A CASE STUDY OF THE BROWNFIELD REDEVELOPMENT IN WELLSTON, MISSOURI

by

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Abstract

This report reviews pertinent knowledge regarding brownfield redevelopment, specifically the processes and issues involved. It addresses such topics as the type of brownfield sites, steps to remediation, types of remediation and barriers to redevelopment. Finally, a precedent study of Wellston, MO is presented. This study examines the impact that the development of two abandoned brownfield sites, Wellston Electrical Company and ABEX Foundry, had on the entire community. It was found that the onset of the development of these sites spurred the revitalization of the whole city of Wellston, having a positive influence across the city and surrounding area.

Table of Contents

List of Figures

List of Tables

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CHAPTER 1 - Introduction

Throughout history cities have developed into thriving urban cores. Generally, cities provide for dense populations, serving as places of trade and commerce, as well as, community and civic organizations. However, cities have not always remained in this thriving state. As early as the 1920s, but mainly throughout 1950s and 1960s, the population of the urban core began to relocate in the areas surrounding many of the Nation's cities. These areas surrounding cities are now generally known as suburbs (sub-urban). During this time the outward migration was greatly enabled due to housing and commercial development moving farther and farther from the urban core. With this migration came highways and other major roadways, which served as connectors to the urban core (Wright, 2002). Unfortunately, over many decades this outward migration has now left many sites within cities abandoned.

Recently, there has been a movement to redevelop these abandoned sites, as a form of urban infill. Essentially, urban infill is used to encourage development within the urban core, not outside of the urban core. The method serves as an alternative to traditional development patterns, encouraging the "recycling of vacant or underutilized lands within cities" (Strategies for Successful Infill Development, 2001, p. 2). Whereas traditional models promote the development of unused, open land and / or agricultural land (i.e. greenfields). Many cities across the nation have implemented infill initiatives, in hopes to revitalize the urban core and combat urban sprawl.

One form of urban infill that many cities are now seeking is brownfield redevelopment. This redevelopment involves the remediation and reclamation of "abandoned or underused properties that have been contaminated with hazardous waste from past commercial or industrial uses" (Brownfields and Brownfield Redevelopment, 2008). Across the nation it is estimated that there are approximately 450,000 brownfield sites, which are available for redevelopment. These sites remain blighted areas acting as urban "eyesores" that disconnect or under utilize portions of many of the Nations' cities. Figure 1-1 and 1-2 are examples of blighted brownfields before redevelopment.

Figure 1- 1 Blighted Brownfield Pre-Development

Figure 1- 2 Blighted Brownfield Pre-Development

Fortunately, many of these sites have low levels of contamination that are able to be addressed with a reasonable method of improvement. However, being labeled as a brownfield site places a stigma of being costly, time consuming and difficult to redevelop on that piece of land. Due to the unfortunate stigma of being labeled as a brownfield, many of these sites are overlooked by cities and developers. This stigma could be broken if more knowledge of brownfields was gained by cities and developers. In general, many understand and realize the concept of brownfield redevelopment. However, the processes and issues regarding brownfields are not well understood.

In the practice of Urban Planning, and even Rural Planning, this knowledge is important to understand, due to the number of vacant sites that cover many of the Nation's cities, large and small. In the past decade the ability to mitigate these sites has become easier to accomplish. This is due in part to the increasing federal and local support of brownfield redevelopment including new laws and regulations, as well as initiatives which offer numerous incentives. Therefore, cities and developers should be more informed of the processes and issues regarding brownfield redevelopment. This action should allow for the understanding, encouragement and increase in the number of sites being mitigated.

Overall, the purpose of this report is to address some pertinent knowledge regarding brownfield redevelopment. The report will review the processes and issues, as they are related to the types of sites which are redeveloped, steps to remediation, types of remediation, and barriers to the redevelopment of brownfields. Finally, to establish a successful precedent of

redevelopment, a case study will be examined to display how an existing development successfully approached the redevelopment of brownfield sites.

The case study to be presented will examine the development in Wellston, MO. This case study will discuss the success of the abandoned industrial sites of the Wagner Electric Company and the ABEX Foundry site. These sites were deserted in the early 1980s and were left to deteriorate for nearly twenty years. Currently, the site is being redeveloped, with an established alliance between the City of Wellston and County of St. Louis. The case study was chosen due to its successful recovery of a city which "once overlooked is fast becoming a place to call home" (Environmental Protection Agency, 2004). Figure 1-3 outlines the main industrial sites that were reclaimed. The ABEX site is located to the north, and the Wagner Electric Company is located to the south.

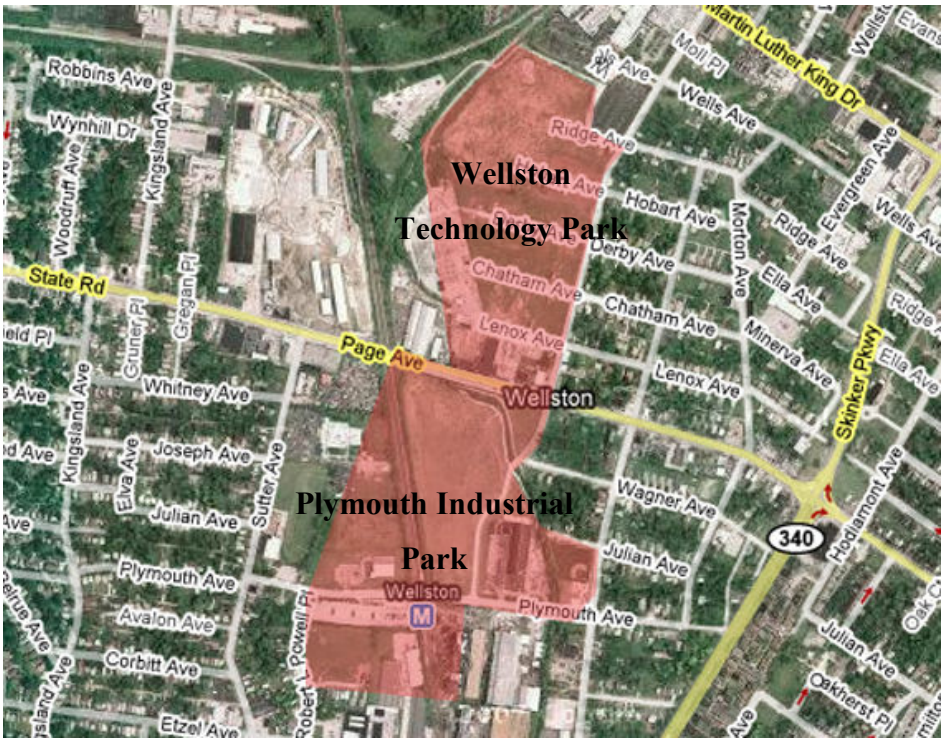

Figure 1- 3 Location of Development Sites in Wellston, MO

CHAPTER 2 - Literature Review

This section introduces published research that is relevant to the topic of brownfields. The published research serves as current and past arguments, opinions and documentation pertaining to the subject matter that has been presented over the past two decades. These sources include books and articles, as well as websites and documentation from supporting organizations that specialize or focus on the development of contaminated or under used land, such as brownfields.

Currently there is ample literature concerning the redevelopment of brownfields. Generally, these sources discuss different state and federal programs that offer insight on available incentives or assistance in development. They also provide recommended methods and development strategies, including the "do's and don'ts" of remediation. Some research focuses on redevelopments relative to specific fields, i.e. real estate and environmental design. Finally, some of the materials use case studies that discuss lessons learned from the field.

This review is central around these main sources. These works focus mainly on the process and issues of brownfield redevelopment, as opposed to other topics. Throughout the research other sources and topics offered other fragments of information, however, not as pertinent to the report.

The following describes the main books; briefly stating their relevance to the research and the field of planning, the general purpose of the book, and the general knowledge and information gained from the book.

The first book, *Redeveloping Brownfields: Landscape Architects, Site Planners and Developers, 2000*, by Thomas Russ, presents the idea that design professionals and developers need to be aware of the processes and issues involving contaminated sites, more than just the issues regarding site design. Russ believes that in order to successfully reclaim contaminated properties one must "become familiar with the environmental site assessment process and protocols and [be] able to incorporate the work of environmental professionals into his or her own work" (Russ, 2000, p. v). Meaning that there are many levels of knowledge that needs to be incorporated, and that it is important by having a general understanding of what others throughout the process are doing. This allows for interdisciplinary work to be completed smoothly.

This need is becoming more prevalent because, "changes in public policy, concern about suburban sprawl, and urban under crowding [has] led to new opportunities for site design professionals in cities of all sizes" (Russ, 2000, p. vi). These opportunities are enabling brownfield redevelopment to become "an emerging area of practice, [allowing for] opportunities as the body of knowledge and state of the practice are defined" (Russ, 2000, p. v). This aspect further enforces the need for professionals to understand brownfield redevelopment.

There are numerous reasons that have lead to the focus of brownfield redevelopment. Russ establishes that "the flight to the suburbs and the shift from an urban industrial economy to a suburban service information economy has left many cities with substantial numbers of empty houses, abandoned industrial districts, and block upon vacant block" (Russ, 2000, p. 245). This is one main challenge that planners must face when defining the type and amount of growth a city may handle.

Another issue which has lead to the existence of abandoned land is the "increasing competition and global economic forces [that] have been largely responsible for the redistribution of industrial resources, and the attendant devaluation of environmentally suspect industrial and commercial property. The existing large inventory of such properties has been the unintended consequences of environmental public policy and real estate market responses" (Russ, 2000, p. 1). These properties typically exist as brownfields and "as we begin to recognize the need to live sustainably and to find ways of re-creating the built environment to function more sustainably, the redevelopment of brownfield sites exists as both a problem and an opportunity" (Russ, 2000, p. 28).

For Russ the opportunity is focused on "recovering urban land as a reminder of the harmful and wasteful practices of the past" which will help to encourage better development practices in the future (Russ, 2000, p. 1). Whereas, the problems that exist include overcoming an array of barriers, as well as the lack of interdisciplinary knowledge; this lack has led to the need to identify and define methods and materials needed to make the development easier and better understood. Even though "defining the methods and materials of sustainable site design

and development may be the most significant challenge faced by the design professions over the next 25 year" (Russ, 2000, p. 245). However, this challenge needs to be met and to do so one must "to fully appreciate and assess the work of the environmental professional, the site professional will also need to acquire a working knowledge of the methods and nomenclature" (Russ, 2000, p. vii).

The second book, *Brownfields Redevelopment: Programs and Strategies for Rehabilitating Contaminated Real Estate*, 1998, by Mark Dennison, "serves as a comprehensive guide to the programs and strategies that landowners, prospective purchasers, developers, investors, lenders, municipal government officials, and other parties must understand to carry out successful brownfield cleanup and redevelopment projects" (Dennison, 1998, p. xxi). Recognizing that "over the past several years, more than 30 states have unveiled brownfield programs to encourage productive reuse of abandoned, idle, or underutilized sites that are hampered by actual or suspected contamination." This overview provides easy accessible information to be utilized for understanding how to start and proceed, as well as a general overview of each federal and state program in order to assist those interested in redeveloping contaminated sites.

Dennison claims that, whether real or perceived, "brownfields are often avoided by developers, businesses, lenders, and investors because of the uncertainties regarding environmental contamination. The main reason is that they are reluctant to risk liability for potential costs associated with hazardous waste assessment and cleanup that may be imposed on current owners and operators of the property under the Comprehensive Environmental Response,

Compensation, and Liability Act (CERCLA)—also known as Superfund—and parallel state hazardous waste cleanup laws, even though they did not cause or contribute to the existing contamination of the site" (Dennison, 1998, p. 1). The reluctance to redevelop brownfield sites "has resulted in increased development of suburban greenfield areas, urban sprawl and continuing economic and environmental blight in former industrial and commercial urban areas" (Dennison, 1998, p. 2). In order to lessen this resistance of redeveloping brownfields "various regulatory initiatives have been introduced at the federal and state government levels to reverse this trend and stimulate cleanup and reuse of brownfield sites. These initiatives offer economic opportunities and financial incentives to revitalize urban areas by bringing these abandoned or underutilized industrial and commercial properties back into productive and sustainable use" (Dennison, 1998, p. 2).

The programs Dennison discusses are generally "state programs—called voluntary cleanup programs, brownfield programs, land recycling programs, and similar names—[that] basically offer financial incentives and protection in exchange for voluntary investigation and cleanup of brownfield properties" (Dennison, 1998, p. 45). "Voluntary cleanup programs are particularly popular…because they allow the private parties to initiate cleanups and avoid some of the costs and delays associated with other enforcement-driven programs. Most programs provide technical guidance and oversight in some cases assisting with site assessment and cleanup. Many programs attempt to provide standards on permissible levels of various types of contamination" (Dennison, 1998, p. 46).

Dennison also contends that not only do many states offer incentives and helpful programs, but once the environmental, economical and other risks are resolved "the development of brownfields has certain advantages over other properties. For example, an important advantage of brownfields redevelopment is that most of these sites have a useful infrastructure already in place, including access to markets for labor, materials and final output; access to existing roads, water, sewer, and electric power; and the presence of existing structures. Further, site preparation costs of a brownfield redevelopment project are significantly lower than the costs associated with developing raw land" (Dennison, 1998, p. 141). He also states that although "redevelopment of a brownfield can be an expensive proposition…the potential profits realized from recycling a brownfield site may be greater than those available from the development of a greenfield" (Dennison, 1998, p. 141).

The third book is *Turning Brownfields into Greenbacks: Developing and Financing Environmentally Contaminated Urban Real Estate*, 1998, by Robert Simons. The goal of this book is to present information for professionals to outline the steps involved in developing brownfields and to provide information on how redevelopment is financed. Overall, the focus is more on achieving the best "bottom-line" for the price of development when the site is completed. However, the book does not only discuss good real estate, it also offers insight on remediation learned from completed projects.

Simons states that "most brownfields have not yet been developed because the additional expense of cleanup makes the net price of contaminated urban land (after site cleanup) too expensive in comparison with greenfield properties in the suburbs. This situation is ironic

because many brownfields have excellent "location, location, location"" that are typically within urban cores (Simons, 1998, p. 8). A "study by the US Conference of Mayors reveals 43,000 of brownfields in 16,000 sites among 39 cities surveyed, including about 20 larger cities with populations over 100,000" (Simons, 1998, p. 29). "The most widely cited source of information about the number of brownfield sites is a study by the US General Accounting Office, which estimates that 130,000 to 450,000 contaminated and industrial sites are located in this country" (Simons, 1998, p. 29). However, the survey reported by the US Conferences of Mayors clearly indicates that the number of sites is more likely to be on the high end.

However, even with the high number of sites Simons states that "much progress has been made in understanding issues and problems involving brownfields…in many states, the stage for a substantial increase in the development of large numbers of brownfield sites" (Simons, 1998, p. 81). Simons contends that problems still exist and that "the dilemma boils down to the lack of public information and the need to redistribute risk among the parties…[with assistance and guidance] a developer could revitalize the brownfields that prevent urban areas from achieving their full potential" (Simons, 1998, p. 81).

Currently, there are numerous organizations seeking to educate and assist interested parties in the implementation of brownfield redevelopment. These organizations have published many documents defining brownfields and the way in which they are remediated, as well as case studies which characterize successfully redeveloped sites and provide lessons from the field. These organizations include the Environmental Protection Agency (EPA), Municipal Research and Services Center of Washington (MRSC), Northeast-Midwest Institute, the Urban Land

Institute (ULI), National Brownfield Associations (NBA), the U.S. Conference of Mayors and the Center for Hazardous Substance Research at Kansas State University (CHSR), among others.

Many of these organizations assert that cities have various opportunities to once again grow from within and improve upon their economic, social and environmental state with brownfield redevelopment. According to the Northeast-Midwest Institute, cities are acting upon these opportunities and have experienced many benefits. Generally, "[cities] are redeveloping vacant and underused properties to create walkable … neighborhoods, often built around transit. … evolving into healthy communities featuring strong, resilient economies and stronger social connections within neighborhoods" (Strategies for Successful Infill Development, 2001). In other reports from the Northeast-Midwest Institute "one acre of redeveloped brownfields has been estimated to conserve 4.5 acres of greenfields sprawl development" (Paull, 2008. P. 16). Furthermore, "although there is no comprehensive national data that represents the full breadth of brownfields redevelopment activity, two sources give an indication of the impacts:

- $1.3 billion invested through the EPA Brownfields Program has leveraged 48,238 permanent jobs and $11.3 billion in new investment, as of March, 2008 (Paull, 2008, p. 21).
- The 2007 US Conference of Mayors survey indicates that 150 cities have successfully redeveloped 1,578 brownfields sites. Eighty of the reporting cities also listed permanent job impacts which totaled 115,600 jobs—a rate of approximately 137 jobs per site" (Paull, 2008, p. 21).

Therefore, the acquired research represented by these organizations presents more relevant and recent information regarding the state of brownfield redevelopment. Overall, the organizations researched present a comprehensive plan for brownfield redevelopment and demonstrate progress as more parties are educated about the process.

Wellston, MO

Information regarding the City of Wellston and the area being redeveloped has been obtained through various organizations supporting the development. These organizations include the EPA, the St. Louis County Economic Council, as well as brownfield programs established by the county of St. Louis and the state of Missouri, such as the Missouri Department of Natural Resources. A professional interview was also conducted in order to further address the issues involving the redevelopment of Wellston, MO. This interview was conducted with Beth Noonan of the St. Louis County Economic Council. The questions and answers from these interviews may be found in Appendix A and B.

CHAPTER 3 - Review of Brownfield Redevelopment

"On the Brownfields of yesterday, we will build the green industries of tomorrow."

--George W. Bush

Over the past four decades the inner ring cores in many of America's once finest cities have been drastically declining. This situation is primarily due to economic change and the concept of urban sprawl which may be defined as "low-density development on the edges of cities and towns that is poorly planned, land-consumptive, automobile-dependent, and designed without regard to its surroundings" (Freilich, 1999). Urban sprawl involves city populations deserting the core of the city, moving to the outlying areas that have the absence of industry. The impacts of urban sprawl began to be realized in the 1950s, the causes of urban sprawl began with the development of suburbs as early as the 1920s into the 1950s following World War II. Upon the realization of the negative impacts of sprawl, cities began seeking methods to redevelop their central core. These methods sought to encourage more of the population to settle within the urban core. To develop from the inward as opposed to outward, cities often offer enticements and accessible amenities for the "city-dweller" to use.

Many distressed communities have ready access to land that they may not recognize as prime assets on where amenities may be constructed. These assets include underused buildings and parks; natural features, such as waterfronts; a typical strong employment base; the availability of inexpensive land; and access to public transit (Strategies for Successful Infill Development, 2001, p. 9). Essentially, this land within the urban core may be used as infill

development. Infill development is "the creative recycling of vacant or underutilized lands within cities and suburbs" (Strategies for Successful Infill Development, 2001, p. 3). The key term is that infill is the recycling of land. Therefore, this method of development breaks from traditional models in that it does not promote the development of vacant, open land and / or agricultural land, i.e. greenfields.

The success of infill development may be measured on many different levels. Generally, successful infill development makes cities more livable, and "feels, and functions differently from development that is single use, low density, and dominated by automobiles and highways. It creates neighborhoods and districts that embrace a mix of uses and incomes, where a wide variety of citizens live, work, and play. It serves pedestrians and cyclists as well as autos" (Strategies for Successful Infill Development, 2001, p. 11). Success, however, cannot be measured by the look and feel of the development, but also the level of safety and community that it establishes. In order to encourage successful development cities should forego any single use development proposals in favor of integrated uses, to allow the type of use to support each other.

Many of the prime sites to build integrated uses have typically been previously developed as single use. Often, the previous uses leave hazardous waste and other contaminations on these sites that must be remediated before they can be used again. These sites are typically coined as brownfield sites and are defined by the EPA as abandoned, idle or underused "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" (Dennison, 1998, p. 1).

Depending on the sources brownfields have other definitions as well. One definition, according to Simons, focuses more on a real estate perspective and may be defined as "formerly industrial or commercial site[s] prevented from attaining its highest and best use as a result of perceived or actual environmental contamination" (Simons, 1998, p. 3). Another definition, as defined by the United States Office of Technology Assessment (OTA) is "a site whose redevelopment may be hindered not only by potential contamination, but also by poor location, old or obsolete infrastructure, or other less tangible factors often linked to neighborhood decline" (Davis, 2002, p. 5). Although, some of these definitions are more broad and some more focused, the main characteristics of brownfields is that they are sites, whether or not their previous use was industrial, commercial or even residential, that are avoided for redevelopment due to possible contamination.

Figure 3-1 depicts to what extent brownfields exist today across the Nation. The map is organized into congressional districts.

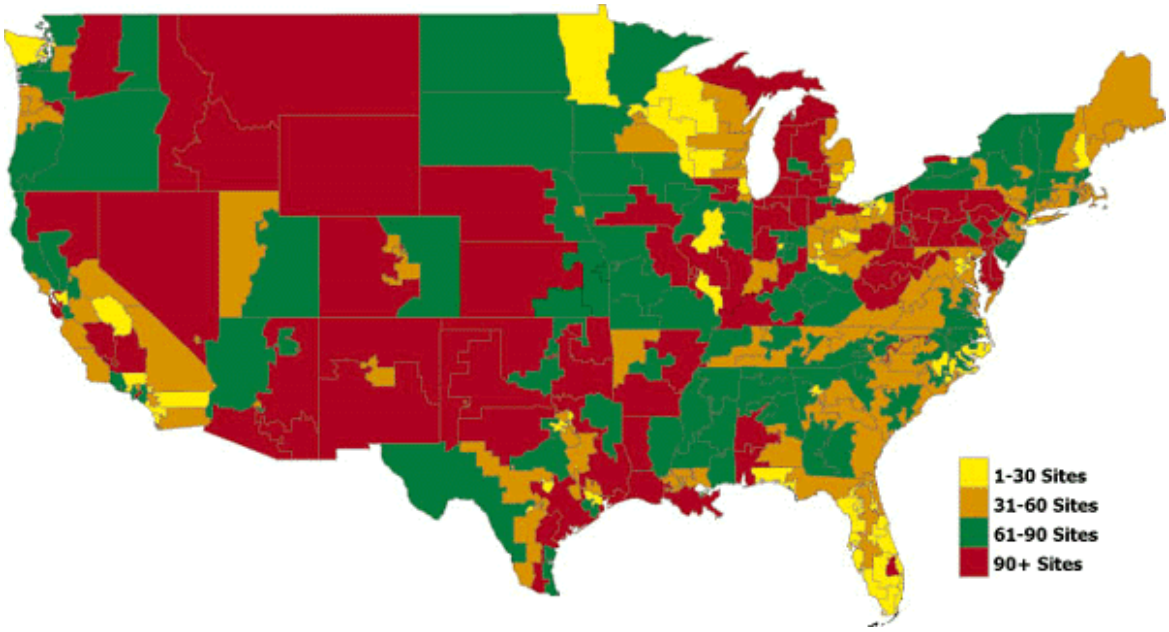

Figure 3- 1 Extent of Brownfields across the Nation

Development of Brownfield Programs

Realizing the numerous benefits that the development of brownfields offers, government at all levels began trying to limit the risks, costs and liabilities associated with the recycling of these sites. Contaminated sites were first considered for beneficial development in the 1970s and 1980s. During this time legislation was passed to regulate polluted industrial sites as well as other laws regarding the cleanup of brownfield sites. These regulations were created through the National Environmental Policy Act (NEPA) signed by President Nixon. This act required a "report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on—(i) the environmental impact of the proposed action, (ii) and adverse environmental effects which cannot be avoided should the proposal be implemented, [and] (iii) alternatives to the action…" (Russ, 2000, p. 8). Overall, the NEPA established the way in which the government and private sector conduct business, requiring an environmental impact statement.

In 1980, with many issues and difficulties present regarding constrained regulations, Congress enacted the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), also known as the Superfund that mandated the cleanup of brownfield sites. This act also established a system ranking the sites on a CERCLA system list (CERCLIS), which is discussed later in this chapter.

Overall, CERCLA defines who is responsible for cleanup, including current owners, prior owners, generators of the hazardous substances, and the transporters who brought the substances to the site, regardless of fault. Those responsible are "liable for cleanup costs incurred by the

government and / or other persons, damage to the environment, and costs of health assessments" (Russ, 2000, p. 9). Besides an act of God or war, the only way to avoid liability on a brownfield site is to prove to be an innocent landowner. An innocent landowner is a "property owner who can demonstrate that he or she acquired the property by no action of his or her own (for example, if he or she inherited the property) or that, at the time of purchase, he or she exercised "good commercial or customary practice" in investigating the property before purchase" (Russ, 2000, p. 10).

In 1986 Congress passed needed changes to CERCLA in the Superfund Amendments and Reauthorization Act (SARA) that includes increased funding for Superfund cleanups. It also established the Worker Right-To-Know and the Emergency Planning and Community Right-To-Know. The Worker Right-To-Know Act defined OSHA standards for the protection of workers on the cleanup sites. The Emergency Planning and Community Right-To-Know Act required state and local officials to establish an emergency response plan (Russ, 2000, p. 16).

During the current era of brownfield reclamation the EPA has offered guidance in hopes to further assist and encourage development. In 1989 guidance was released pertaining to the agreements with prospective purchasers of contaminated sites. This guidance was greatly beneficial to the agency, but did not assist in lifting any liability from the owner. In 1995 the EPA established the Brownfields Program and provided a results oriented program to assist states, communities and other stakeholders in the technical and financial stages of redevelopment. With the amended requirements of the purchaser agreement now in place, the

benefits of the community are now considered over the benefits to the EPA. This action helped to lessen the liability of the owner.

However, even with regulations and guidance from the EPA, issues and difficulties still impeded the development of contaminated sites. This caused many state and local governments to establish their own programs, in order to remove regulatory barriers and provide predictable cleanup standards. These programs initiated by state and local governments are commonly known as voluntary cleanup programs; they include voluntary cleanup funds, grant programs, tax breaks, and other economic incentives. Generally, these programs offer liability protection and financial assistance when owners pursue voluntary investigation and cleanup. "Voluntary cleanup programs are particularly popular—at least with private parties—because they allow the private parties to initiate cleanups and avoid some of the costs and delays associated with other enforcement-driven programs" (Dennison, 1998, p. 45). The most common elements that are present in most state and local programs include the following:

- Relief from environmental liability from others actions
- Predictable / clearer cleanup standards
- Permissible levels of various types of contamination
- Protection from lenders
- Public participation in the review process
- Protection from third-party lawsuits
- Technical guidance and oversight
- Consideration of future land use applications

Realizing the need and most importantly the opportunity to redevelop brownfield sites it may be seen that the federal government responded with legislation and regulations. These actions lead to widely accepted assistance and incentive programs, provided by state and local entities. Still, in 2003, in an attempt to establish federal authority, Congress enacted brownfield legislation, regarding liability. The legislation was to provide resources on environmental assessment and remediation, while also leading developers to the established state and local programs (U.S. Conference of Mayors, 2008, p. 8). Therefore, with the acceptance of brownfield programs on different government levels it is necessary to establish the importance of redeveloping brownfield sites, enforcing why the government chooses to support these programs.

Importance of Brownfield Development

"Cleaning up and redeveloping brownfields is a win for our environment and our economy, and I strongly believe that it is our duty to be better stewards of our environment—for the sake of our own health and the natural legacy that we will pass along to future generations."

--Senator Hillary Clinton

Brownfield development is crucial in supplementing the progress of sustainable development and revitalizing the core of many of the Nation's cities. It is a foregone conclusion that brownfield redevelopment is a viable option to improving the natural and man-made environment. According to a source by the U.S. Conference of Mayors, of over 200 cities responding, there were a total of 24,896 sites located within these cities. On average these sites

are 13.92 acres in size (U.S. Conference of Mayors, 2008, p. 8). One-third of these cities have a population of less than 50,000, indicating that a large amount of land, even in smaller cities, is affected by contamination. Therefore, with the realization of the importance and benefits of development, cities are more likely to pursue that option. Table 3-1 shows the main reasons why cities seek the redevelopment of brownfields.

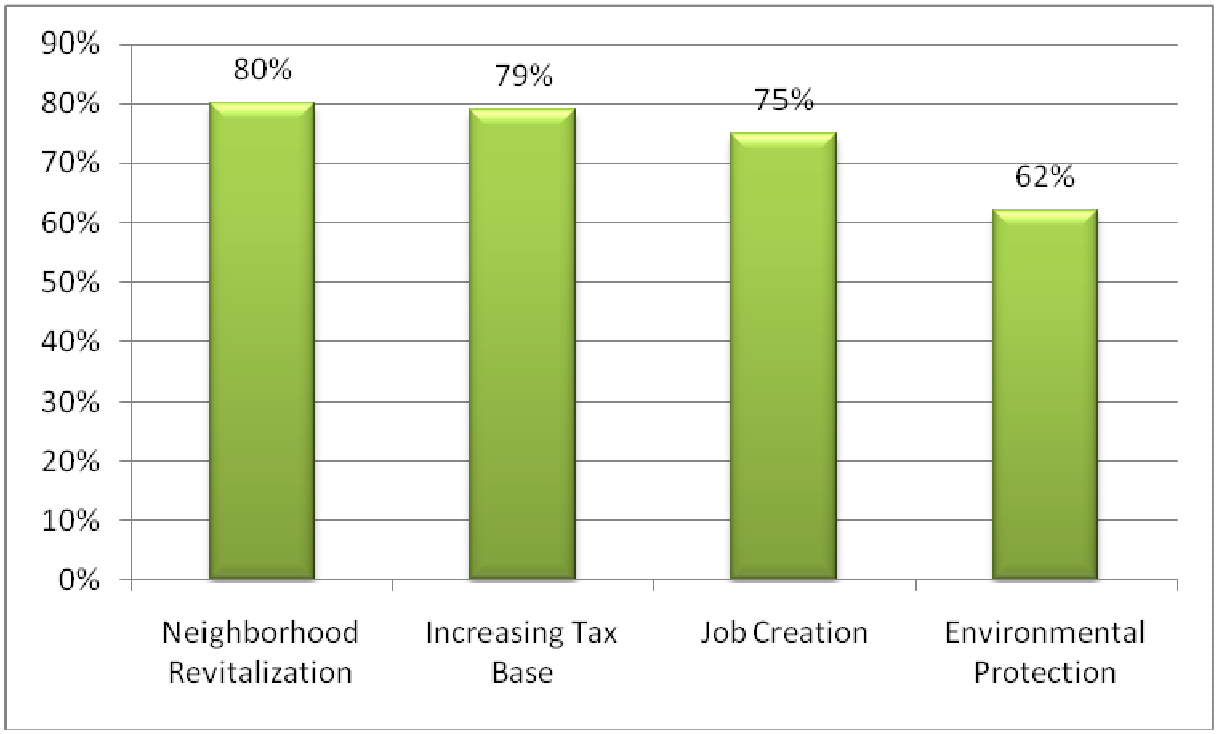

Table 3- 1 Reasons for Brownfield Redevelopment

The first main benefit of redeveloping brownfield sites is that they are typically located in blighted areas that are eyesores in most cities. Generally, unless redevelopment takes place, the potential of the area is not realized. Therefore, through development within a city, as opposed to the development of a greenfield site, cities can boost their economic prosperity, social equity and environmental quality. Once redeveloped, cities may bring to fruition the full potential of the

existing assets of the area. This includes access to major transit networks, waterfronts, historic neighborhoods, parks, employment, and adequate infrastructure, among other benefits.

The second reason that brownfields should be developed involves the large sum of money that the undeveloped land costs cities each year. It is estimated to remediate all 450,000 of the suspected brownfield sites in the nation would cost $650 billion and on average $32 million per site. However, each year of their existence in their current state costs cities an average of $121 - $386 million. The amount is this costly because abandoned brownfields contribute to a decrease in economic development potential, job creation, tax revenue and lost wages within cities (Davis, 2002, p. 6). Therefore, although remediation is expensive, it is more beneficial for cities to pay the costs to redevelop for obvious economic conditions.

The third benefit involves increased job creation for the area. These jobs are created during development, as well as post development. According to the survey conducted by the U.S. Conference of Mayors, of 106 cities 19,338 new jobs were created. On average, it is estimated that 80-100 permanent jobs are created per redevelopment site (Paull, 2008, p. 15).

The fourth benefit of developing brownfield sites is that it reduces greenfield development, slowing the progress of urban sprawl, by enabling brownfields to become productive pieces of land. By one estimate, for every one acre of redeveloped brownfields, we save 4.5 acres of open space (Paull, 2008, p. 16). This method allows for the reinvestment of blighted land and leaves open virgin land untouched, improving the environment in one area and protecting it in another.

Finally, brownfields contain contaminants that will continue to impact the environment and people's health, unless action is taken towards remediation. This contamination, which is not always contained to the initial site, might also begin to contaminate adjacent sites. Therefore, as sites are remediated the environment is improved and this impacts the health, safety and welfare of the surrounding area in a positive manner. Remediation also improves other environmental issues, especially when green development strategies are implemented. "By employing green development strategies when constructing new buildings and roads, retrofitting existing buildings, and promoting sustainable redevelopment of brownfields … we can reduce energy use, conserve potable water, increase recycling, diverse use of raw materials, preserve natural systems, improve indoor air quality, and reduce greenhouse gas emissions" (Removing Market Barriers to Green Development, 2001, p. 8). Health care costs might also be prevented with remediation of contaminations because fewer health issues should arise with uncontaminated sites.

Types of Brownfield Sites

There are numerous types of contaminated sites that have been identified. These sites typically are located in urban areas and include such things as underground storage tanks from gas stations, chemical manufacturing and other industrial uses. Even old dry cleaners, where chemicals have leaked into the ground subsurface, are considered to be brownfields. However, urban areas are not the only areas in which brownfields exist. They also exist within rural areas, such as contaminated agricultural land, due to the use of pesticides, and landfills, due to the release of methane gas and other contaminates. Military installations are also a source of

contamination, leaving brownfield sites on range impact areas, in generally rural areas. Another unsuspected brownfield site is demolished homes. These homes have typically been demolished in one swipe, leaving trash, and debris, such as insulation and sheetrock, in the ground. These materials often contaminate the ground with lead and asbestos. The sites adjacent to brownfields are also considered to be contaminated due to off-site effects, such as drainage and underground seepage (Simons, 1998, p. 3).

Due to the wide range of brownfields, the sites have been categorized into different classification. The classification defines such issues as their need for remediation; type of contamination, type of remediation needed, as well as the likelihood the land will be redeveloped. The following list categorizes the potential classification under which brownfield sites might fall:

National Priorities List Sites (NPL): The EPA classifies brownfields into three different tiers. These sites have known or threatened releases of hazardous waste, pollutants, or contamination. The three tiers are:

Superfund Sites: The highest tier in the database is comprised of sites with a high concentration of hazardous waste, also known as Superfund. They are typically uncontrolled or abandoned and entail perceived public health problems, excessive cleanup costs, long remediation time frames, and strict liability. Therefore, sites listed on the Superfund list are typically avoided by developers.

There are three ways for sites to be listed on the NPL; the site must meet one of the following criteria:

1. EPA's hazard ranking system
2. Designation by state of a top priority to list the site
3. Meets all of the following requirements:
    a. Health advisory issued by the Agency for Toxic Substances and Disease Registry
    b. Poses significant threat to public health
    c. EPA determines it to be more cost-effective to use its remedial authority available to NPL sites, as opposed to it emergency removal authority (Simons, 1998, p. 31).

CERCLIS Sites: Comprehensive Environmental Response, Compensation and Liability Sites are candidates for future Superfund sites and are supervised by the EPA. These sites, through further investigation, will move up to the Superfund tier or down to the lowest tier. Due to their pending classification, these sites are typically of little interest to developers because it has not been determined whether they will move to the Superfund list or the lower tier, which greatly affects the extent of remediation. The investigation of these sites involves evaluating actual or perceived negative effects of the contamination. A preliminary site assessment is completed first and then if needed samples are

taken from the site for further review, to determine if the site will be classified as a Superfund.

No Further Remedial Action Plan (NFRAP): The lowest tier on the NPL includes sites that have been removed from the CERCLIS list when they are no longer in consideration for Superfund sites. These sites have no further action planned and are typically larger sites that have a low potential of being redeveloped, due to market factors such as location.

Federal Facilities Restoration and Reuse Sites: These are hazardous waste sites located on military installations that have closed, or will be closed in the near future. Most sites are located where testing and practice of military vehicles and weapons took place, such as range impact areas, also known as unexploded ordinance areas. The number of these sites have increased in the past couple decades due to the recent downsizing and realignment of the military; they offer many opportunities due to their location, size and access to infrastructure.

Leaking Underground Storage Tanks (LUST): States typically voluntarily track and improve sites that utilize underground storage tanks, whether or not leaks are present. These sites are considered good for development, due to lessened financial/environmental barriers and more extensive government involvement. They are also typically better located within cities, such as local gas stations, due to a more central location along major thoroughfares.

Solid Waste Facilities: These sites include landfills, hazardous waste disposal sites, construction debris disposal sites and resource recovery sites for recycling. Since these sites are typically large, over ten acres, they are likely to be of interest to developers (Simons, 1998, p. 30-33). However, due to materials on-site there are numerous issues to consider and include the extent of time one must wait to be allowed to develop on these sites, such as landfills. One other major consideration is the extent of materials that will need to be moved from the site or avoided on the site.

Types of Redevelopment Uses

Generally, the redevelopment of brownfield sites is pursued and completed in order to increase a city's tax base, revitalize the area, create jobs and improve environmental conditions. As previously stated, they were typically used for industrial or commercial activity. In terms of development potential cities typically look at the current state of the site and what is needed to improve the development area. From this analysis sites are typically redeveloped with the land-use that will bring in the largest tax-revenue. Therefore, according to the U.S. Mayors Conference, sites are typically redeveloped as retail uses. Table 3-2 provides information on the number of each use brownfield sites have been developed as thus far.

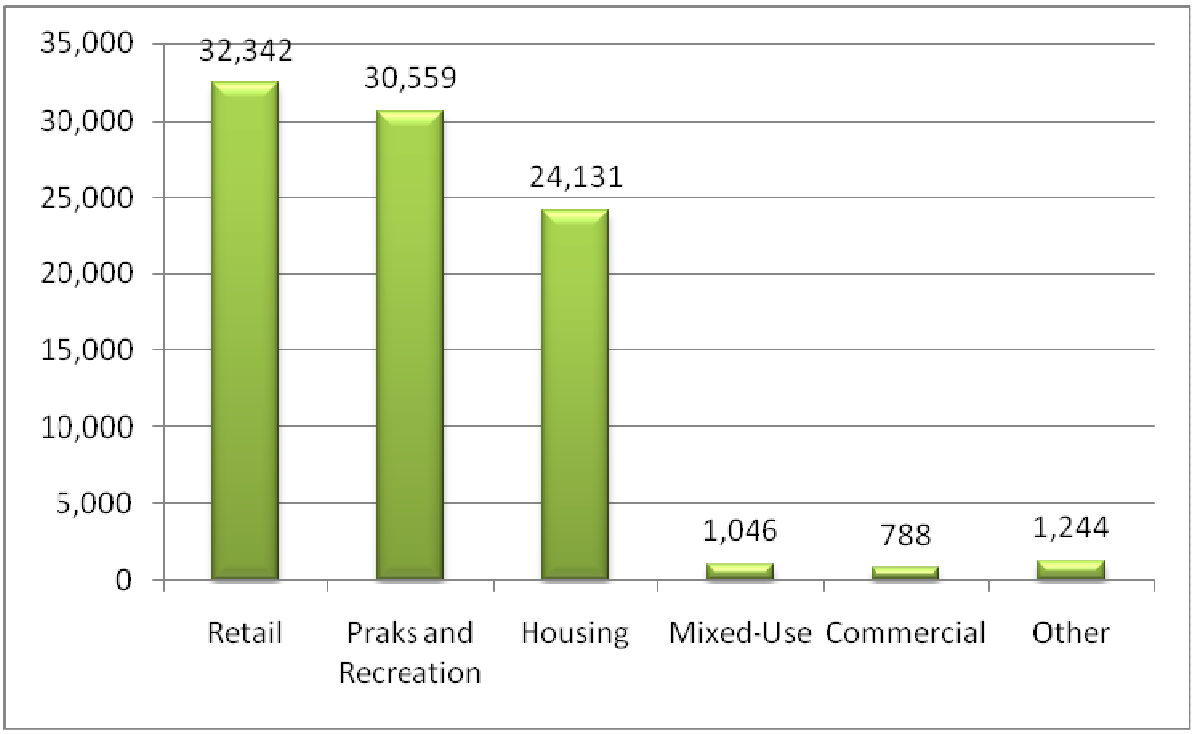

Table 3- 2 Types of Redevelopment Uses

Barriers to Redevelopment

"In large part, the frustration of … officials stems from the ambiguity surrounding brownfields."

--Toss S. Davis

Currently, there are approximately 450,000 brownfield sites across the nation, which are available for development. However, these sites are not redeveloped as quickly or consistently as greenfield sites, due to an array of barriers that come about as a result of CERCLA and its associated liability on each polluted site. Unfortunately, this results in many public and private entities building on greenfields. This action removes development from the urban core,

mitigating the potential of investment within the city. These barriers are based on experience and represent "lessons learned" from the field. Many of which make brownfield redevelopment unique compared to other typical development options.

According to the U.S. Conference of Mayors, the following graph (Table 3-3) depicts the main barriers reported by cities for the year 2007.

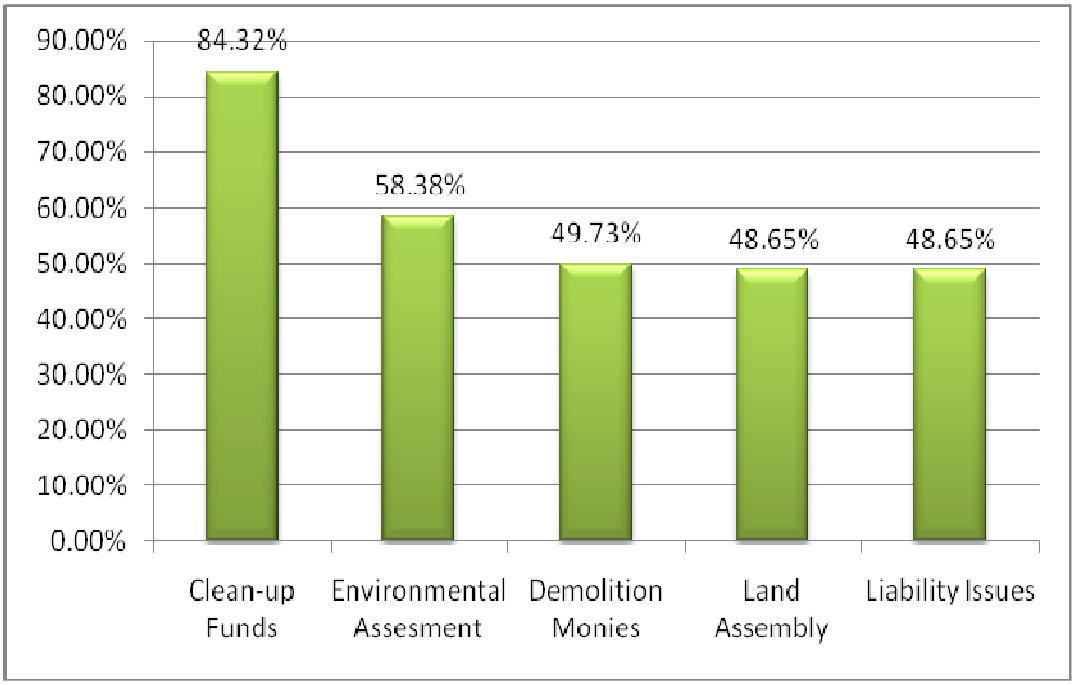

Table 3- 3 Main Barriers to Redevelopment

Financial Barriers: Financing is typically hard to achieve because bankers are not willing to back developers due to the extent of liability and high risks associated with remediation. According to the U.S. Conference of Mayors survey, funding for cleanup ranks as the top impediment to the redevelopment of brownfields (Paull, 2008, p. 10). Bankers will also admit that many loans are delayed due to environmental liabilities, and

the potential risks of foreclosure. They do not want to loan money to a developer without 'hard' figures, which is impossible to know until the site is examined, which can only take place with financial backing.

Another aspect concerning financial barriers is the relationship of public-private partnerships. Generally, many redevelopment efforts require these types of partnerships to establish more credible stakeholders. However, these relationships might prove to be troublesome, depending on how the entities work together. It is important to institute a 'smooth' working relationship to avoid excess, unneeded conflict.

Cleanup Standards / Environmental Assessment: Each site must implement tailored remedial approaches according to its desired end use. However, in some cases different standards are required from site to site, due to different regulations. Cleanup standards are also dependent upon the intended use of the site. These different standards and requirements make it difficult to apply consistent standards from site to site. This confusion requires developers and cities to constantly research the required standards.

Environmental Liability Concerns: Sellers and buyers alike try to avoid brownfield sites due to the numerous legal issues that are intertwined within the development process. The main complaint surrounding legal issues is that the funds exhausted within the legality realm would be better utilized in actually cleaning up the site. Meaning that legality is too expensive, paying for lawyers, documents, permits, insurance, etc. This

financing would be better if invested back into the site. Furthermore, developers are not willing to purchase land that they will have to cleanup when they are not at fault.

Competition from Greenfields: Greenfield development typically offers incentives for developers, although they are typically more costly for cities (Davis, 2002, p. 13). Therefore, even more incentives need to be applied to the redevelopment of brownfields, to avoid the duplication of infrastructure and the support of urban sprawl. According to the U.S. Conference of Mayors, many cities claim that more resources are needed to assist with the planning process, job development and training, loan guarantees and infrastructure upgrades, among others (U.S. Conference of Mayors, 2008, p. 11). This action would make brownfield development more desirable than greenfield development.

Public Opposition: The "true-voice" of the community is generally hard to define. Therefore, even through the redevelopment will improve the community, there are always those that oppose site specific development. In order to get the most out of the redevelopment process it is crucial to have community involvement, although most the time that is easier said than done. In this case the public is characterized as the citizen's of the community. However, it is important to note that community might also pertain to the major stakeholders that work within the city, the "movers and shakers." The "voice" from this party may also greatly influence the development, and may potentially outweigh the citizen views. Both opinions and views are important and should be considered.

The above issues will most likely be present in every redevelopment process. Fortunately, as the federal and state governments realize the present opportunities that brownfields offer, the previously discussed programs are being established and refined to help mitigate these barriers. With the above issues in mind, and an understanding of the possible barriers, the steps to remediation may take place.

Brownfield Remediation

Steps to Remediation

The process of remediation is in-depth and very site specific. Therefore, there is not one set way that remediation should take place. The model process to brownfield redevelopment is very prescriptive and somewhat lengthy (Appendix C). Therefore, it is important to understand the general steps that are present in every redevelopment project. The first step involves the investigation of the history of the site, observing the site at large. Then, the final step considers the individual conditions of the site on a more microscopic level. "This approach provides a rational, efficient use of financial and professional resources" (Russ, 2000, p. 29). These general steps are as follows:

Site Identification: To develop a brownfield site, available sites must first be identified. Typically state and local governments have lists in order to easily find available sites. Initial site identification generally requires a low initial capital cost and low level

financing. The location of this site should have adequate infrastructure and meet the functional needs of the new development (Dennison, 1998, p. 142).

Site Assessment: The most common method used in professional practice of environmental site assessment is the American Society for Testing and Materials (ASTM) Practice for Environmental Assessment Process. Its main purpose is to identify standards and protocols. The key standards applied by the ASTM committee in concern for brownfields are as follows:

- E-1527, Practice for Environmental Site Assessments (ESA) Phase I Environmental Site Assessment Process
- E-1528, Practice for ESA Transaction Screen Process
- E-1903, Standard Guide for Phase II Environmental Site Assessments
- D-5746, Classification of Environmental Condition of Property Area Types
- D-1739, Standard for Risk-Based Corrective Action at Petroleum Release Sites
- PS 104-98, Guide for Risk-based Corrective Action (Russ, 2000, p. 30).

These standards do not require exhaustive investigation of the site. There are two phases to be completed in the environmental assessment process.

Phase I—Initial Investigation: This step is designed to assess the likelihood that hazardous substances may be present on the property, resulting in future liability (Dennison, 1998, p. 143). Therefore, Phase I is limited to visual observation, review of historical current and historical records, interviews with knowledgeable

parties and a report that reflects what was found in the Environmental Site Assessment. The purpose is to define any recognized environmental conditions that are actual or perceived. The process is not as extensive and costly as Phase II (Russ, 2000, p. 31).

Phase II—Detailed Investigation: Further investigation is taken if Phase 1 uncovers potential contamination. This phase entails the collection and analysis of samples taken from the site. This method is meant to determine the presence and the extent of the contamination and to define its horizontal and vertical limits. Sampling is taken in rounds, with each subsequent sample providing more information, which is used to determine the remediation process. At this point it may be found that redevelopment is outweighed by the cost of cleanup, or additional financing may be needed (Russ, 2000, p. 29).

Economic Assessment / Feasibility Study: This type of assessment is important to accurately determine the relationship between the project and the risks. Some sites may be more viable for redevelopment than others, therefore, the invested return and risk varies from site to site. Also, financial feasibility studies must be completed to ensure financing for cleanup and redevelopment before the start of remediation. Lenders are mainly concerned with protecting their investment, avoiding environmental liability, ensuring the value of the property and mediation. Therefore, the price is two-fold, pertaining to what the price would be without contamination and what the actual price is with clean up costs considered (Russ, 2000, p. 59).

Remedial Design Planning and Execution: During this phase parties involved in the remediation must develop a cleanup plan. "The redevelopment strategy is the response method for implementing the proposed redevelopment while addressing the cleanup or mitigation requirements and addressing the site constraints" (Russ, 2000, p. 79). This phase entails high capital costs due to site remediation, public notice requirements and preparation of reports for regulators (Dennison, 1998, p. 147). Within this step the needed level of remediation is considered, contingent upon the amount or remediation needed to support what the community wants developed and what the developer proposes.

Redevelopment of Site: The final stage in redeveloping brownfields involves construction and development of the uncontaminated property (Dennison, 1998, p. 148). Throughout the redevelopment process, the order of the activities may vary. Also, due to the individual qualities of every site, each step might be emphasized differently from project to project.

Types of Contamination

It is estimated that there are over 70,000 artificial chemicals used and found in the environment (Russ, 2000, p. 50). These chemicals are both naturally and artificially made. According to the Agency for Toxic Substances and Disease Registry there are certain hazardous substances listed in a top 20 list (Table 3-4). This list represents the main chemicals associated with brownfields.

	SUBSTANCE	TYPE
1	Arsenic	Metal
2	Lead	Metal
3	Mercury / Metallic	Metal
4	Vinyl Chloride	SVOC
5	Benzene	VOC
6	Polychlorinated biphenyl	PCB
7	Cadmium	Metal
8	Benzo(a)pyrene	SVOC
9	Benzo(b)flouranthene	SVOC
10	Polycyclic aromatic hydrocarbon	PAH
11	Chloroform	VOC
12	Aroclor 1254	PCB
13	DDT	Pesticide
14	Aroclor 1260	PCB
15	Trichloroethylene	VOC
16	Chromium (+6)	Metal
17	Dibenz(a,h)anthracene	SVOC
18	Dieldrin	Pesticide
19	Hexachlorobutadiene	SVOC
20	Chlordane	Pesticide

Table 3- 4 Main Types of Contamination

These chemicals may be arranged into six different groups: metal, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), and pesticides (Russ, 2000, p. 51).

Metals occur naturally in nature; however, they do not exist in as high and refined concentrations. There are many health problems associated with exposure to metal contaminants

including brain and kidney damage. Exposure may occur through breathing and / or absorbed through the skin (Russ, 2000, p. 52).

VOCs may be found naturally or artificially. A main type of VOC is Benzene, which occurs naturally as a byproduct of burning, especially in factories and at gas stations. As with metals, exposure is typically by breathing and skin absorption. The level of health risk is associated with the amount of exposure time. The health problems include cancer, immune deficiencies, dizziness, headaches and even death (Russ, 2000, p. 53).

Another prominent VOC is Trichloroethylene, which occurs artificially in solvents, adhesives, and correction fluid. This too has major health impacts including kidney, liver, and lung damage. The extent of exposure also correlates with the level of health impact, low exposure may cause headaches, dizziness and irritation of the eye, nose and throat, whereas, a higher level of exposure may cause loss of consciousness and death (Russ, 2000, p. 53).

SVOCs typically exist in contaminated water and may be breathed or ingested in to the body system. These contaminants represent a large range of chemicals as well as a range of toxicity factors. SVOCs are associated with many health issues and may cause liver and lung damage and thickening of skin (Russ, 2000, p. 54).

PCBs occur artificially through commercial production, coolants and lubricants and other electrical equipment. Since 1977 PCBs have not been manufactured due to the assumed health effects. Due to this ban exposure generally occurs through residual materials, spills or leaking

equipment. They are believed to be a form of carcinogens, and the full breadth of health impacts is uncertain.

PAHs occur naturally and artificially and are byproducts of incomplete combustion or degradation of organic substances. Typically, high concentrations of PAHs are due to gas and oil use, such as in asphalt plants and even sites of fires. Exposure may occur through breathing, ingestion or skin absorption. They may be carcinogenic and are stored in fat, kidneys, and the liver for only a few days.

The final chemical is pesticides. Pesticides are used throughout the environment and are known to have many negative ecological as well as health effects. Exposure to higher levels may cause nerve damage and death. They also may be carcinogens, causing known tumors in the people who use them, such as farmers.

Types of Remediation

The main goal when redeveloping brownfields is to complete the process in a cost-effective manner. Therefore, there are many different practices used in the mediation of contaminated sites. The method chosen is dependent upon the type and amount / level of contamination that exists on the site. There are a range of possible remediation strategies that one may pursue, including the following:

- No action required, or do nothing—It is sometimes found, through investigation, that the amount of contamination is so low that any form of remediation is not required (Russ, 2000, p. 80).
- Avoidance—In some cases, where there is only small areas of contamination, these areas may be left undisturbed, requiring no mitigation (Russ, 2000, p. 81).
- Administrative controls—Controls may be placed on the site by including specific uses for the site in the deed. This requires a low cost and may be seen as a temporary strategy, to allow for remediation in the future, when the site is more desirable (Russ, 2000, p. 81). Another method of administrative control is to simply fence off the contaminated site, until development is completed in the future.
- Design controls—These controls are site element designed to reduce exposure to contamination or provide passive treatment (Russ, 2000, p. 81).
- On-site remediation
- Off-site remediation

On-site and off-site remediation involves using technological strategies for treatment. On-site involves treatment in-situ, requiring no hauling and transportation costs. Also, liability is reduced because contamination is not moved across public streets and placed elsewhere. Off-site remediation is completed ex-situ; therefore it tends to be more expensive due to hauling costs, disposing of hazardous materials on another site, and risk of off-site exposure during transport. The types of remediation are listed in Table 3-5. Provided is a description of the method as well as a comment concerning the cost.

TYPE	DESCRIPTION	COMMENTS
Haul / Bury	This action is widely practiced, when legally permitted. It involves hauling and burying contaminated soil and debris at construction dumps and low-level waste dumps.	Involves high costs, due to sorting of previously buried materials.
No Treatment	Low contamination should not be treated when under mandated levels.	Useful for low levels of contamination, very cost-effective.
Removal of Hot Spots	Removal of hot spots, with spots below mandated level left untreated or treated on-site.	Good cost minimizing strategy.
Selective On-site Burial	Concentration and burial of highly contaminated materials on site. Areas where contamination are moved may be used, whereas places of burial may only be used for limited use, such as roadways and landscape sites.	Low cost due to no need to haul and bury elsewhere.
Encapsulation	This method is used to completely cover asbestos in buildings. The surface may be paved, with limited use, such as parking areas. Should not be utilized when soil is contaminated with VOCs.	Low to moderate costs, as well as moderate risks.
Partial Encapsulation (capping)	Process involves removing partial contamination and covering the remaining under clay and building structures or plastic barrier.	This solution is not accepted in all cases. May not be a permanent solution.
Absorption	This method involves adding absorbent materials (hay, sawdust, cement, kiln dust, etc) to the soil. The material then acts as a sponge, absorbing the contamination.	Low to moderate costs, depending on price of absorbent materials.

Table 3- 5 Main Types of Remediation

TYPE	DESCRIPTION	COMMENTS
Biological Treatment/ Bioremediation	Biodegradation breaks down contamination without removing from the site, through the addition of microbes to the site. If implemeneted field conditions (pH level, temperature, etc) must be monitored extensively.	Moderate to high costs, including lab expenses, field testing, sampling, monitoring and microbes.
Soil Washing / Steam Stripping	VOCs and SVOCs at low concentrations may be removed by the flushing or injection of steam into the polluted areas, removing the organic contaminants.	Low to moderate costs, including sampling costs and equipment.
Soil Vapor Extraction	This method removes VOCs that have been undisturbed, by injecting air into the ground, transferring the contaminants from the ground to the air.	Moderate costs, including sampling and monitoring costs. Collected contamination must be treated and disposed of properly.
Air Stripping	Removal of VOCs from groundwater. Suited for low concentrations of VOCs. Water from contaminated area is pumped into the top of a plastic object, moving air to the bottom, while VOCs adhere to the plastic bag.	Involves high costs, design and assessment must be completed case by case.
Pump and Treat	This process involves pumping pollutants to one area and collecting them in groundwater for future treatment.	High costs and uncertain length of treatment, with frequent monitoring.
Land Treatment / Land Farming	Applying uncontaminated soils to contaminated soils and mixing them on the subsurface. This action naturally degrades and immobilizes the contamination.	Moderate costs, including costs of new soil, sampling and monitoring.

Table 3- 5 Main Types of Remediation

TYPE	DESCRIPTION	COMMENTS
Laser Separation	Separates chemical and radioactive contaminants from bulk metals and surface sources. A pulsed laser beam removes the polluted layer of the metal, while high-efficiency particulate air filters capture and remove particles and stop them from settling on cleaned areas.	Very high costs, due to level of technology.
Incineration	Burning substances on or off site.	Unpopular, due to travelling ash.
Phytoremediation	Use of plants to absorb or bio stabilize contaminants within the plant tissues in soil, sediments and water.	Cost is dependent on plant material required.

Table 3- 5 Main Types of Remediation

The above list is not an exhaustive list of remediation options; technology is constantly improving and offering more innovative and advanced way to remediate. However, these are the main / typical methods pursued by developers.

CHAPTER 4 - Case Study of Wellston, MO

In order to analyze the revitalization development in Wellston, MO it is important to discuss, in brief, the history of the city and the specific sites. Wellston is located in St. Louis County along the northwest border of the City of St. Louis, MO (Figure 4-1). Its location serves as an important asset, due to its direct access to the City of St. Louis, along St. Charles Rock

Figure 4- 1 Location of Wellston, MO

Road / Martin Luther King Boulevard and Page Avenue. The City covers an area of 0.9 square miles, all of it land (United States Census Bureau, 2000).

The City of Wellston was incorporated in 1909 as a suburb, serving as an industrial corridor to St. Louis. Unfortunately in 1912, due to 'government difficulties' the city was dissolved, only to be reestablished in 1949 (Levy, 2008). According to the 2000 census, the

population of Wellston was 2,460 persons, with an average density of 1,067 persons per half square mile. The City is mainly comprised of African-Americans, which make up 92.07% of the population. The City, as of 2000, was ranked one of the ten poorest cities in the state of Missouri, with a 46 percent poverty rate and a 22 percent unemployment rate. The median household income was $18,596, leaving about 60% of the population below the poverty line (United States Census Bureau, 2000). The states household income and poverty level was $37,934 and 11.7 percent and the nations was $41,994 and 12.4 percent respectively. These measures are drastically different from the circumstances in Wellston.

During the time of the early 1900s St. Louis and the surrounding area began establishing factories in the electrical industry such as the Emerson Electric, Century Electric and Wagner Electric Manufacturing Company. The Wagner Electric Company began development along Plymouth Avenue in Wellston, and soon occupied the entire block (Figure 4-2). The company's main product was small motors for appliances and transformers, serving local and national markets. Due to an increase in war production, the Wagner Plant acted as a major employer across the area, providing 4,500 jobs during World War I (Feurer, 2006).

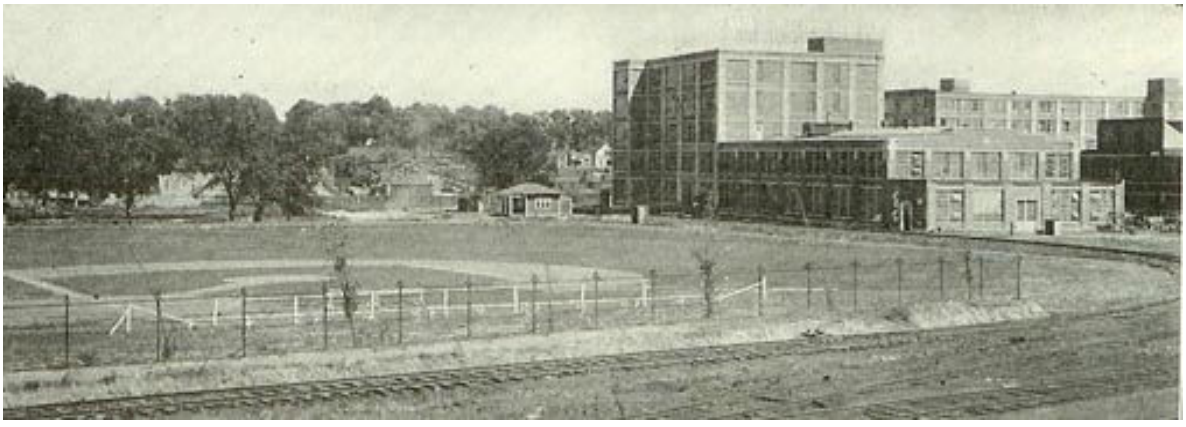

Figure 4- 2 Wagner Electric Company

The site north of the Wagner Electric Company was also developed at this time. This site acted as a secondary steel foundry for the ABEX Corporation. The establishment opened in 1923 providing numerous jobs for Wellston and the surrounding area.

With the numerous industrial plants as anchors, the City was reestablished in 1949 as a vibrant neighborhood, offering many amenities. These amenities included theaters, a hardware store, dance hall, and a variety of numerous retail stores for the community to utilize. Unfortunately, since the 1970s, these amenities have deteriorated. Figure 4-3 and 4-4 depict the hardware store in 1952 and the building of the old hardware store now. It is apparent, through these pictures, that over the past decades, the town has suffered greatly due to numerous economic and social hardships.

Figure 4- 3 Wellston Hardware Store, 1952

Figure 4- 4 Wellston Hardware Store, 2000s

Difficult times began in Wellston in the 1970s. These difficulties, such as the mass exodus of population and struggling economy led to the closing of Wellston's main employers in the 1980s. First, in 1982 the ABEX Corporation stopped operation, closing shop to move elsewhere. Then the Wagner Electric Company closed its doors in 1983. Acting as major employers for the City, much of the population deserted the City upon the closing of these facilities. This action left much of the City abandoned leading to a sixty percent decrease in population since its establishment in 1949.

During the 1950s and 1960s the population remained around 8,000, dropping to around 7,000 in 1970. This decrease was due to people moving to South and West St. Louis County and even St. Charles County, where better value in housing, jobs and other amenities could be found at a lower cost. In two decades the population nearly decreased by half, going from 7,979 in

1960 to 4,495 in 1980. Since then, the population has continued to drop by around 1,000 persons per decade. In 1990 the population was 3,612 and in 2000 the population was 2,460. The decreases in population have contributed to a distressed city, with an increase in crime, vandalism, poverty and further deterioration.

The Need for Revitalization

Since the mid 1990s there has been an increased interest in revitalizing the City of Wellston. First, in 1993 the county of St. Louis constructed a light rail transit system that had access throughout the county, known as the MetroLink. To much surprise, it was realized that ridership of this system greatly surpassed the expectations, with over 40,000 daily passengers across the county. Fortunately, stops were established in 'forgotten' area's and troubled neighborhoods of the county, bringing with it a new hope for life (Alschuer, 1997). One such stop (Figure 4-5) was established in Wellston along Plymouth Avenue, across from the site of the abandoned Wagner Electric Company.

Figure 4- 5 Wellston Metrolink Station

Second, realizing the success of the MetroLink system, the Urban Land Institute (ULI) conducted studies and provided recommendations to the county of St. Louis regarding the potential of the stations located in transitional neighborhoods, including Wellston. In regards to the Wellston station, the ULI panel "sought out a critical mass of private and public investment that would justify area improvements essential to successful economic development" (Alschuer, 1997). According to ULI's recommendations, Wellston was a prime area for the development of a high technology education center. The initial suggestion by ULI proposed 825,000 square feet of light industrial with 20,000 square feet of retail space and 50 homes as infill development, all encompassing the Wellston Technology Park.

The Wellston Technology Park was proposed to be an extension of a project already underway, the Plymouth Industrial Park. The Plymouth Industrial Park was under development on the old site of the Wagner Electric Company. The original redevelopment on this site was 24 acres and with the addition of the Wellston Technology Park, was expanded to nearly 100 acres. The 100 acres included the old Wagner Electric Company, the ABEX Corporation foundry as well as an abandoned residential area adjacent to the ABEX site. Overall, ULI recommended that the City take advantage of the access to the MetroLink station and create new and improved connections to the surrounding serviceable area, essentially developing a Transit Oriented Development.

The third reason for the increased interest in redeveloping areas in Wellston is due to an unfortunate incident that occurred on the abandoned Wagner Electric Company in the mid 1990s. This event was directly incidental to the areas high crime, vandalism, poverty and blight. Figure

4-6 displays the vandalism and illegal dumping that occurred on the abandoned site. According to Michael Clark of Clark Properties, who is a major stakeholder in the project, "the [old

Figure 4- 6 Vandalism and Illegal Dumping

Wagner] site has been a black eye on the community for years. When you have a property that looks that bad, it's difficult to attract companies that are coming in and looking at St. Louis" (Connolly, 2003, p. 2).

Also, upon the closing of the plant, the owners donated the site to the city realizing the barriers to selling the contaminated site in an already struggling city. After the City assumed ownership they decided to set an example and have a positive influence on the community by

redeveloping the site. Through this effort the City sought to bring in more businesses and provide more jobs for the area.

Under the leadership of the St. Louis County Economic Council and the City of Wellston the first steps towards redevelopment were taken. It was first acknowledged that the entire City was struggling and that more than just the abandoned contaminated sites needed attention. Therefore, in association with the Land Clearance for Redevelopment Authority for St. Louis County (LCRA) the entire city needed to be declared blighted. This action would allow for the preparation of a comprehensive plan covering the entire area as opposed to one single part in the city (Noonan, 2009).

As of 1999, the city was declared blighted under Chapters 99 and 353 Revised Statutes of Missouri. The condition of the city was mainly dilapidated, with the majority of the commercial / industrial sites and residential sites underutilized. The occupied sites were even found to be in poor condition. This is mainly due to "the lack of financial resources for maintenance and repair, due to the low-income status of most residents" (Land Clearance for Redevelopment, 1999, p. 5). Therefore, the condition of the city constituted both an economic liability as well as a health hazard to the community. Figure 4-7 displays the housing conditions across the City.

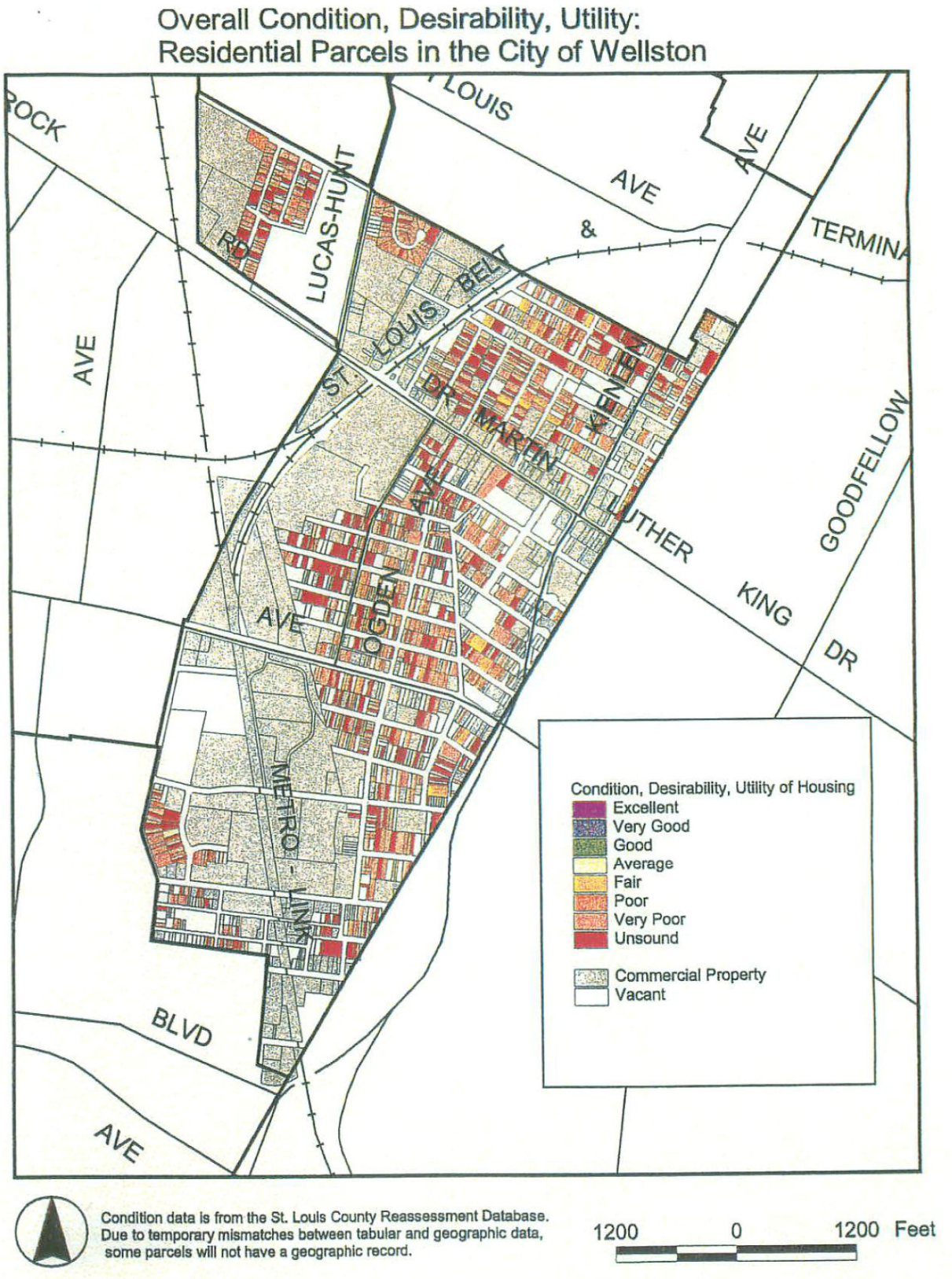

Figure 4- 7 Wellston Housing Conditions

The Wellston Redevelopment Corporation was established in order to administer the project involving the entire city. The Corporation was a five person board that included representatives from the community, the Economic Council and the LCRA (Noonan, 2009). It's main charge was to oversee "strategic business / light industrial development of the abandoned or underutilized former manufacturing facilities, new housing, commercial development, installation of infrastructure and community amenities" (Wellston, MO, 2008).

Development of Wellston

Under the authority of the Wellston Redevelopment Corporation the city with the assistance of the St. Louis County Economic Council developed a plan to revamp the entire City. Through the Land Clearance for Redevelopment Authority, the City "focused on rehabilitating larger brownfield sites, consolidating them with additional smaller parcels to create sites that are suitable for modern light industrial and / or commercial development. The goal is to create a light industrial corridor that spans the length of Wellston, connecting the existing manufacturing areas" (Kovac, 2009). The proposed plan was to take place over a seven year period. A complete development / land use map is shown in Appendix D. The key projects involved in this plan are as follows:

New Housing Construction: Due to the poor conditions of much of the housing, the City proposed to build approximately 180 new homes. Figure 4-8 displays an example of a house within the City that is in poor condition.

Figure 4- 8 Wellston Poor Housing Condition

Wellston initially identified 38 abandoned properties to be redeveloped as brownfields. However, after environmental assessment it was found that no cleanup was needed. During this time the City teamed up with Habitat for Humanity-St. Louis, and proposed to conduct a "Blitz Build," building 15 homes for 15 families in 15 days. According to Elizabeth Noonan, "This was a natural partnership. We were looking for a developer at the time and Habitat was a perfect choice. They had the knowledge and expertise of developing residential lots" (Environmental Protection Agency, 2004). The success that was gained from this partnership prompted Habitat to develop 27 more homes within Wellston, on some of the above mentioned lots. These homes are now owner-occupied with an estimated development cost of $1,905,000. Figure 4-9 shows an example of the Habitat housing that was built in Wellston.

Figure 4- 9 Habitat for Humanity Housing

From 1990 to 1999 there were only three permits for new residential buildings issued. Since then however, following the success of the Habitat for Humanity Housing, the city has issued many more permits. With the increase in new housing the aesthetic condition within the City has greatly improved. Throughout Wellston, blighted housing has been demolished and rebuilt. Figure 4-10 represents many of the new types of homes that have been built throughout the City. In total, the new housing construction amounted to $27,916,441 in investments (Kovac, 2009). The development has taken place throughout the city mainly providing lease to purchase homes for those making less than sixty percent of the area median income.

Figure 4- 10 New Housing in Wellston

Wellston Neighborhood Park and Ball Field: Due to the new housing initiative and an increase in the number of children in the area, Wellston realized the need for a recreational park. The park was developed on a former parking lot and gas station adjacent to the Wagner Electric Company. The site is 2.5 acres offering a ball field, playground, basketball court, concession stand and walking paths. Figure 4-11 is an aerial view of the park, displaying its numerous features and amenities that are provided for the community. The remediation of the park began in 2004. It was completed with the assistance and funding due to its location in the Greater St.

Figure 4- 11 Aerial View of Neighborhood Park

Louis Regional Empowerment Zone, its involvement in a greenway project across the county (Great Rivers Greenway), as well as support from the Cardinals Care Foundation of the St. Louis Cardinals Care Ball Field Program who funded construction of the ball field (Kovac, 2009). Figure 4-12 is a picture of the completed park. The total investment for the development amounted to $552,750 (St. Louis County Economic Council).

Figure 4- 12 Wellston Neighborhood Park

Plymouth Industrial Park: The Plymouth Industrial Park, formerly known as the Cornerstone Industrial Park, has been developed on the previously used Wagner Electric Company site. This development is considered the first phase of industrial development within Wellston. The city hopes that the development of this 15 acre industrial park will provide an anchor near the MetroLink station (Cornerstone Industrial Park).

The development of the Plymouth site began in 1997, declaring the area a brownfield and taking the appropriate steps towards remediation. Through testing, the site was found to have contaminates in the structure as well as the soil and groundwater. Remediation began in July of 2000. All but one of the existing buildings located on the site were demolished. The one building to be saved was the main building that now houses the Metropolitan Education and Training Center (MET) (Figure 4-13 and 4-14). This structure contained asbestos and lead-based paint which was removed from and disposed of off-site. This building was developed separately from the rest of the site (Kovac, 2009).

Figure 4- 13 Abandoned Wagner Electric Company

Figure 4- 14 Interior Wagner Electric Company

The contamination within the soil and groundwater included metals, polychlorinated biphenyls (PCB's), solvents and other miscellaneous petroleum products. To remediate the site 1424.01 tons of soil was removed and disposed of off-site. There was also a two foot cap of compacted soil placed across the site, serving as an engineered cap, protecting any contamination left from reaching the top soil (Cornerstone Industrial Park).

The future use of the site was limited to industrial use, through a restrictive use covenant. This site was to house a "state of the art" workforce training center, the MET Center, as well as three other 2 to 5 acre lots for the development of other light industrial or high-tech facilities (Phase 1). Figure 4-15 is an artist rendering of the proposed future development of the Plymouth Technology Park (St. Louis County Economic Council).

Figure 4- 15 Artist rendering of proposed Plymouth Industrial Park

The Plymouth Industrial Park is located in the federally designated Greater St. Louis Regional Empowerment Zone. This zoning provides numerous financial incentives, including the Historically Underutilized Business Zone, State of Missouri Enterprise Zone and as a Missouri Rebuilding Community (St. Louis County Economic Council). The final funding for the project was provided through four main sources including the Missouri Department of Economic Development Brownfield Remediation Tax Credits, Department of Commerce-Economic Development Administration, Missouri Department of Economic Development / Missouri Department of Natural Resources Brownfield Redevelopment Program and the Industrial Development Authority of St. Louis Count (St. Louis County Economic Council). The overall investment totaled nearly $12 million. The appraised value of the site significantly increased after the completion of redevelopment in 2004. In 1998 the appraised value was $121,500 increasing 768 percent to $1,054,600 in 2005 (Cornerstone Industrial Park).

St. Louis Enterprise Center: The St. Louis Enterprise Center was developed on part of the former Wagner Electric Company. Originally the two acre site was developed as a carpentry shop and saw house, a storage lot for scrap materials and a surface parking lot supporting the manufacturing operation at the plant in 1951. Since the closing of the plant, the site has remained empty.

The St. Louis Enterprise Center serves as one of four small business incubators located across St. Louis County. The business incubator was developed as a 10,000 square foot complex offering low-cost office, manufacturing and warehouse space to assist up to 18 start-up businesses. Within the facility the start-up companies share common services such as office equipment and administrative / clerical assistance. Users may also benefit from training, networking and mentoring opportunities from professionals in related fields (Downs, 2001).

The environmental assessment revealed numerous contaminants within the soil. These pollutants included PCBs, arsenic and lead. The remediation process involved the removal of 4,113 tons of soil. Most of the soil was excavated and removed off-site, however, some was placed onsite underneath the parking lot surface, acting as a cap (Cornerstone Industrial Park).

The funding for development was enabled by the Greater St. Louis Regional Empowerment Zone of the U.S. Department of Housing and Urban Development, Edward Jones Community Partnership, Department of Veteran Affairs and Housing and Urban Development Community Development Grants, Missouri Department of Economic Development Brownfield Remediation Tax Credits, St. Louis Office of Community Development Community

Development Block Grant, Missouri Department of Economic Development Incubator Tax Credits, and St. Louis County Department of Human Services Office of Community Development Community Development Block Grant. Total funding amounted to approximately $2.45 million (St. Louis County Economic Council).

The funding allowed for improvements to the infrastructure and remediation, in addition to construction of the new facility. After the completion of these improvements, the property value greatly increased. The appraised value, as of 2000, was $164,300 and increased by 221 percent to $527,000 in 2005 (Cornerstone Industrial Park).

Wellston Technology Park: The Wellston Technology Park represents the second phase in the redevelopment of the main brownfield sites within the city. This development was completed on the abandoned ABEX foundry site, in addition to a blighted residential area encompassing 24 acres. To commence the redevelopment of this area the SLCEC purchased the ABEX site for $425,000. To also utilize the adjacent residential sites, which were mainly abandoned and had deteriorated to a state qualifying them as brownfields, the county had to assemble each parcel separately. The initial steps to redevelopment began in 1997. However, due to the process of assembling all of the land the whole site was not compiled until 2006 (Wellston Technology Park).

During this nine year period remediation was completed on the ABEX site mainly because of contamination in the soil and groundwater: the contaminants included cadmium, chromium and lead. To eliminate these pollutants 127 tons of soil and 1,380 gallons of water

and sediment were disposed of off-site. A compacted clay soil cap was placed over the site as a surface barrier. The buildings located on-site were contaminated with asbestos; 6,485 tons of this contamination was removed and disposed of off-site (Wellston Technology Park). Figure 4-16 shows a building on the site before remediation.

Figure 4- 16 Abandoned building on ABEX Foundry site

The use of the Wellston Technology Park has been restricted to commercial and light industrial use. The development of this site is still taking place, with the improvement of Ogden Avenue. However, site remediation was completed in 2005 (Kovac, 2009).

Funding of the Wellston Technology Park was provided by numerous sources. These sources include the Greater Regional Empowerment Zone, Missouri Department of Economic Development Brownfield Remediation Tax Credits, Industrial Development Authority of St. Louis County, Federal Transit Administration Surface Transportation Program, Ameren Community Development Corporation, and St. Louis County Office of Community Development—Community Development Block Grant (Kovac, 2009). The redevelopment also received assistance from the U.S. Environmental Protection Agency under the Brownfields

Demonstration Pilot grant. The grant was intended to conduct environmental assessments of the properties and prepare cleanup and redevelopment plans for the community (St. Louis County Economic Council). Overall this funding assisted in land assemblage, remediation of the sites, sewer improvements, road improvements and site preparation. Funding amounted to approximately $10,600,000 in investments (Wellston Technology Park).

Other miscellaneous revitalization efforts include a 16,000 square foot child development center. The facility is located near the MetroLink station and the MET Center and serves 100 children. The funding provided totaled $1,056,000 supporting site improvements and construction of the facilities (Kovac, 2009).

Development Results

At the onset of redevelopment, the overall goal of Wellston was to administer a comprehensive revitalization plan that would promote residential, commercial and light industrial development. After compiling land and implementing remediation of over 300, large and small, brownfield sites within the city, as well as the redevelopment of many blighted areas, the city has successfully implemented the revitalization plan. Overall, the completion of redevelopment has provided nearly 200 new homes. These new homes, along with the location of the MetroLink station, may support the proposed 440 jobs provided through the new industrial and commercial corridor (Noonan, 2009).

Success may be realized in many different facets of redevelopment. First, the aesthetics of the city has greatly improved due to the newly constructed housing, the improved street networks and the new neighborhood park. These improvements have allowed and encouraged new people to settle in the area, which provides evidence that these factors have had a positive impact on the area (Noonan, 2009).

Second, the MET Center (Figure 4-18) has proven to be very successful in the area. The MET is intended to offer short-term training courses, typically over a 12-week period, focusing on a variety of trade certification programs. The facility also provides job search preparation assistance and job retention skills. It is mainly geared towards unemployed or underemployed area residents, acting as a "bridge not only to employment, but also to further college coursework" (Metropolita Education and Training Center, 2009).

Figure 4- 17 Metropolitan Education and Training Center

Over the period of 1998 to 2002 the MET Center enrolled nearly 2,300 students, maintaining a 74 percent retention rate. Of these graduates, 75 percent were able to find jobs with an average beginning wage of $11.16 per hour (Adams, 2002). According to Molly

Bunton, assistant to a St. Louis County Executive, “the center is certainly a success by any measure. For a while, people thought that a certain segment of our society was unmotivated, untrainable and uneducable. The MET Center breaks that myth. When you walk down the halls, you meet people who understand and embrace the work ethic and who are motivated to be responsible citizens” (Adams, 2002).

Third, the St. Louis Enterprise Center (Figure 4-18) has also provided for many successful entrepreneurial stories. The center can support up to 18 start-up businesses, but has limited the space to 8 to 12 businesses at a time (Noonan, 2009). In 2008 the center supported seven businesses that grossed total revenue of $5.8 million, which is very good for new businesses according to Elizabeth Noonan (Noonan, 2009). These businesses maintained seventeen full time jobs and two part-time jobs. Most of the businesses were started in 2007 or 2008, with three businesses graduating from the program in 2008 (Noonan, 2009).

Figure 4- 18 St. Louis Enterprise Center

Finally, perhaps the most important indicator of the success of the revitalization process in Wellston is the interest it has gained from neighboring cities. According to Noonan the nearby City of Hillsdale has contacted the SLCEC in hopes to develop similar plans for revitalization (Noonan, 2009). Other nearby cities that are impacted by their access to the MetroLink are also interested in improvement. Therefore, Wellston has had not only a positive influence on the City of Wellston, but also on a regional basis.

CHAPTER 5 - Conclusion

In conclusion, it may be realized that as society continues to grow, growth should not only take place outward but also inward. It has been determined that one way to develop inward growth is through infill development. This type of development typically assists cities in revitalizing inner-ring areas. This development serves as an attraction, encouraging individuals, couples and families in various life stages to relocate, bringing "life" back to most American cities. This approach allows for the future needs of the community to be met.

The first part of this report discusses, in brief, one form of infill development, brownfield redevelopment. As Elizabeth Noonan states: "all infill development, within cities, typically involves brownfield development" (Noonan, 2009). This is due to the wide variety of previous uses, which were typically industrial or commercial. Consequently, because of the numerous potential brownfield sites that cover many of the nation's cities, it is important for individuals in the planning field to understand the implications this type of development has on the profession.

The implications of brownfield development involve the issues commonly encountered, including many barriers one has to be prepared for (typically costly and strict environmental regulations), and being knowledgeable about different mediation methods as well as the programs established to assist in development. These issues are easily avertable, if one is aware of the options and means to overcome them. Therefore, through this report some pertinent knowledge regarding the processes and issues of brownfield development was discussed. This

allows one to understand brownfields in further detail, beyond the definition, in order to apply the knowledge while practicing.

"As we begin to recognize the need to live sustainably and to find ways of re-creating the built environment to function more sustainably, the redevelopment of brownfield sites exists as both a problem and an opportunity" (Russ, 2002, p. 28). However, it may be concluded that although there are many problems involved, brownfield redevelopment not only serves as a successful form of infill development, but also sustainable development. In order to plan for a more sustainable future the planning profession should focus on the opportunities of brownfield sites. If one disregards these sites they will only continue to degrade the city with further contamination and deterioration. However, if developed they may assist many cities in revitalizing many dilapidated areas in a more sustainable manner, as is desired in the future.

"If we are to make the built environment work sustainably, we must find ways to make cities function environmentally" (Russ, 2002, p. 28). As a step towards focusing on developing environmental cities, many sustainable programs have been established to support brownfield development. These programs include U.S. Green Building Council: Leadership in Energy and Environmental Design (LEED), Smart Growth and Congress of New Urbanism. All of these programs provide higher rankings or incentives when a project is developed on a brownfield. They recognize that the future of cities is dependent upon the development of these sites, as a means towards revitalization.

Overall, it may be confirmed that even with the variety of risks and issues encountered through brownfield development, taking action proves to be more beneficial than the repercussions encountered when no action is taken. These repercussions greatly affect the surrounding community, including health hazards and obvious signs of blight that decrease the value of the community. According to Michael Goldstein, an Akerman Environmental and Resource Shareholder and founding chairman and president of the Florida Brownfield Association, "Brownfield redevelopment is an excellent vehicle for converting formerly unusable real estate into revenue generating property, creating opportunities for capital investment and job creation" (Akerman, Senterfitt Attorneys at Law, 2009). Redevelopment techniques capitalize on opportunities by bringing to fruition the true potential of cities, emphasizing specific qualities and assets to draw the population inward.

The second part of the report presented a precedent study reviewing the redevelopment taking place in Wellston, MO. Wellston is an important study because it represents many facets involved in the redevelopment of brownfields. The development began due to the motivation and support from outside entities that made Wellston aware of the potential aspects that the brownfield sites offered.

The success of Wellston may be seen on many levels. First, the redevelopment spurred revitalization across the city. Although many residents and the city government were at first apprehensive to undertake the project, apprehension changed as the process of development began. This was due to the immediate success achieved by the Wellston Redevelopment Corporation. The community began to show its support for the development by taking steps to

decrease the apparent blight in the area. Many residents are now taking pride in the community, showing this pride by improving and taking care of their own property. The improvement across the city has encouraged others to relocate to the area, allowing the new residents to take advantage of the many assets the city now provides, including a park, mass transit and job / education centers.

Second, Wellston was able to combine resources from county, state and federal levels, to accomplish a successful project. The county, represented by the St. Louis County Economic Council, acted as the main force behind the development. It was able to use state (Missouri Department of Natural Resources) and federal (Environmental Protection Agency) entities as leverage to persuade the city to back the development. To do so, the county established the Wellston Redevelopment Corporation to allow representatives from each entity to have a stake in the development process. This action allowed for a cohesive comprehensive plan to be created for the entire city, resulting in a successful development.

Overall, the lessons learned from the Wellston project convey the importance of community support, use of multiple resources and finally, to always expect the unexpected. The City of Wellston first set out to redevelop the Wagner Electric Site. However, upon the realization of the extent of blight and the number of contaminated sites across the area, the city took advantage of the opportunity to provide a positive influence. Although hesitant to change their first approach, the city is now becoming a vibrant industrial corridor, inspiring surrounding cities to also take action. In order to take action, surrounding cities, as well as cities throughout the nation, may look to the development in Wellston as a successful example of how to promote

job creation, economic development, aesthetic improvements and educational opportunities for the communities.

Even with the success of many redevelopment sites, such as Wellston, the importance of brownfield redevelopment is still being realized. As discussed earlier it is pertinent for future planners to understand what the word "brownfield" entails. With the increase in awareness, importance and support of sustainable initiatives, especially by the federal government, there are many opportunities cities may seek to profit from and embrace this movement. "Brownfield redevelopment will undoubtedly be a hot button issue in 2009, particularly with respect to government incentives for sustainable development endeavors," said Robert Fabricant, Chair of Akerman's Environment and Natural Resources practice group and former General Counsel for the U.S. Environmental Protection Agency. "This could be a win-win situation for both communities and developers in an otherwise challenging economic time" (Akerman, Senterfitt Attorneys at Law, 2009).

Therefore, to truly capitalize on the potential of numerous deteriorating cities across the nation, future implementation of projects and studies involving brownfield development is important. These studies will help to market the hidden-potential of brownfield sites as well as expose the lessons learned. This promotion should support the establishment of more governmental programs that may provide clearer steps and strategies in assisting the development of brownfields. These actions should eventually diminish the stigma that is attached to brownfield sites.

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Appendix A - Interview Questions

1. What was the main drive for the project? / Why was it proposed?
2. Did the history of Wellston influence the proposal / implementation of this project?
3. Did the location of the Metro Link have any influence on the development (i.e. location, type of development)?
4. What were the steps taken to enable the start of the project?
5. Was the community involved in and supportive of the project?
6. Does the community continue to be supportive, or more supportive and involved as the project is being completed?
7. How is the financing being provided? Grants? Loans?
8. How many jobs is the development projected to provide? Is this number currently being realized, how many jobs is the development currently providing?
9. What is the estimated area that the project will influence? The City of Wellston only, the surrounding cities within a 5 mile radius, etc.?
10. Has the project shown success so far?

Appendix B - Interview with Elizabeth Noonan

The following provides the answers received during the interview conducted with Elizabeth Noonan (Noonan, 2009).

1. What was the main drive for the project? / Why was it proposed?

According to Noonan there were three main aspects that were the driving force for the project to take place. Denny Coleman, President and CEO of the St. Louis County Economic Council, sought to revitalize the City of Wellston mainly due to its location along the MetroLink light-rail system, the potential the Urban Land Institute determined and finally the death of a boy on the abandoned Wagner Electric Company site, owned by the City. Noonan stated that Coleman felt that redevelopment would have a positive influence on the City and surrounding area.

2. Did the history of Wellston influence the proposal / implementation of this project?

Noonan felt that the history of Wellston simply lead to the need for redevelopment, and did not necessarily shape the development. If it was not for the fact that the main industries closed, leaving much of the City deserted, the City might not have ended up in the deteriorated state that it was. Therefore, revitalization might not have been needed, or might have taken a different form.

3. Did the location of the Metro Link have any influence on the development (i.e. location, type of development)?

Yes, it served as a mechanism for Wellston, connecting it and marketing it as a regional asset. With the proper revitalization the station essentially was the proper form of transportation to develop the surrounding City as Transit Oriented Development.

4. What were the steps taken to enable the start of the project?

After the report from the Urban Land Institute, stating that the area would be properly suited for light-industrial high technology uses, the City in conjunction with the County of St. Louis began seeking options / methods for revitalization. To do so Wellston was deemed blighted by the Land Clearance for Redevelopment Authority. They wanted to develop a more comprehensive plan, involving the entire city; therefore the Wellston Redevelopment Corporation was established. The corporation allowed all parties, including representatives from the County, City and the Land Clearance for Redevelopment Authority, to have input regarding the redevelopment.

5. Was the community involved in and supportive of the project?

At the beginning of the project the community was involved to the extent of the employers who were represented by the Wellston Redevelopment Corporation and other governmental entities. However, throughout the process the community began to show support, but involvement was still limited to established representatives.

6. How is the financing being provided? Grants? Loans?

Financing was mainly acquired through grants from the Environmental Protection Agency, and other entities such as the Missouri Department of Natural Resources. There were also ordinances passed to support public financing. Since the St. Louis County Economic Council is a non-profit organization the tax-credits received all had to be sold, in order to use the money. However, the return was only 0.85 cents per dollar on average.

7. What are the main lessons learned from the remediation and development of the site?

Noonan contended that there are always lessons, pertaining to each project, the main lesson from the remediation of Wellston sites is that one never knows where the contaminations will be, and they are not always where you think and vice-versa. For example, on the site of the St. Louis Enterprise development there was even contamination on the abandoned parking lot that cost an extra $900,000 to remediate. Therefore, plan for the unexpected, one never knows how the previous users used the site.

8. How many jobs is the development projected to provide?

The Plymouth Industrial Park should support 200 jobs and the Wellston Technology Park should support 240 jobs when completed. The St. Louis Enterprise Center is capable of sustaining fifteen to eighteen start-up businesses, but as typically maintained around seven to eleven annually. The facility also supports seventeen full time employers and two part time.

9. Has the project proven to have a positive influence on the surrounding area?

Noonan discussed how the surrounding cities, specifically Hillsdale, have realized the success of the revitalization in Wellston and have begun contacting the St. Louis County Economic Council for assistant. In essence, the surrounding cities have realized the effect that the support of the council has had on Wellston, and would like the same support to revitalize their own cities.

10. Has the project shown success so far?

Overall, the project has had a positive influence on the area. The increase in new homes has encouraged new people to locate within Wellston that now has over one-hundred new units. The development is also providing many new jobs, as well as education and training.

The above answers and conversation provided insight to the development of Wellston, MO. It allowed for guidance as to where future research should be focused.

Appendix C - Accelerated Remediation Process (ARP)

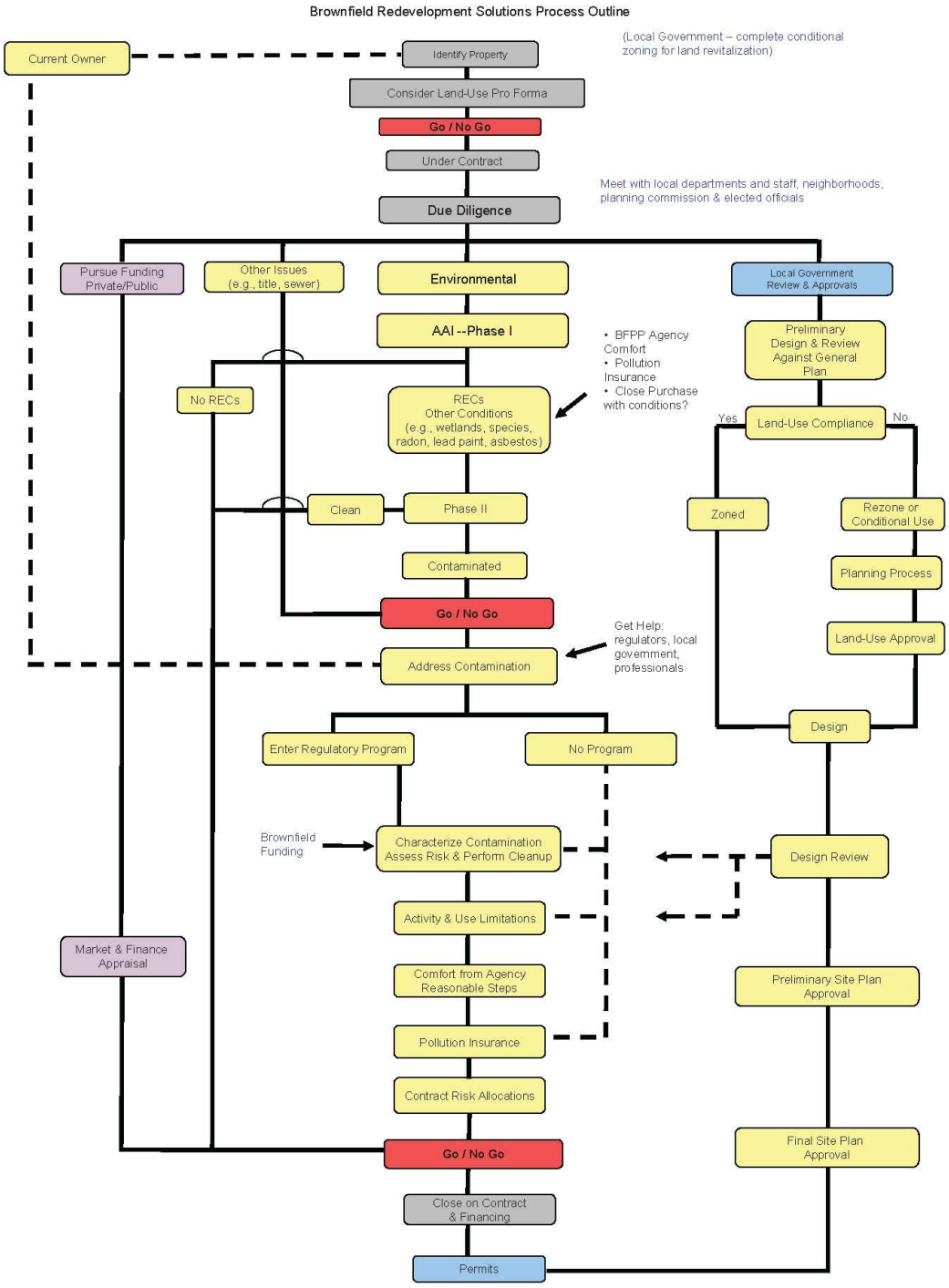

Figure C- 1

Appendix D - Wellston Land Use Plan

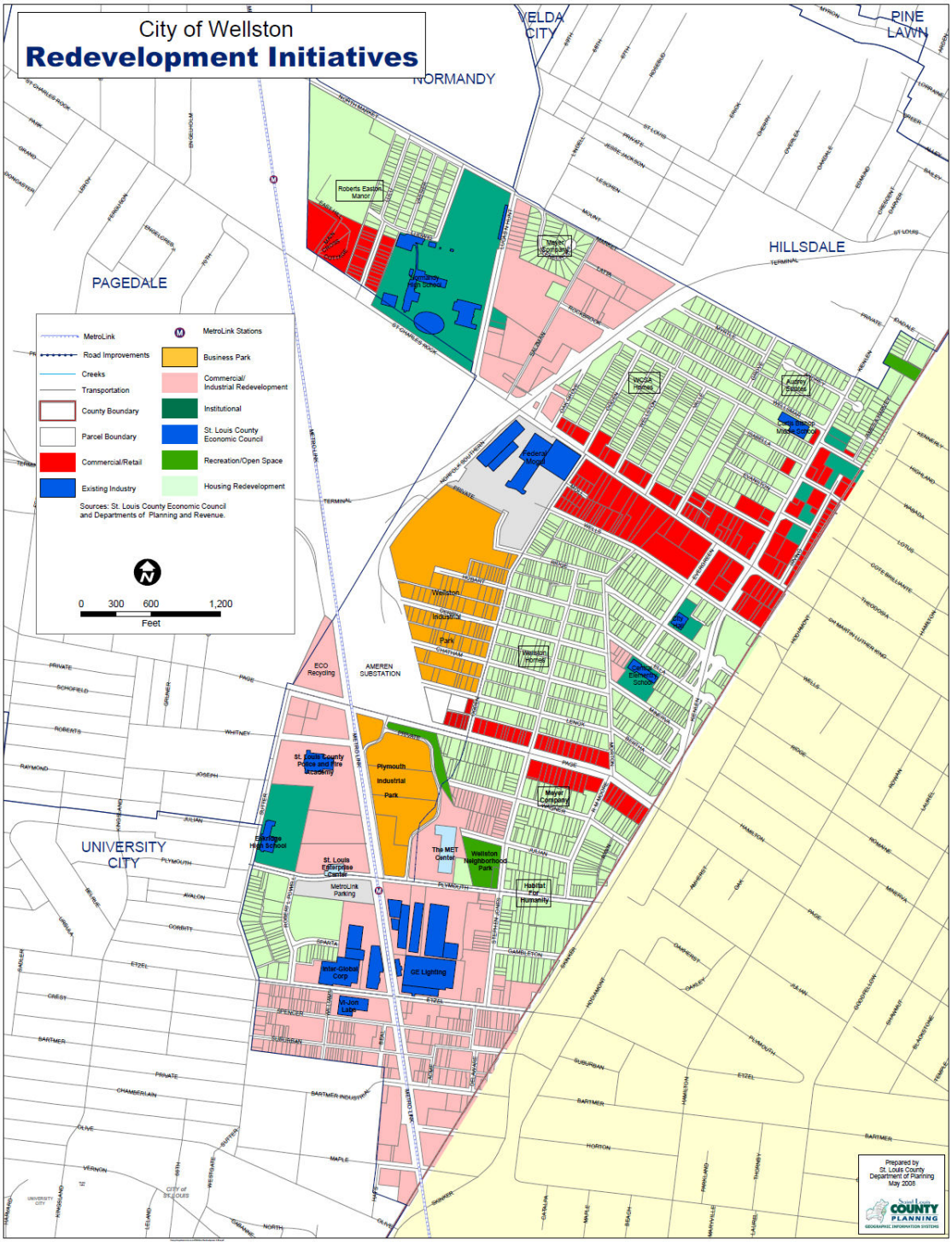

Figure D- 1

Appendix E - Glossary

The following definitions were compiled from different resources. These definitions are the general terms that are used when discussing the redevelopment of brownfields.

Abatement – Reducing the degree or intensity of, or eliminating, pollution (Dennison, 1998, p. 355).

Adsorption – An advanced method of treating waste in which activated carbon removes organic matter from wastewater (Dennison, 1998, p. 356).

Air Stripping – A treatment system that removes volatile organic compounds (VOCs) from contaminated ground water or surface water by forcing an airstream through the water and causing the compounds to evaporate (Dennison, 1998, p. 357).

Bioremediation – The practice of introducing microorganisms with known abilities to fix or metabolize pollutants. Also refers to the practices of adding nutrients and altering environmental conditions to promote vigor and growth in naturally occurring microorganisms (Russ, 2000, p. 260).

Brownfield – Abandoned, idled or under-used real property, the expansion, redevelopment or reuse of which may be complicated by the presence or potential presence of hazardous substance, pollutant, or contaminant.

Characteristic Waste – A solid waste that is a hazardous waste because it exhibits one or more of the following hazardous characteristics: ignitability, corrosivity, reactivity, or toxicity (Dennison, 1998, p. 363).

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) – Also known as Superfund, it is a program to identify sites where hazardous substances have been or might have been released into the environment and to ensure that they are cleaned up. CERCLA is primarily concerned with abandoned sites (Dennison, 1998, p. 365).

Comprehensive Environmental Response, Compensation, and Liability System (CERCLIS) – A list of sites suspected to have environmental contamination. Each site is investigated and ranked. The sites with the highest scores (the worst sites) are placed on the National Priorities List) (Russ, 2000, p. 260).

Contaminant – Any physical, chemical, biological, or radiological substance or matter that has an adverse affect on air, water, or soil (Dennison, 1998, p. 366).

Environmental Assessment – An environmental analysis prepared pursuant to the National Environmental Policy Act to determine whether or not a federal action would significantly affect the environment and thus require a more detailed environmental impact statement (Dennison, 1998, p. 369).

Feasibility Study – Analysis of the practicability of a proposal; e.g., a description and analysis of potential cleanup alternatives for a site such as one on the National Priorities List. The feasibility study usually recommends selection of a cost-effective alternative. It usually starts as soon as the remedial investigation is underway; together, they are commonly referred to as the "RI/FS." (Dennison, 1998, p. 372).

Greenfield – Undeveloped lands such as farmlands, woodlands, or fields located on the outskirts of urbanized areas. Businesses often prefer to develop new facilities on greenfields to avoid the real or perceived difficulties associated with brownfields redevelopment. This tendency to develop on open spaces on the outskirts of cities promotes urban sprawl, taking land away from communities who would otherwise use these areas for recreation or other quality of life purposes. Property that has not previously been used for commercial or industrial activities and is presumed free of contamination (Davis, 2002, p. 5).

Letter of No Further Action – A letter offered under some voluntary cleanup programs and brownfield programs that serves to notify owners that an agency contemplates no further remedial or enforcement actions. Such letters tend to be specific and subject to reopeners (Russ, 2000, p. 263).

National Priority List (NPL) – A list of sites designed as needing long term remedial cleanup. The purpose of the list is to inform the public of the most serious hazardous waste sites in the nation. EPA revises the list periodically to add new sites or delete sites following cleanup. Sites on the list are generally slated for EPA enforcement or cleanup. Note that many elements of the

CERCLA / SARA program apply to sites regardless of whether they are on the NPL (Dennison, 1998, p. 380).

No Further Remedial Action Proposed – Under the Common Sense Initiative, the EPA purged more than 25,000 sites from the CERCLIS list by declaring them as NFRAP sites (Russ, 2000, p. 264).

Phase I Environmental Site Assessment – There are a number of different Phase I Environmental Site Assessment (ESA) protocols which have been developed. Some lenders have an in-house protocol or format, and different professional organizations have created recommended formats, but the most common protocol used is the American Guide for Phase I Environmental Site Assessments E-1527. These guidelines are periodically updated to reflect changes in the professional practices associated with ESA's. There are other ASTM guides that may be used to guide the conduct of an assessment and the evaluation of the work (Russ, 2000, p. 264).

Phase II Environmental Site Assessment – A site assessment undertaken to identify the character and extent of suspected contamination. Phase II site assessments involve the collection of samples for analysis and often require several rounds of testing before they are complete (Russ, 2000, p. 264).

Potential Responsible Party (PRP) – An entity in the chain of title who could be responsible for cleanup under CERCLA (Simons, 1998, p. ix). Thos identified by EPA as potentially liable

under CERCLA for cleanup costs. PRPs may include generators and present or former owners / operators of certain facilities or real property where hazardous wastes have been stored, treated, or disposed of, as well as those who accepted hazardous waste for transport and selected the facility (Dennison, 1998, p. 384).

Remedy / Remediation – a method for cleaning up contamination on a brownfield site, also known as and used interchangeably with cleanup, remedial action, removal action, response action, or corrective action (Scenic, January, 2008).

Stakeholder – Any person or organization with an interest in a project or in the outcomes of a project (Russ, 2000, p. 267).

Underground Storage Tank – When more than 10 percent of a vessel or a tank is underground, it is considered an underground storage tank, but this does not include tanks that are freestanding in basements (Russ, 2000, p. 267).

Voluntary Cleanup Program (VCP) – State initiatives created to encourage private investment into the redevelopment of brownfield sites. VCPs usually provide financial assistance or incentives, remove or reduce the liability of purchasers, and provide predictable cleanup standards (Russ, 2000, p. 268).