 2005, p. 2-15)

To meet its goal of obtaining a wide-range of stakeholder input, multiple steps were taken. This included the formation of a community advisory board, updating residents through public meetings and the newspaper, and conducting a widely-distributed two-part community survey (Village of West Winfield, December 2005).

The village established the community advisory board almost immediately after being awarded the Superfund grant. To structure the board:

> [t]he Village cast a wide-net to involve representatives of key groups in the community on the CAB, including local government, businesses, and civic organizations, as well as area residents in general. By doing so the Village was helping to ensure that redevelopment of the site would have a firm foundation of public and private support (Village of West Winfield, December 2005, p. 2-2).

The committee had representation from “all organizations”, according to one respondent, like the local chapter of the Rotary Club (Hiteman Leather Survey Respondent 2, 2009). Several meetings involving the community advisory board were held over the course of the EPA funded planning process.

In April 2004, the Village of West Winfield administered the first of the two part community survey, with the goal of “acquaint[ing] area residents with the background of the Hiteman Leather Site, learn[ing] more about the residents’ general opinions on living in the Greater West Winfield Area; and to find out what residents felt that their community needed the most” (Village of West Winfield, December 2005, p. 2-16). In September 2004, the village administered the second part of the survey, intended specifically to obtain preferences regarding the reuse of the Hiteman Leather site. Respondents were asked to indicate their preferred reuses and then rank them. The preferred reuses included: commercial/retail uses; community center/pool; housing opportunities; and a municipal sewage system. Over 100 individuals responded to each of the two surveys.

Ultimately, based upon a number of factors, including "the consistent input of the Community Advisory Board and on the needs and desires of area residents, as determined through a two-part survey and public meeting" (Village of West Winfield, December 2005, p. 2-2), it was determined that "the 'reasonably anticipated future land use' for the site is primarily as a regional multi-use Community Center" (p. 2-22). The subsequent redevelopment provided an overview of the anticipated uses as well as a discussion of issues regarding implementation. The redevelopment plan also clarified that it represented an update of the reuse feasibility study completed in 1998 (Village of West Winfield, December 2005). A regionally-based architectural firm was also hired to develop drawings depicting the reuse of the site (Esmond, 2005) and develop cost estimates for the agreed upon reuse (Village of West Winfield, December 2005).

By the end of 2004, the bulk of the reuse assessment and redevelopment plan had been completed, although the document was not finalized until December 2005 (Village of West Winfield, December 2005). The redevelopment plan called for the development of a regional community center to be called the Greater Winfield Community Center. This center was to include several key elements including: municipal offices, court facilities, and state police offices; a library, historical, teen arcade; a community/senior center; and a fitness center with a swimming pool, locker rooms, and a gym track.[39] The cost for constructing the site was estimated to be between $7.3-$8.6 million.

The implementation section of the redevelopment plan described seven basic stages of property development and clarified the steps that the village had achieved so far. This section also described potential funding sources along with specific action steps the village should take in order to successfully move through all seven development stages. These include: 1) coordinating with EPA; 2) forming the Hiteman Leather redevelopment committee; 3) coordinating with federal and state representatives; 4) maintaining public involvement; and 5) continuing work on the feasibility analysis and final site design (Village of West Winfield, December 2005, p. 4-5). A redevelopment committee was intended take over for the community advisory board and was to include a committee of five appointed by the mayor. The goal of the redevelopment committee was to include: focus[ing] on tangible outcomes that can be taken during the time that the final site remediation plans and cleanup are undertaken" (p. 4-5). It was also expected that the committee would communicate to residents about the progress of the project by providing "regular reports to the Village Board and local media" (p. 4-5). By 2006, the transition from the Hiteman Leather community advisory board to the redevelopment committee did take place. The redevelopment committee is continuing to serve as a champion for the Hiteman Leather redevelopment effort (e.g., see U.S. EPA, 2009d).

[39] Recently, it was also clarified that soccer fields and nature trails are expected as well (U.S. EPA, 2009a).

7.3.4. Exploring the Role of Collaborative Planning at the Hiteman Leather Site

One of the key reasons the Hiteman Leather case is valuable to consider is the significant degree of multi-stakeholder collaboration focused on the cleanup and reuse of the site that has been underway for roughly a decade. Some might even argue that the initial discussions that led to the idea of using the Hiteman Leather site as a multi-faceted community reuse center were collaboratively inspired as well. Nevertheless, the collaborative planning component integrated as part of the EPA-funded reuse assessment and redevelopment plans was especially noteworthy. First, even though village leaders had expectations going into the EPA reuse assessment and planning phase regarding their preferred reuse of the site, village leaders demonstrated an openness to consider a wide-range of uses at the site based upon commitment. Second, village leaders established a very active community advisory board to inform redevelopment decisions about the site that purposefully included a broad range of stakeholders, a core principle of effective collaborative planning. Third, village leaders provided substantial opportunity for residents of both West Winfield and several nearby small communities to provide input on general development preferences (through the first survey), and to all municipal water customers residing within the village of West Winfield to provide input on specific site reuse issues (through the second survey). In addition, since the work under the EPA reuse grant was complete, the Hiteman Leather redevelopment committee has been continuing to communicate with local residents regarding the status of reuse efforts.

The case is also noteworthy given the high expectations that both local and regulatory officials have regarding the anticipated reuse of the site. These high expectations are likely driven by the perception that the selected reuse for the site is, in fact, the most appropriate use for the site, that the redevelopment plan was borne out of a collaborative planning process that is perceived as highly legitimate (Hiteman Leather Survey Respondent 1, 2008; Hiteman Leather Survey Respondent 2, 2009), and that local officials and members of the redevelopment committee remain committed to implementing the plan. Other more subtle factors that have likely contributed to the anticipated reuse of the site include: the site's prominent location, which is near downtown West Winfield (Hiteman Leather Survey Respondent 2, 2009); cooperation from the site owner who was unopposed to the village's acquisition of the site, and forgiveness of a state judgment lien against the site as well as approximately $250,000 in property back taxes (Hiteman Leather Interviewee 1, 2009). In addition, the EPA site cleanup manager took a number of steps to help sustain the reuse momentum for the site, including facilitating the site's transfer of ownership (Hiteman Leather Interviewee 1, 2009), integrating cleanup site cleanup activities with the site redevelopment plan (e.g., see U.S. EPA, 2006c), and more generally serving as a champion of reuse as indicated here:[40]

[40] Not all share the view that this site is on track for reuse. One respondent expressed skepticism that the site would ever be transformed into a community center. The respondent explained that towns such as West Winfield simply lack the resources to implement such plans, and moreover, they lack the staff necessary to aggressively pursue outside funding opportunities such as grants. Given this, the respondent explained, "there is not a community center on that site and there may never be" (Hiteman Leather Interviewee 2, 2010).

> I encourage you as the redevelopment committee, …to support that initiative. Because, well, I will tell a story…I grew up on a farm where there were a lot of towns just like West Winfield that existed in New Jersey. We have since become in my lifetime the most densely populated state. A lot of towns are on the maps. but, they are gone. The reason they are gone, they had no anchor….But, you guys have a very unique opportunity. Okay? Especially those on the redevelopment committee. If you install a community complex in the center here, it's the anchor. It becomes something that draws other people in for various activities. And, that will help carry forth the Village of West Winfield. Other then that, you might be absorbed by urban sprawl from Utica when it gets over its economic slump in the area. But, you have a very unique opportunity of controlling the fate of your own Village. And, not everybody realized that. (U.S. EPA, 2006c, pp. 77-79 of public meeting transcript).

Although the use of collaborative planning appears to have played a central part in help place the Hiteman Leather site on a favorable redevelopment trajectory, some important questions about the use collaborative planning to support redevelopment in this case are worth probing. First, can collaborative processes be used in a legitimate manner when the preferences of prominent stakeholders regarding the use of a site are well-known in advance of the collaborative planning process? In the application for the EPA reuse grant award, village leaders clearly indicated that, "It is the intent of the representatives of the town and village governments of West Winfield in Herkimer County to create a community center [on the site]" (Village of West Winfield, 2000, p. 4). Given this, one is reasonable in asking, what's the purpose of a subsequent collaborative process then? A skeptical response would be that the process was simply a means for legitimizing the preferences of those in power. The fact that, upon receiving the EPA grant award, village leaders opted to engage in broad stakeholder effort and avoid "proscib[ing] to the community how the site should be reused" (Village of West

Winfield, December 2005, p. 2-15) suggests this was not necessarily the case. More broadly, it is important to ask whether providing funding to support a robust collaborative planning process in a small, weak-market community was entirely appropriate. One could argue that it was entirely appropriate to support the process as it contributed to a widely accepted redevelopment plan, sustained enthusiasm for the plan, and sustained efforts to identify mechanism to implement the plan. However, one could also argue that given the community and region's sparse population and weak economic conditions, support for an intensive collaborative planning process was risky because it could result in a redevelopment plan that while widely accepted could be very difficult to implement. Ultimately, it speaks to a larger issue of whether the primary funders of such processes bear some obligation for assisting with plan implementation (Hiteman Leather Interviewee 2, 2010).

The Hiteman Leather case raises other important questions. For example, in settling the final reuse preference for the site as part of the EPA funded reuse planning process, how much weight were the survey results given by the Hiteman Leather community advisory board members versus preferences of the board members? Have concerns been expressed by local stakeholders regarding the value of undertaking the EPA-sponsored reuse planning process, given that village leaders had identified its preferences regarding reuse of site several years beforehand? Finally, are decisions regarding implementation of the Hiteman Leather redevelopment plan currently being made by the Hiteman Leather redevelopment committee in accordance with collaborative planning principles or is the effort essentially driven by committee's leader? Finally, looking back, are there features of the EPA-sponsored collaborative planning process that could have been done differently that may have even further improved the chances that the Hiteman Leather site will be redeveloped in the near future? Answers to a number of these questions will be most interesting once it is finally clear whether the Hiteman Leather site will be redeveloped in accordance with the current redevelopment plan. For now, the case nevertheless stands as a good example of how collaborative planning can help build enthusiasm for the redevelopment of a Superfund site.

7.4. Case Study 2: Midvale Slag[41]

"In fact, it is a triumph of federal environmental law and the persistence of local, state and congressional leaders, landowners and developers. They have created a new beginning for an area that was long considered hopeless."(Editorial, 2006)

7.4.1. Introduction

The Midvale Slag Superfund site is located in Midvale City, Utah, approximately ten miles south of Salt Lake City. Once a working class town, Midvale has become a bedroom community for Salt Lake City and nearby areas. Located immediately north of the 530 acre Sharon Steel (Midvale Tailings) Superfund site, the Midvale Slag site is comprised of 446 acres and is surrounded primarily by residential, commercial, industrial, and agricultural uses. A collaborative planning process funded by EPA was initiated at the site between 1999 and 2000 to develop a reuse plan for the site. This built upon a previous community-based collaborative planning effort and resulted in a reuse plan ultimately adopted by the Midvale city council. Today, the site is considered a prominent example of successful Superfund site reuse. When completed, the site's redevelopment is expected to include a vibrant mix of land uses, including residential, commercial, industrial and recreational. Residential housing and LEED-certified commercial buildings have already been constructed. A light-rail station stop is also planned. This case is important for understanding collaborative planning for three main reasons. First, it demonstrates that collaborative planning can have a positive effect on

[41] In an effort to improve the validity of this case study, I emailed a previous version of this case study to five of the primary respondents in February 2010, allowing for a three week review. I also emailed the case study to a city official who played an important role in the foundational reuse planning process for the site but was no longer with the city. No comments were provided.

plan implementation and Superfund site redevelopment. This successful application of collaborative planning principles is particularly noteworthy given the context of distrust and frustration between key stakeholders out of which the collaborative planning effort emerged. Second, the case is important for understanding how the collaborative planning process was able to proceed, even though the primary site owner could have stepped away from the planning process to pursue other site redevelopment goals. Third, the case is important because it demonstrates how the principles of collaboration can be sustained even after the primary collaborative planning process concludes. Finally, as a successful case, the Midvale Slag case provides an excellent opportunity to consider the importance of collaborative planning relative to other factors also influential in the redevelopment of the site.

7.4.2. Site Background, Cleanup, and Current Status

For 100 years intensive smelting operations took place at the Midvale Slag site. After operations were stopped in 1971, the primary industrial facilities were demolished (U.S. EPA, 2008d). Local, state, and federal environmental investigations first began in the early 1980s (U.S. EPA, 2008d). Investigation results in the mid-1980s showed that soil and groundwater were contaminated with heavy metals (U.S. EPA, n.d.-h). Contaminants were ultimately identified in smelter/mill wastes, sediment, surface water, and ground water (U.S. EPA, 2008d). Specific contaminants of concern included arsenic, chromium, copper, lead, and mercury, among others (U.S. EPA, 2008d).

The northern portion of the site, referred to by EPA as Operable Unit 1 (OU-1) consists of 266 acres and contains an abandoned Wastewater Treatment Plant (WWTP), WWTP lagoons, jurisdictional wetlands, and the Winchester Estates Mobile Home Park. The southern portion of the site, OU-2, contains roughly 180 acres and is "also subdivided into areas based on the distribution of unique smelter and mill wastes (U.S. EPA, 2008d, p. 5). The southern portion of the site (OU-2) "was the location of most smelter waste disposal"; however, "some smelter wastes and contaminated soils are also present on OU1" [the northern portion]" (U.S. EPA, 2008d, pp., p. ES-1). Groundwater is contaminated on both the northern and southern portions of the site (U.S. EPA, 2008d).

Investigators determined that individuals may be potentially at risk from consuming contaminated shallow groundwater, or by ingesting, breathing, or contacting contaminated wastes and soil (U.S. EPA, n.d.-h). The site was proposed to the National Priorities List (NPL) in the mid-1980s and was listed as final on the NPL in 1991. Various cleanup actions at the site began in 1990 when EPA installed a fence around the site and removed a portion of highly contaminated soil. EPA subsequently authorized several additional non-time critical and time-critical removal actions between 1992 and 2000. EPA authorized long-term cleanup plans for the northern portion of the site in 1995 and the southern portion of the site in 2002. Minor modifications to various portions of these plans were made in 1996 and 2006. As explained by EPA, the primary cleanup actions required under the long-term cleanup plans and subsequent modifications for the northern portion of the site (OU-1) included:

- Excavating soils on portions of OU1 zoned for residential use, storing soils on OU2 and backfilling excavations with clean soil.[42]
- Implementing ICs to prohibit unrestricted residential land use on the remainder of OU1 without additional assessment and/or clean-up.
- Stabilizing the banks of the Jordan River and/or possible revegetation to minimize Site contamination from sloughing off into the Jordan River. (U.S. EPA, 2008d, p. ES-1)

The primary cleanup actions required under the long-term cleanup plans and subsequent modifications for the southern portion of the site (OU-2) included:

- Excavating and off-Site disposing of a small quantity of highly contaminated smelter waste.
- Constructing and maintaining various barriers over smelter waste and contaminated soils.
- Implementing ICs placing restrictions on future excavations, reviewing proposals for changes to Site land use, restricting surface water management and irrigation practices, requiring mitigation of organic vapors in future structures from contaminated groundwater and restricting water wells.
- Developing and implementing a surface and groundwater monitoring program (applicable to both OU1 and OU2).
- Stabilizing the banks of the Jordan River and/or possible revegetation to minimize site contamination from sloughing off into the Jordan River. (U.S. EPA, 2008d, pp. ES-1-2)

Special accounts resulting from Consent Decree settlements negotiated between EPA, the State of Utah, and responsible parties were used to pay for part of the cleanup costs. Littleson, Inc. (Littleson), "a small family-owned company…which purchased the Midvale Slag Site after the smelter was demolished [in the 1970s]… agreed to conduct the majority of the OU2 Remedy" (U.S. EPA, 2008d, pp. ES-1-2). EPA, Midvale City and the Utah Department of Environmental Quality "assumed responsibility for other remedy elements" (U.S. EPA, 2008d, pp. ES-1-2). In September 2004, Littleson reached

[42] This included the excavation of 18 inches of soil at 14 residential yards (U.S. EPA, 2008d, pp. ES-1-2).

an agreement with EPA after long-running negotiations that permitted Littleson to use $16 million of the EPA settlement money to conduct remaining cleanup activities in exchange for Littleson "cash flow profits every year up to a $2.2 million cap" (Stewart, 2004).

7.4.3. Reuse Planning Process

Midvale citizens had been interested in redevelopment of both the Sharon Steel and Midvale Slag sites at least since the 1990s. One of the first concerted reuse planning efforts directed toward both the Midvale Slag and Sharon Steel sites was initiated in the mid-to-late 1990s. This was led by a local citizens' Superfund site oversight committee – the Citizens for a Safe Future for Midvale (CSFM) – that began operating in 1992. With support from EPA technical assistance grants, the organization first focused on cleanup issues but then broadened its focus to site reuse issues. With the aid of a local architectural firm, CSFM developed goals and objectives for revitalizing both Superfund sites and helped identify a map with proposed land uses called the "Midvale City Consensus Land Use Plan" (Wikstrom Economic & Planning Consultants, Landmark Design, Stantec Consulting, & CHTM Hill, 2000 (Wikstrom et al.), see Appendices B and E). Goals and objectives centered on ensuring the "environmentally safe redevelopment of the area", economic development, tax base enhancement, development that revitalizes older nearby neighborhoods, enhancing the downtown core (located just southeast of the site), greater opportunities for denser development patterns, enhancement of wetlands and nearby river parkway, availability of alternative forms of transportation, additional open space and recreational areas, and mixed use development (see Wikstrom et al., Appendices B and E).

CSFM 's planning efforts helped pave the way for additional land use planning at the Midvale Slag site (Midvale Slag site respondent 3, 2009). In 1998, EPA Region 8 designated the Midvale Slag site as "the pilot program for EPA Region 8's Superfund Redevelopment Initiative" (U.S. EPA, n.d.-h). By designating the site for a reuse planning process, EPA Region 8 had hoped to overcome stakeholder mistrust and frustration that had emerged previously in regards to the handling of cleanup and reuse issues pertaining to Midvale Slag's sister Superfund site, Sharon Steel (Midvale Tailings). According to a regulatory official, the cleanup approach for the Sharon Steel site was "selected over city and community objections", "[r]euse considerations were dismissed", and "[t]ensions and mistrust were high between EPA, State, City, community, and property owners" (Costanzi, 2004, slide 5).

In 1999, planning for the reuse of the Midvale Slag site got underway in earnest after the City of Midvale was awarded $100,000 by EPA's Superfund Redevelopment Initiative to examine the reuse possibilities of the site and outline more specific redevelopment plans. The funding supported the services of a consultant team led by Wikstrom Economic & Planning Consultants, Inc. (Wikstrom). The planning effort included a review of "real estate market conditions and related economic and demographic data," a review of environmental issues potentially impacting redevelopment, a review of the site's "land-use, infrastructure and development context," and public comment. In addition, the effort "included the active involvement of the stakeholders in the plan's creation" (Wikstrom Economic & Planning Consultants, Landmark Design, Stantec Consulting, & CHTM Hill, 2000, p. 11).

The stakeholder involvement process used to develop the *Bingham Junction Reuse Assessment and Master Plan*, or Wikstrom plan, sponsored by the EPA grant, "included an evaluation of the record of public sentiment regarding the site's development as well as full participation of the public and stakeholders throughout the plan's formulation" (Wikstrom et al., 2000, p. 14). Efforts to involve the citizens of Midvale as well as other stakeholders included the creation of a stakeholder advisory panel, presentations at public hearings, and close coordination with CSFM. The stakeholder group included federal, state, and local officials, elected officials, and members of CFSM. In total, the committee included 13 members. Three stakeholder meetings were held over the course of the EPA-funded reuse process. Further, the reuse planning process included a two-day site-planning workshop to identify site redevelopment opportunities. Most stakeholder committee members participated. CSFM representatives also participated (Wikstrom et al., 2000, p. 15).

In February 2000, at a public hearing preliminary findings from the reuse planning effort were presented. During the hearing, "the public was asked to identify the range of uses that should be considered in the master plan." Several CSFM members participated. During the hearing, CSFM also presented its reuse plan (Wikstrom et al., 2000, p. 15). Ultimately, a large number of the recommended reuses included in the CFSM plan were incorporated into the Wikstrom Reuse Plan, which similarly advocated for commercial, residential, and recreational uses (Wikstrom et al., 2000).

The Wikstrom plan was finalized in April 2000 and presented to the city's planning commission that same month. A few months later, the plan was approved by the city council (U.S. EPA, 2002d). The plan represented the generally accepted vision of how the site could be revitalized and came to be considered “the bigger picture plan” (Midvale Interviewee 1, 2009) or concept plan that was later refined through city planning processes. The Wikstrom plan also clarified potential follow-up planning steps necessary to carry out the vision outlined, including adding the plan as an amendment to the city’s General Plan and, if approved by city council, rezoning the site to match the plan, identify funding sources to enhance development opportunities (e.g., tax increment financing), undertake remediation work that will support implementation of the plan, and undertake additional soil sampling (Wikstrom et al., 2000).

In November 2001, Midvale the city council “approved an additional section to its land use ordinance” that outlines specifically how development is to be conducted on site “in a way that is supportive of the remediation, and acknowledges and accommodates the contamination that will remain on site (U.S. EPA, 2002d, pdf p. 47). As part of the ordinance,

> The property owners or future developers are required to submit for approval a master plan for the areas, which meets the city’s goals and responds to development and market needs prior to any redevelopment on the Site. EPA intends to attempt to keep options for future development as open as possible while determining the appropriate course of action for remediation of the Site (U.S. EPA, 2002d, pdf p. 48).

In 2004, the city’s redevelopment agency released a master plan for the site further refining initial plans (Taylor, 2004). According to one local official, “the city developed the master plan specifying density, etc." It represented a further refinement of the Wikstrom plan and reflected an enhanced understanding of site conditions. Even though the initial plan changed, there was "lots of overlap between the first and second plan [i.e., the Wikstrom plan and the City master plan]" (Midvale Interviewee 1, 2009). As with the Wikstrom plan, stakeholder input was used to craft the city's master plan. According to the same local official, although the city's master plan "did not have the same level of involvement as the Wikstrom plan" it still had considerable stakeholder involvement. While "not everyone was satisfied with the city master plan, community input was extensive; we had developers, citizens, businesses, etc. involved in this" (Midvale Interviewee 1, 2009).

Roughly concurrent with these processes, the city passed ordinances in 2004 and again in 2007 enabling a process for the establishment and enforcement of city-based institutional controls on the Midvale Slag site. The city's institutional control ordinance was also attached to the consent decree lodged by the Department of Justice and signed in 2004 involving Littleson and other parties (U.S. EPA, 2008d). A full-time site coordinator position was eventually created, with funding support provided by EPA, "who, along with other City officials and inspectors, ensure that the City Ordinance is enforced" (U.S. EPA, 2008d, p. 19).

In early 2006, while the majority of cleanup activities were being completed, Littleson sold 130 of the 350 acres of the portion of the Midvale Slag site renamed as Bingham Junction to the development company J.D. Mercer; in April it sold the remaining developable portion of the 350 acres to Arbor Gardner LLC (McKitrick, 2006). By mid-2006, EPA determined that cleanup activities had successfully reached a point at which development activities could begin (Nielson-Stowell, 2006). Groundbreaking for redevelopment projects took place in 2007 (Gehrke, 2007). Although most cleanup actions have been completed (U.S. EPA, n.d.-h), riverbank restoration and completion of all groundwater monitoring wells are still underway (U.S. EPA, 2008d). In the summer of 2009, groundbreaking got underway for construction of a nearly 200,000 square foot laboratory and office complex in the northern portion of the site, covering approximately 200 acres (Keahey, 2009). As of October 2009, an estimated 32 acres of development projects had been completed, and another 56 acres of development projects were under construction (Limb, 2009).

7.4.4. Exploring the Role of Collaborative Planning at the Midvale Slag Site

"all that good came about because of ICs, objectives for reuse; the initial Wikstrom plan, and what is seen in [the Bingham Junction and Jordan Bluffs] marketing brochure" (Midvale Interviewee 4, 2010)
"The pilot program and reuse grant process was instrumental in making this happen" (Midvale Interviewee 4, 2010)

The collaborative planning processes used at the Midvale Slag site demonstrates that collaborative planning can help contribute to positive long-term outcomes regarding plan implementation and redevelopment. The Wikstrom-led collaborative planning process resulted into an agreed-upon vision for how the site would be reused. I argue that this collaborative planning effort, made more legitimate by the involvement of CSFM members, served as the cornerstone for future collaborative planning. As explained by one local official, following adoption of the reuse plan, the city undertook its own master plan of the site. Whereas the Wikstrom plan was “the bigger picture plan”, the master planning was undertaken to specify what could be built where and at what density. It also reflected a more informed understanding of site conditions. At the conclusion of the master planning process, the local official added that, there was “lots of overlap between the first and second plan” (Midvale Interviewee 1, 2009). A few years after the conclusion of master planning process, the perception remained that the city was continuing to reach out and work cooperatively with regulators and developers to guide redevelopment activity at the site. This sentiment was conveyed by a long-time CSFM member who, in June 2006, exclaimed that, “It's exciting to see the site go from questionable real estate to prime real estate. This is a real success story of the state, EPA, city, and land owners working together”(Citizens for a Safe Future for Midvale, 2004-2010).

What made the initial and subsequent collaborative planning efforts successful? A few potential reasons stand out. First, it appears that principles of collaborative planning – listening intently, focusing on inclusion, and identifying common ground – were taken seriously (e.g., see Costanzi, 2004, slide 17). Similarly, a local resident explained that, “really everyone has come together with a common goal; the city was hoping for more parks/open space; but [as part of the planning process] the city conceded some park space and the land owner conceded some covered space” (Midvale Interviewee 3, 2009). Second, clearly committed participation of key parties was also critical. EPA, for example, was committed to the Wikstrom planning process. Similarly, strong support from the city was also critical

The participation of the primary owner of the site was also essential. Superfund site property owners retaining at least some control over their sites following the cleanup process can stymie reuse collaborative planning processes if they are unwilling to entertain reuse visions championed by the majority of those participating. Without owner support, other interested stakeholders may see little value in attempting to arrive at group decisions about how a site should be reused. During the EPA-funded reuse planning initiated in 2000-2001, the Wikstrom reuse planning team identified 16 private owners of the site being considered as part of the reuse plan; over 90 percent the property was held b one owner, Littleson (Wikstrom et al., 2001). Littleson's representative participated as a member of the Wikstrom stakeholder committee. According to the Wikstrom team, Littleson did not specify its intention to sell, lease, or develop the property himself. Nevertheless, Littleson's representative appears to have been supportive of the reuse ideas envisioned for the site as part of the planning process. One respondent, for example, explained that, "The owner was willing to entertain an adaptive reuse cleanup approach even though it would cost landowner a bit more to implement remedy." Moreover, he added that throughout the planning and redevelopment process at the site, "we had the cooperation of the landowner" (Midvale Interviewee 3, 2009). Although Littleson may have felt some pressure to support local preferences for reuse, particularly given that EPA and the state were still involved in the site and considerable cleanup work at the site remained, Littleson could have nevertheless negatively impacted the collaborative planning effort simply by indicating that the company had ideas for redeveloping the site that did not match those of the majority of the stakeholder members or that of the public more broadly.

Other factors likely helped establish a fertile bed for reuse ideas derived from the collaborative planning to eventually take root at the site. First, the basic act of land use planning was critical here, especially given the site's size, the amount of waste left in place, and the mixed-use preferences for reusing the site. The site's favorable location, its enormous size, lack of other nearby available land suitable for redevelopment, as well as rapid growth locally and regionally were likely also important. Interest in a similar site located 100 miles away from Salt Lake City as opposed to only 10 miles would have likely been much lower than that shown for the Midvale Slag site. In addition, a commitment by the city, the state, and EPA to ensure that additional cleanup actions could accommodate the reuse plan appears to have been very influential. Likewise, a commitment by city, state, and EPA officials to implement and monitor a complex institutional control system clarifying the types of uses allowed given the location of remaining on-site contamination, appears to have been extremely important as well. Had developers lacked confidence in the institutional control implementation and oversight system, it is reasonable that many developers may have foregone opportunities to develop at the site.

In spite of these other factors, a strong case can be made that the use of collaborative planning was still an essential ingredient in the implementation of the site's reuse plan and subsequent development. As one local respondent explained, "The planning processes were critical, and the fact that we had an inclusive process was critical" (Midvale Interviewee 1, 2009). Nevertheless, there are a number of important questions that remain concerning the Midvale Slag site that have relevance for collaborative planning. First, would most of the stakeholders that participated in the Wikstrom planning process in 2000 feel that the redevelopment underway today is genuinely a product of collaborative planning undertake in the early 2000s? Second, what specifically were the stakeholder involvement and collaborative planning techniques used by the city to master plan the site? Were these techniques consistent with the approaches used by the Wikstrom planning team? Could the collaborative planning efforts undertaken by the city been enhanced? Third, looking back, what were the key factors that drove the friction between stakeholders concerning the Sharon Steel site? If a collaborative reuse planning process had been used at the Sharon Steel site similar to the one used at the Midvale Slag site prior to implementation of the site's long-term remedy, is it reasonable to expect that Sharon Steel would have been on track for redevelopment much sooner than the Midvale Slag site? Or are there particular characteristics regarding the Sharon Steel site that likely would have prevented this from happening? Finally, to what extent have lessons and stakeholder experiences from the collaborative planning efforts for Midvale Slag been used to enhance redevelopment opportunities at the Sharon Steel site? Responses to these questions would shed even more light on the role of collaborative planning in contaminated site redevelopment.

7.5. Case Study 3: McCormick & Baxter Creosoting Co.[43,44]

7.5.1. Introduction

The McCormick & Baxter Creosoting Co. (Portland Plant) (MBC) Superfund site is located in Portland, Oregon, alongside the Willamette River. The site is bordered by the river, idle industrial properties, and a residential area on an overlooking bluff. Two rail lines cross the northwest portion of the property. The University of Portland covering over 100 acres is located approximately a half-mile east of the site. A collaborative planning process was initiated at the site between 1999 and 2001 to identify reuse recommendations for the site, following cleanup. The first meeting of the McCormick and Baxter Site Reuse Advisory Committee took place in February 2000. The committee then met several more times through April 2001. Committee members generally agreed that the use of the site should be as managed open space, but consensus was not achieved regarding whether this should be an interim or permanent use. That same year, the City of Portland's planning bureau developed recommendations calling for the city to acquire the site and develop it as a park. In 2001, the Portland city council adopted the planning bureau's recommendations. After initiating preliminary steps to

[43] In addition to using information from public records and newspaper articles, the McCormick & Baxter Creosoting Co. case study is based on the perspectives of individuals with City of Portland Planning Bureau, the state environmental office (including a cleanup manager and site attorney), a federal cleanup agency, the University of Portland, and a nearby neighborhood association. Permission was granted by the federal and local official to use their survey data to inform the case study.
[44] In an effort to improve the validity of this case study, I emailed a previous version of this case study to five primary respondents in February 2010, allowing for a three week review. One respondent noted that "this looks pretty good" but he also provided some substantive comments and thoughts for consideration. The reviewer's most applicable comments have been incorporated into the case study.

examine the possibility for site acquisition, however, the city's efforts to acquire the site were discontinued. As of 2010 the site remains unused, even though it could currently support redevelopment activity. The MBC case presents an excellent opportunity to better understand the limits of collaborative planning and how collaborative planning processes can fall short of desired goals. However, this case also illuminates how such collaborative planning processes may potentially contribute to positive site redevelopment outcomes even when consensus-based goals are not met.

7.5.2. Site Background, Cleanup and Current Status

The MBC site is comprised of 23 acres of contaminated river sediments and 43 acres of land surface and is "fairly isolated by a steep slope" (McCormick Survey Respondent 2, 2009). The site "used to be just a couple of acres of upland land but more land became available as fill was added (McCormick Interviewee 1, 2009). The site has the unique distinction of being located in within the much larger Portland Harbor Superfund site (McCormick Interviewee 1, 2009) which "encompasses a stretch of the Willamette River" (U.S. EPA, 2008c) and is centered downstream, north of downtown Portland (McCormick Interviewee 2, 2010).

The McCormick & Baxter Creosoting Co. (MBC Co.) began wood treating operations at the site in 1941 manufacturing a variety of timber-related products and continued until 1991(U.S. EPA, 2008b). The site contained four wood treatment structures, a large chemical product storage tank, and a tank farm (U.S. EPA, 2006d). A variety of chemicals were used as part of the manufacturing process resulting in significant site contamination (U.S. EPA, 2006d), including creosote/diesel oil mixtures (U.S. EPA, 2006d, 2008b). Contamination depths reach 80 feet in places; similarly sediment contamination in the river reaches up to 80 feet from the sediment surface (U.S. EPA, 2008b). Groundwater is also contaminated. Health risks center on contact or ingestion with contaminated soils, sediments or groundwater (U.S. EPA, 2006d, 2008b).

MBC Co. started investigations of its property in the early 1980s. As a result, the State required MBC Co. to undertake corrective measures, including groundwater treatment, contamination minimization procedures related to the manufacturing processes, and stormwater collection and treatment. In the early 1990s, the State took over cleanup investigation and cleanup responsibilities after MBC Co. declared bankruptcy. Between 1992 and 1996, during its investigation, the State undertook various removal actions at the site. These included: excavation and disposal of site structures, such as buildings and wood treating structures; disposal of wood-treating process waste; collection and treatment of stormwater from wood treatment structure sumps; and removal of liquid in soil (e.g., creosote) through well installation and treatment (U.S. EPA, 2006d, 2008b).

During this time, EPA chose to address the site as a Superfund site and placed it on the final National Priorities List (NPL) in 1994. Two years later the State and EPA entered into a Superfund State Contract, under which the State took the lead role in site cleanup with EPA providing remedial support. In 1996, EPA and the State agreed to a final remedy intended to address contaminated sediment, stormwater, groundwater, and soil. The remedy called for: improvements to the subsurface liquid extraction/treatment system, treatment of on-site soil, application of a soil cap across the whole site, and a cap over sediments in the river (U.S. EPA, 2006d, 2008b). It also called for institutional controls and monitoring (U.S. EPA, 2006d). A few years later, after discovering that contaminants in soil were more widespread than previously known, EPA and the State modified the planned remedy calling for off-site disposal of shallow soil contaminated at certain levels, and then placing a cap over remaining contaminated soil (U.S. EPA, 2006d).

Excavation and off-site disposal of contaminated soil was completed in 1999 (U.S. EPA, 2006d, 2008b). In 2005, installation of a two-foot soil cap over the site surface was completed. The State continues to operate the extraction system for subsurface liquid (U.S. EPA, 2006d, 2008b). However, in the early 2000s, EPA and the State chose to implement a different remedy for groundwater included as part of the original cleanup strategy as a contingency cleanup measure since the existing treatment systems were failing to contain the subsurface liquid. This included installation of a subsurface wall enclosing the subsurface area of a significant portion of the site to further limit migration of subsurface liquid from the facility site to the sediments in the river (U.S. EPA, 2006d, 2008b). The subsurface wall was completed in 2003. The following year, a 20-acre plus sediment cap was completed (U.S. EPA, 2006d, 2008b). As of 2005, all components of the selected remedies for the site were either completed or in place. Routine operating and maintenance of the site remedies is on-going (U.S. EPA, 2006d, 2008b). In the past few years, a few problems have been identified with the sediment cap; the State is currently investigating these (U.S. EPA, 2006d, 2008b).

7.5.3. Reuse Planning Process

In 1999, EPA awarded the City of Portland a grant through EPA's Superfund Redevelopment Initiative. This was one of ten grants the EPA Superfund program awarded to sites located in each of EPA 10 regions and the first grants ever issued by the Superfund program to involve local governments and other stakeholders in efforts to collaboratively identify future uses of Superfund sites. As part of the grant award, the city's planning bureau undertook a reuse assessment to examine how the site could be reused and provide recommendations (U.S. EPA, n.d.-e). To develop its recommendations, the city, with the support of several other agencies and firms, prepared a series of reports that examined multiple facets of the site and its various reuse opportunities and constraints (City of Portland, 2001).

The city also sought significant stakeholder and community involvement (U.S. EPA, n.d.-e). This included preparing newsletters about the project, presenting at meetings of various community groups, and forming a stakeholder advisory committee "to develop reuse recommendations that represent a broad range of stakeholder interests" (City of Portland, 2001a, p. 11). An independent consulting firm was hired to "help design and conduct an effective public process for developing reuse recommendations" (City of Portland, 2001a, p. 11). The MBC site reuse advisory committee included 16 members. These included the site property owner, Charlie McCormick; neighboring landowners which included businesses, residences, and the University of Portland; community organizations including two neighborhood associations; and city staff. A number of agencies, including the state participated in the process as technical advisors. Over the course of approximately 15 months, the stakeholder committee met 11 times. At the conclusion of a few meetings, the committee chose to make decisions by consensus. After spending a series of meetings on site background and related issues, the remainder of the meetings were then directed toward ultimately identifying agreed upon reuse scenarios.

After 10 meetings, roughly six months after the first meeting, the committee "reached general agreement to recommend use of the site as managed open space, such as a park or natural area, but was divided on whether to recommend this as a permanent or interim use" (City of Portland, 2001a, p. 37). According to one interviewee, the reuse selection process involved significant debate, explaining that:

> there were very strong feelings about the site by many involved in the planning process. DEQ was more or less on the sidelines, but several other governmental agencies felt very strongly that, given the enormous amount of public funds invested at the site, the owner should get absolutely no financial benefit in the future from the property.(McCormick Interviewee 2, 2010)

In an effort to bridge varying these preferences and the preferences of the site owner, the property owner's representative "proposed a long-term lease of the site as an active park, to be reconsidered when other redevelopment options become feasible. Some Committee members supported this proposal, while others recommended securing permanent use of the site as a public park or other managed open space" (City of Portland, 2001a, p. 37). The committee's efforts to reach complete consensus "on how to bring the site into an open space use" was not reached, however, even after attempting to resolve this over the course of 6-8 months (City of Portland, 2001a, p. 37).

Later in 2001, the planning bureau "submitted draft recommendations to the advisory committee, essentially proposing public acquisition and use of the site as a park, riverfront natural area, and possible non-recreational development on part of the property" (City of Portland, 2001a, p. 40). As a final consensus on implementation could not be reached, the final reuse recommendations, while rooted in the discussions and deliberations generated by the advisory committee, reflected the opinion of the planning bureau (City of Portland, 2001a). In the final report, the planning bureau's set of draft reuse recommendations were directed to EPA, the state, the property owner, city council, and additional stakeholders (City of Portland, 2001a). Later that same year, the city council adopted the planning bureau's recommendations. The council also required the planning bureau to undertake a study examining the costs and benefits of site acquisition to establish the park (U.S. EPA, 2002b).

Efforts undertaken by the city to acquire the MBC site for park purposes were short-lived. According to one respondent, it soon became apparent that the city did not need additional park space in that area, nor was it going to be allocated the resources necessary to acquire the park (McCormick Interviewee 4, 2009). According to this same respondent, a few private partners offered alternative reuse solutions. One proposal included a dense condominium development; another included a different type of housing. Since these contrasted with the reuse recommendations however; these reuse proposals were not supported. By 2005-2006, however, the University of Portland had begun expressing serious interest in acquiring the site for similar purposes, while it was simultaneously attempting to acquire a former industrial land adjacent to MBC known as the Triangle property. As an important first step, the University successfully negotiated a bona fide prospective purchaser agreement with EPA covering both properties indicating that EPA would not sue the University for contamination releases on either property resulting from previous contamination. Specifically, in the proposed agreement EPA clarified the University's plans to acquire the MBC site noting that: "The University seeks to continue to pursue and expand its educational and service mission by relocating certain athletic facilities, freeing up its existing land for construction of academic buildings." EPA further noted that the University's plan "includes public access to the Properties, and recreational opportunities, including a planned riverfront trail " (U.S. EPA, 2006a).

The site remains unused except for occasional neighborhood gatherings (McCormick Interviewee 4, 2009). The City also has been "growing all sort of native plants at the site; it just looks great" (McCormick Interviewee 3, 2009). A respondent added that, if the university "does not go after property, the property may remain as open space" (McCormick Interviewee 3, 2009). Efforts by the university to acquire the site have remained stalled, and, as of February 2010, it had not yet purchased the property. Although it has obtained EPA's promise not to sue, the university is seeking similar assurances from the state, who, as a major lien holder against the property, essentially controls its sale. According to one respondent, the state was hoping to reach an agreement with the university regarding the purchase of the property by 2011, but now it is not clear this will happen (McCormick Interviewee 1, 2009).

Concerns persist as to whether additional contamination may be found in the river near the site (Graf, 2009), problems with the remedies in place (McCormick Survey Respondent 1, 2008), and uncertainty regarding the implications of the site's location within the larger Portland Harbor Superfund site (McCormick Survey Respondent 1, 2008). In addition, the city has not yet approved a rezoning of the property from heavy industrial classification to one that would permit recreational type uses there. While it is possible that the university will ultimately purchase the property and implement its reuse plan – and some firmly believe that it will (McCormick Interviewee 2, 2010; McCormick Survey Respondent 1, 2008), it may not do so in the near-term. In late 2008, the university did, however, successfully purchase the nearly 40-acre adjacent Triangle property and agreed to pay $3 million to conduct a non-time critical removal action on the Triangle property (U.S. EPA, 2006a).

7.5.4. Exploring the Use of Collaborative Planning at the MBC Site

The MBC case is an exceptional case for understanding the limitations of collaborative planning in the context of contaminated site redevelopment and plan implementation. To begin, the case reveals critical insights into the limitations of collaborative planning as a tool to support direct redevelopment. Most notably, the process did not result in a widely-agreed upon plan for moving the site into reuse. Although the city outlined a strategy for site acquisition and a planned reuse that was consistent with the majority of the committee members' preferences for site reuse, the fact that committee could not agree to such a plan perhaps contributed to the city's short-lived attempt to acquire the MBC site.

The roots of the committee's failed efforts to reach consensus regarding a permanent or interim use of the site as a managed open space are centered in issues over visions for use of the site, property rights, and philosophical differences regarding the use of public resources for private gain. Early in the process, stakeholders held a variety of visions about how the site could be redeveloped. Recommendations included industrial residential, ecological, recreational, and mixed uses. Even the city, the convenor of the process, was conflicted as some city officials advocated recreational use of the site whereas others advocated for park space.

Although committee members eventually agreed to a use that called for managed open space, disagreements persisted over whether the use should be an interim use or a permanent one. For example, one committee member "suggested that the land could be in public use for perhaps ten years, like a working land-bank situation, and then reevaluated" (City of Portland, 2001b) (p. 76); however, another "objected to the interim lease idea, stating that the public shouldn't put further subsidy into a temporary use on a private site" (City of Portland, 2001b) (p. 80). Similarly, disagreements persisted over how the site should be acquired. Whereas some committee members viewed public acquisition of the site as entirely appropriate given the vast amounts of public resources already invested in the cleanup of the site, others expressed concern "about expecting the property owner to give up ownership" (City of Portland, 2001b) (p. 85) and opposed the idea.

Ultimately, debates over public acquisition of the property cast into relief the utility of collaborative planning process where site ownership is in question and site ownership support for a broadly supported recommended land use is not guaranteed. The owner of the bankrupted family-owned company MBC Co., primarily responsible for contaminating the site, retains current title to the site. According to one interviewee, "the lien holders control the site", but "the company still owns it." However, as the interviewee explained, the state and EPA are the company's two biggest creditors and the state could take it" (McCormick Interviewee 2, 2009). Despite "control of the property" residing with agencies that funded the cleanup process, clearly the owner retained sufficient power during the collaborative planning process to avoid compromising his position. As one respondent explained, the owner "had a keen interest in retaining ownership of the site and basically getting a land use that would pay back what he owed for cleanup" (McCormick Interviewee 2, 2009). A recently updated newspaper article further clarifies the owner's position:

> Property owner Charlie McCormick said he supports a park with ball fields, but he would prefer a lease that would allow him to take back the property in 20 years, to recover costs. 'We have creditors, and we owe people money,' McCormick said. 'That property doesn't have a market value that will allow us to repay our debts. But 20 years from now, we may be able to.' (Jacklet, 2001 (updated 2009))

The question over site ownership regularly resurfaced during meetings. Early in the process "[a] question was asked about who is going to sell the property, Charlie

McCormick or DEQ." In response, a city representative explained that, "from what he has heard, the property owner and two lienholders, DEQ and U.S. Bank, would each need to agree to a sale of the property" (City of Portland, 2001b, p. 61). Several meetings later, the landowner was asked whether "the company or DEQ is in the driver's seat for sale or use of the land?" Underscoring the continued lack of clarity regarding the ownership situation, in response the landowner explained that "it could be argued either way, adding that DEQ staff have said that they would like to see a successful use of the site (City of Portland, 2001b, p. 77).

In addition to lacking site-owner support, the collaborative planning process potentially suffered by the state's designation as a technical advisor instead of as a stakeholder participating on the committee. As explained by one respondent, DEQ essentially sat "on the sidelines." Likewise, the process may have suffered by not having EPA participate as a stakeholder. An enhanced role for the regulators in the planning process may have helped to more fully resolve ownership issues raised during stakeholder meetings. Likewise, had the state's long-term intentions been more fully clarified, perhaps efforts to arrive at consensus would have been more effective. Nevertheless, unless the state had moved to take possession of the property prior to or during the collaborative planning process, the challenge of having the owner agree to a permanent use of the site as a park would have likely persisted.

The inability of the stakeholders to arrive at a consensus agreement on the future use illuminate important insights on collaborative planning's utility in the context of contaminated site redevelopment. First, complete agreement in regards to future land uses may not always be possible. It should not come as a surprise that a group of stakeholders with a range of interests may be unable to agree on how a large piece of unused property may be used for the foreseeable future. This is a critique similar to the one raised by Ruiz-Esquide (2004) who criticized the utility of exploration of future land uses in the context of brownfields redevelopment. In the MBC case, it is perhaps even more unrealistic to think that a wide range of stakeholders can agree on a future land use. After all, the site sits in a mixed use area with industrial land uses nearby and residential neighborhoods overlooking from the adjacent bluff above; similarly, the site sits on a major river that itself is highly contested space between proponents of industrial site retention and expansion and proponents of habitat and fish restoration, such as salmon.

Second, the failed efforts to overcome conflicts regarding the preferred use for the site underscore the importance of ownership clarity. Profound ambiguity regarding ownership of the site in this instance clearly hurt efforts to arrive at a preferred use for the site based on full consensus. This uncertainty became manifest repeatedly during the course of the stakeholder meetings. Were stakeholders planning for a site that was actually a public site, because of the massive amounts of public dollars already invested in the property as well as the corresponding government liens? Or were the stakeholders instead planning for a privately held site that may eventually be acquired by a public entity?

Third, the inability of the stakeholder committee members to arrive at consensus suggests the importance of site ownership support in relation to collaborative planning processes. Even though the “real” owner of the site was in question during the process, the holder of the title to the site remained Charlie McCormick. Stakeholder processes geared to decide future land uses may lose effectiveness, or even fail, if the holder of title to the property retains a genuine interest in the outcome of such a process. In particular, if the site owner's goals for the site contravene the goals of other stakeholders, collaborative processes may be incapable of arriving at consensus positions regarding future use. Further, without the support of such invested owners regarding future land uses, agreements derived through collaborative processes that bypass owner support may lack the political support needed to carry out corresponding implementation plans.

In spite of its shortcomings, one could argue that the process resulted in some benefits. First, the process helped clarify the varying, often clashing, viewpoints held about the site, how it could be reused, and methods for enabling preferred reuse. Unlike some collaborative planning processes that stall due to frustrated stakeholders, the collaborative process used at the MBC site remained intact for the anticipated duration. Even amidst conflict over key issues, the committee continued to regularly meet with high levels of participation. After the last official meeting where full consensus could not be reached on a permanent or interim use, the city engaged in discussions with committee members over the course of several months to try and overcome the impasse. The implication of this is that site stakeholders likely walked away from the process with a deeper understanding of the issues that must be resolved in order to move the site into reuse as well as the type of opposition or support likely to be received from nearby residents if efforts to reuse the site once again move forward. Although the collaborative effort did not result in a fully-agreed upon reuse vision for the site, it nevertheless facilitated thoughtful, beneficial discussion reflecting a form a constructive conflict. The collaborative process also revealed the overarching preference for the site as a park. As explained by one respondent, "In 2002, the reuse planning process was appropriate, because it gave opportunities to evaluate the end use of the property…the end use identified was vetted by the public through meetings and surveys…That public process was meaningful" (McCormick Interviewee 1, 2009). If an entity, such as the University of Portland, ultimately is successful in purchasing the site and redeveloping it in a manner consistent with the generally accepted used identified by the committee members, one could argue that such an entity may be aided by the fact that the collaborative planning process took place. Nearby residents and affected stakeholders should be much less likely to be caught off-guard if the university ultimately moves in a direction toward recreational-type redevelopment. The university will also be able to direct skeptics to the collaborative planning process and explain that its intended use is consistent with the general sentiment of the collaborative planning process stakeholder committee.

Nevertheless, the complexity surrounding the MBC case certainly leaves behind several questions. In hindsight, had the city fully understood how the deep uncertainty surrounding site ownership would have complicated committee discussions, would the city have still felt compelled to convene a robust collaborative planning process? Would it have been more prudent for the city to undertake the same technical analyses of the site performed as part of the original planning process but instead of convening a stakeholder process, only survey or interview potentially interested stakeholders regarding their preferences and then present its recommendations to the city council, the state, and EPA?

Or, instead of convening a multi-stakeholder collaborative planning process, would it have been more prudent to simply convene a series of facilitated meetings between EPA, the state, the city, and the property owner to resolve issues over site ownership? A resolution of the ownership issue could have then clarified whether a collaborative planning process may be in the best interests of the “real” owner. Finally, if a new EPA grant was issued for the MBC site tomorrow with a goal of examining barriers inhibiting reuse of the site, how should such a process be structured and who should be involved as stakeholders and technical advisors? Finally, how should collaborative planning processes be judged? Was the MBC process a success or failure? Should it be considered a failure because it did not produce a consensus-based agreement about the long-term use of the site, or because the preferred use of the site held by the majority of the committee members was never implemented? Or, should the process be considered a success because general agreement was reached that the site should be used as managed open space and the state tailored part of the site remedy to support recreational reuse? I argue that, although the collaborative planning process was a valuable undertaking and has produced some benefits, primarily from social learning perspective, the MBC case failed because it did not generate a consensus-based agreement. Had it done so, it seems reasonable that there would have been a greater likelihood that the city would have moved forward with its park implementation plan.

7.6. Case Study 4: Coleman-Evans Wood Preserving Company[45,46]

7.6.1. Introduction

The Coleman-Evans Wood Preserving Company (Coleman-Evans) Superfund site is located in the suburban community of Whitehouse, Florida inside the city of Jacksonville. Located less than ten miles from the Jacksonville's downtown area, the site encompasses ten acres on a mostly flat property (U.S. EPA, 2004f). The site is bordered by a rail line, private residences, a road with residences located on the other side, and a wooded area. An elementary school is also nearby**.** The area surrounding the site used to be mostly rural; however, since roughly the 1980s, "it's gone from kind of a quiet, almost rural community to a very busy suburban area, [with] new neighborhoods going in all the time" (U.S. EPA, 2006b, p. 5 of public meeting transcript).

In the early 2000s, an EPA explained that the site "known at one time for creating fence posts that 'can last forever,' is now the site of one of Jacksonville's most notorious eyesores and most hazardous waste sites." EPA also described it as a "mega-site" given

[45] In addition to using information from public records and newspaper articles, the Coleman-Evans Wood Preserving Company case study is based primarily upon the perspectives of an individual with the city of Jacksonville parks department, and an individual formerly with a consulting firm that helped lead the original reuse planning process. Communications with a federal cleanup agency were limited via email only. Efforts were also made to speak with two other City officials involved in the initial reuse planning process. I also attempted to speak with several residents who participated in the initial planning process. One individual was deceased; none of the other residents returned phone calls. Efforts were also make to speak with the former city council member and current council member for the district containing Whitehouse. Neither returned my calls. I also attempted to speak with the state environmental agency lead. This phone call too was not returned.

[46] In an effort to improve the validity of this case study, I emailed a previous version of this case study to three primary respondents in February, allowing for a three week review. The respondent with the city of Jacksonville commented that, "The case study is very informative."

the large amount of cleanup that was then taking place at the site. In 2002, for example, 300 tons of contaminated soil per day was being treated (U.S. EPA, 2002a). In 2000, EPA awarded the city of Jacksonville a $100,000 cooperative agreement for the purposes of developing a land use plan for the site. Collaborative planning processes were used to inform the plan which called for redeveloping the site as a park. Although the site is currently unused, except for periodic ground water monitoring, the city recently acquired the site and expects to implement the plan once resources are available. The use of collaborative planning at the Coleman-Evans Superfund site is important for a few reasons. One, it provides an opportunity to examine the impact of a collaboratively-inspired redevelopment plan that has essentially remained unused following planning completion in September 2002. Second, as a collaborative planning process that did not include the establishment of a multi-stakeholder committee, this case invites questions regarding the appropriateness of the form of collaborative planning used. For example, would use of a multi-stakeholder collaborative planning committee inspired greater attention to implementation of the plan? Or was this format appropriate given the location of the site in relation to the nearby community and the progress of cleanup at the time planning was underway?

7.6.2. Site Background, Cleanup, and Current Status

Between the mid-1950s up through the mid-1980s, the Coleman-Evans site was used to treat wood products. Resulting wastewater was discarded into a drainage ditch, ultimately flowing into a creek south of the site. Large amounts of wastewater frequently overflowed resulting in contamination across the site and into the residential neighborhood. Although nearly all residences used private wells for drinking, groundwater contamination occurred primarily in the surficial aquifer not directly impacting the primary well water source (U.S. EPA, 2004f).

In the late 1980s wood treating operations discontinued; however wood processing activities continued at the site until the mid-1990s (U.S. EPA, n.d.-g). EPA and the state first became involved at the site in the 1980s after the city identified the site as a problem (U.S. EPA, 2006b, see public meeting transcript). EPA listed the site as final on the National Priorities List in 1983. Between the mid-1980s and mid-1990s, EPA conducted many emergency response actions at the site to counter real-time threats that could affect nearby residents (U.S. EPA, n.d.-g). Sludge disposal pits were excavated, on-site contaminated structures were removed, temporary fencing was placed around likely play areas for children, contaminated soil and sediments in nearby residential yards were excavated and placed on-site, and a permanent fence was installed (U.S. EPA, n.d.-g). In addition, up until the late 1980s, EPA undertook multiple enforcement actions against Coleman-Evans (U.S. EPA, 2006b, see public meeting transcript). A major concern of residents centered on the location of the Whitehouse Elementary just a few blocks from the site; however, EPA's testing of school soil revealed no harmful contaminants (U.S. EPA, 2002a).

While removal actions were underway, EPA began identifying plans for further site cleanup. In 1986, EPA settled on a cleanup strategy for site soil and groundwater contamination. The cleanup approach was significantly altered in 1997; after that EPA made minor changes to the 1997 approved cleanup approach at multiple points through the mid-2000s. The fundamental cleanup approach called for excavating on-site and off-site contaminated sediment and soil, use of a new heat-based technology to treat the soil following excavation, and also treating contaminated groundwater on site. EPA intended the soil treatment to be final for all contaminants of concern, except one – dioxin. In crafting the cleanup approach for soil, EPA used an interim cleanup standard for dioxin, since the state, at the time, was intending to eventually establish a dioxin limit stricter than EPA's. Once the state finalized the new limit, EPA planned to initiate a new cleanup action for dioxin-contaminated soils located outside the main site boundary (U.S. EPA, 2006b). The soils from both the new and previous cleanup actions would then be covered with clean soil (U.S. EPA, n.d.-g).

EPA completed soil treatment as specified in the 1997 ROD Amendment in early 2004 (U.S. EPA, 2006b). By this time, nearly all groundwater cleanup goals had been met except for slight contamination identified in one groundwater well. In total, EPA oversaw treatment of over 100,000 tons of soil and 50 million gallons of wastewater. In 2006, EPA selected its final strategy for treating off-site soils containing low-levels of dioxin associated with the previous facility and placing the excavated soils back on the facility property. A year later, EPA completed these cleanup actions and installed a two-foot cover over the treated soil on-site. Currently, the only major Superfund action remaining is on-going monitoring to ensure that natural attenuation of groundwater contamination continues to meet cleanup goals (U.S. EPA, n.d.-g).

7.6.3. Reuse Planning Process

In 2000, EPA awarded the city of Jacksonville a $100,000 cooperative agreement intended to develop a land use plan that would address concerns the community had about the site and improve community quality of life (U.S. EPA, 2000b). At the onset of the award, it was anticipated that input would be sought from businesses, residents located nearby, and local community organizations and that intensive efforts would be made to involve residents near the site (U.S. EPA, 2000b). Similarly, EPA explained that first, efforts would be made to generate community consensus on how the site should be reused. Second, the city would " engage in public workshops to develop a reuse plan that is compatible with the cleanup" (U.S. EPA, 2000b). According to another EPA document, "Duval County (Jacksonville) [was] excited about what use the Superfund site will have once cleaned up" (U.S. EPA, 2002a).

The city's parks department secured the services of a planning firm to carry out the community involvement and planning process to determine recreational reuse opportunities at the site. The planning firm undertook initial site research, held meetings with local government officials, and then convened a meeting to involve community residents (U.S. EPA, 2009f). In total, the planning firm convened three community meetings to gather input from the public. The first of these, which took place in late June 2002, focused on potential recreational facilities that would be suitable for the site. A primary community concern identified at the meeting centered on human contact with soil at the site (City of Jacksonville (prepared by HDR Landers Atkins Planners), 2002). A July 2002 local newspaper article underscored these concerns. One resident suggested he would not allow his children to engage in recreational activities at the site; another remarked that after cleanup he would let his children play there once it was treated noting it would probably be cleaner than “your own yard.” Recommendations for reuse included a parking lot, a library, a non-human bird sanctuary, and ball fields (Strickland, 2002). As a result of input received, the planning firm developed plans that would minimize opportunities for individual contact with the soil by “by covering most of the site with sports courts, recreation facilities, and parking” (U.S. EPA, 2009f).

At the second meeting, conducted just over a month later in mid-August, the firm presented its four “alternative concept plans.” According to the planning firm, “the community expressed its desire for Alternative Concept A with a three-phase development” (City of Jacksonville (prepared by HDR Landers Atkins Planners), 2002, p. 14). This called for “a community center with full gymnasium, skateboard rink, one play structure, handball courts, 4 basketball courts, and 4 tennis courts” (p. 10). It also called for reusing certain industrial structures currently on site to support certain recreational uses. A few weeks later in September, the planning firm, presented its Master Plan for the site in order to obtain consensus on the plan and the three-phased approach to redevelopment. According to the planning firm, the community agreed to the final plan (City of Jacksonville (prepared by HDR Landers Atkins Planners), 2002). It was anticipated that funding would eventually be available to assist in park development through Capital Improvements Projects funding (City of Jacksonville (prepared by HDR Landers Atkins Planners), 2002).

Following plan completion, in 2004 EPA noted that eventually the city would acquire the site, consider final site conditions and community input before making final decisions (U.S. EPA, 2004b). That same year, an in-depth EPA review of site cleanup implementation and effectiveness up to that point makes no mention of the park master plan (U.S. EPA, 2004f). In choosing the cleanup strategy for addressing remaining dioxin contamination in 2006, however, EPA hinted that the site's reuse as a park was still a possibility. For example, during its public meeting to discuss the proposed final remedy for the site, EPA remarked that,

> So when we get that done, what's going to happen? Well, right now the city of Jacksonville has a master plan to convert the property into use as a park and community center. I know several years ago we had our community day, one of the councilman was there and he's still committed to building this. Obviously, we have to finish our work first, so we're going to perform our work in a manner that allows the city to do this type of use. I can't speak for the city. I don't know what they're going to do or when they might do something (U.S. EPA, 2006b, p. 15 of public meeting transcript).

In the final remedy decision document, EPA discussed the reuse plan noting that the main objective of the master plan was to establish a safe and usable space for community members to engage in physical and sporting activities (U.S. EPA, 2006b). EPA also stressed that the selected cleanup strategy was compatible with this preferred reuse and that modifications to the remedy were planned partly to ensure alignment with the planned reuse. Moreover, EPA explained that institutional controls would be enacted that would limit subsurface soil disturbance and limit the property's use to commercial use only, including park use.

In 2009, a cleanup official involved at the site explained that he was unaware of any plans by the city to redevelop the site (Coleman-Evans Respondent 1, 2009). An individual closely involved in the early site planning efforts similarly was unaware stating that, "Whether the eventual reuse will be the same as the original plan is unknown" (Coleman-Evans Interviewee 1, 2009). However, in a recently completed in-depth EPA-led review of cleanup implementation and effectiveness, the report authors noted that:

> At the time of this review, the Site is not in reuse. However, the city of Jacksonville has plans to redevelop the Site as a community park. The redevelopment plan for the park includes a community center, court facilities, and parking. The city of Jacksonville is trying to secure funding for the construction of the park (U.S. EPA, 2009e, p. 15)

In December 2009, a representative with the city explained that "until just a few months ago everything was tied up in legal trouble" (Coleman-Evans Interviewee 2, 2009). Since then, the city has acquired the site. He added that the city does not currently have funding to implement the plan. However, "I would say that it is on track for reuse" (Coleman-Evans Interviewee 2, 2009). A review of city documents further clarifies steps the city has taken recently to enable the transition of the site into a park in the future, if a park use continues to remain the city's goal. In July 2009, an ordinance was issued by the city council at the request of the mayor that authorizes a declaration of restrictive covenants to "limit the future land use to compatible purposes at the site… to commercial use, including use as a park." This document also notes that, "City ownership was obtained through tax default" (City of Jacksonville, 2009a). In late 2009, the city successfully finalized and executed a restrictive covenant on the site restricting all residential-type uses of the site and use of the surficial aquifer for drinking or industrial purposes" (City of Jacksonville, 2009b). Although one could justifiably argue that it is not known for certain whether the city will transform the site into a park, remarks by the city suggest there are good reasons why a park for the site remains a continuing goal of the city.

7.6.4. Exploring the Role of Collaborative Planning at the Coleman-Evans Site

The use of collaborative planning at the Coleman-Evans site provides a valuable opportunity to examine the impact of a collaboratively-based redevelopment plan that has essentially sat unused following planning completion in September 2002 but is still considered viable. Although the Coleman-Evans reuse plan has not been implemented, a city official involved in the 2002 planning process explained that the Coleman-Evans site recreational reuse plan is on track to be implemented. Why is this the case? The reason, the official explained, is the fact that a plan was created for the site that was based on community input, adding that, "The community involvement aspect helped create a plan that was enduring" (Coleman-Evans Interviewee 2, 2009). In 2002, another city official similarly underscored the importance placed on meaningful community involvement as part of the planning process, explaining that residents' input was being factored into the planning process, adding that, "'We don't want to put something in that isn't going to be used'" (Strickland, 2002).

Other factors may also be keeping the reuse plan viable. First, the area surrounding the Coleman-Evans site is "growing, and getting more dense" (Coleman-Evans Interviewee 2, 2009). This rapid growth being experienced around the site was also commented on in EPA's recent in-depth review of the site noting that, "The community of Whitehouse is undergoing significant development as a suburban residential area for the city of Jacksonville" (U.S. EPA, 2009e, p. 15). Second, according to the city representative, "Fields and courts are things that we are deficient in." The site, in particular, can help accommodate the suburban type recreational demands this area of Jacksonville is facing (Coleman-Evans Interviewee 2, 2009). Another aspect potentially keeping the site "on track" for redevelopment is local political leadership. Municipal acquisition of federal Superfund sites can be daunting for local officials requiring attention to both federal and state cleanup laws to ensure protection against future cleanup costs as well as state legal requirements that specify the onerous steps that must be taken to legally take title to a site. The city would likely have not have chosen to undertake such a challenging endeavor, and subsequently enact a restrictive covenant, if it did not feel it could facilitate reuse of the site.

Had a similar plan been created behind closed-doors, it is reasonable that this plan could have been easily set aside. Instead, the public involvement component, although completed nearly eight years ago (since January 2010) appears to have set forth momentum for the site's reuse as a park that, while likely not nearly as strong as it was in

2002, apparently still remains. If, however, the city engenders a completely different use for the site, the case for collaborative planning's role at this site will be significantly weakened. Building from this, it is important to consider whether this was genuine collaborative planning process or not and whether a more intensive collaborative process involving a greater number of stakeholder, or more significant community involvement, would have yielded a plan that, perhaps, would have been held in more prominence by City, state, and EPA officials after the plan was finalized. EPA's own ambitions regarding community involvement for the project upon awarding the grant were high (e.g., see U.S. EPA, 2000b). However, a key party involved in the planning process remarked that, "We engaged in fairly normal outreach for the city of Jacksonville" (Coleman-Evans Interviewee 1, 2009). Moreover, the Master Plan suggests that officials outside the community meetings involving multiple stakeholders were involved in setting the boundaries for reuse conversation prior to the series of public meetings. For example, before the first community meeting, the decision to use the site as park had already been made. The purpose of the three community meetings was to discuss the type of park that should be constructed there not the general type of use preferred. Moreover, although community meeting sign-in sheets suggest different stakeholders were involved in these meetings, including residents, city officials, a city elected official, and regulatory officials (i.e., EPA or the state), community participation declined in the second and third meetings, from approximately eight residents in the first meeting to approximately four in the final meeting.

Had a more intricate or in-depth system of collaborative engagement been structured to help formulate the plan, however, it is unclear that this would have accelerated implementation of the plan. The plan was completed in September 2002, but EPA did not complete the final component of its long-term remedial approach for the site until September 2007. It is difficult to envision even the most sophisticated of planning processes resulting in local leadership that could have sustained interest in redevelopment of the site for an additional five years, especially given the dynamics of the surrounding area. According to the local official, for example, "I would say that there has been a large turnover there; the people that attended those meetings would not necessarily know all the details [regarding the plan]" (Coleman-Evans Interviewee 2, 2009). In essence, the collaborative planning process appears to have been just strong enough to have produced a plan that remains viable to the city.

Although a process rooted more directly in collaborative planning process principles can be envisioned, it is also worth considering whether such a process would have been appropriate given the stakeholders involved and the ownership situation. In this case, the site owner was not involved in discussions regarding reuse. Instead, the anticipation was that the city would acquire the property. An argument could be made then that the city took a reasonable step in keeping reuse discussions limited to park design instead of general land use preferences, if reuse of the site as a park was its primary purpose.

The case invites important questions as well. How was the plan used, if at all, by City officials between September 2002 and 2010? Has it ever been used as a basis of discussions about priorities for the city of Jacksonville's Outer Rim planning area where the site is located? Given the high rate of growth in the Whitehouse area, at what point might the possibility of park construction be seriously considered once again? From the city's perspective, why was a recreational reuse chosen prior to its series of meetings with the community? Was this preference based more on its perception of land use needs in the area or concerns about what the type of land use the damaged Coleman-Evans site could physically and politically support? Finally, looking back, would it have been more beneficial for the city to have initiated an intensive reuse planning process for the site following site acquisition? The Coleman-Evans case is valuable for considering somewhat ambiguous plan implementation/site redevelopment outcomes. It also invites consideration of what really constitutes a collaborative process and when it is appropriate to use such processes. More time will likely need to elapse before additional light on these issues can be shed.

7.7. Cross-Case Study Analysis

7.7.1. Relationships between Collaborative Planning and Redevelopment

The collaborative planning literature suggests that use of collaboration should have a number of benefits for those participating in such processes. These include enhancing social learning (Forester, 1999), enhancing understanding of issues (Gray, 1989), creating better decisions (Gray, 1989), and generating decisions or recommendations more likely to be implemented (Gray, 1989; Innes & Booher, 1999a; National Civic League, 2000). The overarching intent of the four case studies was to better understand how collaborative planning processes may affect long-term redevelopment outcomes and to fill a gap in the collaborative planning literature criticized for its lack of evaluations centered on long-term outcomes (Frame, Gunton, & Day, 2004; Innes & Booher, 1999a; Margerum, 2002).

The case studies suggest that it is possible that collaborative planning can have a genuinely positive impact on redevelopment outcomes. Most notably, in the case of the Midvale Slag site, use of collaborative planning seems to have been a central reason why the site is being redeveloped today. Starting within a climate of mistrust between stakeholders, collaborative planning at Midvale helped inspire the vision for redevelopment of the site which served as the foundation from which related, but more specific, planning efforts could take place. Flash forward nearly 10 years since the conclusion of the foundational collaborative planning process and you find the on-going redevelopment efforts at the site are resulting in one of the of the boldest and most innovative large-scale Superfund redevelopment projects in the nation. Case study results also suggest that use of collaborative planning can help put sites "on track" for redevelopment. This is the case at two sites (Hiteman Leather and Coleman-Evans Wood Preserving (Coleman-Evans)) where the expectation is that the redevelopment plans successfully created from collaborative planning efforts will be implemented once the necessary approvals are given or needed funding is secured. Of course, these are significant "ifs." Time will ultimately be the arbiter of whether collaborative planning genuinely contributed to the redevelopment of these sites. Results from the fourth case study (McCormick and Baxter Creosoting Company (MBC)), however, suggest that in some instances collaborative planning will not work as a means to facilitate the redevelopment of a site.

What accounts for the variation in outcomes? A few issues stand out. First, although redevelopment outcomes were positively affected by the use of collaborative planning at the Midvale Slag site, other factors were certainly present to help push the Midvale Slag site across the redevelopment finish line. Most notably, it had critical long-term support from key stakeholders – the majority property owner, local elected officials, the state, and EPA – which manifest in different ways. Perhaps more fundamentally, stakeholders involved in the Midvale Slag site had learned from failed experiences aimed at facilitating redevelopment of the sister Sharon Steel site and stakeholders appeared were committed to avoiding similar mistakes (e.g., "No more Sharon Steels" (Costanzi, 2004) . Further, redevelopment prospects of the Midvale Slag site clearly benefited from the site's location, just south of Salt Lake City, where growth forces were particularly strong. Likewise, redevelopment prospects at Midvale Slag were aided by a sophisticated combination of land use and remediation planning that set forth a clear path for what could and could not be done on the site in terms of redevelopment, even though contamination remains on site. Similarly, although final judgments about the Hiteman Leather and MBC cases cannot yet made, the "on track" status of these sites are also clearly buoyed by local political support and a lack of ownership obstacles. However, market forces appear to be more important in the MBC case than in the Hiteman Leather case. Finally, because the MBC site is arguable not "on track" for redevelopment, it is especially important to consider what is holding this site back from redevelopment. Had the collaborative planning effort for the MBC site succeeded in producing a consensus regarding the site's long-term use, an argument could be made that the City of Portland may have been much more likely to continue efforts to acquire the site and usher in its redevelopment as a park. However, other considerable forces continue to hold down MBC's reuse prospects – even though the University of Portland has seriously explored purchasing the site since around 2005. These factors include ambiguity regarding site ownership, lack of support from the current title holder to support redevelopment, on-going questions about the efficacy of the site's remedy, and uncertainty regarding the site's unique position of being located within another Superfund site.

If we set aside the Hiteman Leather and Coleman-Evans cases – given the ultimate uncertainty surrounding the redevelopment outcomes of these sites – and instead simply look at the Midvale Slag and MBC cases and try to distill the critical elements that critically affect the contrasting reuse outcomes of these sites, a few factors stand out. First, successful – as opposed to robust – collaborative planning processes are critical. The collaborative planning process used at the MBC site was certainly robust, but not successful in achieving its ultimate goal. The support of local officials as well as regulatory officials is also critical. EPA and Midvale officials were deeply dedicated to seeing the Midvale Slag site returned to a beneficial use. However, the City of Portland, while supportive generally, did not exert that same enthusiasm for MBC's redevelopment. Similarly, EPA was committed to a cleanup approach for the Midvale Slag site compatible with reuse goals and took steps after remedy implementation to further assist the development process by funding a local site coordinator to ensure that redevelopment of the site takes place in accordance with site restrictions. At MBC, although regulatory officials are supportive of redevelopment, and some would very much like to see it redeveloped as a recreational space, the broad-based commitment from regulatory officials to further this possibility has not transpired. Issues regarding ownership support are similarly critical. At Midvale Slag, the majority owner was committed to enabling the redevelopment of the site in a manner that aligned with broader stakeholder preferences. In the case of the MBC site, the owner would not commit to the preferred vision of the majority of the stakeholders. Today, although the owner may ultimately want to sell his property, the owner's inability to achieve liability protection pertaining to the Portland Harbor Superfund site from the state and EPA may be holding up property sale negotiations. Another issue centers on the degree of contamination remaining in place and the protectiveness of the remedy at Superfund sites. Although considerable contamination remains on the Midvale site, the remedy and institutional controls in place seem to have allayed most fears developers have about this. Considerable contamination also remains on the MBC site; however this remains a central concern. Questions about the efficacy of the remedy at the MBC site simply add to these concerns. Finally, the degree of cooperative spirit between stakeholders that has seemed to undergird redevelopment planning and subsequent redevelopment activity at the Midvale Slag site does not appear to be present at similar levels between stakeholders at the MBC site. Ultimately, overcoming this may, more than anything else, be the key to unlocking MBC's development potential.

7.7.2. Other Insights

Case studies are valuable because they shed insight on the specific questions of interest, but because they also illuminate other critical issues related to the researcher's phenomena of interest. After completing the four case studies the issues that emerged as being most important with regards to collaborative planning theory center on issues of fairness and power. These issues generally have received attention from a number of scholars studying collaborative planning processes (e.g., see Chaskin, 2005; Flyvbjerg, 2001; Lowry, Adler, & Milner, 1997; Selin, Schuett, & Carr, 2000). In the MBC case, the presence of the site owner in the collaborative planning process created a deliberative dynamic that arguably fell short of collaborative planning ideals. Instead of simply determining the long-term reuse of the site, stakeholders had to continually assess how the role of the owner played into reuse preferences of the stakeholders and more than a few times created frustration. For example, at one meeting, a stakeholder committee member remarked that “too much energy in this process has been put on what’s economically feasible and the owner’s views”; similarly, another complained that the “project has been too hemmed in by the owner’s constraints” (City of Portland, 2001b, p. 81). Although in the Midvale Slag case, the site’s majority owner similarly held a strong position relative to other stakeholders participating in the process, concerns about the owner shaping the discussions over land use did not appear as prominent. This may have been in part because the owner was generally supportive of the reuse vision for the site, and, perhaps, more importantly, at the time of the initial collaborative planning process, the owner needed support from the city and EPA to ensure that the site could one day support development activity. Issues of power and fairness also manifest themselves in the Coleman-Evans and Hiteman Leather cases, albeit in different ways. In these cases the roles of the site owners were not as critical because it was assumed that the local governments would sooner or later acquire the affected properties. Theoretically then, the Hiteman Leather and Coleman-Evans Superfund sites represented blank canvasses on which stakeholders could cast their reuse preferences. In reality, local officials helped frame the limits regarding future use discussions. For example, the City of Jacksonville established prior to its meetings with community residents that the City’s intention was to develop the site as a park and that the collaborative planning aspect of the project would be limited to the type of park to developed on the site. In the case of Hiteman Leather, local officials had made it clear prior to the collaborative planning process conducted in the late early 2000s that their expectation and desire was for the Hiteman Leather site to be redeveloped into a multi-faceted community center. Although collaborative planning process allowed stakeholder to consider a broader range of uses for the site than just the community center, the local officials' initial expectations regarding the site, arguably limited the possibility for a fairer collaborative planning process. The extent to which these power imbalances, or lack of equal opportunity, for all stakeholders to shape reuse of the site, ultimately undermined the associated collaborative processes is an issue that merits further consideration.

7.7.3. Concluding Questions

Lastly, the cases together raise a number of questions important for advancing our understanding of collaborative planning as a tool for facilitating contaminated site redevelopment and plan implementation. First, is it realistic to expect that issues of power and fairness will not affect the outcome of collaborative planning processes in the context of contaminated site redevelopment? Site owners, entities that control or have a financial interest in these properties, and entities that may soon acquire these properties may in most cases have privileged positions within collaborative planning processes. Is this problematic? And if so, are there collaborative planning structures that can overcome these inequities? Second, what actually constitutes a collaborative planning process in the context of contaminated site redevelopment? Is the process the initial collaborative process bringing stakeholders together to make decisions or recommendations about the contaminated site? Or, should we assume that collaborative planning is the series of techniques and processes used to involve stakeholders in the redevelopment of the site from the initial visioning to actual site redevelopment? If we look at collaborative planning as an overall approach toward stakeholder engagement from this latter viewpoint, one could argue that collaborative planning has been used at the Midvale Slag site for years, arguably leading to very positive site redevelopment outcomes. Similarly, a case can be made that collaborative planning continues to be practices by local stakeholders at the Hiteman Leather site as they work to identify the appropriate resources to redevelop the site. At the Coleman-Evans site, however, although collaborative planning was used to craft the specific recreational vision for the site, the principles of collaborative planning do not appear to have been employed since then. Similarly, collaborative planning was attempted nearly ten years ago at the MBC site; however, since then collaborative planning processes have not been used to overcome the site's persistent redevelopment barriers.

Third, of the three cases where reuse plans were successfully forged from collaborative planning processes, to what extent were these plans the product of genuine stakeholder collaboration? Daniels and Walker (2001) explain that in collaborative planning processes, decisions are the result of deep dialogue. Were such plans the result of deep dialogue between stakeholders or primarily the result of the plan writers? Likewise, if the intent of a collaborative process is to merely obtain stakeholder approval for one land use preference over another, can such a process really be called collaborative? Ironically, it does appear stakeholders involved in reuse planning for the MBC site engaged in deep dialogue in an effort to arrive at group decisions.

Finally, what should be our expectations for collaborative planning processes and they should be judged? Should we expect that stakeholders with varied interests will routinely be able to arrive at consensus, or even widely-shared, preferences regarding long-term uses of contaminated property? After all, if issues of power and fairness will likely regularly insert themselves into such processes, can such processes ultimately be the arbiter? Perhaps collaborative planning processes should be judged not by the extent to which consensus agreements are reached but by the extent to which they enable a genuine surfacing of the range of concerns and expectations various stakeholders have for such properties. If certain conditions are present, e.g., lack of site owner ambiguity, willingness of site owner, or likely site owner, to go along with stakeholder preferences, perhaps only then should such processes be used to forge land use plans to guide the long-term future uses of these sites.

8. Conclusions and Policy Recommendations

8.1. What Really Drives Redevelopment and Plan Implementation?

This study considers a number of factors to better understand the role of collaborative planning on Superfund site redevelopment and plan implementation using multiple methods. The foundation for this effort was the development of two predictive models based on extensive literature reviews populated with data from a survey of federal cleanup managers and secondary data sources. One model was comprised of factors hypothesized to predict Superfund site redevelopment; the second model was comprised of factors hypothesized to predict Superfund site redevelopment plan implementation. A series of univariate and bivariate analyses were performed on data collected for each of the variables included in each of the two models; where possible, multivariate regression analysis was also performed. I then followed these efforts with a series of case studies that tried to more fully explore the phenomena of Superfund site redevelopment and plan implementation. After these steps, what can we say confidently say about collaborative planning in Superfund site redevelopment and plan implementation?

Results of the bivariate and multivariate analysis suggest that collaborative planning is in fact a critical ingredient to help place Superfund sites on track for redevelopment. In particular, planning with consistent and widespread stakeholder involvement and higher numbers of stakeholder involved appear to be important whereas intensive levels of consistent widespread stakeholder involvement does not emerge as critical. The act of planning, generally, also emerged as a critical factor alongside collaborative planning variables. However, collaborative planning and planning, generally, are not the only factors that emerged as critical. Other critical factors identified include: site redevelopment suitability site location suitability, neighborhood market strength (as reflected by the degree of development pressure around a site prior to redevelopment), neighborhood land availability, incentives, site-owner support, and the extent to which sites are capable of supporting redevelopment because of sufficient cleanup.

The four case studies provide some additional support for the notion that collaborative planning and planning are important in some instances. However, they also helped illuminate that the acts of planning and collaborative planning by themselves, not surprisingly, are not sufficient to facilitate site redevelopment. In the case of the Midvale Slag site, for example, the roles of planning and collaborative planning appear to have played key roles in facilitating that site's return to productive use. At the McCormick & Baxter Creosoting (MBC) site in Portland, Oregon, however, in spite of an in-depth collaborative planning process, the site's reuse status remains very much in limbo.

The challenge of determining factors that influence Superfund site redevelopment plan implementation are even greater, especially given the significant limitations of my data set. Results from the bivariate analysis suggest that site location suitability, local political support and site's readiness for reuse associate most strongly and consistently with plan implementation variables. Depending up the dependent variable – whether it focuses on the extent of plan implementation generally (PLAN IMPLEMENTATION

ON $TRACK_1$) or the extent to which the completed redevelopment matches or is expected to match plan specifications (PLAN IMPLEMENTATION ON $TRACK_2$) – additional variables emerge as important factors as well (NEIGHBORHOOD MARKET $STRENGTH_2$ and INCENTIVES for PLAN IMPLEMENTATION ON $TRACK_{1;}$ PLANNNING $CULTURE_2$ and SUPERFUND SITE AGE for PLAN IMPLEMENTATION ON $TRACK_2$). Interestingly, only one collaborative planning type variable exhibited a positive and statistically significant relationship with only one of the dependent variables (PLAN IMPLEMENTATION ON $TRACK_1$); moreover, the level of association, while positive, was only marginal. Surprisingly, bivariate results showed that collaborative planning processes with higher levels of perceived legitimacy are marginally to moderately associated with *reduced* levels of plan implementation. The case studies shed some additional light on these findings. Local political support for plan implementation, for example, was a critical factor influencing plan implementation at all four sites. In particular, local political support for plan implementation at the Midvale Slag has been absolutely essential for or success; meanwhile, lack of political support for the implementation of the original reuse plan for the MBC site contributed to the shelving of that plan. Regarding the role of collaborative planning specifically, the extent to which each of the four case study sites' foundational reuse plans were collaboratively-derived appears to have been influential in encouraging plan implementation at three of the four sites. Although plans have not been implemented at Coleman-Evans or Hiteman Leather, the assumption is that the foundational plans created for these sites will ultimately be. Moreover, conversations with respondents suggest that the role of public involvement in the creation of these plans has helped keep these plans viable. At the MBC site, use of collaborative planning was not sufficient to enable implementation of the corresponding reuse plan. However, the vision of a recreational reuse for the site remains, which can be directly attributable to the fruits of the foundational collaborative planning process. Regarding the vexing finding from the bivariate analysis that higher levels of perceived legitimacy of collaborative planning processes are associated with reduced levels of plan implementation, overall findings from the case studies do not lend strong support for this.

But what *really* drives redevelopment and plan implementation? Regarding redevelopment generally, it is clear that preferential site locations and local markets matter considerably, as do incentives, site-owner support, the ability of the site to accommodate redevelopment activity given the state of site cleanup, and the amount of surrounding developable land to a lesser extent. Land use planning also seems to matter a great deal, as does collaborative planning. What is more important? Clearly, it is difficult to undertake collaboration regarding the reuse of a site without first having a planning process through which collaboration can be integrated. Hence, the role of land use planning generally seems to be more important. I would also argue that the influence of planning on redevelopment outcomes increases if it is rooted in collaboration. However, even with intensive levels of collaboration the case studies undertaken for this study show that collaboration is not always critical for success. In spite of other favorable factors, including a strong collaborative planning process, redevelopment prospects may sour because of continual uncertainty about remedy’s efficacy, issues concerning liability, or, more straightforward, a lack of interested developers or project financing. Even so, intensive collaboration around the site may establish a foundation that interested parties can draw upon if the means and interest in redeveloping a site once again emerges.

Regarding plan implementation, the statistical evidence suggests that plans are more likely to be implemented if sites are preferentially located, the plans have strong local political support (particularly stakeholder support generally), and the sites can accommodate plan implementation because of sufficient cleanup progress. The evidence that collaborative planning plays an essential role in plan implementation is weak; however, the case studies generally suggest that collaborative planning is important. The degree of its importance requires further study. What is known though is that use of collaborative planning will not always lead to plan implementation. But if collaborative planning is not always critical, what else is? Perhaps it is the case that my plan implementation and redevelopment models are both missing key factors that are also essential, or even more so than the ones included. Perhaps what really drives plan implementation and redevelopment more generally are leadership and an on-going cooperative spirit across multiple stakeholders. Clearly a cooperative spirit between city officials and politicians, EPA, the site owner, and developers helped facilitate the redevelopment of the complex Midvale Slag site. EPA made a conscious decision in the late 1990s that it was going to help facilitate its reuse, after leaving behind a remedy on the adjacent Sharon Steel site that constrained reuse opportunities. At the MBC site, however, it is unclear that this intensive level of cooperative spirit exists, even though the foundation for a cooperative spirit was established through the collaborative planning process nearly 10 years ago. One respondent explained that a key regulatory agency involved at the MBC site could convene the key parties, identify mutual goals for the site across stakeholders, and “figure this out” to help advance the redevelopment of the site. However, according to the same stakeholder, the key agency’s cleanup program does not yet understand that in real estate development, you “must have a certain level of trust with people.” Until this can be overcome, this may be the biggest hurdle standing in the way of new recreational facilities alongside the Willamette River in Portland Harbor and perhaps other sites as well.

8.2. Theoretical and Research Contributions

This study makes two key theoretical contribution and several research contributions. In terms of its theoretical contribution, this study is one of the first to conceptually clarify how collaborative planning could positively impact both redevelopment and plan implementation outcomes for contaminated sites (i.e., long-term outcomes). Although community involvement and collaborative planning are frequently championed in the brownfields and Superfund redevelopment literatures, very little effort has thus far been undertaken to clarify how specifically collaborative planning could impact long-term redevelopment outcomes.

Second, and related, this study is one of the first to develop in-depth models that carefully attempt to explain two important phenomena: Superfund site redevelopment and Superfund site redevelopment plan implementation. Most studies examining development in the brownfields and Superfund realms explore the phenomena of redevelopment by attempting to correlate numerous factors with redevelopment outcomes that are only loosely based on a theoretical framework, or they obtain input general input from practitioners on factors that could be influential via surveys or interviews. These efforts are valuable and have greatly informed this work; however, my modeling efforts provide a rigid structure against which hypotheses can be tested. Moreover, to my knowledge no other efforts have been taken to model what factors drive plan implementation in the context of contaminated sites.

In terms of research contributions, first, this study is has produced a survey with over 50 questions that can now serve as a foundation for researchers interested in conducting similar research efforts in the future. Second, this study is one of the first to test specifically a number of factors that could theoretically impact Superfund site redevelopment and plan implementation that have not been tested before. Moreover, not only did this study test for the effect of collaborative planning, for example, on long-term outcomes, it developed multiple collaborative planning type variables each reflecting different conceptualizations of collaborative planning that provide slightly different insight into collaborative planning's theorized importance. Variables were constructed, for instance, to test for the effects of: consistent widespread stakeholder involvement in the reuse planning process generally, number of stakeholders involved, very high/high versus moderate to minimal levels of involvement (i.e., to test for threshold level effects) and the use of face-to-face collaborative planning processes. Similarly, this study was further structured to examine how perceptions regarding the legitimacy of collaborative planning processes would affect Superfund site plan implementation.

Another research contribution is the manner in which this study was conducted. Although many studies are based upon secondary data sources or from surveys data generated from hypothetical scenarios or success stories, the bulk of the data utilized for this study were based upon cleanup managers' perceptions regarding particular sites – not perceptions generally about reuse. Finally, because this study was based primarily off of cleanup managers' perspectives of specific sites, I was able to test variables that cannot be readily tested using secondary data sources. For instance, I was able to collect perceptions regarding site location suitability from individuals who visit these sites as opposed to making determinations of site suitability based upon "numbers of miles from a train station" derived through a GIS application that may have only limited relevance given the context of a site.

8.3. Study Limitations

This study has a number of limitations. They have been frequently touched upon. However, I attempt to summarize all the major ones here. First, the majority of the data analyzed for this study is based upon individual perspectives – namely federal Superfund site cleanup managers. My feeling is that site cleanup managers were well-positioned to answer these questions. They visit their sites occasionally, if not frequently depending upon the state of site cleanup; they are typically updated regarding critical activities at their sites even if they cannot travel to their sites on a regular basis. Moreover, they should be very familiar with the range of interests that may impact cleanup and reuse decisions of sites they oversee. Moreover, not only should site managers have valuable perspectives regarding the cleanup and reuse activities that took place at their sites, many were directly involved in reuse planning at their sites as technical advisors. However, because much of my data is based upon single perspectives, an argument could also be made that variables are based on data that is potentially biased. Although I attempted to ask local government officials the same questions for each of the sites that federal cleanup managers had answered questions about, this effort failed because of low-level participation from local officials.

Second, the bulk of my analysis is based upon a non-random sample of sites; as such it is not representative of all NPL sites. Although at the beginning of this study I had ambitious plans to collect data on two sets of sites to develop a comprehensive and unbiased picture of the phenomena of interest for this study, real world realities required me to take alternative approaches to collecting the necessary data. Ultimately, I requested that site managers select a site to respond to questions about that they were currently the cleanup manager for (or had been until recently) and that the site was redeveloped after 1995 or was currently capable of being reused. Because site managers could select the site of interest to them, they may have purposely chosen sites that were "more successful" from their perspective in terms of reuse outcomes. However, site managers were not asked or encouraged to select sites that utilized collaborative planning – the key variable of interest for this study.

Third, the value of my statistical results is limited because of the small sample size used to conduct the analysis, especially the results derived from multivariate regression. Notably, because of my small sample size, I could not test the *full* version of my Superfund site redevelopment model or any version of my plan implementation model in a regression framework. As a result, my Superfund site redevelopment model regression results suffer from under specification. Variables that consistently emerged as statistically significant predictors may in fact ultimately be proven to be insignificant if fuller versions of the models can be tested. Related, I utilize OLS regression analytic techniques when arguably other regression techniques would be better suited to the nature of my data and variables. For example, my dependent variables are not true unbounded continuous level variables. Although I did employ logistic modeling to some extent, arguably I should have employed logit modeling techniques to a greater extent. The standards that must be met to appropriately apply these modeling techniques could not be met, however, in any meaningful way, given the limitations of my sample size.

In addition, my study is limited because it was not officially supported by officials within the Superfund program. Moreover, there are limitations as to what type of information federal officials can provide in such surveys and how they can respond to survey questions.

My cross-case study analysis also has limitations. One reason for this is that I only developed four case studies. Further, the case studies are also limited because each arguably utilized robust collaborative planning processes. A better case study approach would have been to undertake case studies of sites where the collaborative planning processes were not so strong. This variation on a key independent variable would theoretically have helped to generate more meaningful results about this and other variables' impact on long-term outcomes (i.e., the redevelopment and plan implementation dependent variables). This was strongly considered during my case study selection. However, finding cases where the collaborative planning process was considered to be "poorly done" or "not successful" proved elusive. Additionally, the value of the case studies is further limited due to the low number of interviewees that informed each case, especially the Coleman-Evans site. Many potential interviewees chose not to participate.

8.4. Policy Implications

Findings from this study suggest there are a number of factors that influence Superfund site redevelopment and plan implementation. Collaborative planning appears to play a critical role in the redevelopment of Superfund sites and to a much lesser extent in Superfund site plan implementation. If I were a government official, site owner, or developer I would be interested in primarily in three aspects of this study's results: 1) that planning generally has a positive and consistent statistically significant effect on redevelopment; 2) that *collaborative* planning in particular similarly has a positive and consistent statistically significant effect on redevelopment; and 3) that local political support has a positive and consistent statistically significant effect on plan implementation. I would also be interested in the finding that perceptions of collaborative planning process legitimacy could potentially have a negative effect on plan implementation. I would also recognize there are serious limitations in the plan implementation statistical analyses rooted mainly in the small sample size. From the case studies, I would be very interested that three of the four case study sites – site that had robust collaborative planning processes – appear to be on-track for redevelopment. However, I would also take note that the MBC site does not appear to be on track for redevelopment despite use of a robust collaborative planning process.

Fundamentally, before undertaking any policy actions directed toward collaborative planning in the context of contaminated site redevelopment, a more systematic study of collaborative planning is needed. <u>If further study suggests that it is</u>

important, then some of the following policy recommendations may be considered. For example, EPA or Congress might consider providing funding for and requiring that all National Priorities List (NPL) Superfund sites that could realistically be reused within 10-15 years of being listed on the final NPL undergo in-depth reuse planning processes. EPA or Congress might also consider requiring reuse planning, prior to remedy selection, as a condition for the release of federal funding to implement long-term remedial approaches for EPA- or state-lead sites. Third, EPA or Congress might consider requiring that all required reuse planning process meet minimum requirements for multi-stakeholder involvement and collaboration. Collaborative planning requirements for sites that lack viable owners could be made even more specific. Fourth, Congress and EPA might consider allocating significant funding to sponsor reuse planning processes for all construction complete or deleted NPL sites that remain unused. Funding for these sites might also be made available to examine how remedies could be modified to support proposed reuses. Fifth, Congress and EPA might consider allocating funding for all sites with completed reuse plans to periodically review these reuse plans (e.g., every two-three years) to ensure they remain viable given the status of site cleanup and nearby land use trends. Finally, Congress and EPA might consider the development of a national Superfund redevelopment funding mechanism that can assist localities and other developers in the implementation of reuse plans. Such a mechanism could potentially provide low-interest, long-term loans to support the efforts of municipal governments to acquire sites, undertake dilapidated building deconstruction, and put in place the other necessary fundamental components to implement reuse plan.

8.5. Directions for Future Research

This study is the first one of its kinds to focus so thoroughly on Superfund site redevelopment and plan implementation. As such it was undertaken to some degree within an experimental framework. With so little known about Superfund site redevelopment at the start of this study, in terms of the published literature available, it made sense to test a variety of different variables that reflect site location suitability and neighborhood market strength, for instance. However, now that much of the groundwork has already been laid, more strategic, efficient, and effective research effort can be carried out in the future. A few potential research possibilities are discussed below.

First, undertake a content analysis of Five-Year Review reports to obtain a federal perspective on site reuse. Five-Year Review reports are in-depth analyses that the federal Superfund program performs every five years for sites that retain contamination on site above levels that allow for unrestricted use once remedial actions have started. These documents typically indicate whether sites are in reuse and they typically include discussions about reuse of the site and how reuse may have been considered as part of the risk assessment, remedy selection, and remedial design. Such an analysis while limiting in some respects would enable researchers to explore reuse dynamics at a large number of Superfund sites in a consistent manner using publicly-available data. These reports may also provide useful clues about local contacts that could be consulted to learn more about specific reuse activity. An excellent opportunity would be to examine the most recent

Five-Year Review reports available for all sites initially selected as Superfund Redevelopment pilot projects.

Second, modify the research questions and models applied in this study to different universes of sites. For example, the survey used to collect data for this study could readily be applied to examine reuse of state Superfund sites or brownfield/voluntary cleanup program sites. The real challenge of course is in obtaining an acceptable response rate. The findings, while valuable in their own right (e.g., examining brownfields), could also enable valuable comparisons with results from similar studies undertaken of different types of contaminated sites, or similar types of sites in different parts of the U.S.

Third, conduct in-depth qualitative interviews with entities responsible for Superfund site redevelopment. Perhaps no one knows best about what factors result in Superfund site redevelopment than those government officials and private developers that ultimately make the decision to physically redevelop a Superfund site. In-depth conversations with these stakeholders would greatly advance the field of Superfund site redevelopment.

Fourth, move beyond redevelopment outcomes generally and focus on the redevelopment outcome quality. A lesson that has emerged over the course of this study is that not all successful Superfund site redevelopments are equal. While some may have a positive effect on the local tax base or in providing jobs or enhancing recreational opportunities, other redevelopments may be perceived as lost opportunities. A related research track would be to study how the role of collaborative planning impacts the type of redevelopment selected.

Finally, it would be extremely valuable to formally explore the role that both planning and collaborative planning have on other outcomes at Superfund sites. For example, results from the survey indicated that irrespective of the state of site redevelopment, site manager perceive that redevelopment planning processes effectively inform remedial planning processes, allow for positive, proactive dialogue regarding the site, and facilitate cleanup of their sites. More formal research would help confirm or refute the findings, and perhaps lead the way to new planning approaches that further assist cleanup agencies in achieving the other important outcomes.

8.6. Concluding Comments

"Future urban infill and growth depend on salvaging and re-imagining the collective body of in-between landscapes. For many American cities, as landscape surfaces accumulate through horizontal urbanization, it becomes paramount to locate waste and identify potential problems and opportunities for reusing it" (Berger, 2006).

Figure 6. R&H Oil/Tropicana site (proposed NPL site) and nearby area, San Antonio, Texas (2009)

The role of collaborative planning in site redevelopment and plan implementation are critical topics in the context of contaminated sites. Since American society is only beginning to understand the magnitude of its contaminated sites problem, efforts to understand how to appropriately plan for and reuse these sites are considerably lagging. In the 1990s and 2000s, collaborative planning was frequently cited in the urban planning realm as a critical, if not an essential, way to plan in a world dominated by numerous stakeholder interests and increasingly complex, interconnected problems. This study sought to put collaborative planning to the test in the context of contaminated site redevelopment, properties that generate emotions of fear, uncertainty, and anxiety. Although this study has several limitations, its results suggest the role of collaborative planning appears robust in the context of contaminated site redevelopment. The case of the redevelopment of the Midvale Slag site, where intensive collaborative planning was used to help plan for an enormous site covered with mining waste that is now rapidly being redeveloped, stands as an important example of this. Considerably more research is needed, however, before collaborative planning's impact on contaminated site redevelopment and plan implementation can be more fully known.

Along Interstate-35, both north and southwest of Austin, sit two former industrial sites. The Pesses Chemical Company site, located in Ft. Worth, was listed on the NPL in 1986 and deleted from the NPL in 1995. The site remains an unused eyesore surrounded by barbed-wire fencing. The R&H Oil/Tropicana site, located in San Antonio, was proposed to the NPL in 2001. It may never be listed as final on the NPL and the prospects for future cleanup remain unclear. Meanwhile the site sits; another unused eyesore surrounded by barbed wire. Could collaborative planning help bring these sites into a state of redevelopment in the future? Although more research is certainly needed, results from this study suggest that it is a reasonable bet to make.

Figure 7. Pesses Oil Company site and nearby area (deleted NPL site), Ft. Worth, Texas (2008)

Appendices

Appendix A – Superfund Sites Redeveloped as of or Prior to 1999 that Utilized Multi-Stakeholder Involvement/or Community Involvement to Inform Redevelopment

Superfund Sites Redeveloped as of or Prior to 1999 that Utilized Multi-Stakeholder Involvement/or Community Involvement to Inform Redevelopment

Site Name	State	City	Acres	Most recent former operations	Status	Multi-Stakeholder Planning / Community Involvement	Factors Identified by EPA as Important
ASARCO Tacoma Smelter	WA	Tacoma	67	Smelting and refining	Mixed (expected by 2003)	MS	• Multi-stakeholder involvement in cleanup and reuse planning (U.S. EPA, 1999q) • Waterfront location
Hanford 1100 Area	WA	Richland	5 sq. miles	Federal weapons arsenal (vehicle maintenance and transportation distribution center)	Industrial (rail transportation and locomotive repair)	Unclear	• Local agencies and advisory boards provided EPA-DOE abreast of community viewpoints • Prime location • Access to rail lines (U.S. EPA, 2000a) • EPA-DOE-State –local community partnership
Northwest Transformer (South Harkness Street)	WA	Everson	1	transformer reclamation, storage, and manufacturing facility	Public (parking lot)	MS	Area demand for parking (U.S. EPA, 1999q)
Pacific Sound Resources	WA	Seattle	?	Wood treatment	Marine terminal	MS	• Intense need by shipping company for additional space at Port of Seattle marine terminal (U.S. EPA, 1999q)
Spokane Junkyard and Associated Properties	WA	Spokane	16	Junkyard for heavy equipment and appliances	Recreational	CI	• None identified • Planned reuse for site occurred after cleanup had occurred (U.S. EPA, 1999q)
McColl	CA	Southern CA	?	Acidic sludge pit	Recreational (3-hole golf course)	MS	• "Through a series of public and community technical advisory group meetings, the community informed EPA of its desire to fold the McColl property into an adjacent golf course" (U.S. EPA, 1999q)
California Gulch	CO	Leadville	16.5 sq. mile	Former mining district	Recreation – Mineral Belt Trail (portion of site)	MS	
Central City	CO	Clear Creek Black Hawk	?	Contaminated waste rock piles and other mining residual	Casinos, hotels, restaurants, and other amenities	CI	
Denver Radium	CO	Denver	17	Tile and brick manufacturer	Home Depot	CI	• Denver Radium site is actually comprised of multiple sites located throughout the area, but the

Site Name	State	City	Acres	Most recent former operations	Status	Multi-Stakeholder Planning / Community Involvement	Factors Identified by EPA as Important
							reuse case here refers to only one property (U.S. EPA, 1999g)
Rocky Mountain Arsenal	CO	Denver	27 sq. miles	Pesticide production	Urban national wildlife refuge (in progress)	CI	• Noting that "The cooperation among EPA, the Army, CDPHE, Shell Oil, USFWS, and the adjacent communities is key to the successful transformation of the site" (U.S. EPA, 1999q)
Old Works/East Anaconda Smelter	MT	Anaconda	?	Copper smelter	18-hole golf course	MS	• Noting that "The strong partnership forged among EPA, ARCO, and the local community was the key ingredient to the successful turnaround at the site. EPA, ARCO, and the local community played an active role in planning the cleanup and redevelopment. EPA also orchestrated an agreement that addressed the liability concerns that ARCO and the county had at the site, while ensuring future protection through maintenance of the soil cover." (U.S. EPA, 1999q)
Silver Creek/Butte Area	MT	Butte	?	Multiple mine waste dumps	Recreational and ecological	MS	• Noting that "Working together, ARCO, EPA, and the community returned the property to productive use." (U.S. EPA, 1999q)
Bayou Bonfouca	LA	Slidell	?	Creosote plant	Public operations offices	MS	• Noting that "A key ingredient to the successful cleanup of the Bayou Bonfouca is the partnership between EPA, the State of Louisiana, the City of Slidell, the community, and the Braselman Corporation. This partnership led to the timely cleanup of the site and reuse of Bayou Bonfouca." (U.S. EPA, 1999q)
French Ltd.	TX	Crosby	23	Industrial waste storage and disposal	Man-made wetlands	MS	• Noting that "EPA identified 90 companies potentially responsible for the contamination. These parties formed the French Limited Task Group (FLTG) and agreed to work with EPA, the Texas Water Commission, and the community to clean up the site. The FLTG treated the soil and groundwater, and created over 23 acres of new wetlands near the site to compensate for damaged habitat.." (U.S. EPA, 1999q)
MacGillis & Gibbs Co./Bell Lumber &	MN	New Brighton	?	Wood treatment	Urban center and office complex	MS	• Noting that "This is part of an effort led by EPA, the state, the City of New Brighton, and the local

Site Name	State	City	Acres	Most recent former operations	Status	Multi-Stakeholder Planning / Community Involvement	Factors Identified by EPA as Important
Pole Co.							community to transform the once-blighted and contaminated property into Brighton Corporate Park III, an urban center and office complex." (U.S. EPA, 1999q)
Bowers Landfill	OH	Pickaway Co.	?	Hazardous waste landfill	Man-made wetlands	MS	• Noting that "the nearby residents and representatives from the City of Circleville and Pickaway County formed the Bowers Landfill Information Committee, which helped keep the community involved and informed. Committee members provided site managers with suggestions and community reaction and feedback throughout the cleanup and redevelopment process, and acted as a channel for community concerns." (U.S. EPA, 1999b)
Luminous Processors	GA	Athens	1	Watch parts manufacturing	McDonald's restaurant and children's playground		• Noting that "EPA's partnership with the State of Georgia and the local community was key to the successful redevelopment of the Luminous Processors site. This cooperation was crucial to developing a cleanup plan that satisfied everyone's concerns. Community members had input into EPA's and the state's redevelopment planning as well" (U.S. EPA, 1999l).
Woolfolk Chemical Plant	GA	Fort Valley	?	Pesticide plant	public library, welcome center, and office space	MS	• Noting that "The reuse of the formerly–contaminated property surrounding the plant could not have occurred without the cooperative efforts of EPA, Canadyne-Georgia, and the local community" (U.S. EPA, 1999s)
Rock Hill Chemical Co.	SC	Rock Hill	?	Chemical production facility.	Auto service centers	CI	• Noting that "By teaming up with the state and community, EPA helped turn the site into an asset providing jobs, income, and a useful service for local residents" (U.S. EPA, 1999q).
Army Creek Landfill	DE	New Castle Co.		Landfill	Ecological habitat	CI	• Noting that "These community groups made contributions that were vital in determining whether and how the site could be transformed into a wildlife enhancement area. EPA worked closely with these partners to ensure that the ecological components of the cleanup and reuse plans were appropriate and were designed and implemented

Site Name	State	City	Acres	Most recent former operations	Status	Multi-Stakeholder Planning / Community Involvement	Factors Identified by EPA as Important
							correctly" (U.S. EPA, 1999a).
New Castle Spill	DE	New Castle		Chemical production facility	Public office space	CI	• (U.S. EPA, 1999a).
Wildcat Landfill	DE	Dover		Landfill	Restored habitat and future recreational area	MS	• (U.S. EPA, 1999a)
Ohio River Park	PN	Neville Island	32	Landfill	Private multi-purpose indoor/outdoor recreational center	MS	• (U.S. EPA, 1999n)
Chisman Creek	VA	York County		Industrial dump	Outdoor recreational center	MS	• Noting that "The Stewardship Committee created a powerful forum for interested people and organizations to provide input on cleanup and redevelopment decisions and hear about progress. EPA, York County, and Virginia Power together coordinated the cleanup and redevelopment" (U.S. EPA, 1999e)
Lipari Landfill	NJ	Pitman and Mantua	?	Landfill	Improved outdoor recreation area	MS	• Noting that "To achieve this successful cleanup and redevelopment, EPA formed partnerships with the state, the Borough of Pitman, the affected communities, and the PRP. EPA provided incentives for the Borough of Pitman to purchase the property, which included the former racetrack, and allowed an expedited cleanup of the off-site areas." (U.S. EPA, 1999e)
Army Materials Technology Laboratory (AMTL) Watertown	MA	Watertown	?	Weapons manufacturing and related research	Office and manufacturing center	MS	• Noting that "In 1996, the Watertown Arsenal Development Corporation was formed, and its seven members, all residents of Watertown, are responsible for choosing, negotiating with, and overseeing a developer who will create an office park on 30 acres of the land" (U.S. EPA, 1999a)
Ft. Devens	MA	Devens	?	Former military base	Multiple (planned: business, community services, rail, industry and	MS	• Noting that "To address the contamination, representatives from the Army, EPA, and the State of Massachusetts formed the Fort Devens Base Realignment and Closure Cleanup Team (BCT). Together with the surrounding communities, the BCT developed a cleanup plan that was consistent

Site Name	State	City	Acres	Most recent former operations	Status	Multi-Stakeholder Planning / Community Involvement	Factors Identified by EPA as Important
					trade; and open space and recreation)		with projected uses of the base" (U.S. EPA, 1999h)

Appendix B – Superfund Redevelopment Model Variable Description

Dependent Variables: Reuse on Track, Reuse on Track by 2008, Reuse on Track by 2012

(1) Definition and Logic: To avoid relying upon only one operationalization of the concept REUSE ON TRACK, three related variables were developed: the first of these variables – REUSE ON TRACK_1 – is intended to reflect the extent to which a Superfund site has been redeveloped or is on track for redevelopment based upon selection from one of several statements indicating the site's level of redevelopment. The second and third of the three REUSE ON TRACK variables – REUSE ON $\text{TRACK}_{2 \text{ and } 3}$ (by 2008/2012) – are intended to reflect the extent to which a Superfund site, or portion thereof, was redeveloped at the time the survey was administered, and if not, the likelihood that the site/portion would be redeveloped by the end of 2008 or the end of 2012. I argue that it is justifiable to classify sites meeting certain criteria as being "on track" for redevelopment even though they may not have yet been redeveloped as long as the site manager indicates that the site is "near redevelopment."

(2) Data and Measure: The REUSE ON TRACK_1 variable was constructed as an ordinal measure, using RPM survey data generated in response to the following question:

1. Which statement best characterizes the state of redevelopment for the site? ***(Please check the most appropriate response.)***

____A. Redevelopment is complete and is being used by customers, clients, etc.

____B. Redevelopment is near completion.

____C. Redevelopment has been planned and will be implemented once cleanup sufficiently progresses and/or necessary resources are secured.

____D. Efforts are currently underway to plan for redevelopment.

____E. Redevelopment plan has been finalized but there have been no serious efforts to implement the plan.

____F. No substantive redevelopment planning efforts have been undertaken. *(If you checked this option, please proceed to Question 4 below.)*

____G. Redevelopment is not possible because, for example, operations at the site never ceased, existing operations ceased only temporarily and will resume following cleanup, or the site falls within an existing residential development. *(If you checked this option, please proceed to Part XII on the last page.)*

____H. Don't know *(If you checked this option, please proceed to Part XII on the last page.)*

____I. Other____

Sites that RPMs marked as G or H were excluded from the analysis.[47] Options marked as I or "Other" were recoded to match the most appropriate category, if possible, depending upon RPM comments.[48] Options A-F correspond to a scale, where Option A represents the maximum point of progress that a site could reach in terms of its return to productive use and Option F represents the lowest point of reuse progress attainable. I also used data collected for this variable to construct a dichotomous version of this same variable (REUSE ON TRACK$_{1\text{-}B}$) in order to test the Superfund site redevelopment model using binary logit modeling. In this instance, sites marked as A, B, C, or D were considered to "on track" for redevelopment; sites marked options as E or F were categorized as "not on track" for redevelopment.

[47] Unless otherwise noted, all variables constructed as ordinal measures are assumed to serve as proxies for continuous level variables.
[48] Unless otherwise noted, all indications of "Other" were recoded to match one of the main response categories if RPMs provided sufficient data to permit recoding.

The REUSE ON TRACK VARIABLES$_{2 \text{ and } 3}$ (by 2008/2012) were also constructed as ordinal measures, using RPM survey data generated in response to the following question:

4. **How likely is it that the site will be redeveloped by the end of 2008?** ***(Please check the most appropriate response.)***

____A. Not at all likely ____E. Likely
____B. Unlikely ____F. Extremely likely / Already redeveloped
____C. Somewhat unlikely ____G. Don't know
____D. Somewhat likely ____H. Other____

5. **How likely is it that the site will be redeveloped by the end of 2012?** ***(Please check the most appropriate response.)***

____A. Not at all likely ____E. Likely
____B. Unlikely ____F. Extremely likely / Already redeveloped
____C. Somewhat unlikely ____G. Don't know
____D. Somewhat likely ____H. Other____

Options A-F correspond to a scale, where Option F indicates that a site is already redeveloped or would be redeveloped and Option A indicates that it is not at all likely that a site would be redeveloped by 2008/2012.

Independent Variables: Site-Specific

(1) Definition and Logic: The SITE REDEVELOPMENT SUITABILITY variable indicates the extent to which a site exhibits on-site physical features, such as flat topography, that make a site suitable for redevelopment. It is intended to reflect a site's development value that is independent from its location. It reflects the assumption that sites may have characteristics that make them attractive for a variety of uses, such as functional buildings, existing infrastructure, or favorable topography. The variable's underlying logic is that sites with a higher extent of on-site characteristics suitable for redevelopment will be more likely to be redeveloped than those with a lesser extent of similar characteristics.

(2) Data and Measure: The SITE REDEVELOPMENT SUITABILITY variable was constructed as an ordinal measure, using RPM survey data generated in response to the following question:

4. Did/does the site have any ON-SITE PHYSICAL FEATURES such as flat topography, access points, infrastructure, or buildings, either prior to redevelopment or now (if not redeveloped), that made/make the site appealing for redevelopment, in your opinion? ***(Please check the most appropriate response.)***

____A. Not at all

____B. To a minimal extent

____C. To some extent

____D. To a high extent

____E. To a very high extent

____F. Don't know

____G. Other____

Options A-E correspond to a scale, where Option E indicates that a site has on-site features to a very high extent making it appealing for redevelopment and Option A indicates it has no on-site features making it appealing for redevelopment.

(1) Definition and Logic: The concept of location is an extremely important one in the literature of contaminated site redevelopment and real estate development more generally. Its importance is frequently underscored in EPA's case study briefs on successful Superfund site redevelopment (e.g., see U.S. EPA, 1999b, 1999c, 1999g, 1999h; U.S. EPA, 1999p, 2004e) as well as related academic studies (e.g., see Wernstedt

& Hersh, 1998b). Similarly, studies of brownfields redevelopment typically mention the importance of location as a key factor on brownfields redevelopment (see Alberini, Longo, Tonin, Trombetta, & Turvani, 2005; DeSousa, 2004; Hill, 2000; Pepper, 1997). One prominent brownfields study, however, found no evidence of the location effect (Lange & McNeil, 2004b). I nevertheless felt compelled to include a variable reflecting site location suitability. Superfund sites are often located in less densely population areas (Wernstedt, Hersh, & Probst, 1999); hence, in order for many Superfund sites to appear suitable for redevelopment it seems reasonable that these sites would often require a favorable geographic position before developers would consider implementing projects at less complex sites.

Three related variables were developed to reflect the concept of site location suitability (SITE LOCATION SUITABILITY$_{1,\ 2,\ \text{and}\ 3}$). The underlying logic of these variables is that favorably located Superfund sites are more likely to be redeveloped than those that are not. The first variable SITE LOCATION SUITABILTIY$_1$ indicates the extent to which the location of site makes the site suitable for redevelopment. SITE LOCATION SUITABILTIY$_{2\ \text{and}\ 3}$ are closely related: one indicates whether a site is located near one or more features that made/make the location of the site appealing for redevelopment, the other indicates the number of features the site is located near that made/make the location of the site appealing for redevelopment. The rationale behind constructing the SITE LOCATION SUITABILITY$_2$ variable is that favorable proximity to only one location feature associated with a Superfund site may be all that is needed to draw the interest of a developer. The rationale behind SITE LOCATION SUITABILITY$_3$ variable is that sites associated with a higher number of location features should theoretically draw greater interest for redevelopment.

(2) Data and Measure: The challenge in estimating the suitability of a Superfund site's location centers on determining what constitutes a suitable location. Is it proximity to the interstate, another major highway, freight railway station, waterfront, harbor, major employment center, etc.? An additional layer of complexity obviously is that while one aspect of a site's location may seem suitable to one developer (e.g., proximity to major airport), this locational aspect may have minimal to zero import for another.

The SITE LOCATION SUITABILITY$_1$ variable was constructed as an ordinal measure, using RPM survey data generated in response to the following question:

2. How suitable was/is the LOCATION of the site for redevelopment, in your opinion, either prior to redevelopment or now (if not redeveloped)? ***(Please check the most appropriate response.)***

____A. Not at all suitable	____E. Extremely suitable
____B. Minimally suitable	____F. Don't know
____C. Moderately suitable	____G.Other__________________________
____D. Very suitable	______________________________

Options A-E correspond to a scale, where Option E indicates that a site is extremely suitable for redevelopment and Option A indicates it is not at all suitably located for redevelopment.

The SITE LOCATION SUITABILITY$_2$ variable was constructed as a dichotomous (ordinal) measure; the SITE LOCATION SUITABILITY$_3$ variable was constructed as a summated index measure. Both variables were constructed using RPM survey data generated in response to the following question:

3. Which, if any, of the features listed below are located near the site that made/make the site appealing for redevelopment, either prior to redevelopment or now (if not redeveloped)? ***(Please check all that apply.)***

____A. Central business district or other major employment center
____B. U.S. Interstate highway
____C. Other major highway
____D. Entrance/exit ramp for U.S. Interstate or major highway
____E. Major commercial airport or air freight terminal
____F. Passenger rail station
____G. Freight rail station or spur
____H. Prominent waterfront district
____I. Port/harbor
____J. City/urban area/metropolitan region (population > 100,000)
____K. Large-scale residential/mixed-use development
____L. Other____

Respondents had the option of selecting all options that applied. If a respondent marked "Other" this was also counted as a legitimate feature in addition to any other features marked above.

(1) Definition and Logic: The degree of contamination at a site was also theorized to impact the likelihood a site would be redeveloped. The underlying logic is that more highly contaminated would be less likely to be redeveloped. Accurately depicting site contamination using available measures is challenging.[49] For this analysis, I

[49] The most frequently referenced measure to indicate a site's overall contamination – EPA's Hazardous Ranking System (HRS) score – is unreliable. Some sites have scores that are subject to an older HRS scoring process and some sites to a newer process. In addition, scores are either not available for all sites

developed two site contamination measures, one indicating a site's approximate level of threat to public health when first discovered (SITE CONTAMINATION$_1$) and one indicating total contaminants of concern identified at NPL Superfund sites, determined as part of the Superfund assessment and inspection process (SITE CONTAMINATION$_2$). EPA defines contaminants of concern as:

> the chemical substances found at the site that the EPA has determined pose an unacceptable risk to human health or the environment. These are the substances that are addressed by cleanup actions at the site. Identifying COCs is a process where the EPA identifies people and ecological resources that could be exposed to contamination found at the site, determines the amount and type of contaminants present, and identifies the possible negative human health or ecological effects that could result from contact with the contaminants (U.S. EPA).

Whereas SITE CONTAMINATION$_1$ is intended to reflect the severity of the threat presented by a site upon its discovery by or notification to EPA, SITE CONTAMINATION$_2$ is a proxy for the breadth of the cleanup challenges encountered at a site. It is assumes that a site with a more extensive list of contaminants of concern will likely be more challenging to cleanup than a site with a shorter list, thus slowing reuse chances.

(2) Data and Measure: The SITE CONTAMINATION$_1$ variable was constructed as an ordinal measure, using RPM survey data generated in response to the following question:

(or not readily identifiable through public sources). Equally problematic, is that EPA does not maintain HRS scores in a single publicly-accessible database.

Options A-E correspond to a scale, where Option A indicates that no threat to public health existed and Option E indicates that an extremely high public health threat existed.

1. When the site was first discovered/notified to EPA, what was the site's approximate level of threat to public health? ***(Please check the most appropriate response.)***

____A. None	____E. Extremely high
____B. Minimal	____F. Don't know
____C. Moderate	____G. Other______________________________
____D. High	______________________________

The SITE CONTAMINATION$_2$ variable was developed using EPA's Superfund Site Information database (also known as CERCLIS). It was constructed as a summated index measure reflecting the total number of "contaminants of concern" listed in EPA's Superfund Site the Progress Profile available for each NPL site. The list of contaminants of concern can include contaminants that are listed more than once, if they are identified in more than one media (e.g., in groundwater *and* in soil, etc.). If the same contaminant was listed twice for a particular, for example, to account for different contaminated media, I likewise counted that particular contaminant of concern twice. This variable is intended as a very rough indicator of a site's contamination complexity. It does not account for where contamination is located in relation to a particular subsite, or the relevance of a certain type of contamination at the site may realistically impact a site's redevelopment chances.

(1) Definition and Logic: The SITE OWNERSHIP variable indicates whether a site was publicly or privately held during efforts to plan for redevelopment of the site or ownership at the time the survey was taken, if no redevelopment planning had yet taken place. The underlying theory is that the type of ownership should influence the likelihood that a site is reused. Conventional wisdom suggests that privately-held sites may be more likely to be redeveloped because companies would benefit if their sites once again became productive assets. However, another theory suggests that privately-held sites are more likely to remain idle as often times these sites retain some type of pollution treatment system and/or residual contamination that owners would prefer not be disturbed. Similarly, private owners of these sites may often simply not view moving these sites back in functional uses as a priority, particularly when held by large corporations. I hypothesize here that sites where ownership is ambiguous (e.g., site owner is not financial viable) and sites that are government-held are going to be more likely to placed back into productive use than privately-held sites.

(2) Data and Measure: The SITE OWNERSHIP variable was constructed as a dichotomous (ordinal) measure, using RPM survey data generated in response to the following questions:

1. **Who owned the site when first discovered/notified to EPA?** *(Please check all that apply.)*

____A. Private site owner

____B. Multiple private site owners

____C. Private site owner who was not financially viable (e.g., in bankruptcy)

____D. Multiple private site owners who were not financially viable

____E. No identifiable property owner

____F. Local, state, or federal government

____G. Don't know

____H. Other____

3. **Did/will site ownership change significantly prior to (or during) efforts to redevelop the site?** *(Please check the most appropriate response.)*

____A. Yes. The site was (or will soon be) acquired by a different company or individual.

____B. Yes. The site was (or will soon be) acquired by local/state/federal government or non-profit.

____C. No. The ownership situation did not change.

____D. No. The ownership situation is not expected to change.

____E. N/A

____F. Don't know

____G. Other____

Sites were identified as being publicly-held if Options D, E, or F were marked in response to Question 1, *and* if the ownership situation was not expected to change, as indicated in Question 3 above. If a site was privately-held, but it was expected that the site was going to be acquired by a federal, state, or local government, as indicated in Question 3, then the site was also categorized as being a publicly-held site.

Independent Variables: Neighborhood and Regional

(1) Definition and Logic: The NEIGHBORHOOD MARKET STRENGTH concept represents the degree to which the area containing a Superfund site exhibits characteristics of a relatively robust local economy. Whereas the SITE LOCATION SUITABILITY variable reflects the value of a Superfund site because of its proximity to other key locations, the NEIGHBORHOOD MARKET STRENGTH variable reflects the notion that, irrespective of how far a site is from a major interstate, for instance, the local market economy will exert considerable influence on whether a site will be redeveloped. Theory suggests that a site surrounded by a thriving local economy would experience greater redevelopment pressure than sites located in areas with anemic local economies. In essence, this variable represents at least a partial proxy for market demand, which has been frequently identified in the literature as influential in brownfields redevelopment (Howland, 2003; Meyer & Lyons, 2000; Pepper, 1997; Wernstedt & Hersh, 2006). Similarly, Greenstein & Sungu-Eryilmaz (2004), writing from a broader perspective, argue that, "The answer to the question of redevelopment [of abandoned, contaminated, and underutilized properties] lies in the strength of the neighborhood and local economies" (p. 7). The role of *local* market demand is not often cited in the modest Superfund redevelopment literature however, apart from one case study brief (see U.S. EPA, 2004c) that emphasized the high demand placed on undeveloped property in one Florida city which influenced the redevelopment of a Superfund site. Nevertheless, I would argue that such a variable is crucial and cannot be excluded.

I developed two related variables. NEIGHBORHOOD MARKET STRENGTH$_1$ is a rough indicator of the number of businesses operating per 100 persons residing in the zip code containing a sample site. NEIGHBORHOOD MARKET STRENGTH$_2$ indicates the level of development pressure around the site (within roughly one mile from the site boundary).

(2) Data and Measure: The NEIGHBORHOOD MARKET STRENGTH$_1$ variable was constructed as a continuous ratio measure, using 2000 Census data. Specifically, this measurement was constructed by:

(i) identifying the number of business operating in the Zip Code Tabulation Area containing the site using 2000 U.S. Census Zip Business Patterns,
(ii) identifying the population of the Zip Code area containing the site;
(iii) dividing this number by 100; and
(iv) using the resulting figure to divide the number of business operating in the Zip Code Tabulation Area containing the site according to 2000 U.S. Census Zip Business Patterns.

This approach is arguably problematic because of a potential lack of exact correspondence between Zip Code Tabulation Areas and Zip Code Areas. However, according to the Census, only certain types of zip codes (e.g., zip codes dedicated entirely to a single business) tend not to correspond. And although, the Census notes that ZIP codes established by the U.S. Post Service after January 2000 will not be matched by a corresponding Census 2000 Zip Code Tabulation Areas, nearly all of the study sites were listed on the NPL prior to 2000. Hence it was presumed here that the study will have an approximate Zip Code Tabulation Area – Zip Code match (U.S. Census Bureau, 2001). Further, because these results represent rough approximations only I argue here that as a measure it is sufficient, especially given the lack of similar business data that can be easily gathered for a national cross-section of sites.

The NEIGHBORHOOD MARKET STRENGTH$_2$ variable was constructed as an ordinal measure, using RPM survey data generated in response to the question below. Options A-E correspond to a scale, where Option A indicates “no development pressure at all” and Option E indicates “extremely high development pressure.”

5. How would you characterize the LEVEL OF DEVELOPMENT PRESSURE around the site (within roughly one mile from the site boundary), either prior to redevelopment or now (if not redeveloped)? ***(Please check the most appropriate response.)***

____A. No development pressure at all

____B. Minimal development pressure

____C. Moderate development pressure

____D. High development pressure

____E. Extremely high-level development pressure

____F. Don't know

____G. Other____

(1) Definition and Logic: Although local economies are important, I argue that a site located within a robust local economy may be still tend to be overlooked as a redeveloped candidate if a considerable number of vacant or undeveloped properties are located around the site. Hence, I constructed the NEIGHBORHOOD LAND AVAILABILITY variable to reflect local land availability, specifically indicating the level of development pressure around the site (within roughly one mile from the site boundary).

6. How would you characterize the AMOUNT OF UNDEVELOPED/VACANT PROPERTY around the site (within roughly one mile from the site boundary), either prior to redevelopment or now (if not redeveloped)? ***(Please check the most appropriate response.)***

____A. No undeveloped/vacant property at all

____B. Minimal amount of undeveloped/vacant property

____C. Moderate amount of undeveloped/vacant property

____D. High amount of undeveloped/vacant property

____E. Extremely high amount of undeveloped/vacant property

____F. Don't know

____G. Other____

(2) Data and Measure: The NEIGHBORHOOD LAND AVAILABILITY variable was constructed as an ordinal measure, using RPM survey data generated in response to the question above. Options A-E correspond to a scale, where Option A indicates “no undeveloped/vacant property at all” and Option E indicates “extremely high amount of undeveloped/vacant property.”

(1) Definition and Logic: It was also theorized that Superfund sites would be more likely to be redeveloped if located in areas that showed a proclivity toward land use planning more generally (i.e., higher levels of “planning culture”). I developed and tested three different PLANNING CULTURE variables to test this proposition. PLANNING CULTURE$_1$ is intended to reflect planning culture at the county level, PLANNING CULTURE$_2$ is intended to reflect planning culture in the area surrounding or near the site by demonstrating whether there had been any neighborhood, city, or regional land use plans that included/include recommendations for redeveloping the site, and PLANNING CULTURE_3 is intended to reflect planning culture at the State level by demonstrating whether a state is a growth management state as classified by Yin and Sun (2007) requiring local level growth management planning.

(2) Data and Measure: The PLANNING CULTURE_1 variable represents a 1997 composite index of social capital for each county in the U.S. made available by Rupasingha and Goetz (2008b) first used in a published study by Rupasingha, Goetz, & Freshwater (2006).[50] The social capital index applied here was developed by the authors through using principal components analysis (PCA). After examining a range of variables through PCA, Rupasingha and Goetz chose a calculation based upon on total associations per 10,000 people within the county based upon 1997 County Business Patterns data as the index of social capital. Associations could include bowling centers; civic and social associations; physical fitness facilities; public golf courses; religious organizations; sports clubs, managers and promoters; membership sports and recreation clubs; political organizations; professional organizations; business associations; labor organizations; and membership organizations not elsewhere classified (2008a).

The variable PLANNING CULTURE_2 variable was constructed as a dichotomous (ordinal) measure, using RPM survey data generated in response to the following question:

7. Were/are you aware of any neighborhood, city, or regional land use plans that included/ include recommendations for redeveloping the site, either prior to redevelopment or now (if not redeveloped)? ***(Please check the most appropriate response.)***

____A. Yes ____B. No ____C. Don't know ____D. Other____________________________

[50] The social capital data was downloaded from the Northeast Regional Center for Rural Development within the Pennsylvania State University at http://nercrd.psu.edu/Social_Capital/index.html.

The PLANNING CULTURE$_3$ variable was constructed as a dichotomous (ordinal) measure based upon the work of Yin and Sun (2007) which identified states as growth management states. States identified as such included Hawaii, California, Vermont, Oregon, Florida, New Jersey, Maine, Rhode Island, Georgia, Washington, Maryland, Arizona, Tennessee, Colorado, and Wisconsin. In order for me to classify a Superfund site as "within a growth management state", redevelopment planning efforts had to have begun a full three years following the year that growth management legislation for a particular state was implemented. For example, according to Yin and Sun, Wisconsin adopted growth management legislation in 2000, as a result, the earliest that a site could be classified as "within a growth management state" by my criteria would be 2004. If a site had not yet planned for redevelopment but it was "within a growth management state" it was classified as "within a growth management state."

(1) Definition and Logic: In addition to a healthy local, or neighborhood, economy, the strength of regional markets should serve as another indicator of the likelihood that a Superfund site will be redeveloped. In robust regional economies, it is reasonable to expect that demand for abandoned urban properties will be higher than for sites in economically depressed regions, as they are more likely to attract new employment and new residents, which will in turn place more pressure on urban land. In their comprehensive assessment of brownfields redevelopment, Urban Institute et al. (1997) found that "the variation in economic conditions between different metropolitan areas (or the shift in one metropolitan area's economic conditions over time), can have a dramatic effect in terms of the feasibility of brownfield redevelopment" (p. 35). Regional market strength also serves as a proxy for the relative capacity of local agencies to plan for and facilitate the redevelopment of brownfield and Superfund sites and a region's overall education as well as crime levels.

To measure REGIONAL MARKET STRENGTH two related variables were developed. REGIONAL MARKET STRENGTH$_{1,}$ a more static indicator, reflects the median household income for counties containing selected sites; REGIONAL MARKET STRENGTH$_2$, a more dynamic indicator, reflects population change for counties containing selected sites over a period of 15 years (1990-2005).

(2) Data and Measure: The REGIONAL MARKET STRENGTH$_1$ variable was constructed as continuous ratio measure, using 2000 Census data. REGIONAL MARKET STRENGTH$_2$ was similarly constructed as a ratio measure. Data for this measure was generated from 1990 and 2005 Census data.

Independent Variables: Redevelopment Variables

(1) Definition and Logic: INCENTIVES represent the range of economic incentives that developers/new tenants have accessed, or intend to access, which have been made available by the local, state, or federal government for the purposes of stimulating contaminated or abandoned land specifically or depressed areas in which these sites are located more generally. The role of public and private incentives have figured prominently in brownfields redevelopment (see Alberini, Longo, Tonin, Trombetta, & Turvani, 2005; Hill, 2000; Lange & McNeil, 2004b; Pepper, 1997; Urban

Institute et al., 1997) as well as Superfund site redevelopment (U.S. EPA, 2004c, 2004d, 2004e). In rare instances, incentives have been found to have no effect on brownfields and Superfund site redevelopment (e.g., see Meyer & Lyons, 2000). In towns or cities where a substantial supply of undeveloped or previously-developed land is available the availability of incentives may be sufficient to encourage developers to undertake a project at a site. A Superfund site falling within a state-sponsored enterprise zone, for instance, may be looked upon more favorably by a developer than a similar non-Superfund site located outside an enterprise zone. The utility of incentives will vary according to the entity in control of site development (e.g., private versus local government) and type of project proposed (e.g., mixed use development versus public recreation area). It is assumed generally that more incentives make a site more attractive for redevelopment. And because so many Superfund sites likely have a commercial or industrial redevelopment component, it was assumed that the availability of some form of incentive would likely play an important role in the redevelopment of Superfund sites in this study.

The significance of incentives is made complicated given the uncertainty in terms of the type of incentives potentially available (e.g., targeted incentives versus area-wide) and by the fact the some sites will have only reached a point where, if incentives were offered or made available to developers, they may not yet be in position to accept them because they have not completed their redevelopment plans; others may expect to only use incentives once reuse of the site is granted approval by EPA. To better account for these nuances, two INCENTIVES variables were developed. INCENTIVES_1 specifically indicates whether the developer was/will be granted public-sector financial incentives (e.g., lien waivers, tax exemptions, tax deductions, low-interest loans) to redevelop the site. INCENTIVES$_2$ builds off the first variable indicating whether the developer was/will be granted public-sector financial incentives (e.g., lien waivers, tax exemptions, tax deductions, low-interest loans) to redevelop the site, *and/or* whether the site was/is located in any economic development districts, either prior to redevelopment or at the time of the survey (if the site was not already redeveloped).

(2) Data and Measure: Both measures were constructed as ordinal measures, using RPM survey data generated in response to the following questions:

8. Was/will the developer (be) granted public-sector financial incentives (e.g., lien waivers, tax exemptions, tax deductions, low-interest loans) to redevelop the site? ***(Please check the most appropriate response.)***

____A. Yes
____B. No. Redevelopment took place/is taking place without public incentives.
____C. Public incentives will likely be granted by the end of 2008.
____D. It is unlikely that public incentives will be granted in the near future.
____E. It is too early to know.
____F. Don't know
____G. N/A
____H.Other______________________________

9. Which, if any, of the following special districts was/is the site located in, either prior to redevelopment or now (if not redeveloped)? ***(Please check all that apply.)***

____A. Tax Increment Finance (TIF) District
____B. Locally-sponsored special assessment or improvement, revitalization, redevelopment, renaissance or similar district
____C. Local or state-sponsored enterprise zone
____D. Federally-sponsored empowerment zone
____E. Federally-sponsored Historically Underutilized Business Zones (HUBZone) Program
____F. Site is not located in any of the special districts mentioned.
____G. Don't know
H. Other

For INCENTIVES$_1$, sites marked as Option A or C in response to Question 8 were classified as sites receiving incentives. For INCENTIVES$_2$, sites were classified as receiving incentives/located in an incentive zone, if Option A or C was marked in response to Question 8, or any of the incentive zone options were marked in response to Question 9 (e.g., Options A-E).

(1) Definition and Logic: Some EPA Superfund sites are held by the state, local government, or even EPA because prior property owners failed to comply with property tax requirements or simply abandoned their facility after closure. Local and state governments are often eager to see their sites returned to tax-contributing uses. Private owners of such sites, who are often PRPs, may be *un*interested in actually redeveloping their sites following site cleanup. Even privately-held sites whose eventual redevelopment has been planned for through publicly-based planning processes may not be redeveloped because of reluctance on the part of one or more private property owners to support or implement such plans. The SITE-OWNER SUPPORT variable indicates the level of interest expressed by the site owner/s in returning the site to productive use. The variable's underlying logic is that sites more likely to be "on track" for redevelopment are those which are controlled by entities actively supportive of site redevelopment.

(2) Data and Measure: This variable was constructed as an ordinal measure, using RPM survey data generated in response to the following question:

2. **What was/is the general level of interest expressed by the site owner(s) (specified in the previous question) in returning the site to productive use?** ***(Please check the most appropriate response.)***

____A. No interest at all

____B. Minimal

____C. Moderate

____D. High

____E. Extremely high

____F. Don't know

____G. Other______________________________

The reference to the "previous question" refers to a question that asks about what entity held the site at the time when the site was first discovered or notified to EPA (see Question 1 listed above under the discussion of the SITE OWNERSHIP variable). Hence the focus of Question 2 centers on the original site owner's support for reuse. Options A-E correspond to a scale, where Option A indicates "no interest at all" in redevelopment by the site owner and Option E indicates an "extremely high" level of interest in redevelopment.

(1) **Definition and Logic:** The role of planning – and collaborative planning in particular – in facilitating the redevelopment of Superfund sites represent the key for examining *the* critical phenomenon of interest in my examinations of both Superfund site redevelopment and plan implementation. Five PLANNING TYPE variables were developed to shed further light on this phenomenon. The underlying logic of each of these is that sites which utilize land use planning – and collaborative land use planning processes in particular – to plan for redevelopment are more likely to be "on track" for redevelopment than sites that use processes with less intensive stakeholder involvement, or no planning processes at all. PLANNING TYPE$_1$ indicates whether there were/are specific efforts (being) undertaken to plan for the redevelopment of the site. The emphasis of this variable clearly is on the use of planning processes *generally*, irrespective of the degree of collaboration. However, land use planning is typically dependent upon some form of collaboration, at least to a limited degree.

PLANNING TYPE variables 2-5 are intended to reflect the extent to which (or whether) collaborative planning processes were used. PLANNING TYPE$_2$ indicates the extent to which a wide-range of stakeholders was/is being consistently involved in efforts to plan for the redevelopment of the site. PLANNING TYPE$_3$ indicates whether a wide range of stakeholders was/are being involved in efforts to plan for the redevelopment of the site at a high/very high extent. PLANNING TYPE$_4$ reflects the number of stakeholders that were/are (being) consistently involved in efforts to plan for the redevelopment of the site. PLANNING TYPE$_5$ indicates whether an interactive, face-to-face, multi-stakeholder decision making process was used to generate recommendations for reusing the site.

1. Were/are specific efforts (being) undertaken to plan for the redevelopment of the site?
(Please check the most appropriate response.)

____A. Not at all *(If you checked this option, please proceed to Part XII on the last page.)*

____B. To a minimal extent

____C. To some extent

____D. To a high extent

____E. To a very high extent

____F. Don't know *(If you checked this option, please proceed to Part XII on the last page.)*

____G. Other____

(2) Data and Measure: PLANNING TYPE$_1$ was constructed as an ordinal measure, using RPM survey data generated in response to the following question: Options A-E correspond to a scale, where Option A indicates no efforts at all were undertaken to plan for the reuse of the site and Option E indicates that efforts to plan for the redevelopment of the site were undertaken to "a very high extent."

PLANNING TYPE$_2$ was constructed as an ordinal measure. PLANNING TYPE$_3$ was constructed as a dichotomous (ordinal) measure, both using RPM survey data generated in response to the following question:

6. In your opinion, was/is a wide-range of stakeholders (being) CONSISTENTLY INVOLVED in efforts to plan for the redevelopment of the site? ***(Please check the most appropriate response.)***

____A. Not at all

____B. To a minimal extent

____C. To some extent

____D. To a high extent

____E. To a very high extent

____F. Don't know

____G. Other____

Options A-E correspond to a scale, where Option A indicates that a wide-range of stakeholders was not at all consistently involved to plan for the redevelopment of the site and Option E indicates stakeholders were consistently involved "to a very high extent." For PLANNING TYPE$_3$, which reflects a high/low distinction in terms of the extent of involvement, sites marked as Option D or E were categorized as sites that had a high levels of consistent widespread stakeholders involvement; sites marked as A, B, or C were classified as having no or low levels of consistent and widespread stakeholder involvement.

PLANNING $TYPE_4$ was constructed as a summated index measure, using RPM survey data generated in response to the following question:

5. Which of the following stakeholders were/are (being) CONSISTENTLY INVOLVED in efforts to plan for the redevelopment of the site? ***(Please check all that apply.)***

____A. Prospective private purchaser/developer	____H. PRPs (excluding PRPs who were also original site owners and/or federal/state/local government)
____B. Local government	____I. Residents/organizations near site
____C. U.S. EPA	____J. Other local residents/organizations
____D. Other federal agencies	____K. Don't know
____E. State environmental agency	____L. Other________________________
____F. Other state agencies	________________________________
____G. Original site owners (entities who owned site when first discovered/notified to EPA, excluding federal/state/local government)	________________________________

Respondents could select up to 11 options, including "Other."

PLANNING $TYPE_5$ was constructed as a dichotomous (ordinal) measure, using RPM survey data generated in response to the following question:

5. In your opinion, was/is an interactive, face-to-face, multi-stakeholder decision making process (being) used to inform the site's most recent redevelopment plan? (e.g., planning workshops, advisory committees, interactive public meetings) ***(Please check the most appropriate response.)***

____A. Yes

____B. No *(If you checked this option, please proceed to Part X on the following page.)*

____C. Don't know *(If you checked this option, please proceed to Part X on the following page.)*

____D. Other____

(1) Definition and Logic: The PLANNING TIMING variable indicates when key decisions about site remedies took/are taking place. The underlying logic is that sites which plan for the redevelopment prior to remedy selection or when most key decisions about remedies are being made are more likely to be redevelopment than sites that do not undertake planning until after key decisions about site remedies have been made.

(2) Data and Measure: PLANNING TIMING was constructed as a dichotomous (ordinal) measure, using RPM survey data generated in response to the following question:

3. Relative to key decisions about site remedies, approximately when did efforts to plan for the redevelopment of the site take place? ***(Please check all that apply.)***

____A. BEFORE most key decisions about site remedies were made

____B. AROUND THE SAME TIME during which most key decisions about site remedies were being made

____C. AFTER most key decisions about site remedies were made

____D. Planning process is NOW UNDERWAY but most key decisions about site remedies HAVE NOT been made.

____E. Planning process and most key decisions about site remedies are BOTH taking place NOW.

____F. Planning process is underway but most key decisions about site remedies were made PRIOR to initiation of the planning process.

____G. Don't know

____H. Other____

Sites marked as Options A, B, D, and/or E were categorized as sites which undertook planning prior to or during remedy selection. Sites marked as C or F were categorized as sites that undertook planning primarily after remedy selection.

Independent Variables: Controls

(1) Definition and Logic: The SITE READINESS FOR REUSE variable indicates whether *any* redevelopment activity can be permitted at the site that is consistent with cleanup activities by the end of 2008 or 2012. Its underlying logic is that sites ready for reuse by 2008/2012 will be more likely to be reused or on track for reuse than sites that are not. The variable is in essence a proxy for level of cleanup progress. Sites that are farther long in reaching cleanup goals should be more likely to be redeveloped than ones that are not.

(2) Data and Measure: SITE READINESS FOR REUSE$_{1\text{ and }2}$ (by 2008/2012) were constructed as dichotomous (ordinal) measures, using RPM survey data generated in response to the following question:

2. When will ANY redevelopment activity be permitted at the site that is consistent with cleanup activities? ***(Please check the most appropriate response.)***

____A. Can now accommodate redevelopment activity

____B. By the end of 2008

____C. By the end of 2012

____D. Will likely NOT be able to accommodate redevelopment activity by the end of 2012

____E. Don't know

____F. Other____

Sites marked as Options A and B were classified as sites permitting redevelopment activity by the end of 2008. Sites marked as Options A, B, or C were classified as sites permitting redevelopment activity by the end of 2012. The variable indicating that the site could accommodate reuse activity at the time the survey was taken or by the end of 2008 was used to test the REUSE ON TRACK and REUSE ON TRACK BY 2008 dependent variables. The variable indicating that the site could accommodate reuse activity at the time the survey was taken or by the end of 2008, or by the end of 2012 was used to test the REUSE ON TRACK and REUSE ON TRACK BY 2012 dependent variables.

(1) Definition and Logic: The CLEANUP INTENSITY variable indicates whether the completed/planned cleanup activities for a site will allow for unrestricted use. The underlying logic is uncertain. Some experts feel that more intensive reuse should facilitate site redevelopment since developers will be more interested in developing sites unencumbered by residual contamination. Others believe that sites cleaned up only to those uses that match the reasonable future use of the site (which is often an industrial or commercial use) will be more likely to be redeveloped since the cleanup of these sites should take less time than more extensive cleanups.

(2) Data and Measure: The CLEANUP INTENSITY variable was constructed as an ordinal measure, using RPM survey data generated in response to the following question:

3. Does/will the completed/planned cleanup activities for the site allow for unrestricted use?
(Please check the most appropriate response.)

____A. Yes	____E. Don't know
____B. No	____F. Other____________________
____C. For a limited portion	
____D. Too early to tell	

Options A-C correspond to a scale, where Option A indicates the highest level of cleanup intensity, Option C represents moderate cleanup intensity, and B indicates the lowest level of cleanup intensity. Sites marked as “too early to tell” or “don’t know” were treated as missing data points in the statistical analysis.

(1) Definition and Logic: The COUNTY POPULATION variable is included to control for the effects of differences in population within the counties containing Superfund sites. The variable’s underlying logic is that population may act as a proxy for other important influences on site redevelopment, such as the capacity of planning staff. More populous counties, for instance, in addition to having planning departments, may have greater expertise in the redevelopment of contaminated sites because of the likelihood that they have dealt with other similar-type sites before. In contrast, sparsely populated counties may be more apt to focus attention on redeveloping their Superfund sites – especially if former site occupants included major local employers –and therefore may be more likely to significantly influence its redevelopment.

(2) Data and Measure: The COUNTY POPULATION variable was constructed as continuous ration measure using 2000 Census data.

(1) Definition and Logic: The SITE SIZE variable refers to the actual real or approximated acreage of Superfund sites or portions of these sites that are intended to be redeveloped. It is included to capture the variation in site size, recognizing that size may impact the likelihood that all or a portion of a site may be redeveloped. The prevailing wisdom in the redevelopment of contaminated sites is that larger sites are more suited for redevelopment purposes. Although this has some support in the literature on brownfields and Superfund sites, a few brownfields studies have found site size to have either no effect, or a negative association in terms of whether a brownfield property sells.

(2) Data and Measure: The SITE SIZE variable was constructed as a continuous ratio measure, using RPM survey data generated in response to the following question:

5. What is the approximate acreage of land area for the portion of the site you selected?

____

In instances of missing acreage data, for example, this was determined by reviewing site reports or contacting the RPM. If a respondent chose to respond to questions about a subset of a site, but the subset acreage could not be identified, the full acreage of the site was used particularly for site acreage.

(1) Definition and Logic: The SUPERFUND SITE AGE variable refers to the number of years between when a site was first listed as final on the National Priorities List and 2008. Ideally, I had hoped to developed a variable that reflected the time elapsed between when a site was first listed on the National Priorities List (NPL) and when a site was "on track" for redevelopment, or, if a site is not "on track" the number of years between when a site was listed and 2008. However, because RPMs frequently skipped questions about when sites were first considered as "on track" for redevelopment, efforts to construct this variable were discontinued. The underlying logic of SUPERFUND SITE AGE is that sites placed on NPL earlier are more likely to be redeveloped primarily because more time has elapsed during which to cleanup activities. Moreover, the stigma associated with a Superfund site should in theory diminish over time further improving the chances that a site will be redeveloped.

(2) Data and Measure: SUPERFUND SITE AGE was measured using data made available through EPA's CERCLIS database indicating the year in which the study sites were placed on the NPL.

(1) Definition and Logic: The SOUTH/WEST variable indicates whether a county containing one of the Superfund study sites is located in the Census-defined West or South portion of the U.S. As an example, EPA Region 4, which is responsible for EPA's program in the southeast United States, reportedly receives numerous inquiries regarding available Superfund sites in the state of Florida. The underlying theory is that over the past 15 years states in the South and the West have generally been the fastest growing states in the nation, and therefore Superfund sites in these primary geographic regions of the U.S. should be more likely to be redeveloped than sites located in states outside these regions. Alig et al. (2004) used a similar variable in their nationwide study of urbanization between 1982 and 1997, finding that all regional dummy variables were negatively and significantly correlated with increased urbanization in comparison with the reference population comprised of southern states.

(2) Data and Measure: The SOUTH/WEST variable was constructed as dichotomous (ordinal) measure, using a map developed by the U.S. Census which it divided into four regions: Northwest, Midwest, South, and West. Sites located in the

Census-defined South or West were classified as 1; the sites located in the remaining states were classified as 0.

Independent Variables: Moderating

In addition to developing the variables outlined above to estimate their effect on the REUSE ON TRACK dependent variables, I also developed variables to use as interaction terms to examine the extent that PLANNING TYPE variables are moderated by location, collaborative planning process legitimacy, and collaborative planning process duration. I discuss each of these moderating variables below.

(1) Definition and Logic: The LAND USE COMMERCIAL/RESIDENTIAL variable indicates if a site is surrounded by residential and/or commercial uses. As an interaction term combined with the PLANNING TYPE variables, the underlying logic is that planning more generally, and collaborative planning in particular, will have a greater and positive effect on reuse outcomes than sites located in, for example, industrial or agricultural only settings.

(2) Data and Measure: The LAND USE COMMERCIAL/RESIDENTIAL variable was constructed as a dichotomous (ordinal) measure, using RPM survey data generated in response to the following question:

PART III. SITE CHARACTERISTICS

1. Which type(s) of land uses immediately surrounded/surround the site, either prior to redevelopment or now (if not redeveloped)? ***(Please check all that apply.)***

____A. Commercial (e.g., retail shops, offices, grocery stores, restaurants, other businesses)

____B. Public service (e.g., government agency/non-profit uses including offices, libraries and schools, bus depots, public infrastructure and related services)

____C. Green/open space (e.g., agricultural, recreational, or ecological use)

____D. Industrial (e.g., factories, power plants, warehouses, waste disposal sites, landfill operations, and salvage yards)

____E. Military or other Federal facilities (e.g., military facilities, non-military Federal facilities)

____F. Residential (e.g., single-family homes, apartment complexes and condominiums, town houses, and child/elder care facilities)

____G. Don't know

____H. Other____

Sites marked as Options A, B, or F, were classified as sites with commercial and residential land uses.

(1) Definition and Logic: The COLLABORATIVE PLAN PROCESS LEGITIMACY variable reflects the extent to which an RPM viewed the most recent planning process for the site as a legitimate one. Joined with the PLANNING TYPE$_5$ variable, the underlying theory of this variable is that classic face-to-face collaborative planning processes that have greater degrees of legitimacy should result in more significant and positive reuse outcomes.

(2) Data and Measure: The COLLABORATIVE PLAN PROCESS LEGITIMACY variable was constructed as a mean index measure, using RPM survey data generated in response to the three questions below. These questions were intended to reflect key characteristics of the planning process: the extent to which the process allowed participants to fully explain their viewpoints (see Question 7), the extent to which consensus recommendations generated from the process would be incorporated into the redevelopment plan (see Question 8), and the extent to which participants in the planning process expected that recommendations generated from the multi-stakeholder process would influence how the site was/will be redeveloped (see Question 9). The variables corresponding to each of these questions were constructed as ordinal measures.

7. In your opinion, to what extent did/is the multi-stakeholder process ALLOW(ing) participants to FULLY EXPLAIN THEIR VIEWPOINTS? *(Please check the most appropriate response.)*

____A. Not at all
____B. Minimal extent
____C. Moderate extent
____D. High extent
____E. Very high extent
____F. Don't know
____G.Other____________________________

8. In your opinion, to what extent were/will any CONSENSUS RECOMMENDATIONS developed through the multi-stakeholder process (be) INCORPORATED into the redevelopment plan? *(Please check the most appropriate response.)*

____A. Not at all
____B. Minimal extent
____C. Moderate extent
____D. High extent
____E. Very high extent
____F. Don't know
____G. Other____________________________

9. In your opinion, to what extent did/do participants EXPECT that recommendations generated from the multi-stakeholder process WOULD/WILL INFLUENCE how the site was/will be redeveloped? *(Please check the most appropriate response.)*

____A. Not at all
____B. Minimal extent
____C. Moderate extent
____D. High extent
____E. Very high extent
____F. Don't know
____G.Other____________________________

(1) Definition and Logic: The COLLABORATIVE PLAN PROCESS DURATION variable reflects the DURATION of the multi-stakeholder decision-making process for the planning process the produced the most recent redevelopment plan for the site. Joined with PLANNING TYPE$_5$ variable, the underlying theory of this variable is that classic face-to-face collaborative planning processes that meet more often over a longer period of time should result in more significant and positive reuse outcomes.

(2) Data and Measure: The COLLABORATIVE PLAN PROCESS DURATOIN variable was constructed as an ordinal measure, using RPM survey data generated in response to the question below. Options A represents the minimum duration whereas Option H represents the highest.[51]

6. **Which statement best describes the DURATION of the multi stakeholder decision making process?** ***(Please check the most appropriate response.)***

____A. One meeting/workshop (0-4 hours)

____B. One intensive meeting/workshop (4+ hours)

____C. A few meetings over the course of one year (0-12 months)

____D. A few meetings over the course of a few years (0-24 months)

____E. A few meetings over the course of several years (24 months+)

____F. Several meetings over the course of one year (0-12 months)

____G. Several meetings over the course of a few years (0-24 months)

____H. Several meetings over the course of several years (24 months+)

____I. Other____

[51] Because of the small sample size, the variables COLLABORATIVE PLAN PROCESS DURATION and COLLABORATIVE PLAN PROCESS LEGITIMACY were ultimately not interacted with the PLANNING TYPE variables to identify the moderating effect on the REUSE ON TRACK variables. However, they were applied as interaction terms in the bivariate analysis conducted of the PLAN IMPLEMENATION ON TRACK dependent variables.

Appendix C - Superfund Site Redevelopment Plan Implementation Model Variable Description

Dependent Variables: Plan Implementation on Track and Plan Conformance

(1) Definition and Logic: Two dependent variables were developed to operationalize the concept of plan implementation. The PLAN IMPLEMENTATION ON $TRACK_1$ variable indicates the extent to which a Superfund site redevelopment plan is being implemented. The PLAN IMPLEMENTATION ON $TRACK_2$ variable indicates the extent to which that the redevelopment outlined in the relevant plan matches or will match what was required or recommended by the plan. As noted earlier, the interest in explaining variation within these variables generally is rooted in the theory that land use redevelopment plans derived through collaborative planning processes are more likely to be implemented than plans derived through less intensive participatory processes or none at all. A critical issue that emerged in the development of these variables was that sites may have developed more than one plan over time for the entire, or relevant sub-portion, of a site. If this is indeed the case, the question becomes which plans should be measured in terms of implementation. I chose to measure implementation on the most recent plan completed for the site. In hindsight I would have likely chosen the first major plan completed for a site (including plans scheduled for completion by the end of 2008). Nevertheless, I reasoned that more relevant information could be gathered if plan implementation questions focused on the most recent plan completed for a site.

(2) Data and Measure: Both PLAN IMPLEMENTATION ON TRACK variables were constructed as an ordinal measures, using RPM survey data. The question derived to produce the PLAN IMPLEMENTATION ON TRACK$_1$ variable is shown below:

2. To what extent has the most recent plan for the site been implemented? ***(Please check the most appropriate response.)***

____A. Plan has been fully implemented (e.g., the site has been redeveloped and is being used by customers, clients, etc.).
____B. Plan is in the process of being implemented or will soon be implemented.
____C. Efforts are currently underway to obtain support/resources necessary to implement the plan.
____D. Redevelopment is underway or complete, but ONLY PARTLY ACCORDING TO THE PLAN.
____E. Substantive efforts to implement the plan have been discontinued.
____F. No substantive efforts have been made to implement the plan.
____G. Redevelopment is underway or complete, but NOT ACCORDING TO THE PLAN.
____H. N/A - Redevelopment plan is not yet complete.
____I. Don't know
____J. Other________________________________

Options A-G correspond to a scale, with Option A representing the maximum degree of implementation and Option G representing the lowest degree.

The question derived to produce the *PLAN IMPLEMENTATION ON TRACK$_2$* is shown below:

3. To the best of your knowledge, is the completed (or anticipated) physical redevelopment of the site consistent (or expected to be consistent) with the TYPE OF DEVELOPMENT (BEING) PROPOSED in the most recent redevelopment plan? ***(Please check the most appropriate response.)***

____A. Not consistent with plan at all (0% consistent)
____B. Slightly (or barely) consistent (1-25% consistent)
____C. Somewhat consistent (26-50% consistent)
____D. Moderately consistent (51-75% consistent)
____E. Mostly consistent (76-99% consistent)
____F. Matches plan exactly (100% consistent)
____G. Don't know
____H. Other________________________________

Options A-F correspond to a scale, where Option A indicates the minimum level of conformance and Option F indicates the maximum level of conformance.

Independent Variable: Site-Specific

(1) Definition and Logic: Three SITE LOCATION SUITABILITY variables are also utilized in this model (SITE LOCATION SUITABILITY$_{1,\ 2,\ \text{and}\ 3}$). Although the arguments for why SITE LOCATION SUITABILITY similar to the arguments presented when discussing the Superfund Site Redevelopment Model, the underlying logic for including in the plan implementation model is that plans for sites that are favorably located will be more likely to be implemented than plans for sites less favorably located.

(2) Data and Measure: See the "Data and Measure" description for this variable in the Superfund Site Redevelopment Model section above.

Independent Variables: Neighborhood and Regional

(1) Definition and Logic: The NEIGHBORHOOD MARKET STRENGTH$_{1\text{and}\ 2}$ are also included as part of the Superfund Site Redevelopment Model. The variable's underlying logic behind its inclusion in this model is that sites located in areas with considerable market strength are likely to experience greater pressure for implementation of reuse plans than sites located in areas that exhibit diminished market power. Local businesses, local government officials, and local residents will likely all be better positioned to ensure plans are implemented than the same groups in weak market towns or cities. Similarly, towns, cities, or counties with considerable market strength should have greater local government staff capacity to assist in ensuring that plans are implemented. Local governments may play a particularly important role when plans require zoning changes and implementation of institutional controls if waste is expected to remain at the site.

(2) Data and Measure: See the "Data and Measure" description for this variable in the Superfund Site Redevelopment Model section above.

(1) Definition and Logic: The NEIGHBORHOOD LAND AVAILABILITY variable is also included in the Superfund Site Redevelopment Model. Its underlying logic for inclusion in the plan implementation context is that reuse plans for sites in areas with less nearby vacant, abandoned or under-used land will be more likely to be implemented than plans for sites competing with considerable nearby vacant land.

(2) Data and Measure: See the "Data and Measure" description for this variable in the Superfund Site Redevelopment Model section above.

(1) Definition and Logic: The PLANNING CULTULRE$_{1,2,\text{and } 3}$ variables are also included in the Superfund Site Redevelopment Model. The underlying logic behind inclusion of these related variables in the plan implementation context is that reuse plans for sites in counties with higher levels of planning culture will be more likely to be implemented than reuse plans for sites in counties with lower levels of planning culture. Counties accustomed to planning and working together more generally will likely not only be more interested in planning for the reuse of Superfund sites, they will likely exert greater pressure to ensure corresponding plans are implemented. They may also be more inclined to assist in identifying resources necessary to implement the plans – particularly in areas where some form of municipal use is planned for the site.

(2) Data and Measure: See the "Data and Measure" description for this variable in the Superfund Site Redevelopment Model section above.

(1) Definition and Logic: The REGIONAL MARKET STRENGTH$_{1 \text{ and } 2}$ variables are also included in the Superfund Site Redevelopment Model. The logic underlying including these in the plan implementation context parallels the logic behind why neighborhood market strength is important in the redevelopment context. Reuse plans for sites in regions with stronger local economies should be more likely to implemented than plans for sites in areas with weaker regional economies. With stronger regional economies comes greater pressure on unused land. Moreover, local entities potentially involved in overseeing the site reuse plan will likely have greater resources and constituent pressure to implement Superfund site reuse plans than local entities in areas with weaker regional economies.

(2) Data and Measure: See the "Data and Measure" description for this variable in the Superfund Site Redevelopment Model section above.

Independent Variable: Redevelopment

(1) Definition and Logic: The INCENTIVES$_{1 \text{ and } 2}$ variables are also included in the Superfund Site Redevelopment Model. The underlying behind including these related variables in the plan implementation context is that reuse plans for sites for which incentives have been or will be made available, or sites located in economic development zones, will be more likely to be implemented than sites with reuse plans where incentives will not be made available or sites not located in any economic development zones.

(2) Data and Measure: See the "Data and Measure" description for this variable in the Superfund Site Redevelopment Model section above.

(1) Definition and Logic: The MRP POLITICAL SUPPORT variable is similar to the SITE OWNER SUPPORT variable included in the Superfund Redevelopment model. The key difference, however, is that this new variable is designed to reflect not only the support of the owner of the site during the cleanup process, but also to reflect the general level of support from other key factors including those of local government, local elected officials, and nearby residents for the most recent redevelopment plan completed for the site. Studies reviewed on plan implementation do not regularly emphasize the importance of local political support. Professional experience with Superfund site redevelopment suggests that multiple actors are often perceived to be responsible for plan implementation, and that even private owners of sites will look to local officials for guidance on how to move forward on specific aspects of collaboratively-derived plans. Moreover, it seems reasonable that for a Superfund site reuse plan to move forward, local residents should generally be supportive of the plan. If negative criticism is repeatedly lobbied by residents, elected officials then may recoil at taking additional steps, such as allocated financial resources in support of the plan.

(2) Data and Measure: The MRP POLITICAL SUPPORT variable was constructed as a mean index variable comprised of two variables based upon RPM survey data from questions shown below, where a higher average indicates higher levels of political support. The two index foundational variables were constructed as ordinal variables: one indicating local government support for the reuse plan (see Question 3) and one indicating stakeholder support more broadly (see Question 4).

3. **Overall, in your opinion, to what extent did/do the stakeholders involved in the process WANT the redevelopment plan implemented?** ***(Please check the most appropriate response.)***

____A. Not at all

____B. Minimal extent

____C. Moderate extent

____D. High extent

____E. Very high extent

____F. Don't know

____G. Other____

4. **More specifically, in your opinion, to what extent did/does LOCAL GOVERNMENT WANT the redevelopment plan implemented?** ***(Please check the most appropriate response.)***

____A. Not at all

____B. Minimal extent

____C. Moderate extent

____D. High extent

____E. Very high extent

____F. Don't know

____G. Other____

Options A-F for both Questions 3 and 4 correspond to a scale, where Option A indicates the lowest level of political support and Option F the highest.

(1) Definition and Logic: The MRP PLAN QUALITY variable is intended to indicate the quality of the most recent redevelopment completed for the site. That high quality plans result in plans more likely to be implemented has some support in the broader plan implementation literature (see Koontz, 2005; Laurian et al., 2004). Moreover, in EPA's study of collaborative planning for Superfund site redevelopment (U.S. EPA, 2005) questions regarding plan quality and whether such plans could be practically implemented were raised in two of the cases studies, also suggesting that plan quality may be influential. Although site-specific land use plans should be based on rigorous technical information and analysis about the appropriateness of potential uses given local and regional conditions, the remedial components that are often required to be kept in place at Superfund sites – such as engineering controls – long after the primary remedy has been complete will often necessitate extra attention when planning for the reuse of the site. A failure to consider such issues may render a plan that is completely logical from the standpoint of local and/or regional market demand but that is nevertheless incompatible with the remedy for the site.

Those researchers who have examined plan implementation have taken rather sophisticated approaches to measuring plan quality, relying upon multiple indicators of plan quality. Such efforts have tended to focus on uniform sets of plans (e.g., plans for farmland preservation) or specific aspects of plans (e.g., hazard mitigation). Reuse plans for Superfund sites will vary significantly depending upon the entity charged with developing the plan, the proposed use described in the plan, and the actual Superfund site conditions. Use of multiple indicators would have been preferable, however, I utilized a very basic approach in order to reduce the overall number questions included in the RPM

5. Overall, how would you characterize the QUALITY of the redevelopment plan? ***(Please check the most appropriate response.)***

____A. Extremely low quality

____B. Minimal quality

____C. Moderate quality

____D. High quality

____E. Extremely high quality

____F. Don't know

____G. Other____ survey.

(2) Data and Measure: The MRP PLAN QUALITY variable was constructed as an ordinal measure constructed as an ordinal measure, using RPM survey data generated in response to the following question. Options A-E correspond to a scale, where Option A indicates a plan to be “extremely low quality” and Option F indicates the plan to be “extremely high quality.”

(1) Definition and Logic: Two PLANNNING TYPE variables were developed to reflect the degree of collaboration involved in the preparation of Superfund site reuse plans. The underlying logic of these variables is similar to the PLANNING TYPE variables included as part of the Superfund Redevelopment Model – that greater collaboration in the planning process will lead to better plan implementation outcomes. Findings have shown collaborative planning type processes to be positively associated with plan implementation (see Albert, Gunton, & Day, 2003; Burby, 2003; Calbick, Day, & Gunton, 2003). The MRP PLANNING $TYPE_2$ variable indicates the number of stakeholders that were being consistently involved in efforts to plan for the most recently completed redevelopment plan for the site. The variable suggest that involvement of a greater number of stakeholders in the reuse planning process should increase the chances that a reuse plan will be implemented than planning processes where fewer stakeholders were involved. The MRP PLANNING $TYPE_3$ variable indicates whether an interactive, face-to-face, multi-stakeholder decision making process was used to generate recommendations for reusing the site, during preparation of the most recent redevelopment plan for the site. This variable's corresponding logic is that reuse plans established through interactive, face-to-face process will be more likely to be implemented than those that are not.

(2) Data and Measure: The MRP PLANNING TYPE$_2$ variable was constructed as a summated index measure, using RPM survey data generated in response to the

2. Which of the following stakeholders were/are (being) involved in the process? ***(Please check all that apply.)***

____A. Prospective private purchaser/ developer

____B. Local government

____C. Residents/organizations near site

____D. Other local residents/organizations

____E. U.S. EPA

____F. Other federal agencies

____G. State environmental agency

____H. Other state agencies

____I. Original site owners (entities who owned site when first discovered/notified to EPA, excluding federal/state/local government)

____J. PRPs (excluding PRPs who were also original site owners and/or federal/state/local government)

____K. Don't know

____L. Other________________________________

question below. An RPM could identify up to 12 different stakeholders that participated in the process, which includes the option marked as "Other."

The MRP PLANNING TYPE$_3$ variable is the same as the PLANNING TYPE$_5$ variable included as part of the Superfund Site Redevelopment. The discussion regarding the measurement approach to this variable is included there.

(1) Definition and Logic: The MRP PLANNING TIMING variable indicates when key decisions about site remedies took/are taking place prior to or during key decisions about site remedies, or otherwise. The underlying logic is that reuse plans crafted prior to remedy selection or when most key decisions about remedies are being made are more likely to be implemented than sites that do not undertake planning until after key decisions about site remedies. By essentially planning around the remedy process, and potentially directing some remedy decisions through the planning process, such plans should simply be easier to implement.

(2) Data and Measure: MRP PLANNING TIMING was constructed as a dichotomous (ordinal) measure, using RPM survey data generated in response to the following question:

1. **Relative to key decisions about site remedies, approximately when did efforts to plan for the redevelopment of the site take place that produced/is producing the most recent plan for the site?** ***(Please check all that apply.)***

____A. BEFORE most key decisions about site remedies were made

____B. AROUND THE SAME TIME during which most key decisions about site remedies were being made

____C. AFTER most key decisions about site remedies were made

____D. Planning process is NOW UNDERWAY, but most key decisions about site remedies HAVE NOT been made

____E. Planning process and most key decisions about site remedies are BOTH taking place NOW

____F. Planning process is underway, but most key decisions about site remedies were made PRIOR to initiation of the planning process

____G. Don't know

____H. Other____

Sites marked as Options A, B, D, and/or E were categorized as sites which undertook planning for the most recently completed reuse plan for the site prior to or during remedy selection. Sites marked as C or F were categorized as sites that undertook planning after remedy decision making.

Independent Control Variables

(1) Definition and Logic: The SITE READINESS FOR REUSE variable, also included in the Superfund Site Redevelopment Model, indicates whether *any* redevelopment activity will be permitted at the site that is consistent with cleanup activities by the end of 2008 or 2012. Its underlying logic in the context of plan implementation is that reuse plans for sites will be more likely to be implemented if the site is ready for reuse by 2008/2012 than reuse plans for sites that are not. The variable is in essence a proxy for cleanup progress. Reuse plans for sites that are farther along in reaching cleanup goals should be more likely to be implemented than reuse plans for sites that are not.

(2) Data and Measure: See the "Data and Measure" description for this variable in the Superfund Site Redevelopment Model section above.

(1) Definition and Logic: The COUNTY POPULATION variable, also included in the Superfund Site Redevelopment Model, is included to control for the effects of differences in population within the counties containing Superfund sites. In the plan implementation context, the variable's underlying logic is that population may act as a proxy for other important influences that influence site reuse plan implementation, such as the capacity of planning staff.

(2) Data and Measure: See the "Data and Measure" description for this variable in the Superfund Site Redevelopment Model section above.

(1) Definition and Logic: The SUPERFUND SITE AGE variable, also included in the Superfund Site Redevelopment Model, refers to the number of years between when a site was first listed as final on the National Priorities List (NPL) and now. Ideally, I had hoped to develop a variable that reflected the time elapsed between when a site was first listed on the NPL and when a site was "on track" for plan implementation, or, if a site was not “on track” the number of years between when a site was listed and 2008. However, because RPMs frequently skipped questions about when sites were first considered as “on track” for plan implementation, efforts to construct this variable were discontinued. In the context of plan implementation, the underlying logic of SUPERFUND SITE AGE is that reuse plans for sites placed on NPL earlier will be more likely to be implemented than reuse plans for sites that have been on the NPL for a shorter period of time.

(2) Data and Measure: See the “Data and Measure” description for this variable in the Superfund Site Redevelopment Model section above.

Independent Variables: Moderating Variables

In addition to developing the variables outlined above to estimate their effect on the REUSE ON TRACK dependent variables, I also utilized variables as interaction terms to examine the extent to which the MRP PLANNING TYPE variables are moderated by location, collaborative planning process legitimacy, and collaborative planning process duration. I discuss each of these moderating variables below.

(1) Definition and Logic: The LAND USE COMMERCIAL/RESIDENTIAL variable, also used in the Superfund Site Redevelopment context, indicates if a site is surrounded by residential and/or commercial uses. As an interaction term combined with the MRP PLANNING TYPE variables in the plan implementation context, the underlying logic is that planning more generally, and collaborative planning in particular, will have a greater and positive effect on plan implementation outcomes in sites surrounded by residential, commercial, or municipal-type uses than sites located in, for example, industrial or agricultural only settings.

(2) Data and Measure: See the “Data and Measure” description for this variable in the Superfund Site Redevelopment Model section above.

(1) Definition and Logic: The COLLABORATIVE PLAN PROCESS LEGITIMACY variable, also used in the Superfund Site Redevelopment context, reflects the extent to which an RPM site manager viewed the most recent planning process for the site as a legitimate one. Joined with MRP PLANNING $TYPE_5$ variable, the underlying theory of this variable is that classic face-to-face collaborative planning processes that have greater degrees of legitimacy should result in more significant and positive effect pm plan implementation outcomes.

(2) Data and Measure: See the “Data and Measure” description for this variable in the Superfund Site Redevelopment Model section above.

(1) Definition and Logic: The COLLABORATIVE PLAN PROCESS DURATION variable, also used in the Superfund site redevelopment model, reflects the DURATION of the multi-stakeholder decision-making process for the planning process the produced the most recent redevelopment plan for the site. Joined with MRP PLANNING $TYPE_5$ variable, the underlying theory of this variables is that classic face-to-face collaborative planning processes that meet more often over a longer period of time should result in more significant and positive plan implementation outcomes.

(2) Data and Measure: See the “Data and Measure” Description for this variable in the Superfund Site Redevelopment Model section above.

Appendix D. Descriptive Statistics and Kendall's Tau-b Correlation Coefficients for Control and Reuse on Track Variables

Descriptive Statistics and Kendall's Tau-b Correlation Coefficients for Control and Reuse on Track Variables

	N	Range	Mean	S.D.	REUSE ON TRACK$_1$ R	1-t	2-t	REUSE ON TRACK$_{1\text{-}D}$ R	1-t	2-t	REUSE ON TRACK$_2$ R	1-t	2-t	REUSE ON TRACK$_3$ R	1-t	2-t	Hyp.	Est.
Reuse On Track$_1$	63	1-6	3.46	1.97	---	---	---	0.76	***	***	0.68	***	***	0.65	***	***	--	--
Reuse On Track$_{1\text{-}D}$	63	0-1	0.65	0.48	0.76	***	***	---	---	---	0.50	***	***	0.54	***	***	--	--
Reuse On Track$_2$ (By 2008)	69	1-6	2.54	2.11	0.68	***	***	0.50	***	***	1.00	---	---	---	***	***	--	--
Reuse On Track$_3$ (By 2012)	68	1-6	4.15	1.72	0.65	***	***	0.54	***	***	0.66	***	***	---	---	---	--	--
Site Redevelopment Suitability	70	1-5	3.41	1.07	0.31	**	**	0.43	***	***	0.23	*	*	0.33	***	***	+	+
Site Location Suitability$_1$	70	2-5	4.00	0.99	0.33	***	**	0.28	**	*	0.27	**	*	0.45	***	***	+	+
Site Location Suitability$_2$	70	0-1	0.90	0.30	0.2	*	†	0.27	*	*	0.00			0.15	†		+	+
Site Location Suitability$_3$	70	0-7	2.46	1.67	0.21	*	*	0.26	*	*	0.13	†		0.23	**	*	+	+
Site Contamination$_1$	70	1-5	3.72	0.81	-0.1			-0.11			-0.06			0.02			-	-
Site Contamination$_{2\text{-}B}$	70	1-4	2.39	1.16	0.04			0.09			0.00			-0.03			-	+
Site Ownership	56	0-1	0.59	0.50	-0.1			-0.03			-0.05			-0.18	†		+	-
Neighborhood Market Strength$_{1\text{-}B}$	70	1-4	2.50	1.11	0.17	*	†	0.19	†		0.22	*	*	0.26	**	**	+	+

Neighborhood Market Strength$_2$	70	1-5	2.52	0.97	0.32	**	**	0.34	**	**	0.25	**	*	0.37	***	***	+	+
Neighborhood Land Availability	70	1-5	2.69	0.87	-0.2	*	†	-0.15	†		-0.05			-0.16	†		-	-
Planning Culture$_{1\text{-}B}$	70	1-4	2.49	1.13	-0.1			-0.01			-0.15	†		-0.06			+	-
Planning Culture$_2$	56	0-1	0.52	0.50	0.07			0.31	*	*	0.09			0.01			+	+
Planning Culture$_3$	70	0-1	0.34	0.48	0.1			0.02			0.08			0.02			+	+
Regional Market Strength$_{1\text{-}B}$	70	1-4	2.51	1.13	0.16	†		0.12			-0.06			-0.02			+	+
Regional Market Strength$_{2\text{-}B}$	70	1-4	2.50	1.11	0.04			0.02			0.01			0.09			+	+
Incentives$_2$	44	0-1	0.36	0.49	0.35	**	*	0.44	**	**	0.19	†		0.33	**	*	+	+
Site-Owner Support	63	1-5	3.06	1.57	0.17	†		0.28	**	*	0.01			0.22	*	*	+	+
Planning Type$_1$	70	1-5	3.37	1.20	0.52	***	***	0.63	***	***	0.25	**	*	0.39	***	***	+	+
Planning Type$_2$	70	1-5	2.91	1.26	0.35	***	***	0.46	***	***	0.22	*	*	0.27	**	**	+	+
Planning Type$_3$	70	0-1	0.11	0.32	0.19	*	†	0.26	*	*	-0.02			0.10			+	+
Planning Type$_4$	67	0-9	3.45	1.94	0.36	***	***	0.41	***	***	0.18	*	†	0.25	**	*	+	+
Planning Type$_5$	33	0-1	0.82	0.39	-0			0.05			0.06			0.10			+	+
Planning Timing	64	0-1	0.64	0.48	0.23	*	†	0.26	*	*	0.08			0.08			+	+
Site Readiness For Reuse$_1$ (by '08)	70	0-1	0.69	0.45	0.4	***	***	0.39	***	**	0.31	**	**	0.15	†		+	+
Site Readiness For Reuse$_2$ (by '12)	70	0-1	0.94	0.23	0.17	†		0.28	*	*	0.04			0.13			+	+

Cleanup Intensity$_D$	64	0-1	0.22	0.42	0.01			0.03			-0.03			-0.01			-	+
County Population$_B$	70	1-4	2.51	1.13	0.25	**	*	0.15			0.13			0.11			+	+
Site Size$_B$	70	1-4	2.54	1.13	-0			0.05			-0.11			-0.11			+	-
Superfund Site Age	70	4-25	18.89	5.76	-0.1			-0.02			-0.19	*	†	-0.10			+	-
South/West	70	0-5	3.07	1.59	0.46	***	***	0.54	***	***	0.23	*	*	0.32	***	***	+	+
Planning Type$_1$ x LU_C_R^x	70	0-5	2.59	1.54	0.36	***	***	0.45	***	***	0.16	†		0.23	**	*	+	+
Planning Type$_2$ x LU_C_R^x	70	0-1	0.11	0.32	0.19	*	†	0.26	*	*	-0.02			0.10			+	+
Planning Type$_3$ x LU_C_R^x	67	0-9	3.07	2.14	0.41	***	***	0.43	***	***	0.20	*	†	0.27	**	**	+	+
Planning Type$_4$ x LU_C_R^x	33	0-1	0.70	0.47	0.17			0.11			0.00			-0.01			+	+
Planning Type$_5$ x LU_C_R^x	70	0-1	0.87	0.34	0.25	*	*	0.27	*	*	0.02			0.15	†		+	+
LU_C_R^i	70	4-25	18.89	5.76	-0.1			-0.02			-0.19	*	†	-0.10			+	-

10. The first four variables listed are the four dependent variables assessed as part of this analysis.
11. 1-t/2-t denotes significance derived from p-value for one-tailed/two-tailed significance test
12. †p<.10; *p<.05; **p<.01;***p<.001
13. D – indicates the variable has been transformed as a dichotomous (ordinal) variable.
14. B – indicates the variable has been transformed based upon quartiles.
15. LU_C_R stands for “Land Use Commercial/Residential”
16. Hyp. / Est. Hyp. indicates the Hypothesized direction of the relationship between the independent variable and the dependent variable. Est. refers to the estimated direction of the relation. Only the estimated relationship for REUSE ON TRACK$_1$ is shown here.
17. ^{x}Interaction terms.
18. ^{i}Indicates variable tested as part of an interaction term.

Appendix E. Descriptive Statistics and Kendall's Tau-B Measures of Association for PLAN IMPLEMENATION ON TRACK$_{1-2}$ Models

Descriptive Statistics and Kendall's Tau-B Measures of Association for PLAN IMPLEMENATION ON TRACK$_{1\text{-}2}$ Models

					PLAN IMP. ON TRACK1			PLAN IMP. ON TRACK2 (CONF.)					
	N	Range	Mean	S.D.	R	1-t	2-t	R	1-t	2-t	Hyp.	Est.1	Est.2
Plan Imp. On Track$_1$	33	2-7	5.6	1.6	1	---	---	0.5	***	**	--	--	--
Plan Imp. On Track$_2$ (Conf.)	31	3-6	5.2	0.7	0.53	***	**	1	---	---	--	--	--
Site Location Suitability$_1$§	70	2-5	4.0	1.0	0.32	*	*	0.3	*	†	+	+	+
Site Location Suitability$_2$§	70	0-1	0.9	0.3	-0.1			-0.12			+	-	-
Site Location Suitability$_3$§	70	0-7	2.5	1.7	0.2	†		-0.08			+	+	-
Neighborhood Market Strength$_{1\text{-}B}$	70	1-4	2.5	1.1	0.04			-0.05			+	+	-
Neighborhood Market Strength$_2$§	70	1-5	2.5	1.0	0.29	*	*	-0.01			+	+	-
Neighborhood Land Availability§	70	1-5	2.7	0.9	-0.1			-0.07			-	-	-
Planning Culture$_{1\text{-}B}$	70	1-4	2.5	1.1	-0.1			0.1			+	-	+
Planning Culture$_2$	56	0-1	0.5	0.5	0.23			0.76	***	***	+	+	+
Planning Culture$_3$§	70	0-1	0.3	0.5	-0.1			0.01			+	-	+
Regional Market Strength$_{1\text{-}B}$	70	1-4	2.5	1.1	0.01			0.15			+	+	+
Regional Market Strength$_{2\text{-}B}$	70	1-4	2.5	1.1	-0.1			0.05			+	-	+
Incentives$_2$§	44	0-1	0.4	0.5	0.3	†		0.15			+	+	+
MRP Local Political Support	33	1.5-5	4.1	0.8	0.21	†		0.33	*	†	+	+	+
MRP Plan Quality	28	3-5	4.2	0.6	0.16			0.23			+	+	+
MRP Planning Type$_2$	38	0-9	4.6	2.3	0.05			-0.05			+	+	-
Planning Type$_5$	33	0-1	0.8	0.4	0.17			-0.1			+	+	-
MRP Planning Timing	39	0-1	0.6	0.5	-0			-0.26	†		+	-	-
Site Readiness For Reuse$_1$ (By 2008)	70	0-1	0.7	0.4	0.32	*	*	0.28	*	†	+	+	+
Site Readiness For Reuse$_2$ (By 2012)	70	0-1	0.9	0.2	0.04			0.21			+	+	+
County Population$_2$	70	1-4	2.5	1.1	0.29	*	†	0.13			+	+	+
Superfund Site Age	70	4-25	18.9	5.8	-0.1			0.21	†		+	-	+
MRP Planning Type2 x LU_C_R^x	38	0-9	4.1	2.5	0.07			-0.07			+	+	-
MRP Planning Type$_3$ x LU_C_R^x	33	0-1	0.7	0.5	0.21			-0.02			+	+	-

MRP Planning Type$_3$ x Collab. Planning Process Legitimacy[x]	25	2.7-5	3.8	0.7	-0.3	*	†	0.11			+	-	+
MRP Planning Type$_3$ x Collab. Planning Process Duration[x]	27	3-8	6.1	1.8	-0.1			0			+	-	-
Land Use Commercial/Residential (LU_C_R)[i]	70	0-1	0.9	0.3	0.21	†		0.21			+	+	+
Collaborative Plan Process Involvement [ii]	24	3-5	4.1	0.7	-0.4	*	*	0.03			+	-	+
Collaborative Plan Process Consensus [ii]	23	3-5	3.6	0.7	-0.2			-0.02			+	-	-
Collaborative Plan Process Implementation[ii]	23	2-5	3.5	0.8	-0.2			0.15			+	-	+
Collaborative Plan Process Duration§ [ii]	27	3-8	6.1	1.8	-0.1			0			+	-	-
Stakeholder Support [ii]	34	2-5	4.1	0.8	0.38	**	*	0.55	**	**	+	+	+
Local Government Support[ii]	34	1-5	4.1	1.0	0.1			0.14			+	+	+

12. The first four variables listed are the four dependent variables assessed as part of this analysis.
13. 1-t/2-t denotes significance derived from p-value for one-tailed/two-tailed significance test.
14. †p<.10; *p<.05; **p<.01;***p<.001
15. D – indicates the variable has been transformed as a dichotomous (ordinal) variable.
16. B – indicates the variable has been transformed based upon quartiles.
17. LU_C_R stands for “Land Use Commercial/Residential”
18. Hyp. / Est. Hyp. indicates the Hypothesized direction of the relationship between the independent variable and the dependent variable. Est 1. refers to the estimated direction of the Plan Imp. On Track$_1$; Est. 2 refers to the estimated direction of the Plan Imp. On Track$_2$ (Conf.) variable.
19. [x]Interaction terms.
20. [i]Indicates variable tested as part of an interaction term.
21. [ii]Indicates variables used to construct indices. Collaborative plan process involvement, consensus, and implementation were used to construct the mean index variable Collaborative Planning Process Legitimacy. Stakeholder Support and Local Government Support were used to construct the mean index variable MRP Local Political Support.
22. MRP stands for “Most Recent Plan” completed.

Appendix F – Multicollinearity Detection

Multicollinearity Detection

The SAS System 19:07 Thursday, December 17, 2009

22

The REG Procedure
Model: MODEL1
Dependent Variable: ROT_1

Number of Observations Read	70
Number of Observations Used	63
Number of Observations with Missing Values	7

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	152.62027	25.43671	16.37	<.0001
Error	56	87.03053	1.55412		
Corrected Total	62	239.65079			

Root MSE	1.24664	R-Square	0.6368
Dependent Mean	3.46032	Adj R-Sq	0.5979
Coeff Var	36.02681		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Standardized Estimate	Tolerance	Variance Inflation
Intercept	1	-0.90013	0.89032	-1.01	0.3164	0	.	0
PLAN	1	0.81608	0.14599	5.59	<.0001	0.51262	0.77109	1.29686
RFR_08	1	1.59070	0.36797	4.32	<.0001	0.36730	0.89826	1.11327
CNT_POP2	1	0.15005	0.15300	0.98	0.3310	0.08762	0.81249	1.23078
SF_AGE	1	-0.06319	0.02804	-2.25	0.0282	-0.18648	0.94692	1.05605
SLS_1	1	0.11259	0.18837	0.60	0.5524	0.05634	0.72997	1.36992
NMS_2	1	0.35342	0.17970	1.97	0.0542	0.17493	0.81968	1.21999

The REG Procedure
Model: MODEL1
Dependent Variable: ROT_1

Collinearity Diagnostics

Number	Eigenvalue	Condition Index
1	6.35052	1.00000
2	0.24996	5.04049
3	0.13686	6.81193
4	0.10354	7.83150
5	0.09134	8.33806
6	0.04642	11.69647
7	0.02136	17.24209

Collinearity Diagnostics

	Proportion of Variation						
Number	Intercept	PLAN	RFR_08	CNT_POP2	SF_AGE	SLS_1	NMS_2
1	0.00074481	0.00203	0.00538	0.00313	0.00184	0.00097119	0.00238
2	0.00337	0.01179	0.96474	0.00265	0.00680	0.00259	0.01190
3	0.00640	0.08938	0.00833	0.73229	0.00109	0.03039	0.01568
4	0.01158	0.07762	0.00057814	0.00045788	0.46171	0.00685	0.26075
5	0.00219	0.34035	0.00149	0.20450	0.03164	0.00044800	0.54361
6	0.09698	0.46006	0.00913	0.04674	0.22012	0.35141	0.16555
7	0.87873	0.01877	0.01035	0.01024	0.27680	0.60734	0.00014339

The REG Procedure
Model: MODEL1
Dependent Variable: ROT_1

Number of Observations Read	70
Number of Observations Used	63
Number of Observations with Missing Values	7

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	123.51598	20.58600	9.93	<.0001
Error	56	116.13481	2.07384		
Corrected Total	62	239.65079			

Root MSE	1.44008	R-Square	0.5154
Dependent Mean	3.46032	Adj R-Sq	0.4635
Coeff Var	41.61705		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Standardized Estimate	Tolerance	Variance Inflation
Intercept	1	-0.97372	1.04186	-0.93	0.3540	0	.	0
PLN_EXT	1	0.46150	0.15068	3.06	0.0034	0.30312	0.88351	1.13185
RFR_08	1	1.61160	0.42504	3.79	0.0004	0.37213	0.89839	1.11310
CNT_POP2	1	0.23254	0.17543	1.33	0.1904	0.13579	0.82467	1.21261
SF_AGE	1	-0.05015	0.03251	-1.54	0.1286	-0.14801	0.93996	1.06388
SLS_1	1	0.37794	0.20575	1.84	0.0715	0.18911	0.81644	1.22484
NMS_2	1	0.34478	0.20798	1.66	0.1030	0.17065	0.81657	1.22464

The REG Procedure
Model: MODEL1
Dependent Variable: ROT_1

Collinearity Diagnostics

Number	Eigenvalue	Condition Index
1	6.29850	1.00000
2	0.25428	4.97690
3	0.15845	6.30480
4	0.11779	7.31257
5	0.09597	8.10136
6	0.05345	10.85579
7	0.02156	17.09038

Collinearity Diagnostics

	Proportion of Variation						
Number	Intercept	PLN_EXT	RFR_08	CNT_POP2	SF_AGE	SLS_1	NMS_2
1	0.00073810	0.00318	0.00546	0.00322	0.00185	0.00110	0.00241
2	0.00284	0.04547	0.92195	0.00049012	0.00357	0.00268	0.00968
3	0.00000592	0.44063	0.04638	0.33810	0.03279	0.00840	0.01548
4	0.02201	0.16676	0.00035867	0.42878	0.25435	0.01242	0.01767
5	0.00046427	0.11765	0.00058676	0.17474	0.09225	0.01023	0.72848
6	0.04126	0.22271	0.01582	0.04872	0.31158	0.42823	0.22584
7	0.93268	0.00359	0.00944	0.00593	0.30361	0.53694	0.00043473

The REG Procedure
Model: MODEL1
Dependent Variable: ROT_3_12

Number of Observations Read 70
Number of Observations Used 68
Number of Observations with Missing Values 2

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	98.11653	16.35275	9.93	<.0001
Error	61	100.41288	1.64611		
Corrected Total	67	198.52941			

Root MSE	1.28301	R-Square	0.4942
Dependent Mean	4.14706	Adj R-Sq	0.4445
Coeff Var	30.93781		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Standardized Estimate	Tolerance	Variance Inflation
Intercept	1	-0.23969	0.90600	-0.26	0.7922	0	.	0
PLAN	1	0.46197	0.14349	3.22	0.0021	0.32620	0.80765	1.23816
RFR_08	1	0.03242	0.36701	0.09	0.9299	0.00853	0.88878	1.12514
CNT_POP2	1	-0.04634	0.15009	-0.31	0.7585	-0.03030	0.86107	1.16135
SF_AGE	1	-0.03679	0.02840	-1.30	0.2001	-0.12194	0.93553	1.06891
SLS_1	1	0.56310	0.17345	3.25	0.0019	0.32709	0.81684	1.22423
NMS_2	1	0.54917	0.17403	3.16	0.0025	0.31166	0.85003	1.17642

The REG Procedure
Model: MODEL1
Dependent Variable: ROT_3_12

Collinearity Diagnostics

Number	Eigenvalue	Condition Index
1	6.36495	1.00000
2	0.24079	5.14135
3	0.12804	7.05063
4	0.10135	7.92489
5	0.08716	8.54553
6	0.05678	10.58740
7	0.02093	17.44037

Collinearity Diagnostics

	Proportion of Variation						
Number	Intercept	PLAN	RFR_08	CNT_POP2	SF_AGE	SLS_1	NMS_2
1	0.00070368	0.00211	0.00520	0.00307	0.00175	0.00112	0.00246
2	0.00359	0.01516	0.94999	0.00088167	0.00283	0.00561	0.01496
3	0.00377	0.06873	0.02290	0.84704	0.00358	0.03358	0.00211
4	0.01327	0.03155	0.01144	0.00193	0.36548	0.00143	0.45816
5	0.00250	0.45235	0.00005814	0.10853	0.11426	0.00888	0.44108
6	0.04668	0.42527	0.00002867	0.01475	0.18003	0.39497	0.07660
7	0.92948	0.00482	0.01039	0.02380	0.33207	0.55442	0.00462

The REG Procedure
Model: MODEL1
Dependent Variable: ROT_3_12

Number of Observations Read	70
Number of Observations Used	68
Number of Observations with Missing Values	2

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	89.26330	14.87722	8.31	<.0001
Error	61	109.26612	1.79125		
Corrected Total	67	198.52941			

Root MSE	1.33838	R-Square	0.4496
Dependent Mean	4.14706	Adj R-Sq	0.3955
Coeff Var	32.27287		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Standardized Estimate	Tolerance	Variance Inflation
Intercept	1	-0.33674	0.95829	-0.35	0.7265	0	.	0
PLN_EXT	1	0.29830	0.13935	2.14	0.0363	0.21562	0.88931	1.12447
RFR_08	1	0.08851	0.38252	0.23	0.8178	0.02329	0.89032	1.12319
CNT_POP2	1	-0.03719	0.15698	-0.24	0.8135	-0.02432	0.85650	1.16754
SF_AGE	1	-0.02487	0.02965	-0.84	0.4049	-0.08242	0.93443	1.07017
SLS_1	1	0.66805	0.17476	3.82	0.0003	0.38805	0.87562	1.14205
NMS_2	1	0.58249	0.18102	3.22	0.0021	0.33057	0.85499	1.16961

The REG Procedure
Model: MODEL1
Dependent Variable: ROT_3_12

Collinearity Diagnostics

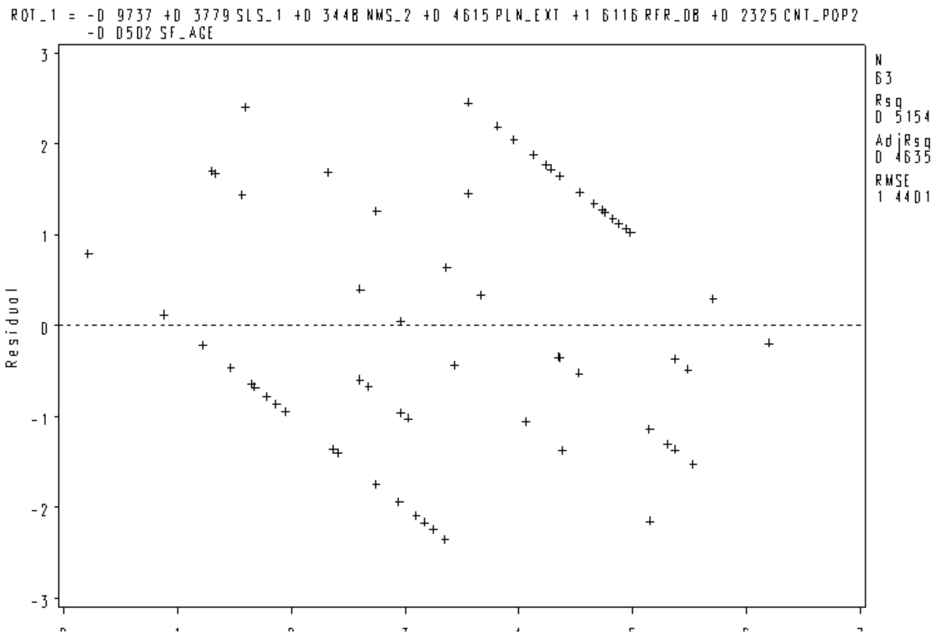
Number	Eigenvalue	Condition Index
1	6.31845	1.00000
2	0.24883	5.03915
3	0.13475	6.84752
4	0.11916	7.28178
5	0.09747	8.05126
6	0.06050	10.21961
7	0.02083	17.41504

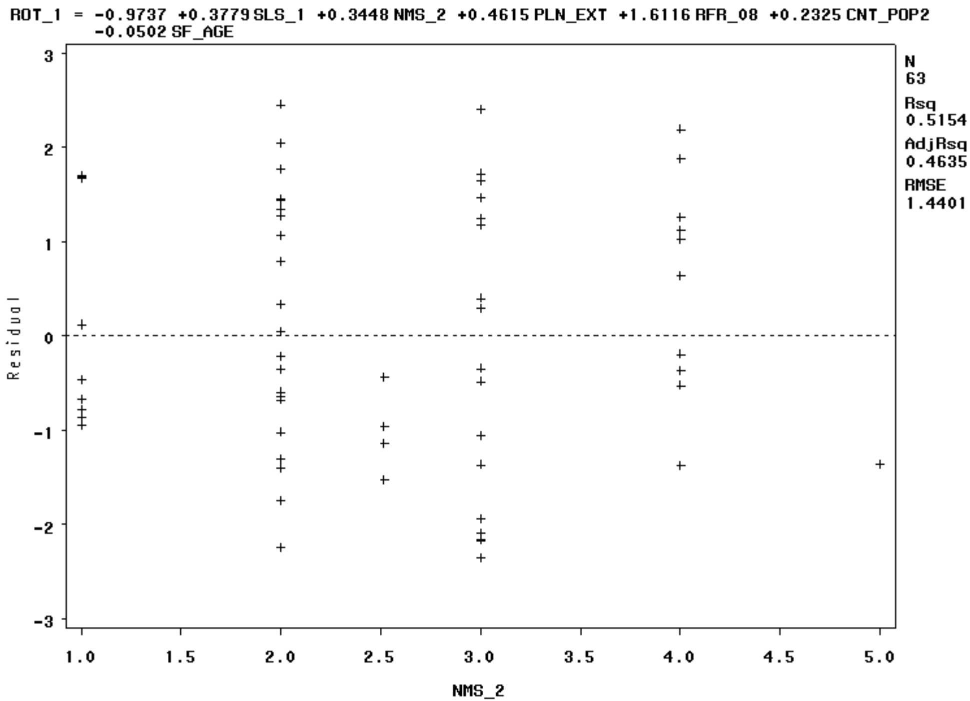
Collinearity Diagnostics

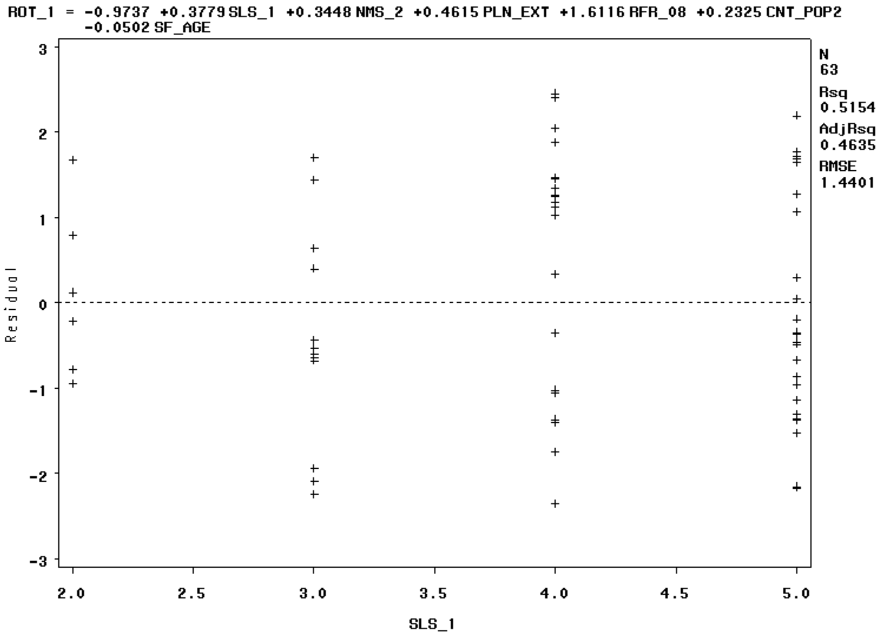
	Proportion of Variation						
Number	Intercept	PLN_EXT	RFR_08	CNT_POP2	SF_AGE	SLS_1	NMS_2
1	0.00069488	0.00309	0.00526	0.00310	0.00177	0.00121	0.00251
2	0.00254	0.05889	0.88277	0.00023328	0.00054715	0.00461	0.01081
3	0.00056721	0.50594	0.09583	0.33558	0.05829	0.00818	0.00801
4	0.01757	0.14736	0.00205	0.55313	0.16536	0.02841	0.00006979
5	0.00426	0.08016	0.00235	0.04951	0.11885	0.00097989	0.83153
6	0.01961	0.19475	0.00158	0.04077	0.30924	0.44910	0.14442
7	0.95476	0.00980	0.01015	0.01767	0.34594	0.50751	0.00265

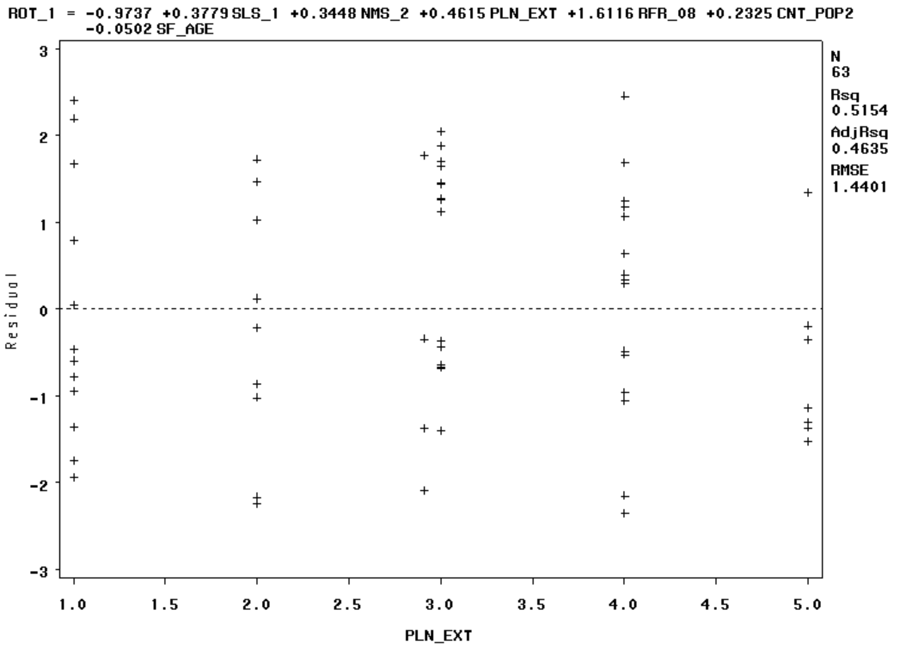
Appendix G – Heteroscedasticity Detection

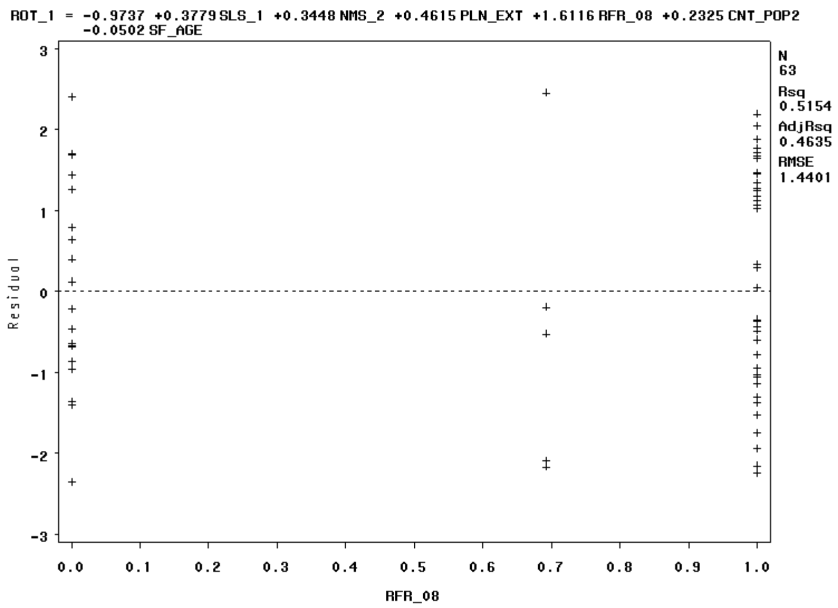
Heteroscedasticity Detection

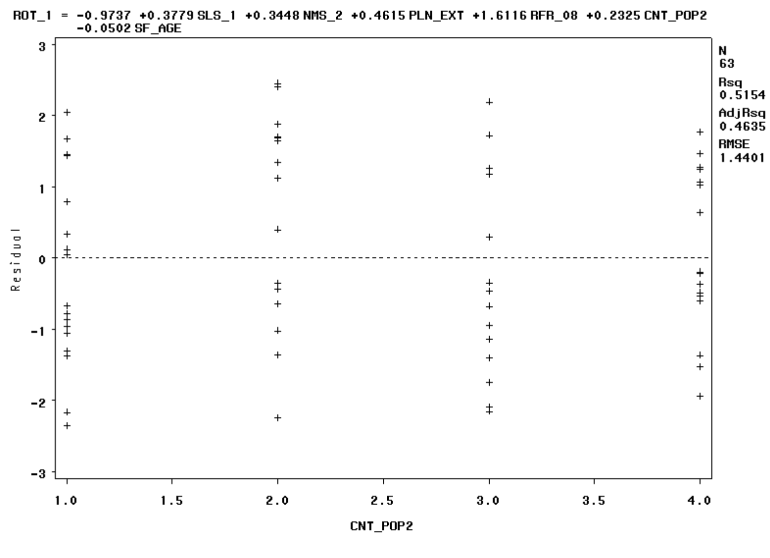


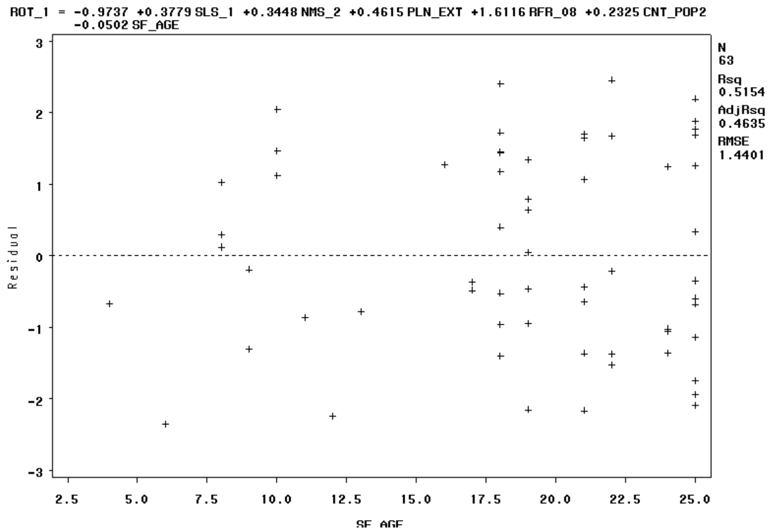


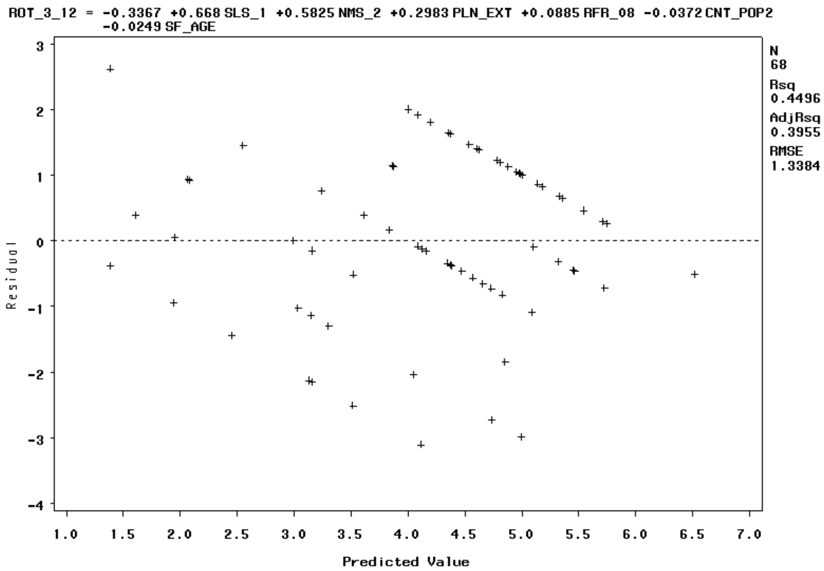

ROT_1 = -0.9737 +0.3779 SLS_1 +0.3448 NMS_2 +0.4615 PLN_EXT +1.6116 RFR_08 +0.2325 CNT_POP2
-0.0502 SF_AGE
N
63
Rsq
0.5154
AdjRsq
0.4635
RMSE
1.4401
Residual
SLS_1


ROT_1 = -0.9737 +0.3779 SLS_1 +0.3448 NMS_2 +0.4615 PLN_EXT +1.6116 RFR_08 +0.2325 CNT_POP2
-0.0502 SF_AGE
N
63
Rsq
0.5154
AdjRsq
0.4635
RMSE
1.4401
Residual
PLN_EXT


ROT_1 = -0.9737 +0.3779 SLS_1 +0.3448 NMS_2 +0.4615 PLN_EXT +1.6116 RFR_08 +0.2325 CNT_POP2
-0.0502 SF_AGE
N
63
Rsq
0.5154
AdjRsq
0.4635
RMSE
1.4401
Residual
RFR_08


ROT_1 = -0.9737 +0.3779 SLS_1 +0.3448 NMS_2 +0.4615 PLN_EXT +1.6116 RFR_08 +0.2325 CNT_POP2
-0.0502 SF_AGE
N
63
Rsq
0.5154
AdjRsq
0.4635
RMSE
1.4401
Residual
CNT_POP2

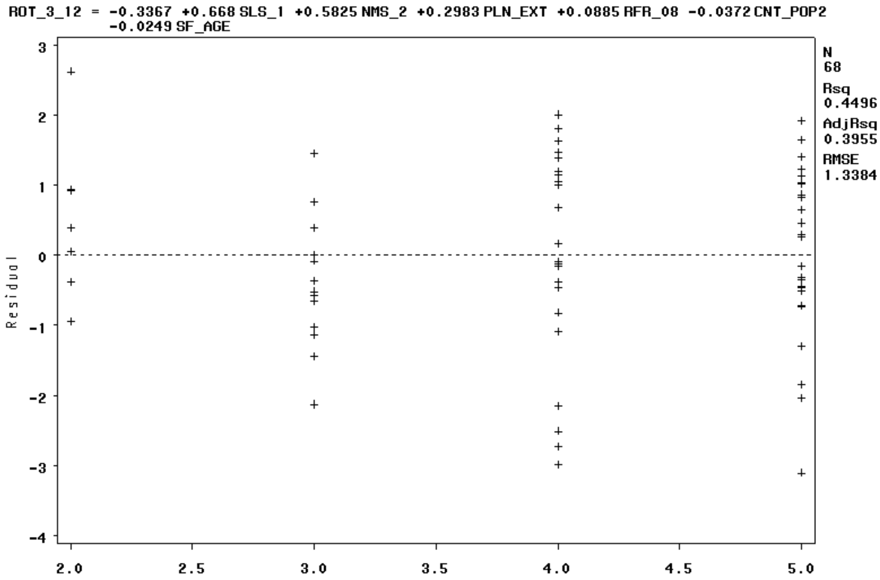


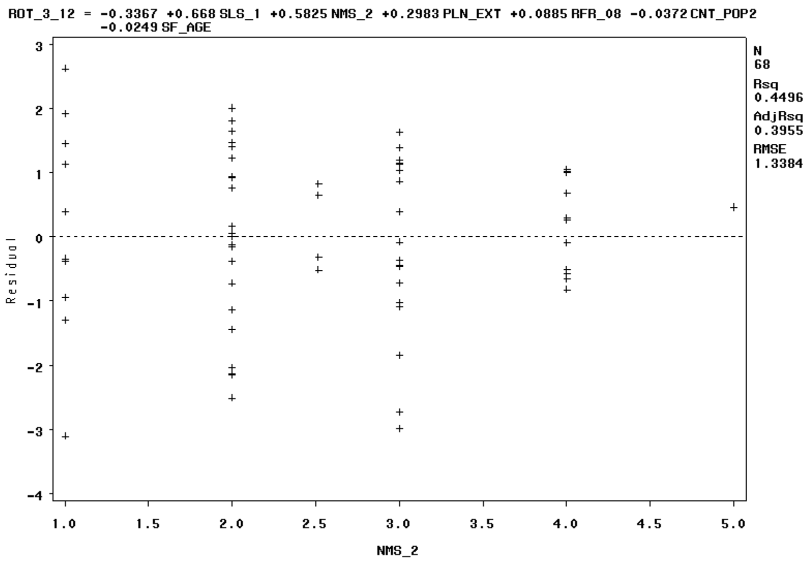


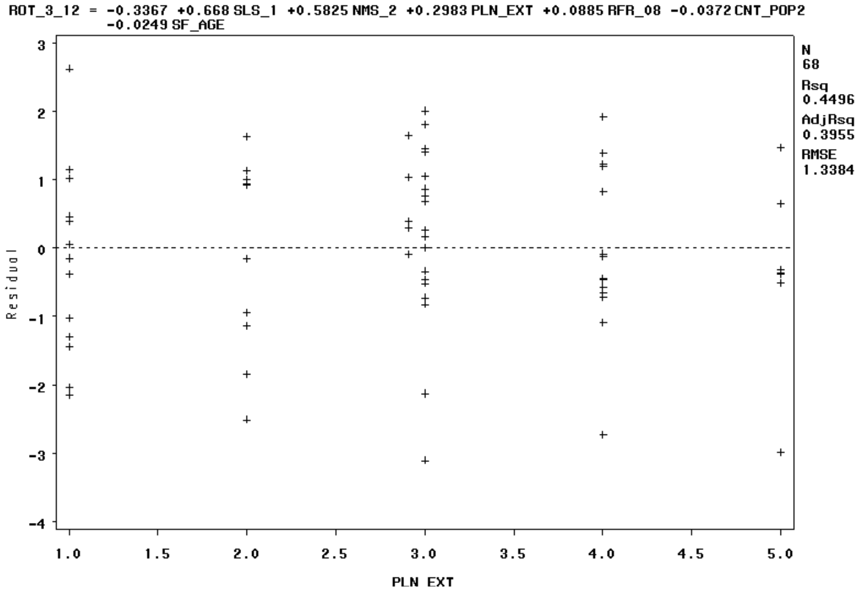
Formal test for heteroscedasticity using White's test[52]

```
The SAS System                    18:37 Saturday, January 9, 2010  27
                                                    The REG Procedure
                                                      Model: MODEL1
                                               Dependent Variable: ROT_1

                                                Test of First and Second
                                                  Moment Specification

                                               DF    Chi-Square    Pr > ChiSq

                                              27         25.44        0.550
```

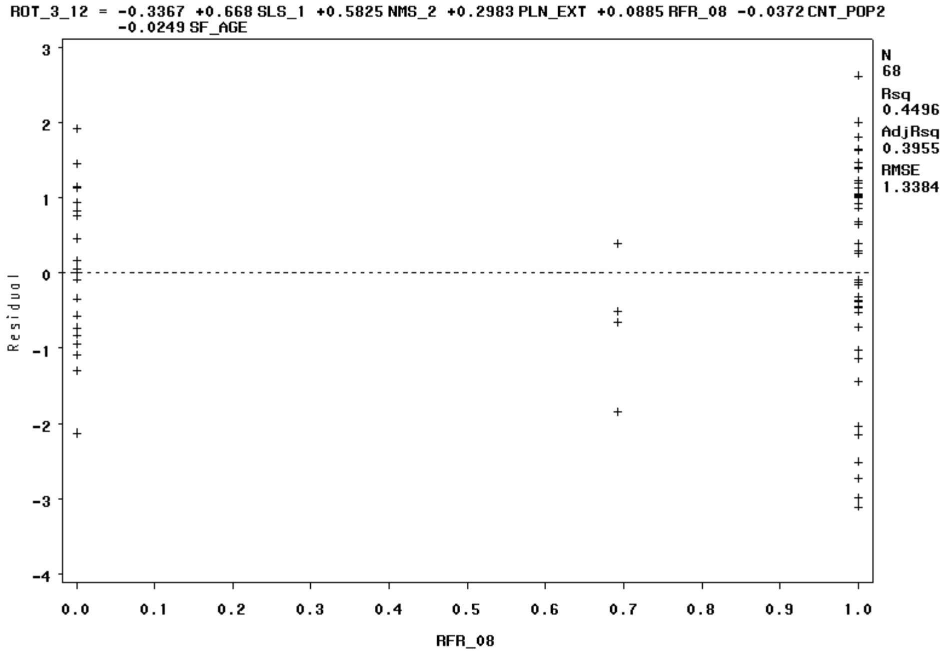
[52] This version of the White test is from "Theorem 2 on page 823 of White (1980)" (SAS Institute Inc., n.d.).


ROT_3_12 = -0.3367 +0.668 SLS_1 +0.5825 NMS_2 +0.2983 PLN_EXT +0.0885 RFR_08 -0.0372 CNT_POP2
-0.0249 SF_AGE
N
68
Rsq
0.4496
AdjRsq
0.3955
RMSE
1.3384
Residual

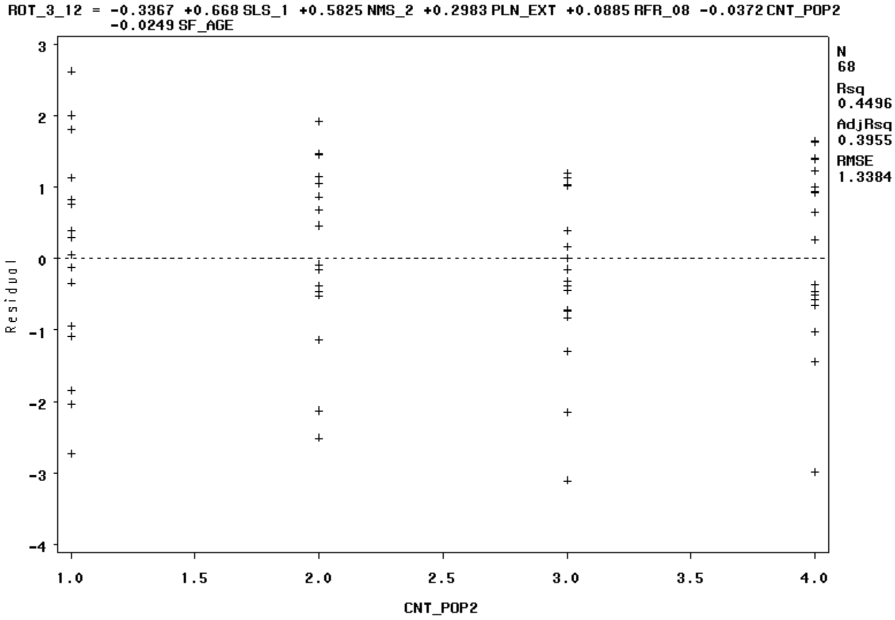

ROT_3_12 = -0.3367 +0.668 SLS_1 +0.5825 NMS_2 +0.2983 PLN_EXT +0.0885 RFR_08 -0.0372 CNT_POP2
-0.0249 SF_AGE
N
68
Rsq
0.4496
AdjRsq
0.3955
RMSE
1.3384
Residual
NMS_2

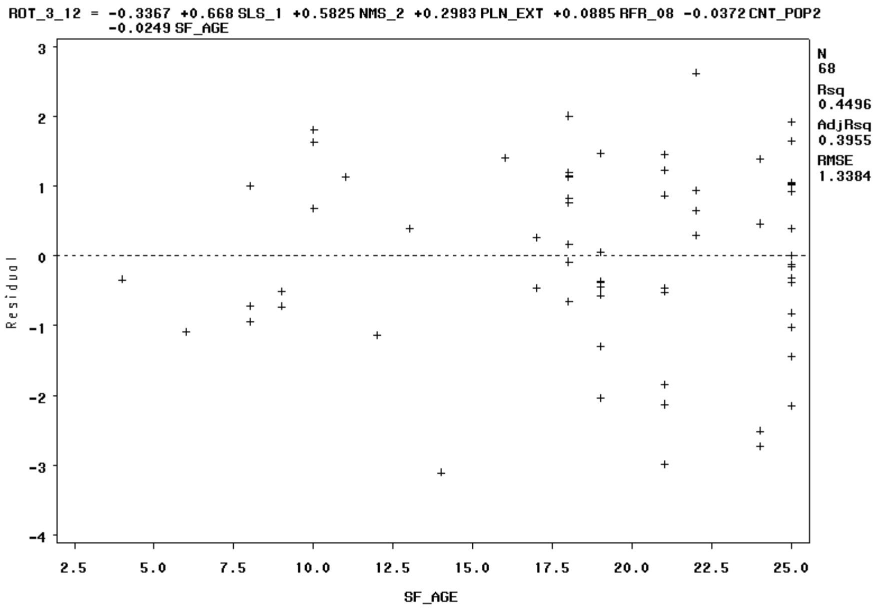


ROT_3_12 = -0.3367 +0.668 SLS_1 +0.5825 NMS_2 +0.2983 PLN_EXT +0.0885 RFR_08 -0.0372 CNT_POP2 -0.0249 SF_AGE
N
68
Rsq
0.4496
AdjRsq
0.3955
RMSE
1.3384
Residual
PLN EXT



ROT_3_12 = -0.3367 +0.668 SLS_1 +0.5825 NMS_2 +0.2983 PLN_EXT +0.0885 RFR_08 -0.0372 CNT_POP2 -0.0249 SF_AGE
N
68
Rsq
0.4496
AdjRsq
0.3955
RMSE
1.3384
Residual
RFR_08


ROT_3_12 = -0.3367 +0.668 SLS_1 +0.5825 NMS_2 +0.2983 PLN_EXT +0.0885 RFR_08 -0.0372 CNT_POP2
-0.0249 SF_AGE
N
68
Rsq
0.4496
AdjRsq
0.3955
RMSE
1.3384
Residual
CNT_POP2


ROT_3_12 = -0.3367 +0.668 SLS_1 +0.5825 NMS_2 +0.2983 PLN_EXT +0.0885 RFR_08 -0.0372 CNT_POP2
-0.0249 SF_AGE
N
68
Rsq
0.4496
AdjRsq
0.3955
RMSE
1.3384
Residual
SF_AGE

Formal test for heteroscedasticity using White's test[53]

```
The SAS System                    18:37 Saturday, January 9, 2010  29

                                                 The REG Procedure
                                                   Model: MODEL1
                                            Dependent Variable: ROT_3_12

                                              Test of First and Second
                                                Moment Specification

                                             DF    Chi-Square    Pr > ChiSq

                                            27         25.14        0.5669
```

[53] This version of the White test is from "Theorem 2 on page 823 of White (1980)" (SAS Institute Inc., n.d.).

Appendix H – Spatial Autocorrelation Detection

Testing for Spatial Autocorrelation at the Site Level

The SAS System   13:30 Wednesday, December 9, 2009 45

The VARIOGRAM Procedure
Dependent Variable: ROT_1

Number of Observations Read	70
Number of Observations Used	63

Pairs Information

Number of Lags	11
Lag Distance	8.36
Maximum Data Distance in Long	75.88
Maximum Data Distance in Lat	35.08
Maximum Data Distance	83.60

Pairwise Distance Intervals

Lag Class	---------Bounds---------		Number of Pairs	Percentage of Pairs
0	0.00	4.18	110	5.63%
1	4.18	12.54	544	27.85%
2	12.54	20.90	399	20.43%
3	20.90	29.26	286	14.64%
4	29.26	37.62	343	17.56%
5	37.62	45.98	207	10.60%
6	45.98	54.34	25	1.28%
7	54.34	62.70	6	0.31%
8	62.70	71.06	15	0.77%
9	71.06	79.42	18	0.92%
10	79.42	87.78	0	0.00%

Autocorrelation Statistics

Assumption	Coefficient	Observed	Expected	Std Dev	Z	Pr > |Z|
Normality	Moran's I	-0.00425	-0.0145	0.0252	0.406	0.6845
Normality	Geary's c	1.10524	1.0000	0.0693	1.520	0.1286

The SAS System   13:30 Wednesday, December 9, 2009 46

The VARIOGRAM Procedure
Dependent Variable: ROT_3_12

Number of Observations Read	70
Number of Observations Used	68

Pairs Information

Number of Lags	11
Lag Distance	8.36
Maximum Data Distance in Long	75.88
Maximum Data Distance in Lat	35.08

Maximum Data Distance 83.60

Pairwise Distance Intervals

Lag Class	Bounds		Number of Pairs	Percentage of Pairs
0	0.00	4.18	124	5.44%
1	4.18	12.54	613	26.91%
2	12.54	20.90	482	21.16%
3	20.90	29.26	316	13.87%
4	29.26	37.62	386	16.94%
5	37.62	45.98	263	11.55%
6	45.98	54.34	52	2.28%
7	54.34	62.70	7	0.31%
8	62.70	71.06	15	0.66%
9	71.06	79.42	20	0.88%
10	79.42	87.78	0	0.00%

Autocorrelation Statistics

Assumption	Coefficient	Observed	Expected	Std Dev	Z	Pr > |Z|
Normality	Moran's I	-0.0192	-0.0145	0.0239	-0.199	0.8426
Normality	Geary's c	1.0402	1.0000	0.0467	0.861	0.3894

Testing for Spatial Autocorrelation at the State Level

The SAS System 13:30 Wednesday, December 9, 2009 47

The VARIOGRAM Procedure
Dependent Variable: ROT_1

Number of Observations Read	70
Number of Observations Used	63

Pairs Information

Number of Lags	11
Lag Distance	8.47
Maximum Data Distance in ST_Lon	77.76
Maximum Data Distance in ST_Lat	33.55
Maximum Data Distance	84.69

Pairwise Distance Intervals

Lag Class	Bounds		Number of Pairs	Percentage of Pairs
0	0.00	4.23	61	3.24%
1	4.23	12.70	523	27.79%
2	12.70	21.17	405	21.52%
3	21.17	29.64	296	15.73%
4	29.64	38.11	351	18.65%

5	38.11	46.58	189	10.04%
6	46.58	55.05	18	0.96%
7	55.05	63.52	6	0.32%
8	63.52	71.99	14	0.74%
9	71.99	80.45	18	0.96%
10	80.45	88.92	1	0.05%

Autocorrelation Statistics

Assumption	Coefficient	Observed	Expected	Std Dev	Z	Pr > |Z|
Normality	Moran's I	0.0434	-0.0145	0.0409	1.416	0.1567
Normality	Geary's c	1.0181	1.0000	0.0859	0.211	0.8330

The VARIOGRAM Procedure
Dependent Variable: ROT_3_12

Number of Observations Read	70
Number of Observations Used	68

Pairs Information

Number of Lags	11
Lag Distance	8.47
Maximum Data Distance in ST_Lon	77.76
Maximum Data Distance in ST_Lat	33.55
Maximum Data Distance	84.69

Pairwise Distance Intervals

Lag Class	---------Bounds---------		Number of Pairs	Percentage of Pairs
0	0.00	4.23	69	3.14%
1	4.23	12.70	597	27.19%
2	12.70	21.17	477	21.72%
3	21.17	29.64	335	15.26%
4	29.64	38.11	401	18.26%
5	38.11	46.58	237	10.79%
6	46.58	55.05	38	1.73%
7	55.05	63.52	7	0.32%
8	63.52	71.99	14	0.64%
9	71.99	80.45	20	0.91%
10	80.45	88.92	1	0.05%

Autocorrelation Statistics

Assumption	Coefficient	Observed	Expected	Std Dev	Z	Pr > |Z|
Normality	Moran's I	0.0132	-0.0145	0.0382	0.724	0.4693
Normality	Geary's c	0.9840	1.0000	0.0647	-0.247	0.8053

Testing for Spatial Autocorrelation at the EPA Regional Level

```
The SAS System       13:30 Wednesday, December 9, 2009  49

                              The VARIOGRAM Procedure
                             Dependent Variable: ROT_1

                      Number of Observations Read          70
                      Number of Observations Used          63


                                 Pairs Information

                  Number of Lags                                11
                  Lag Distance                                8.28
                  Maximum Data Distance in R_Long            77.76
                  Maximum Data Distance in R_Lat             28.59
                  Maximum Data Distance                      82.85


                            Pairwise Distance Intervals

                                                   Number
                 Lag                                   of    Percentage
               Class    ---------Bounds---------    Pairs      of Pairs

                   0        0.00          4.14       12         0.71%
                   1        4.14         12.43      512        30.24%
                   2       12.43         20.71      474        28.00%
                   3       20.71         29.00      234        13.82%
                   4       29.00         37.28       83         4.90%
                   5       37.28         45.57       36         2.13%
                   6       45.57         53.85      102         6.02%
                   7       53.85         62.14        0         0.00%
                   8       62.14         70.42      114         6.73%
                   9       70.42         78.70       84         4.96%
                  10       78.70         86.99       42         2.48%


                             Autocorrelation Statistics

          Assumption    Coefficient    Observed    Expected    Std Dev         Z    Pr >
|Z|

          Normality     Moran's I        0.0158     -0.0145     0.0374     0.811
0.4173
          Normality     Geary's c        1.1211      1.0000     0.0895     1.353
0.1759
                                              The SAS System       13:30 Wednesday,
December 9, 2009  50

                              The VARIOGRAM Procedure
                             Dependent Variable: ROT_3_12

                      Number of Observations Read          70
                      Number of Observations Used          68


                                 Pairs Information

                  Number of Lags                                11
```

Lag Distance	8.28
Maximum Data Distance in R_Long	77.76
Maximum Data Distance in R_Lat	28.59
Maximum Data Distance	82.85

Pairwise Distance Intervals

Lag Class	---------Bounds---------		Number of Pairs	Percentage of Pairs
0	0.00	4.14	15	0.76%
1	4.14	12.43	571	28.82%
2	12.43	20.71	536	27.06%
3	20.71	29.00	243	12.27%
4	29.00	37.28	91	4.59%
5	37.28	45.57	45	2.27%
6	45.57	53.85	136	6.87%
7	53.85	62.14	0	0.00%
8	62.14	70.42	160	8.08%
9	70.42	78.70	120	6.06%
10	78.70	86.99	64	3.23%

Autocorrelation Statistics

Assumption	Coefficient	Observed	Expected	Std Dev	Z	Pr > |Z|
Normality	Moran's I	-0.0175	-0.0145	0.0352	-0.0846	0.9326
Normality	Geary's c	1.0279	1.0000	0.0702	0.3980	0.6906

Appendix I – Examining Differences Across Continuous Variables and Related Variable Transformations

Examining Differences Across Continuous Variables and Related Variable Transformations

The SAS System 12:19 Sunday, March 7, 2010 790

The CORR Procedure

Pearson Correlation Coefficients
Prob > |r| under H0: Rho=0
Number of Observations

	ROT_1		ROT_1D	ROT_2_08		ROT_3_12	
SC_2 (continuous)	0.07328		0.13722	-0.04694		-0.11854	*Corr. Coeff.*
	0.588		0.3087	0.7194		0.367	*Level of sig.*
	57		57	61		60	*N*
SC_2B (quartile transformation)	0.0394		0.0992	-0.01162		-0.04308	
	0.7591		0.4392	0.9245		0.7272	
	63		63	69		68	
SC_2L (natural log transformation)	0.13361		0.17179	0.00016		-0.02592	
	0.3218		0.2013	0.999		0.8441	
	57		57	61		60	
NMS_1	0.12319		0.12655	0.03887		0.16012	
	0.3361		0.323	0.7512		0.1921	
	63		63	69		68	
NMS_1B	0.20489		0.20843	0.21294		0.32501	
	0.1072		0.1012	0.079	+	0.0068	**
	63		63	69		68	
NMS_1L	0.19579		0.20855	0.12064		0.27482	
	0.1241		0.101	0.3234		0.0233	*
	63		63	69		68	
RMS_1	0.23622		0.16971	0.09469		0.07217	
	0.0623	+	0.1836	0.439		0.5586	
	63		63	69		68	
RMS_1B	0.18337		0.1207	-0.00187		-0.02651	
	0.1503		0.346	0.9878		0.8301	
	63		63	69		68	
RMS_1L	0.24374		0.18052	0.08547		0.06744	
	0.0542	+	0.1568	0.485		0.5847	
	63		63	69		68	

†p<.10; *p<.05; **p<.01;***p<.001 for two-tailed significance test.

	ROT_1		ROT_1D	ROT_2_08		ROT_3_12	
CNTY_POP	0.15588		0.12217	0.24038		0.16034	*Corr. Coeff.*
	0.2225		0.3402	0.0466	*	0.1915	*Level of sig.*
	63		63	69		68	*N*
CNT_POP2	0.30149		0.1601	0.20107		0.11987	
	0.0163	*	0.2101	0.0976	+	0.3302	
	63		63	69		68	
CNT_POPL	0.26852		0.13579	0.221		0.15187	
	0.0333	*	0.2886	0.068	+	0.2163	
	63		63	69		68	
ACRES	0.06973		0.20575	0.02078		-0.0675	
	0.5871		0.1057	0.8654		0.5844	
	63		63	69		68	
ACRES_B	-0.00465		0.05478	-0.14388		- 0.13401	
	0.9711		0.6698	0.2382		0.2759	
	63		63	69		68	
ACRESL	0.02403		0.13067	-0.12463		- 0.11298	
	0.8517		0.3074	0.3076		0.359	
	63		63	69		68	

†p<.10; *p<.05; **p<.01;***p<.001 for two-tailed significance test.

Appendix J – Comparing the Effect of Including Quartile versus Continuous Version of County Population Independent Control Variables for Regression of PLANNING TYPE and Other Predictors on the Four Superfund Site Reuse D.V.s

Comparing the Effect of Including Quartile versus Continuous Version of County Population Indepdent Control Variables for Regression of PLANNING TYPE and Other Predictors on the Four Superfund Site Reuse D.V.s (REUSE ON TRACK1,1-D, 2, and 3)

Planning Type1 (with County Pop. Quartile Transformation)

	ROT1	1-t	2-t	ROT1-D (Y/N)	1-t	2-t	ROT2 (by 2008)	1-t	2-t	ROT3 (by 2012)	1-t	2-t
Planning Type1	0.81608	***	***	0.26686	***	***	0.18829			0.45745	**	**
Site Readiness for Reuse1 (by 2008/2012)	1.5907	***	***	0.33395	***	***	1.3625	**	*	0.12395		
County PopulationB	0.15005			-0.04542			0.20161			-0.04686		
Superfund Site Age	-0.06319	*	*	-0.00172			-0.07996	*	+	-0.03645	+	
Site Location Suitabiltiy1§	0.11259			-0.0434			0.41424	+		0.56223	***	**
Neighborhood Market Strength2§	0.35342	*	+	0.10692	**	*	0.31794			0.54877	**	**
F-Value / d.f.	16.37 / 56			16.81 / 56			4.29 / 62			9.94 / 61		
Adj.R 2	0.60			0.60			0.23			0.44		

Planning Type1 (with County Pop. Continuous)

	ROT1	1-t	2-t	ROT1-D (Y/N)	1-t	2-t	ROT2 (by 2008)	1-t	2-t	ROT3 (by 2012)	1-t	2-t
Planning Type1	0.84118	***	***	0.26324	***	***	0.17951			0.45072	**	**
Site Readiness for Reuse1 (by 2008/2012)	1.6617	***	***	0.31907	***	***	1.39562	**	**	0.09665		
County PopulationB	-3.279E-08			-1.479E-08			1.787E-07			1.383E-08		
Superfund Site Age	-0.05933	*	*	-0.0034			-0.0715	*	+	-0.03733	+	
Site Location Suitabiltiy1§	0.09879			-0.03938			0.40453	+		0.56485	***	**
Neighborhood Market Strength2§	0.41646	*	*	0.09633	*	*	0.3212	+		0.53201	**	**
F-Value / d.f.	15.99 / 56			16.31 / 56			4.48 / 62			9.92 / 61		
Adj.R 2	0.59			0.59			0.3			0.49		

PLANNING TYPE2 (with County Pop. Quartile Transformation)

	ROT1	1-t	2-t	ROT1-D (Y/N)	1-t	2-t	ROT2 (by 2008)	1-t	2-t	ROT3 (by 2012)	1-t	2-t
Planning Type2	0.4615	**	**	0.16207	***	***	0.11862			0.11862		
Site Readiness for Reuse1 (by 2008)	1.6116	***	***	0.34064	**	**	1.38078	**	*	1.38078	**	*
County PopulationB	0.23254	+		-0.01931			0.20769			0.20769		
Superfund Site Age	-0.05015	+		0.00275			-0.07468	*	+	-0.07468	*	+
Site Location Suitabiltiy1§	0.37794	*	+	0.03924			0.45636	*	+	0.45636	*	+
Neighborhood Market Strength2§	0.34478	+		0.10299	*	+	0.33279	+		0.33279	+	
F-Value / d.f.	9.93 / 56			7.57 / 56			4.19 / 62			4.19 / 62		
Adj.R 2	0.46			0.39			0.22			0.22		

PLANNING TYPE2 (with County Pop. Continuous)

	ROT1	1-t	2-t	ROT1-D (Y/N)	1-t	2-t	ROT2 (by 2008)	1-t	2-t	ROT3 (by 2012)	1-t	2-t
Planning Type2	0.49147	**	**	0.16826	***	***	0.08077			0.3135	*	*
Site Readiness for Reuse1 (by 2008)	1.72489	***	***	0.33883	**	**	1.41916	**	**	0.72329		
County PopulationB	-5.417E-08			-2.379E-08			1.778E-07			-1.207E-08		
Superfund Site Age	-0.04337	+		0.0018			-0.06704	*	+	-0.026		
Site Location Suitabiltiy1§	0.36645	*	+	0.03922			0.45388	*	+	0.64224	***	***
Neighborhood Market Strength2§	0.44367	*	*	0.10384	*	+	0.34328	+		0.55743	**	**
F-Value / d.f.	9.42 / 56			7.72 / 56			4.34 / 62			8.59 / 61		
Adj.R 2	0.44			0.39			0.22			0.4		

PLANNING TYPE3 (with County Pop. Quartile Transformation)

	ROT1	1-t	2-t	ROT1-D (Y/N)	1-t	2-t	ROT2 (by 2008)	1-t	2-t	ROT3 (by 2012)	1-t	2-t
Planning Type3	0.246			0.23718	+		0.11862			0.27499		
Site Readiness for Reuse1 (by 2008)	1.58684	***	**	0.31304	**	*	1.38078	**	*	0.54112		
County PopulationB	0.26173	+		-0.01318			0.20769			-0.01823		
Superfund Site Age	-0.05842	+		0.0002536			-0.07468	*	+	-0.03013		
Site Location Suitabiltiy1§	0.53446	**	*	0.08532	+		0.45636	*	+	0.72523	***	***
Neighborhood Market Strength2§	0.39795	*	+	0.12622	*	*	0.33279	+		0.62521	***	**
F-Value / d.f.	7.2 / 56			4.05 / 56			4.19 / 62			7.23 / 61		
Adj.R 2	0.48			0.23			0.22			0.36		

PLANNING TYPE3 (with County Pop. Continuous)

	ROT1	1-t	2-t	ROT1-D (Y/N)	1-t	2-t	ROT2 (by 2008)	1-t	2-t	ROT3 (by 2012)	1-t	2-t
Planning Type3	0.3419			0.28684	+		-1.20258	+		0.18344		
Site Readiness for Reuse1 (by 2008)	1.68677	***	***	0.30652	**	*	1.57237	**	**	0.52569		
County PopulationB	-4.374E-09			-2.091E-08			2.951E-07	*	+	2.889E-08		
Superfund Site Age	-0.0501	+		-0.0004712			-0.0694	*	+	-0.02982		
Site Location Suitabiltiy1§	0.5239	*	*	0.08435	+		0.51349	*	*	0.72661	***	***
Neighborhood Market Strength2§	0.49515	*	*	0.13003	*	*	0.3145	+		0.61151	***	**
F-Value / d.f.	6.66 / 56			4.12 / 56			4.48 / 62			7.24 / 61		
Adj.R 2	0.35			0.23			0.25			0.35		

PLANNING TYPE4

	ROT1	1-t	2-t	ROT1-D (Y/N)	1-t	2-t	ROT2 (by 2008)	1-t	2-t	ROT3 (by 2012)	1-t	2-t
Planning Type4	0.31874	**	**	0.08891	***	**	0.08738			0.16512	*	+
Site Readiness for Reuse1 (by 2008)	1.55538	***	***	0.32768	**	**	1.41031	**	**	0.50478		
County PopulationB	0.15785			-0.03189			0.10496			-0.07367		
Superfund Site Age	-0.06128	*	+	-0.000132			-0.08667	*	*	-0.03652		
Site Location Suitabiltiy1§	0.30228	+		0.03441			0.35437			0.62375	**	**
Neighborhood Market Strength2§	0.44214	*	*	0.12786	*	*	0.49076	*	+	0.64121	***	**
F-Value / d.f.	10.16 / 54			6.23 / 54			4.35 / 59			7.79 / 58		
Adj.R 2	0.48			0.34			0.24			0.39		

PLANNING TYPE4

	ROT1	1-t	2-t	ROT1-D (Y/N)	1-t	2-t	ROT2 (by 2008)	1-t	2-t	ROT3 (by 2012)	1-t	2-t
Planning Type4	0.33556	***	***	0.08836	***	**	0.076			0.15803	*	+
Site Readiness for Reuse1 (by 2008)	1.62598	***	***	0.31874	**	**	1.4124	**	**	0.45728		
County PopulationB	-4.248E-08			-1.362E-08			1.467E-07			1.505E-08		
Superfund Site Age	-0.05822	*	+	-0.00124			-0.08152	*	*	-0.03765		
Site Location Suitabiltiy1§	0.28829	+		0.03701			0.35178	+		0.63064	***	**
Neighborhood Market Strength2§	0.51605	**	*	0.12088	*	*	0.47439	*	+	0.6121	***	**
F-Value / d.f.	9.93 / 54			6.17 / 54			4.56 / 59			7.73 / 58		
Adj.R 2	0.47			0.34			0.24			0.38		

Bibliography

Alberini, A., Longo, A., Tonin, S., Trombetta, F., & Turvani, M. (2005). The role of liability, regulation and economic incentives in brownfield remediation and redevelopment: Evidence from surveys of developers. *Regional Science and Urban Economics, 35*, 327-351.

Albert, K. H., Gunton, T. I., & Day, J. C. (2003). Achieving effective land use planning: An evaluation of a collaborative land use planning process. *Environments, 31*(3), 51-68.

Alig, R. J., Kline, J. D., & Lichtenstein, M. (2004). Urbanization on the US landscape: Looking ahead in the 21st century. *Landscape and Urban Planning 69*, 219–234.

Altshuler, A. (1965). The goals of comprehensive planning. *Journal of the American Institute of Planners, 31*(3), 186-197.

Andrew, J. S. (2001). Making or breaking alternative dispute resolution? Factors influencing its success in waste management conflicts. *Environmental Impact Assessment Review, 21*(2001), 23-57.

Archer, W. R., & Smith, M. T. (2003). Explaining location patterns of suburban offices. *Real Estate Economics, 31*(2), 139-164.

Ashford, N. A., & Rest, K. M. (1999). *Public participation in contaminated communities*. Retrieved November 22, 2005. from http://web.mit.edu/org/c/ctpid/www/tl/TL-pub-PPCC.html.

Bartsch, C. (2003). *Community involvement in brownfields redevelopment*. Washington, D.C.: Northeast-Midwest Institute.

Beierle, T., C., & Cayford, J. (2002). *Democracy in practice: Public participation in environmental decisions*. Washington, D.C.: Resources for the Future.

Berger, A. (2006). *Drosscape: Wasting Land in Urban America*. New York: Princeton Archietectural Press.

Brody, S. D. (2003). Measuring the effects of stakeholder participation on the quality of local plans based on the principles of collaborative ecosystem management. *Journal of Planning Education and Research, 22*, 407-419.

Brody, S. D., & Highfield, W. E. (2005). Does planning work: Testing the implementation of local environmental planning in Florida. *Journal of the American Planning Association, 71*(2), 159-175.

Bromm, S., & Lofton, J. (2002). *Negotiations in superfund cases – the role of communities in site redevelopment.* Paper presented at the Sixth International Conference on Environmental Compliance and Enforcement, San Jose, Costa Rica.

Brulle, R. J. (2000). *Agency, Democracy, and Nature: The U.S. Environmental Movement from a Critical Theory Perspective*. Cambridge, MA: The MIT Press.

Burby, R. J. (2003). Making plans that matter: Citizen involvement and government action. *Journal of the American Planning Association, 69*(1), 33-49.

Burby, R. J., & Dalton, L. C. (1994). Plans can matter! The role of land use plans and state planning mandates in limiting the development of hazardous areas. *Public Administration Review, 54*(3), 229-238.

Calbick, K. S., Day, J. C., & Gunton, T. I. (2003). Land use planning implementation: A 'best practices' assessment. *Environments, 31*(3), 69-82.

Chaskin, R. J. (2005). Democracy and bureaucracy in a community planning process. *Journal of Planning Education and Research, 24*, 408-419.

Chess, C., & Purcell, K. (1999). Public participation and the environment: Do we know what works? *Environmental Science and Technology, 33*(16), 2687-2692.

Citizens for a Safe Future for Midvale. (2004-2010). *CSFM Meeting Minutes* Retrieved April 23, 2010, from http://midvaletag.org/minutes/index.html

City of Jacksonville. (2009a). *City Council Research Division Legislative Summary - July 28, 2009*. Retrieved December 1, 2009. from http://www.coj.net/City+Council/CC+Mtgs+Online.htm.

City of Jacksonville. (2009b). *Coleman-Evans Restrictive Covenant*.

City of Jacksonville (prepared by HDR Landers Atkins Planners). (2002). *Master Plan: Coleman-Evans Park at Whitehouse*.

City of Portland. (2001a). *McCormick & Baxter Site Reuse Assessment: Final Report*. Retrieved September 29, 2009. from http://www.portlandonline.com/bps/index.cfm?&a=59139.

City of Portland. (2001b). *Summary notes of project meetings (Appendix 2 in McCormick & Baxter: Site Reuse Assessment: Final Report)*. Retrieved April 19, 2010. from http://www.portlandonline.com/bps/index.cfm?&a=59149.

Coleman-Evans Interviewee 1. (2009). Coleman-Evans Wood Preserving Co. Superfund site.

Coleman-Evans Interviewee 2. (2009). Coleman-Evans Wood Preserving Co. Superfund site.

Coleman-Evans Respondent 1. (2009). Coleman-Evans Wood Preserving Co. Superfund site.

Congressional Research Service. (2004). *Brownfields and Superfund Issues in the 108th Congress* (No. IB10114). Washington, D.C.

Cormick, G., Dale, N., Emond, P., Sigurdson, S. G., & Stuart, B. D. (1996). *Building consensus for a sustainable future: Putting principles into practice*. from http://www.nrtee-trnee.ca/Publications/HTML/Book_Building-Consensus_E.htm.

Costanzi, F. (2004). Midvale Slag Superfund Site: Building Consensus for Reuse Planning. *Revitalizing Land and Restoring Communities: Interdisciplinary Approaches to Transforming Contaminated Sites: Conference Papers and Presentations.* Retrieved April 22, 2010, from http://www.virginia.edu/superfund/pdf/presentations/Costanzi.pdf

Daniels, S. E., & Walker, G. B. (2001). *Working through environmental conflict: The collaborative learning approach*. Westport, CT: Praeger.

Deason, J. P., Sherk, G. W., & Carroll, G. A. (2001). *Public Policies and Private Decisions Affecting the Redevelopment of Brownfields: An Analysis of Critical*

Factors,Relative Weights and Areal Differentials. Washington, D.C.: Prepared for: Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency.
DeSousa, C. A. (2004). The greening of brownfields in American cities. *Journal of Environmental Planning and Management, 47*(4), 579-600.
Ding, C. (2001). An empirical model of urban spatial development. *Review of Urban & Regional Development Studies, 13*(3), 173-186.
Editorial. (2006, September 1, 2006). Urban rebirth: Midvale site officially called 'clean'. *Salt Lake Tribune*.
English, M. R., Gibson, A. K., Feldman, D. L., & Tonn, B. E. (1993). *Stakeholder involvement: Open processes for reaching decisions about the future uses of contaminated sites*. Knoxville, TN: Waste Management Research and Education Institute, University of Tennessee
Esmond, P. (2005, September 18, 2005). Cleanup process at 'halfway point' in W. Winfield. *The Observer-Dispatch*.
Farrell, A. E. (2007). Overview of the Superfund Program. In Gregg P. Macey and Jonathan Z. Cannon (Ed.), *Reclaiming the Land: Rethinking Superfund Institutions, Methods, and Practices* (pp. pp. 25-47). New York: Springer.
Federal Interagency Working Group on Environmental Justice. (2002). *Environmental Justice Collaborative Model: A Framework to Ensure Local Problem-Solving*. Retrieved October 14, 2006. from http://www.epa.gov/compliance/resources/publications/ej/interagency/iwg-status-02042002.pdf.
Flyvbjerg, B. (2001). *Making social science matter: Why social inquiry fails and how it can succeed again*. Cambridge, UK: Cambridge University Press.
Forester, J. (1999). *The Deliberative Practitioner*. Cambridge, MA: The MIT Press.
Frame, T. M., Gunton, T., & Day, J. C. (2004). The role of collaboration in environmental management: An evaluation of land and resource planning in British Columbia. *Journal of Environmental Planning and Management, 47*(1), 59-82.
Gardner, S. S. (2004). Environmental devolution and local capacity: Brownfield implementation in four distressed cities in New Jersey. In R. Greenstein & Y. Sungu-Eryilmaz (Eds.), *Recycling the city: The use and reuse of urban land* (pp. 135-157). Cambridge, MA: Lincoln Institute of Land Policy.
Garson, G. D. (2009, July 13, 2009). Testing of Assumptions. Retrieved November 25, 2009, from http://faculty.chass.ncsu.edu/garson/PA765/assumpt.htm
Gehrke, S. (2007, March 1, 2007). Building plans ready for cleaned-up sites. *The Salt Lake Tribune*.
Graf, T. (2009). Portland's Willamette River development risks rise [Electronic Version]. *Daily Journal of Commerce (Oregon)* from http://djcoregon.com/news/2009/08/24/willamette-river-development-risks-rise/.
Gray, B. (1989). *Collaborating: Finding Multiparty Ground for Multiparty Problems*. San Francisco: Jossey-Bass Publishers.

Greenberg, M., & Lewis, M. J. (2000). Brownfields redevelopment, preferences and public involvement: A case study of an ethically mixed neighborhood. *Urban Studies, 37*(13), 2501-2514.

Greenstein, R., & Sungu-Eryilmaz, Y. (2004). Introduction: Recycling urban vacant land. In R. Greenstein & Y. Sungu-Eryilmaz (Eds.), *Recycling the city: The use and reuse of urban land* (pp. 2-12). Cambridge, MA: Lincoln Institute of Land Policy.

Gregory, R., & McDaniels, T. (2000). *Structured decision processes for environmental management: Linking consultation and analysis.* Paper presented at the Community based environmental decision making proceedings (Stakeholder participation and decision making - session two), Arlington, Virginia.

Gujarati, D. N. (2003). *Basic Econometrics* (Fourth ed.). Boston: McGraw-Hill.

Gunton, T. I., & Day, J. C. (2003). The theory and practice of collaborative planning in resource and environmental management. *Environments, 31*(2), 5-19.

Habisreutinger, P., & Gunderson, D. E. (2006). Real estate reuse opportunities within the ReGenesis project area: A case study. *International Journal of Construction Education and Research, 2*, 53-63.

Hammett, Y. C. (2006, January 19). Residents oppose golf course plan: Superfund site would be location *The Tampa Tribune*.

Hansen, K. N. (2004). *The Greening of Pentagon Brownfields: Using Environmental Discourse to Redevelop Former Military Bases*. New York: Lexington Books.

Healey, P. (1993). Planning through debate: The communicative turn in planning theory. In F. Rischer & J. Forester (Eds.), *The argumentative turn in policy analysis and planning* (pp. 233-253). Durham: Duke University Press.

Healey, P. (1997). *Collaborative Planning: Shaping Places in Fragmented Societies*. Vancouver: UBC Press.

Helling, A. (1998). Collaborative visioning: Proceed with caution! Results from evaluating Atlanta's Vision 2020 project. *Journal of the American Planning Association, 64*(3), 335-348.

Hersh, R., Probst, K., Wernstedt, K., & Mazurek, J. (1997). *Linking land use and Superfund cleanups: Uncharted territory*.

Hill, C. (2000). Measuring success in the redevelopment of former military bases: Evidence from a case study of the Truman Annex in Key West, Florida. *Economic Development Quarterly 14*(3), 267-275.

Hiteman Leather Interviewee 1. (2009). Hiteman Leather Co. Superfund Site.

Hiteman Leather Interviewee 2. (2010). Hiteman Leather Co. Superfund Site.

Hiteman Leather site respondent 1. (2008).

Hiteman Leather Survey Respondent 1. (2008). Hiteman Leather Co. Superfund Site.

Hiteman Leather Survey Respondent 2. (2009). Hiteman Leather Co. Superfund Site.

Howland, M. (2003). Private initiative and public responsibility for the redevelopment of industrial brownfields: Three Baltimore case studies. *Economic Development Quarterly, 17*(4), 367-381.

Howland, M. (2004). The role of contamination in central city industrial decline. *Economic Development Quarterly, 18*(3), 207-219.

ICMA. (2002). *Growing greener: Revitalizing brownfields into greenspace*. Washington, D.C.: International City/County Management Association.
ICMA, & NEMW. (2001). *Brownfields blueprints: A study of the Showcase Communities Initiative*: ICMA.
Innes, J. (1996). Planning through consensus building: A new perspective on the comprehensive planning ideal. *Journal of the American Planning Association, 62*(4), 460-472.
Innes, J., & Booher, D. (1999a). Consensus building and complex adaptive systems: A framework for evaluating collaborative planning. *Journal of the American Planning Association, 65*(4), 412-423.
Innes, J., & Booher, D. (1999b). Consensus building as role playing and bricolage: Toward a theory of collaborative planning. *Journal of the American Planning Association, 65*(1), 9-26.
Innes, J., & Gruber, J. (2005). Planning styles in conflict: The Metropolitan Transportation Commission. *Journal of the American Planning Association, 71*(2), 177-188.
Jacklet, B. (2001 (updated 2009)). Super park planned for Superfund site [Electronic Version]. *Portland Tribune*. Retrieved January 18, 2010 from http://www.portlandtribune.com/news/print_story.php?story_id=5145.
Janofsky, M. (2004, December 5). Changes may be needed in Superfund, chief says. *The New York Times*.
Jung, J. (2005). *Dissertation: The impact of institutional settings on local hazard mitigation efforts: A "new institutional" perspective.* The University of Texas at Austin, Austin, Texas.
Keahey, J. (2009, August 4, 2009). Danish firm to be first at Bingham Junction. *The Salt Lake Tribune*.
Kivell, P. (1993). *Land and the City: Patterns and Processes of Urban Change*. London: Routledge.
Koontz. (2005). We finished the plan, so now what? Impacts of collaborative stakeholder participation on land use policy. *The Policy Studies Journal, 33*(3), 459-481.
Koontz, T. (2003). The farmer, the planner, and the local citizen in the dell: How collaborative groups plan for farmland preservation. *Landscape and Urban Planning, 66*, 19-34.
Lange, D., & McNeil, S. (2004a). Brownfield development: Tools for stewardship. *Journal of Urban Planning and Development, 30*(2), 109-116.
Lange, D., & McNeil, S. (2004b). Clean it and they will come? Defining successful brownfield development. *Journal of Urban Planning and Development, June*, 101-108.
Larson, K. (2005, March 19, 2005). In state with most Superfund sites, towns ponder land use. *The Associated Press State & Local Wire*.
Laurian, L. (2004). Public participation in environmental decision making: Findings from communities facing toxic waste cleanup. *Journal of the American Planning Association, 70*(1), 53-65.

Laurian, L., Day, M., Backhurst, M., Berke, P., Ericksen, N., Crawford, J., et al. (2004). What drives plan implementation? Plans, planning agencies and developers. *Journal of Environmental Planning and Management, 47*(4), 555-577.

Leach, W. D., Pelkey, N. W., & Sabatier, P. A. (2002). Stakeholder partnerships as collaborative policymaking: evaluation criteria applied to watershed management in California and Washington. *Journal of Policy Analysis and Management, 21*(4), 645–670.

Lewis-Beck, M. S. (1995). *Data Analysis: An Introduction*. Thousand Oaks: Sage Publications.

Limb, R. (2009). Bingham Junction Progress Update [Electronic Version]. *Midvale City Newsletter*. Retrieved December 15, 2009 from http://midvalejournal.com/pages/home/.

Lowry, K., Adler, P., & Milner, N. (1997). Participating the public: Group process, politics, and planning. *Journal of Planning Education and Research, 16*, 177-187.

Lynn, F. M., & Busenberg, G. J. (1995). Citizen advisory committees and environmental policy: What we know, what's left to discover. *Risk Analysis, 15*(2), 147-162.

Margerum, R. D. (2002). Evaluating collaborative planning: Implications from an empirical analysis of growth management. *Journal of the American Planning Association, 68*(2), 179-193.

Marsh, E. L. (2006). Predicting Superfund Site Redevelopment: Course term paper, Advanced Empirical Methods for Policy Analysis, Spring 2006: The University of Texas at Austin.

Mascarenhas, M., & Scarce, R. (2004). ''The intention was good'': Legitimacy, consensus-based decision making, and the case of forest planning in British Columbia, Canada. *Society and Natural Resources, 17*, 17–38.

Mastop, H., & Faludi, A. (1997). Evaluation of strategic plans: The performance principle. *Environment and Planning B: Planning and Design, 24*, 815-832.

McCann, E. J. (2001). Collaborative visioning or urban planning as therapy? The politics of public-private policy making. *Professional Geographer, 53*(2), 207-218.

McCormick Interviewee 1. (2009). McCormick & Baxter Creosoting Co. (Portland Plant)

McCormick Interviewee 2. (2009). McCormick & Baxter Creosoting Co. (Portland Plant)

McCormick Interviewee 2. (2010). Written comments submitted based upon case study review. McCormick & Baxter Creosoting Co. (Portland Plant)

McCormick Interviewee 3. (2009). McCormick & Baxter Creosoting Co. (Portland Plant)

McCormick Interviewee 4. (2009). McCormick & Baxter Creosoting Co. (Portland Plant)

McCormick Survey Respondent 1. (2008). McCormick & Baxter Creosoting Co. (Portland Plant).

McCormick Survey Respondent 2. (2009). McCormick & Baxter Creosoting Co. (Portland Plant).

McGuirk, P. (2001). Situating communicative planning theory: context, power, and knowledge. *Environment and Planning A, 33*, 195-217.

McKitrick, C. (2006, April 22, 2006). Midvale land bought for development. *The Salt Lake Tribune*.

Melcher, B. H., & Kerzner, H. (1983). *Strategic Planning: Development and Implementation*: Tab Books.
Meyer, P. B., & Lyons, T. S. (2000). Lessons from private sector brownfield redevelopers. *Journal of the American Planning Association, 66*(1), 45-56.
Midvale Interviewee 1. (2009). Midvale Slag.
Midvale Interviewee 3. (2009). Midvale Slag.
Midvale Interviewee 4. (2010). Midvale Slag.
Midvale Slag site respondent 3. (2009).
Moore, C. M., Longo, G., & Palmer, P. (1999). Visioning. In L. Susskind, S. McKearnan & J. Thomas-Larner (Eds.), *The Consensus Building Handbook* (pp. 557-590). Thousand Oaks: Sage Publications.
Moote, M. A., McClaran, M. P., & Chickering, D. K. (1997). Theory in practice: Applying partipatory democracy theory to public land planning. *Environmental Management, 21*(6), 877-899.
Musick, M. (2006). OLS Regression Assumptions: Course handout prepared for class: Analysis of the Texas Survey, Spring 2006: The University of Texas at Austin.
Myers, D., & Kituse, A. (2000). Constructing the future in planning: A survey of theories and tools. *Journal of Planning Education and Research, 19*, 221-231.
NALGEP, & NEMW. (2004). *Unlocking brownfields: Keys to community revitalization*. Retrieved November 20, 2005. from http://www.nalgep.org/ewebeditpro/items/O93F4460.pdf.
National Civic League. (2000). *The community visioning and strategic planning handbook* (3rd ed.). Denver, CO: National Civic League.
Navarro, M. (2009, April 23, 2009). On the Gowanus Canal, Fear of Superfund Stigma. Online version. *The New York Times*.
Nelson, K. C. (1990). Pig's Eye attempted mediation. In J. E. Crowfoot & J. M. Wondolleck (Eds.), *Environmental disputes: Community involvement in conflict resolution* (pp. 209-225). Washington, D.C.: Island Press.
Nielson-Stowell, A. (2006, August 28, 2006). After 23 years, Midvale Slag site is clean. *Deseret Morning News*.
Northam, R. (1971). Vacant urban land in the American city. *Land Economics, 47*(345-355).
Norton, R. K. (2005). More and better local planning: State-mandated local planning in coastal and North Carolina. *Journal of the American Planning Association, 71*(1), 55-71.
Pagano, M. A., & Bowman, A. O. M. (2004). Vacant land as opportunity and challenge. In R. Greenstein & Y. Sungu-Eryilmaz (Eds.), *Recycling the city: The use and reuse of urban land* (pp. 15-32). Cambridge, MA: Lincoln Institute of Land Policy.
Paterson, R. G. (1999). Negotiated development: Best practice lessons from two model processes. *Journal of Architectural and Planning Research, 16*(2), 133-148.
Pepper, E. M. (1997). *Lessons from the Field: Unlocking Economic Potential With an Environmental Key*. Washington, DC: Northeast-Midwest Institute.

Potapchuk, W. R., & Crocker, J. (1999). Implementing consensus-based agreements. In L. Susskind, S. McKearnan & J. Thomas-Larner (Eds.), *The Consensus Building Handbook* (pp. 527-555). Thousand Oaks: Sage Publications.
Prugh, T., Costanza, R., & Daly, H. (2000). *The Local Politics of Global Sustainability*. Washington, D.C.: Island Press.
Ruiz-Esquide, A. (2004). The Uniform Environmental Covenants Act: An environmental justice perspective. *Ecology Law Quarterly, 31*, 1007-1050.
Runyon, L. C., & Morandi, L. (2003). *Liablity Protections to Promote Brownfields Redevelopment: NCSL State Legislative Report*.
Rupasingha, A., & Goetz, S. J. (2008a). Data Dictionary SK Variables, US County-Level Social Capital Data, 1990-2005, The Northeast Regional Center for Rural Development, Penn State University, University Park, PA.
Rupasingha, A., & Goetz, S. J. (2008b). US County-Level Social Capital Data, 1990-2005, The Northeast Regional Center for Rural Development, Penn State University, University Park, PA.
Rupasingha, A., Goetz, S. J., & Freshwater, D. (2006). The production of social capital in US counties. *The Journal of Socio-Economics, 35*, 83–101.
Sager, T. (2001). Planning style and agency properties. *Environment and Planning A, 33*, 509-532.
SAS Institute Inc. (2009). *Base SAS(R) 9.2 Procedures Guide*. Cary, NC: SAS Institute Inc.
SAS Institute Inc. (n.d.). A Simple Regression Model with Correction of Heteroscedasticity Retrieved January 6, 2010, from http://support.sas.com/rnd/app/examples/ets/hetero/index.htm
Scher, E. (1999). Negotiating Superfund cleanup at the Massachusetts Military Reservation. In L. Susskind, S. McKearnan & J. Thomas-Larner (Eds.), *The Consensus Building Handbook* (pp. 859-878). Thousand Oaks: Sage Publications.
Schoenbaum, M. (2002). Environmental contamination, brownfields policy, and economic redevelopment in an industrial area of Baltimore, Maryland. *Land Economics, 78*(1), 60-71.
Schon, D. A., & Rein, M. (1994). *Frame Reflection: Toward the Resolution of Intractable Policy Controversies*. New York: Basic Books.
Selin, S. W., Schuett, M. A., & Carr, D. (2000). Modeling stakeholder perceptions of collaborative initiative effectiveness. *Society and Natural Resources, 13*, 735-745.
Sipe, N. G. (1998). An empirical analysis of environmental mediation. *Journal of the American Planning Association, 64*(3), 275-285.
Sipe, N. G., & Stiftel, B. (1995). Mediating environmental disputes: How well does it work? *Environmental Impact Assessment Review, 15*, 139-156.
Small Business Liability Relief and Brownfields Revitalization Act, U.S.C. Section 9601(40) (2002).
Smersh, G. T., Smith, M. T., & Schwartz, A. L. (2003). Factors affecting residential property development patterns. *Journal of Real Estate Research, 25*(1), 61-75.

Smith, J. E., & Garcia, M. W. (2002). From Superfund site to developable property: The case of Rentokil. *Journal of Environmental Planning and Management, 45*(2), 157–179.
Stewart, E. (2004, September 10, 2004). EPA, Midvale landowner strike deal. *Deseret Morning News*.
Strickland, S. (2002, July 3). Plan uses 'eyesore' for park. *The Florida Times Union (Jacksonville.Com)*.
Talen, E. (1996a). After the plans: Methods to evaluate the implementation success of plans. *Journal of Planning Education and Research, 16*, 79-91.
Talen, E. (1996b). Do plans get implemented? A review of evaluation in planning. *Journal of Planning Literature, 10*(3), 248-259.
Talen, E. (1997). Success, failure, and conformance: An alternative approach to planning evaluation. *Environment and Planning B: Planning and Design, 24*, 573-587.
Taylor, D. (2004, January 19, 2004). Master plan to be unveiled for Midvale Superfund site. *The Enterprise*.
U.S. Census Bureau. (2000). Census 2000 Demographic Profile Highlights, Summary File 1 (SF 1) and Summary File 3 (SF 3). Retrieved December 2, 2009, 2009, from http://factfinder.census.gov/home/saff/main.html?_lang=en
U.S. Census Bureau. (2001). *ZIP Code® Tabulation Area (ZCTA™) Frequently Asked Questions* Retrieved October 24, 2009. from http://www.census.gov/geo/ZCTA/zctafaq.html.
U.S. EPA. *Superfund Information Systems, Superfund Site Progress Profile, Contaminants fo Concern*. Retrieved October 24, 2009. from http://cfpub.epa.gov/supercpad/cursites/srchsites.cfm.
U.S. EPA. (1995). *Land Use in the CERCLA remedy selection process*.
U.S. EPA. (1999a). *Army Creek Landfill Case Study*.
U.S. EPA. (1999b). *Bowers Landfill Case Study*.
U.S. EPA. (1999c). *Central City Case Study*.
U.S. EPA. (1999d). *Cherokee County Galena Subsite (OU5) Case Study*.
U.S. EPA. (1999e). *Chisman Creek Case Study*.
U.S. EPA. (1999f). *Coalinga Asbestos Mine Case Study*.
U.S. EPA. (1999g). *Denver Radium Case Study*. Retrieved October 13, 2006. from http://www.epa.gov/superfund/programs/recycle/success/casestud/denvrcsi.htm.
U.S. EPA. (1999h). *Ft. Devins Case Study*. Retrieved October 10, 2006. from http://www.epa.gov/superfund/programs/recycle/success/casestud/devecsi.htm.
U.S. EPA. (1999i). *General Mills/Henkel Case Study*. Retrieved October 13, 2006. from http://www.epa.gov/superfund/programs/recycle/success/casestud/gmillcsi.htm.
U.S. EPA. (1999j). *Industri-Plex Site Case Study*. Retrieved October 11, 2006. from http://www.epa.gov/superfund/programs/recycle/success/casestud/iplexcsi.htm.
U.S. EPA. (1999k). *Kane & Lombard Street Drums Case Study*.
U.S. EPA. (1999l). *Luminous Processors Case Study*. Retrieved.
U.S. EPA. (1999m). *MacGillis & Gibbs Co./Bell Lumber & Pole Co. Case Study*.
U.S. EPA. (1999n). *Ohio River Park Case Study*.

U.S. EPA. (1999o). *Old Works/East Anaconda Smelter Case Study*.
U.S. EPA. (1999p). *Publicker Industries Case Study*.
U.S. EPA. (1999q). *Sites in Reuse*.
U.S. EPA. (1999r). *A sustainable model brownfields framework.*
U.S. EPA. (1999s). *Woolfolk Chemical Plant Case Study*.
U.S. EPA. (2000a). *Hanford 1100 Area Case Study*.
U.S. EPA. (2000b). *"Superfund Redevelopment Pilots: Coleman-Evans Wood Preserving"*. Retrieved September 15, 2009. from http://www.epa.gov/superfund/programs/recycle_old/pilot/facts/r4_19.pdf.
U.S. EPA. (2001). *Reuse Assessments: A Tool To Implement The Superfund Land Use Directive*. Retrieved March 1, 2010. from http://clu-in.org/download/toolkit/thirdednew/reuseassesstool.pdf.
U.S. EPA. (2002a). *Coleman-Evans: The Metamorphosis of an Eyesore into a Community Asset*. Retrieved April 24, 2010. from http://epa.gov/superfund/accomp/success/pdf/coleman.pdf.
U.S. EPA. (2002b). *EPA Superfund Explanation of Significant Differences: McCormick & Baxter Creosoting Co. (Portland Plant)*. Retrieved September 26, 2009. from http://www.epa.gov/superfund/sites/rods/fulltext/e1002012.pdf.
U.S. EPA. (2002c). *Public Involvement Policy of the U.S. Environmental Protection Agency*. Retrieved December 13, 2005. from http://www.epa.gov/publicinvolvement/pdf/policy2003.pdf.
U.S. EPA. (2002d). *Record of Decision for Midvale Slag OU 02*. Retrieved September 17, 2009. from http://www.epa.gov/superfund/sites/rods/fulltext/r0803002.pdf.
U.S. EPA. (2003). *Towards an Environmental Justice Collaborative Model: An Evaluation of the Use of Partnerships to Address Environmental Justice Issues in Communities*. Retrieved October 20, 2005 from http://www.epa.gov/evaluate/eval_ejcm.htm#case.
U.S. EPA. (2004a). *Characterization of Reuse Activities at Contaminated Sites*. Washington, D.C.: National Center for Environmetnal Economics.
U.S. EPA. (2004b). *Coleman-Evans Wood Preserving Site: Phase 1 Completion Announcement*. Retrieved October 10, 2009. from http://www.epa.gov/region4/waste/npl/nplfln/colemanevans.pdf.
U.S. EPA. (2004c). *EPA Region 4 Site Reuse Fact Sheets: Sites in Reuse: Munisport Landfill Superfund Site*. Retrieved October 10, 2006. from http://www.epa.gov/region4/waste/reuse/fl/munisportreusesuc.pdf.
U.S. EPA. (2004d). *EPA Region 4 Site Reuse Fact Sheets: Sites in Reuse: Solitron Microwave Superfund Site*.
U.S. EPA. (2004e). *EPA Region 4 Site Reuse Fact Sheets: Sites in Reuse: Trans Circuits Superfund Site.*
U.S. EPA. (2004f). *First Five-Year Review Report for Coleman-Evans Wood Preserving*. Retrieved September 16, 2009. from http://www.epa.gov/superfund/sites/fiveyear/f04-04019.pdf.

U.S. EPA. (2005). *Determining Future Uses of NPL Sites with Enhanced Stakeholder Involvement Reuse Planning Lessons Learned Report*.
U.S. EPA. (2006a). *Proposed Agreement and Covenant Not To Sue for the Portland Harbor Superfund Site, Triangle Park Removal Area, and the McCormick & Baxter, Inc. Superfund Site, Portland, Multnomah County, OR. Federal Register: November 27, 2006 (Volume 71, Number 227)*. Retrieved September 26, 2009. from http://regulations.justia.com/view/61599/.
U.S. EPA. (2006b). *Record of Decision for Coleman-Evans Wood Preserving Co.* Retrieved September 17, 2009. from http://www.epa.gov/superfund/sites/rods/fulltext/r2006040001242.pdf.
U.S. EPA. (2006c). *Record of Decision for Hiteman Leather Co.* Retrieved September 8, 2009. from http://www.epa.gov/superfund/sites/rods/fulltext/r2006020001430.pdf.
U.S. EPA. (2006d). *Second Five-Year Review Report for McCormick & Baxter Creosoting Co. (Portland Plant)* Retrieved September 26, 2009. from http://www.epa.gov/superfund/sites/fiveyear/f2006100001357.pdf.
U.S. EPA. (2006e). Superfund Redevelopment (SURE) Database: Accessed October 15, 2006, courtesy of the Superfund Redevelopment Program.
U.S. EPA. (2006f). UST Program Facts.
U.S. EPA. (2008a). *EPA Regional Content: Hiteman Leather Co.* Retrieved September 9, 2009. from http://www.epa.gov/Region2/superfund/npl/0202360c.pdf.
U.S. EPA. (2008b). *EPA Regional Content: McCormick & Baxter Creosoting Co. (Portland Plant)*. Retrieved December 30, 2009. from http://yosemite.epa.gov/r10/nplpad.nsf/88d393e4946e3c478825631200672c95/b16dc780a11714ad85256594006a01b0?OpenDocument.
U.S. EPA. (2008c). *EPA Regional Content: Portland Harbor*. Retrieved December 30, 2009. from http://yosemite.epa.gov/r10/nplpad.nsf/epaid/orsfn1002155.
U.S. EPA. (2008d). *Second Five-Year Review Report: Midvale Slag Superfund Site*. Retrieved September 16, 2009. from http://www.epa.gov/superfund/sites/fiveyear/f2009080002996.pdf.
U.S. EPA. (2009a). *Celebrating 10 Years of Returning Superfund Sites to Beneficial Use: Superfund Redevelopment Success Story Fact Sheet: Hiteman Leather Co.* Retrieved October 15, 2009. from http://www.epa.gov/superfund/programs/recycle/pdf/hiteman10yr.pdf.
U.S. EPA. (2009b). *EPA Regional Content: Hiteman Leather Co.* Retrieved December 9, 2009. from http://www.epa.gov/Region2/superfund/npl/0202360c.pdf.
U.S. EPA. (2009c). NPL Site Totals by Status and Milestone. Last Updated December 10, 2009. Retrieved December 17, 2009, from http://www.epa.gov/superfund/sites/query/queryhtm/npltotal.htm
U.S. EPA. (2009d). *Return to Use Initiative: 2009 Demonstration Pilot: Hiteman Leather*. Retrieved January 15, 2010. from http://www.epa.gov/oerrpage/superfund/programs/recycle/pdf/rtu09_hiteman.pdf.

U.S. EPA. (2009e). *Second Five-Year Review Report for Coleman-Evans Wood Preserving*. Retrieved January 21, 2010. from http://www.epa.gov/superfund/sites/fiveyear/f2009040003225.pdf.

U.S. EPA. (2009f). *Sites in Reuse: Coleman-Evans Wood Preserving Superfund Site*. Retrieved January 20, 2010. from http://www.epa.gov/region4/waste/sf/sri/pdf/coleman_reuse_fl.pdf.

U.S. EPA. (n.d.-a). About Brownfields. Retrieved October 14, 2006, 2006, from http://www.epa.gov/brownfields/about.htm

U.S. EPA. (n.d.-b). *Build it and they will come: The story of Pepe Field*.

U.S. EPA. (n.d.-c). Cleaning Up and Reusing Abandoned Gas Station Sites (RAGS).

U.S. EPA. (n.d.-d). Cleanup Process. Retrieved October 14, 2006, 2006, from http://www.epa.gov/superfund/action/process/sfproces.htm

U.S. EPA. (n.d.-e). *"Compendium of Superfund Redevelopment Initiative Pilot Snapshots"*. Retrieved September 15, 2009. from http://www.epa.gov/superfund/programs/recycle/activities/pilot.html.

U.S. EPA. (n.d.-f). Superfund. Corrective Action: Basic Information.

U.S. EPA. (n.d.-g). *EPA Regional Content: Coleman-Evans Wood Preserving Company*. Retrieved October 30, 2009. from http://www.epa.gov/region4/waste/npl/nplfln/colevafl.htm.

U.S. EPA. (n.d.-h). *EPA Regional Content: Midvale Slag* Retrieved December 30, 2009. from http://www.epa.gov/region8/superfund/ut/midvale/.

U.S. EPA. (n.d.-i). Frequently Asked Questions. Retrieved November 20, 2005, from http://www.epa.gov/superfund

U.S. EPA. (n.d.-j). *Leadville, Colorado: Moving Beyond the Scars of Mining, Integrating Remedial Design and Site Reuse*.

U.S. EPA. (n.d.-k). *Miami Drum Services One-page summary*.

U.S. EPA. (n.d.-l). RCRA Brownfields Prevention Initiative.

U.S. EPA. (n.d.-m). Superfund Program Frequently Asked Questions: What happens to a Superfund site after the cleanup is over? Retrieved September 9, 2009, from http://cfpub.epa.gov/superapps/index.cfm?fuseaction=faqs.default

U.S. General Accounting Office. (1994). *Superfund: Estimates of number of future sites vary* (No. GAO/RCED-95-18). Washington, D.C.

U.S. General Accounting Office. (1995). *Community development: reuse of urban industrial sites* (No. GAO/RCED 95-172). Washington, D.C.: GAO.

U.S. General Accounting Office. (1996). *Barriers to Brownfield Redevelopment* (No. GAO/RCED-96-125). Washington, DC: U.S. General Accounting Office.

UCLA: Academic Technology Services Statistical Consulting Group. (2009). Introduction to SAS: How can I calculate Moran's I in SAS? Retrieved December 14, 2009, from http://www.ats.ucla.edu/stat/SAS/faq/morans_i.htm

Urban Institute et al. (1997). *The effects of environmental hazards and regulation on urban redevelopment*.

USEPA. (2004). *Characterization of Reuse Activities at Contaminated Sites*. Washington, D.C.: National Center for Environmetnal Economics.

USEPA. (2005). *Investing in partnership, possibility, and people: A report to stakeholders from the U.S. EPA Brownfields Program*.
Village of West Winfield. (2000). *Superfund Redevelopment Pilot Program Proposal - West Winfield Community Center*.
Village of West Winfield. (December 2005). *Reuse Assessment and Redevelopment Plan for the Hiteman Leather Superfund Site*.
Wernstedt, K., & Hersh, R. (1998a). "Through a lens darkly" -- Superfund spectacles on public participation at Brownfield sites *RISK: Health, Safety & Environment 9*(2), 153-173.
Wernstedt, K., & Hersh, R. (1998b). Urban land use and Superfund cleanups. *Journal of Urban Affairs, 20*(4), 459-474.
Wernstedt, K., & Hersh, R. (2006). Brownfields regulatory reform and policy innovation in practice. *Progress in Planning, 65*, 7-74.
Wernstedt, K., Hersh, R., & Probst, K. (1999). Grounding hazardous waste cleanups: a promising remedy? *Land Use Policy, 16*, 45-55.
Wernstedt, K., Meyer, P. B., & Alberini, A. (2006). Attracting private investment to contaminated properties: The value of public interventions. *Journal of Policy Analysis and Management, 25*(2), 347–369.
Wikipedia. (n.d.-a). Spatial Analysis. Retrieved December 2, 2009, 2009, from http://en.wikipedia.org/wiki/Spatial_analysis
Wikipedia. (n.d.-b). *West Winfield, New York*. Retrieved April 25, 2010. from http://en.wikipedia.org/wiki/West_Winfield,_New_York.
Wikstrom Economic & Planning Consultants, I., Landmark Design, I., Stantec Consulting, I., & CHTM Hill, I. (2000). *Bingham Junction Reuse Assessment and Master Plan (Public Review Draft, April 4, 2000)*.
Yin, M., & Sun, J. (2007). The impacts of state growth management programs on urban sprawl in the 1990s. *Journal of Urban Affairs, 29*(2), 149–179.
Yin, R. K. (2003). *Case Study Research: Design and Methods* (Vol. 5). Thousand Oaks: Sage Publications.

VITA

Eric Lane Marsh attended Clovis High School in Clovis, New Mexico. In 1990 he entered the University of Notre Dame in South Bend, Indiana. He received the degree of Bachelor of Arts in May, 1994. Between the years 1994 and 1996 he served in the U.S. Peace Corps in The Gambia, West Africa. During the years 1997 and1999 he attended the University of Michigan. In December, 2002, he was awarded a Master of Science. During the years 1999 and 2003 he worked as an analyst for the U.S. Environmental Protection Agency. In September, 2003, he entered the Graduate School at The University of Texas at Austin. Since 2006 he has worked for the environmental policy and planning firm, E^2 Inc.

Permanent Address: 1217 Tetbury Lane, Austin, Texas 78748

This manuscript was typed by the author.