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Environmental Equity: Gradient Measures of Race and Social Class in the Areas Surrounding Pennsylvania Superfund Sites

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Environmental Equity:

Gradient Measures of Race and Social Class

in the Areas Surrounding Pennsylvania Superfund Sites

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Dedicated to the memory of Florence Jablonski - Mother

and friend, forever missed…

The woods are lovely, dark and deep,
But I have promises to keep,
And miles to go before I sleep,
And miles to go before I sleep.
Robert Frost
from "Stopping by Woods on a Snowy Evening"

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Abstract

This study examines the socioeconomic and racial characteristics of the areas surrounding the 120 National Priority List Superfund hazardous waste sites in the Commonwealth of Pennsylvania. Using three distinct concentric distance measures, the study uses 1990 census tract data to determine whether Nonwhite and low-income populations live in closest proximity to Pennsylvania's most toxic sites and consequently bear the brunt of the negative externalities associated with having Superfund sites nearby. The results of the study suggest that environmental inequities are not prevalent in the areas surrounding Pennsylvania Superfund sites. Rather, the areas between 1.667 and 3.333 miles away from the sites were found to be significantly more affluent than all other areas in Pennsylvania. One key variable, Nonwhites below the poverty level, showed results consistent with the claims of environmental justice advocates, thus signifying a band of poor residents within the overall more affluent population.

CHAPTER 1

INTRODUCTION

Problem Statement

This study examines the racial and socioeconomic characteristics of the areas surrounding the 120 National Priority List Superfund hazardous waste sites in the Commonwealth of Pennsylvania. Using three distinct concentric distance measures, the study determines statistically whether Nonwhite and low-income populations live in closest proximity to Pennsylvania's most toxic sites and bear the brunt of the negative externalities related to having a Superfund site nearby.

Overview of the Issue

Environmental policy entered a new era with the emergence of the environmental justice movement. Prompted by studies indicating that minority and low-income communities often bear a disproportionate level of the environmental and health effects of pollution, environmental justice advocates challenged the view that all Americans faced pollution equally (Bullard, 1983 & 1994, Burke, 1993, CRJ, 1987, GAO, 1983, Lavelle & Coyle, 1992). The conceptual origins driving the environmental justice movement were unique to the environmental policy landscape, because for the first time the moral concerns of the Civil Rights movement united with the sense of urgency of the environmental movement because of their race and color. Environmental justice advocates have aimed not only at the environmental disparities, but also against the often-institutionalized oppression and dehumanization that permeates society through racism (Bullard, 1993: pp. 1-15).

Leaders of the emergent movement, along with environmentalists, community representatives and policymakers identify this new blend of environmental concern under three interconnected labels: environmental equity, environmental justice and environmental racism[1]. Christopher H. Foreman, Jr., contends that labels are crucial to mobilizing support for public policy objectives and the term "environmental racism" was intended to be inherently provocative. Foreman explains, by mobilizing constituencies, casting blame and generating pressure against targeted institutions, "environmental racism" and "environmental justice" serve as effective rhetorical tools that helped pave the way for preferred procedures and policy changes (Foreman, p. 9).

Claims of environmental inequities, in conjunction with a number of widely cited studies, propelled the environmental justice movement's concerns to the forefront of federal and state policy initiatives. On February 11, 1994, President William J. Clinton issued Executive Order 12898 mandating that federal agencies provide detailed reports outlining plans to eliminate racially disparate environmental effects. The order included a provision that set into place an inter-agency task force involving 17 executive departments and agencies to work with the Environmental Protection Agency's Office of Environmental Equity to assure the equitable implementation of federal policies. The federal judicial branch witnessed an influx of environmental equity claims against permitting agencies under Title VI of the 1964 Civil Rights Act, bringing its use into the new and non-customary domain of environmental policy. Further, the U.S Congress introduced environmental justice legislation that focused on prohibiting or limiting the

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1 ***Environmental equity*** refers to the issue and the actuality of the fairness of the distribution of environmental hazard with disproportionate risk on any population group, as defined by gender, age, income or race regard to the population. This is an appropriate starting point for the scientific and policy inquiry. It implies no bias or presumptions. It is the point from which one can ask whether the distribution of environmental hazards is equitable across the population, or with regard to race, ethnicity, or income. The U.S. Environmental Protections Agency (EPA) chooses to use the term environmental equity to refer to this issue, and the broader issue of disproportionate risk on any population group, as defined by gender, age, income or race (EPA, 1992)
Environmental justice is the political movement aimed at achieving environmental equity. The terms environmental equity and environmental justice are often used interchangeably and environmental equity is sometimes referred to as a movement. A tenet of the environmental justice movement is that current inequities in the distribution of pollution are due, at least in part, to racial discrimination (Taylor, 1992). The environmental justice movement started largely as a grassroots movement.
Environmental racism was coined about a decade ago, when a series of protests failed to halt the siting of a hazardous waste landfill in predominantly Black Warren County, North Carolina (Satchell, 1992). The term is often used synonymously with environmental justice, in reference to the movement. However, the term itself contains the conclusion that inequities exist and a declaration of the cause of the inequities. The term is, of course, highly political, and is used often as a rallying cry to highlight inequities and motivate participation in the movement (as cited in Burke, 1993).

concentration of industrial sitings in minority areas, as well as mandating the EPA to factor environmental justice considerations into its assessment of environmental risk.

Three key directives from Executive Order 12898 support the need for additional research and provide an important policy impetus for the proposed research.

1. Directs federal agencies to incorporate environmental justice into their missions and decision making
2. Directs federal agencies to ensure that federal programs, policies and activities are not discriminatory or have the effect of being discriminatory
3. Directs federal agencies to research and to collect and analyze data regarding minority and low income populations whenever practicable, appropriate and permitted by existing law

The task of assessing whether each incidence of hazardous waste or pollution in the United States is being handled justly and equitably calls for the compilation of an expanded body of research from as many areas of the country as possible; therefore, this study aims at contributing to the evolutionary pool of data that will assist federal and state governments in their required efforts to determine whether current environmental policies are equitable (see Appendix A for the full text of Executive Order 12898).

CHAPTER 2

LITERATURE REVIEW

Environmental equity, though first researched in the 1970s, entered the forum of social and public policy discourse in the 1980s. By the mid 1990s, concerns over environmental justice resulted in wide-ranging policy mandates that continue to carry a potent impact today. While the literature points to Chicago's People for Community Recovery and the Mothers of East Los Angeles in the late 1970s as the earliest grassroots groups to call attention to undesirable pollution in their communities by engaging in protests reminiscent of the Civil Rights Movement, national attention first focused on the environmental justice movement in Warren County, North Carolina in 1982. Evidence seemed to indicate that the rural, impoverished, and mostly Black county was chosen for a PCB landfill not because it was the most environmentally sound choice, but because the residents were powerless to resist the siting. Out of the protests and demonstrations opposing the landfill came the environmental justice movement, and the term "environmental racism." As more than 500 hundred of the protesters were arrested, there were assertions of institutional racism often familiar in housing, education, municipal services, and law enforcement (Bullard, 1993: pp. 1-15)

Historically, minority participation in the mainstream environmental movement was low and it remains low. However, these minority-based, grassroots environmental organizations became energized by the legal, social and moral obligations they found due to them under the equal protection clause of the constitution. They sought environmental equity within their communities by challenging the existing institutional structure, government, and private industry, which were seen as providing advantages and privileges to White while perpetuating segregation, underdevelopment, disenfranchisement, and toxic poisoning (Bullard, 1993: pp. 1-15).

A summary of scholarly studies and sources follows. The review encompasses the full spectrum of thought ranging from empirical claims that substantiate environmental injustices to skeptics that call attention to weaknesses in the foundation of both environmental equity claims and the supportive research. A literature review that encompasses both qualitative and quantitative environmental justice research is important for a quantitative study such as presented here because it more clearly sets the stage for the stratified nature and shear breadth of the issues related to environmental justice and speaks to the multiplicity of methods and findings that are often contradictory. The first section examines the research that propelled the issue of environmental justice into the policy forum. Next, the literature review explicates a full range of research that includes the critical and less popular studies that provide fuel for objective, well-informed analysis.

Popular Studies

In the late 1970s, Robert D. Bullard, a sociologist, and perhaps the most widely cited authority on environmental justice issues, researched the municipal solid waste disposal system of Houston, Texas. Bullard tested the proposition that waste disposal siting followed the path of least resistance. The path of least resistance refers to the deficient political mobilization and representation that precludes minority communities from opposing political decisions that result in negative community impacts. The case study employed multiple theories that generally concerned urban land use policies, the social and economic distributional consequences of the spatial location of polluting facilities, and, the lack of mobility often correlated to impoverished urban communities. Bullard's findings appeared to unearth the first empirical evidence to support the claims of the fledgling environmental justice advocates. Bullard asserted two key findings:

1. Houston's all-White and all-male city council, with the assistance from its planning and solid waste departments, made key decisions on where to dispose of the city's waste. As landfills and waste disposal sites are considered to be dis-amenities to residential areas, Bullard found it plausible that White council members located these facilities away from their neighborhoods (i.e., White neighborhoods).
2. The population data of the communities that housed incinerators and landfills in Houston, indicated that Blacks accounted for 28% of the population in 1980, while their neighborhoods hosted to six of the eight (75%) incinerators, and fifteen of the seventeen (88%) landfills (Bullard, 1983)

Bullard concluded that Houston’s policies led to the siting of operational solid waste facilities in neighborhoods that were predominantly Black. Furthermore, the segment of private industry engaged in waste disposal followed the lead of local municipalities in locating their solid waste sites in predominantly Black neighborhoods. The permits granted by the Texas Department of Health to authorize the sitings indicated a long established pattern of siting Houston landfills in Black neighborhoods. Although the long-term effects and health risks associated with living next to solid waste sites had not been established, Bullard deduced that “those neighborhoods and schools that are nearest to the waste disposal sites are likely to pay a significantly higher health price (i.e., shorter lives, illnesses, and traffic hazards for children)” (Bullard, 1983, pp. 275-281).

The range of Bullard's research was narrow, but the conclusions gave legitimacy to the emergent environmental justice movement. Bullard boldly concluded that institutional discrimination through the siting of waste disposal facilities systematically provided social and economic advantages to Whites at the expense of Blacks, because Whites did not live around or send their children to schools near landfills (Bullard, 1983, p. 285-86).

Bullard's research provided key testimony in the first, but unsuccessful lawsuit (Bean v. Southwestern Waste Management Corp., 1979) to bring action alleging environmental racism. In addition, Bullard's 1983 study served as the cornerstone of two widely cited books, Invisible Houston (Bullard, 1987) and Dumping in Dixie (Bullard, 1994). The Dumping in Dixie study expanded the research conducted in Houston to include "the efforts of five African American communities empowered by the civil rights movement, to link environmentalism with issues of social justice” (Bullard, 1994, p. 186).

Bullard's Dixie study examined "how community attitudes and socioeconomic characteristics influence activism and mobilization strategies of Black residents who are confronted with the threat of environmental stressors” (Bullard, 1994, p. 17). Descriptive case studies were built from three data sources: (1) government documents and archival records, (2) in-depth-interviews with local opinion leaders, and (3) household surveys (1994, p. 17). The analysis included demographic and economic profiles, as well as socio-historic context of the individual environmental conflicts.

Generally, the findings in Dixie were symmetrical to those in his Houston study (1983) - the people most victimized by pollution were minorities and the poor. The conclusions that Bullard arrived at in Dumping in Dixie were insightful, sweeping and lengthy - covering over a decade worth of research. Bullard offered keen insights into the mobilization of minority communities in the environmental justice movement, and provided excellent background information for virtually all aspects of the issue. Although Bullard's insights were invaluable for general knowledge on the subject of environmental racism, much of his work is not particularly relevant to the present study. Therefore, it is appropriate to depart from Bullard, and examine another famous study conducted by the Commission for Racial Justice of the United Church of Christ.

The Commission for Racial Justice (CRJ) of the United Church of Christ (1987) was the first national study to compile empirical evidence to determine whether Blacks and other minorities were exposed disproportionately to hazardous wastes in their communities. The study resulted from the increasing concern that many unknowing minority citizens were exposed to the toxic substances that hazardous waste facilities treat, store and discard, "as well as thousands of abandoned waste sites" (CRJ, 1987, p. xi).

The research presented findings from two cross-sectional studies that examined the racial and socioeconomic characteristics of the zip codes surrounding 415 hazardous waste facilities operating in the United States in 1986 (CRJ, p. xii). The first was an analytical study of commercial waste treatment, storage, and disposal facilities (TSDFs), and the second was a descriptive evaluation that chronicled the presence of uncontrolled toxic waste sites in minority communities (p. xiii).

Methodologically, the two studies used statistical data from the 1980 U.S. Census and the EPA's CERCLIS to determine the level of exposure experienced by minority communities. From this information, five variables were isolated:

> (1) Minority percentage of the population was used to measure racial composition of communities. (2) Mean household income and (3) Mean values

> of owner-occupied homes were included to determine whether socioeconomic factors were more important than race in the location of commercial facilities. Home values could also be used as a substitute or "proxy" variable to appraise the role of land values. (4) Number of uncontrolled toxic waste sites per 1000 persons was used to evaluate underlying historic or geographic factors associated with the location of the commercial hazardous waste facilities in ways not accounted for by other variables. (5) Pounds of hazardous waste generated per person were used to determine the location of facilities and their proximity to sources of waste generation, i.e., potential customers (pp. 10-12)

The study, then, drew comparisons between the communities that housed, and did not house the sites. From this information, a correlation resulted between the number of commercial waste facilities and the percentage of minorities in the communities studied. The CRJ discovered "a consistent national pattern" in which race was "the most significant among the variables tested," indicating that race more than socioeconomic factors, influences the location of the toxic facilities (CRJ, p. xiii). In specific terms, the CRJ found that in communities hosting one operating commercial hazardous facility, the average minority percentage was double (24% vs. 12%) that of communities not hosting a facility (CRJ, p. 13). For the communities that hosted "two or more facilities," the average minority percentage of the population was more than three times that of communities without facilities (38% vs.12%) (CRJ, p. xiii). The findings of the descriptive study showed "an inordinate concentration of uncontrolled toxic waste sites in Black and Hispanic communities, particularly in urban areas" (CRJ, p. 23). The results of the two studies led the CRJ to conclude that it would be "virtually impossible" for these patterns to result by chance. The pattern, according to the CRJ, was clear: "communities with greater minority percentages of the population are more likely to be the sites of commercial hazardous waste facilities" (CRJ, p. 23). While the CRJ's conclusions centered on the role of race as it related to toxic waste, the importance of social class emerges as a measure of equal importance in this early study and virtually all subsequent research that follows.

The findings of the CRJ study were supported by several local and regional studies, such as the one by the United States General Accounting Office (GAO). The GAO report (1983) is cited often, along with Bullard's work in Houston, for drawing national exposure to the issue of environmental equity. The GAO study sought to determine the correlation between the location of hazardous waste landfills and the racial and economic status of surrounding communities at four of the countries largest hazardous wastes landfills in EPA's Region IV comprised Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee (GAO, 1983, p. 20).

The GAO research found that three of the four landfills were located in areas that had Black populations of 52%, 66%, and 90% respectively, while in the eight states studied, Blacks constituted between 22% to 30% of the total population. Poverty was found to be a significant variable in the host communities as well, with between 26% and 42% of the population living below the poverty level, compared to the eight state poverty range of 14% to 19%" (Been, p. 1393; citing GAO at pp. app. I, 1, 4, 5, 7). The GAO concluded that the distinct correlation between the disparate siting of hazardous waste landfills and racial and socioeconomic status of the surrounding communities placed minority citizens at greater risk of exposure to the potentially dangerous facilities than the general population (Been, p. 1393; citing GAO at pp. app. I, 1, 4, 5, 7).

The research conducted by Marianne Lavelle and Marcia Coyle of the National Law Journal (NLJ) in 1992 focused on disparities in the enforcement and remediation procedures for every residential toxic waste site in the EPA’s 12-year-old Superfund program" (NLJ, S2, col. 1). The findings of the NLJ indicate that "penalties against pollution law violators in minority areas are lower than those imposed for violations in largely White areas" (NLJ, S2, col. 1). The NLJ reported, what it termed a "striking imbalance between White and minorities," with a 506 percent disparity level of fines imposed under Resource Conservation and Recovery Act, (i.e., sites having the greatest White population were about 500 percent higher than penalties at sites with the greatest minority population) (NLJ, S2, col. 1).

The NLJ's findings are startling, but controversial, because the NLJ did not publish its data. According to Christopher Boerner and Thomas Lambert from the

Center for the Study of American Business (CSAB) the NLJ “refused to release its data set" because they felt that their "findings were too controversial” (Boerner and Lambert, 1994, notes 8, 9, at pp. 24-25). Without access to the NLJ’s data, it is impossible to derive the statistical significance of the findings (Boerner and Lambert, 1994, notes 8, 9, at pp. 24-25). Boerner and Lambert claim the lack of data makes it possible that factors other than racial discrimination caused disparities in assessed fines. For example, they cite differentials such as the EPA regular practice of taking into account, one's ability to pay when assessing the amount of fines. Even though the methodologies of the NLJ study are not specifically relevant to the present study, an overview of the research and its shortcomings are critical to understanding the foundational evolution of environmental justice movement.

Critical Studies and Contradictory Evidence

The policy study by Christopher Boerner and Thomas Lambert for the Center for the Study of American Business (CSAB) (1994), critically evaluated several of the most frequently cited studies, such as those discussed at length above. When examining the evidence, Boerner and Lambert cited several methodological difficulties with the studies. Boerner and Lambert’s work is important because it addresses and overcomes the flawed methodologies which it identifies.

The first criticism concerned the definition of the term "community." In the NLJ study, for example, all of the affected communities under study "were ranked according to percentage of White residents" (Boerner and Lambert, p. 25, note 11). A "White community" then was defined as the top quartile (25%), whereas "minority community" indicated the bottom quartile (25%). If the definition of "minority community" meant a community where the percentage of Nonwhites exceeded the average of the entire population, it was plausible that a community could be designated "minority,” although "the vast majority of its residents were White" (Boerner and Lambert, p. 4). Boerner and Lambert challenged the NLJ methodology further by asserting that "the whitest of the minority communities had a higher percentage of White residents (84.1%) than the general population of the United States, which is 83.1% White" (Boerner and Lambert, p. 25, note 11). Furthermore, Boerner and Lambert showed that if the NLJ methodology were applied to an examination of "Stanton Island---home of the nation's largest landfill," it too, would be considered a "minority" community even though over 80 percent of its residents were White. In fact, Stanton Island was the "whitest" of New York City's five boroughs" (Boerner and Lambert, pp. 4-5). This criticism amplifies the problematic nature of trying to categorize "community" - in this particular case the unit of analyses are zip codes.

Next, Boerner and Lambert challenged the methodologies of the frequently cited environmental justice research for disregarding population density in the analyses. They assert that when a study only specifies the percentage of minority or low-income residents in a community, its measurement is impaired because the true level of environmental exposure experienced by the host community being studied is invalid. To buttress this point the authors offer the following example:

> Given that Blacks presently comprise approximately 16 percent of the nation's population, a host community of 1,000 residents, 20 percent of whom are Black, would be considered minority, while a host community of 6,000 residents, 15 percent of whom are Black, would not. By overlooking population density, the studies fail to point out that more Blacks (900 versus 200) would be exposed to pollution in the second, non-minority community, than in the first (Boerner and Lambert, p. 5).

Boerner and Lambert's critique of existing environmental justice studies challenged the assumption that proximity somehow equates to risk and exposure. The studies that propelled the issue of environmental equity to the forefront of policy agendas implied rather than explicitly stated the actual risk presented by toxic materials, and none of the studies presented epidemiological proof of the dangers associated with living near a facility. Health risks, Boerner and Lambert contended, "are a function of actual exposure, not simply proximity to a waste facility" (Boerner and Lambert, p. 6). The consequences of relying on assertions unsubstantiated by scientific and empirical data could generate regulatory restrictions that create burdens greater than the initial problem of living proximate to a hazardous waste facility. Exposure related to toxic materials however, is not the only negative externality related to living proximate to hazardous sites. Issues of social justice and discrimination in labor, education and housing could all play a role in the location of poor and minority residents living proximate to hazardous waste. The present study concerns itself with these latter issues.

Boerner and Lambert's analysis brought to light two additional points of great importance. These points are explicated at some length in the studies that follow:

1. Existing environmental justice research fails to establish that discriminatory siting and permitting practices caused present environmental disparities (industries may have been existence prior to the minority communities)
2. Existing research fails to take into account the potential for "aggregation errors" from defining the affected area in geographic terms that are too broad (Boerner and Lambert, pp. 5-6).

Boerner and Lambert's insights are important to this study because they address the problematic nature of defining community; indicate the shortcomings of using too large of a unit of analysis and point to the necessity of measuring race and social class more effectively and accurately.

A study by the Social and Demographic Research Institute (SADRI), at the University of Massachusetts at Amherst (1994), was the first national study to examine treatment, storage, and disposal of hazardous wastes (TSDFs) using census tract data. After comparing social and demographic data of census tracts, SADRI found "no consistent and statistically significant differences in the racial or ethnic composition of tracts that contain commercial TSDFs and those that do not" (Anderton, Anderson, Oakes, Fraser, Rossi, Weber, & Calabrese, p. 123). Boerner and Lambert declared the SADRI study to be "the most comprehensive analysis of environmental justice to date," and "cast serious doubt" on much of the previously conducted research (Boerner and Lambert, p. 6). With regard to the issue of minorities being exposed to greater risk, SADRI researchers concluded that it "depends on how distance from TSDF sites is related to that risk, an issue on which there is currently little knowledge" (Anderton et al, p. 123).

The SADRI study examined whether TSFD sites were located disproportionately in communities with Black or Hispanic residents. In the research design, SADRI researchers addressed the problem of operationalizing the term "community or neighborhood." SADRI researchers asserted that since the essential concern of environmental equity was potential harm or risk from TSDFs, "the area chosen for analysis should correspond to the likely aerial distribution of possible harm from TSDFs" (Anderton, pp. 127-28). The problem, SADRI researchers found, was the lack of "firm guidelines on how to define areas that are subject to the potential effects of a TSDF" (Anderton, p. 128). SADRI researchers confronted this issue in the following manner:

> in the absence of clear indications about which aerial unit to adopt as a unit of analysis, the sensible strategy is to choose the smallest available aerial units that can then be aggregated into larger units if necessary. Beginning with too large a geographic unit of analysis invites the possibility of aggregation errors and ecological fallacies (i.e., reaching conclusions form larger unit of analysis that do not hold true in analyses of smaller, more refined, geographic units) (Anderton et al, p. 128).

It is worth noting that frequent criticisms of the GAO study, and the CRJ study, centered on the way these studies defined community (i.e., use of 5 digit zip codes). Census tracts clearly emerge in the literature as the optimal unit of analysis given the more parsimonious nature of census block group variables along with the potential of sampling error that exists with the smaller sample sizes of block group data as well.

SADRI researchers selected eight census tract characteristics for the study, that reflected the principal findings of past environmental justice research. By examining racial, economic and industrial housing characteristics, SADRI researchers arrived at three major conclusions that stand contrary to findings of the studies previously discussed:

1. The appearance of equity in the location of TSFDs depends heavily on how areas of potential impact or interest are defined.

2. Using census tract areas, TSDFs are no more likely to be located in tracts with higher percentages of Blacks and Hispanics than in other tracts.
3. The most significant and consistent effect on TSDF location of those studied was that TSDFs were located in areas with larger proportions of workers employed in industrial activities, a finding that is consistent with a plausibly rational motivation to locate near other industrial facilities or markets.

It is important to note, however, that the findings varied with different geographic units of analysis. For example, when the 25 largest SMSAs were examined, census tracts with higher proportions of Hispanics were "slightly more likely, to be TSDF locations," than areas with a proportionately higher Black population (Anderton et al, p. 136).

Further, SADRI reported dramatic changes in the ratio of Blacks located close to TSDFs, when much larger areas were analyzed. The study noted that it was only in tracts on the periphery of the 2.5-mile radius circle around TSDFs that the proportions of Black residents were significantly larger" (Anderton et al, p. 136). SADRI goes on to conclude that:

> only in the single regions of the country in which the Black and Hispanic populations are most well represented is there evidence that TSDFs are more likely to be located in tracts with greater proportions of these minorities. Certainly, these minorities are not the most immediately exposed to the potential hazards of TSDFs throughout most of the country. None of these effects appears to be as consistent or significant as the finding that TSDFs are most likely to be attracted to industrial tract areas (Anderton et al, p. 136).

Another study by Vicki Been, a Law Professor, at New York University School of Law drew results that contradicted the conventional wisdom found in the popular studies examined earlier.

Vicki Been (1994), replicated the GAO study, and Bullard's study of Black Houston, but she appended important and often overlooked dimensions. Been not only analyzed current demographic data, but she also examined the "demographic characteristics of host neighborhoods in those studies at the time the siting decisions were made," and traced "demographic changes in the neighborhoods after the siting" (Been, p. 1387).

The purpose of Been's research was two-fold. First, the research sought to determine whether the sites for “local undesirable land uses” (LULUs) were originally chosen fairly, but "subsequent events produced the current disproportion in the distribution of LULUs" (Been, p. 1385). Second, she sought to determine whether alternate explanations, such as "poverty, housing discrimination, and the location of jobs, transportation, and other public services," caused minorities to move to areas that offered the least expensive housing, but contained a LULU (Been, p. 1385). Been's contention was that claims of racism and classism by environmental justice advocates, could not be accurately appraised by policy makers until a comparative study of the socioeconomic characteristic was conducted, while also considering potential causality resulting from the many factors under the rubric of market dynamics.

The replications that traced historical demographics, rather than analyzing only current data, showed significant differences in the evidence as compared to the original GAO and Bullard studies. The results seemed to show the importance of market factors in support of the theory that the location of LULUs cause property values to decline for the homes around the site. For example, Been found that subsequent to a landfill siting in Harris County, Texas, the property values nearest the site declined relative to other areas in that county, "and the host communities became increasingly populated by African-American and increasingly poor" (Been, p. 1405).

While the findings on the siting process were mixed, Been established that when census data was examined in relation to the date of the siting, African-Americans bore a disproportionate effect. Regarding the specifics of each replication, Been found that these studies suggest that the siting process bears some responsibility for the disproportionate burden waste facilities now impose upon the poor and people of color. The extension of the GAO study suggests that market dynamics play no role in the distribution of the burden. The extension of the Bullard study, on the other hand, suggests that market dynamics do play a significant role in that distribution (Been, p. 1405).

Been concluded that efforts to properly address the disproportionate number sitings in minority communities was hampered by existing evidence that failed to take into account "which came first---the people of color and poor or the LULU" (Been, p. 1406). Been contended that if minorities disproportionately populated communities at the time of the siting, then it can be inferred that changes need to be made because of discriminatory practices in the siting process. However, if minorities did not disproportionately populate the communities, then policy makers are confronted with finding remedies in a complex situation involving forces such as "housing discrimination, poverty, and free market economics" (Been, p. 1406). Finally, Been called attention to the importance of resolving the issue of what came first, otherwise, “proposed solutions to the problem of disproportionate siting run a substantial risk of missing the mark" (Been, p. 1406).

Studies that addressed the issue of "what came first" have been limited. James T. Hamilton of Duke University addressed the issue by drawing parallels between original siting issues and issues related to changes in capacity by operational toxic facilities. Hamilton studied the correlations between (1) the planned capacity changes of facilities that processed hazardous waste as it related to political power (measured by voter registration) of counties that housed the facilities; and (2) planned capacity changes and county demographics.

Hamilton's conclusions were consistent with the often-made assertion of environmental justice advocates about low involvement rates among minorities in environmental issues. First, when other factors were controlled, the "Nonwhite population percentages was not a statistically significant factor in the expansion decisions of the commercial facilities" (Hamilton, p. 117). However, in communities with a higher Nonwhite population, the possibility of a facility reducing its capacity was less likely. Hamilton's research found that decisions to expand or contract the output capacity of a hazardous waste facility were influenced by a community’s ability to mobilize for collective action. Hamilton claimed that "voter turnout rate is truly a proxy for collective action," and can be observed in "the positive association between voting rates and firm decisions to close facilities (i.e., the more politically active the community, the more likely hazardous waste facilities were to plan net reductions in capacity)" (Hamilton, p. 122).

Scholars studying Hamilton's research concur with his proposition that a relationship between siting decisions and the demographic characteristics of the host community exists, because the factors that influence facility decisions to expand or contract its services are in many ways parallel to the factors involved in the initial siting decision (Hamilton, pp. 101, 106-20; see also Been, p. 1396; and Boerner and Lambert, note 16, p.26).

A portion of the evidence in John A. Hird's (1993) study found that while political activism could be held attributable for a site gaining Superfund designation, the rate at which a site was cleaned-up, once placed on the Environmental Protection Agency's NPL, appeared to be unaffected by political activism. The thrust of Hird's study aimed at the equity implications of the EPA's Superfund Program. To assess the equity implications, Hird studied the geographic distribution of sites nationally using county level data as the unit of analysis to ascertain the socioeconomic characteristics of the counties (Hird, p. 323).

The results were both unexpected and mixed. As expected, the research found a significant manufacturing presence "strongly associated with more county NPL sites," and, like Vicki Been (1994), Hird found a correlation between TSFDs and attenuating property values (Hird, p. 332). The unexpected result "indicated that more economically advantaged counties (in terms of both wealth and the absence of poverty) were likely to have more Superfund sites" (Hird, p. 333). Hird concluded:

the geographic distribution of Superfund sites suggests that the likely beneficiaries of program expenditures live in counties that are on average both wealthier and more highly educated the rest, and also have lower rates of poverty. The pace of the EPA's cleanups, however, depends mostly on the sites' potential hazard, and is not apparently motivated by the localities' socioeconomic characteristics or political representation. The program is found in several respects to be both inefficient and inequitable, yet Superfund enjoys considerable support for reasons beyond these traditional public policy goals, including its political and symbolic appeal (Hird, p. 323).

Rae Zimmerman (1993) found higher potential exposures for minorities at Superfund sites. Using minor civil divisions (MCDs) as "communities," Zimmerman found that in the aggregate the percentages of Blacks (18.7%) and Hispanics (13.7%) in MCDs with NPL sites were higher than their national population percentages of 12.1% for Blacks and 9.0 percent for Hispanics. Three quarters of the Black population living around NPS sites are concentrated in communities with 20% or more Black residents (which account for only 15% of the total NPL communities). The average population in these Black communities is much higher than the average population of communities with Superfund sites. Thus for Black residents, Zimmerman determined that their relatively higher potential exposure to risk to Superfund sites arises from their living in a relatively small number of populated communities with hazardous waste sites (as cited in Hamilton & Viscusi, 1999).

Anderton, Oakes and Egan (1997) examined exposure to Superfund risks using census tract data. Using a multivariate analysis they found a higher percentage of Black residents is associated with a greater number of CERCLIS[2] sites (NPL and non-NPL sites) in a tract but a smaller number of NPL sites. Regarding the issue of whether Blacks neighborhoods received equitable prioritization in a site being placed on the NPL the researchers concluded:

> Our analysis of the prioritization process is consistent in suggesting that neighborhoods with higher percentages of Black residents are potentially less likely to have a timely designation on NPL sites from among CERCLIS sites. Yet to definitively determine the equity of the prioritization process would require costly or even an infeasible independent assessment of site hazards (as cited in Hamilton & Viscusi, 1999).

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[2]Uncontrolled hazardous waste sites are identified by the EPA in the "Comprehensive Environmental Response, Compensation and Liability Act Information System" (CERCLIS). From the time Superfund program was created, it collected a wealth of technical information. In 1986, as part of the Superfund Amendments & Reauthorization Acts (SARA), Congress created the CERCLIS database to maintain all the related information. The system tracks information on all Superfund sites - both the most hazardous (NPL Superfund sites) and those where cleanup is easier or less urgent. For a fuller discussion of the legislative and regulatory strictures governing toxic waste. See the explication offered by the US EPA Superfund Home Page http://www.epa.gov/superfund/.

Bowen, Salling, Haynes and Cyran et al (1995) found high correlations between racial variables and spatial distribution of toxic industrial pollution as identified by the EPA's Toxic Release Inventory. The authors of the study reported that the highest levels of toxic release in Ohio occur in the state's most urban counties, fourteen of which contain approximately 90 percent of the state's minority population. The author's however, report an important caveat related to the geographic unit of measurement and the results speak to the critical nature of this element in the study of environmental equity. The author's found that when using census tracts instead of the larger unit of counties that

> the most urban of these counties, Cuyahoga, reveals no relationships between race and toxicity. The tract level data do provide some evidence of income-environment inequity, and these findings prompt several methodological advisories for further research. The principal conclusion of this paper is that spatial scale is critical in studies of industrial environmental hazards and environmental justice (Bowen, Salling, Haynes, & Cyran, 1995).

In sum, this literature review highlighted the major studies and methodological issues often looked to by current decision makers and scholars, who, in a relatively short period of time, have pushed the issue of environmental equity to the top of the nation's environmental policy agenda. While several of the more commonly accepted studies found positive correlations between minority populations and proximity to pollution, other studies cautioned that some results from previous studies often depended upon methodological issues and assumptions that can bias the outcome.

Several vital methodological issues are woven through the fabric of the literature. For the purposes of this study, the optimum choices contained in the literature were used to build its methodological foundation. The unit of analysis, method of measurement, statistical tests, comparison groups and assumptions are critical factors that if selected improperly can lead to misleading results. The theoretical and methodological issues of this study are addressed at length in the next two chapters.

CHAPTER 3

THEORETICAL FORMULATION AND RESEARCH HYPOTHESES

In general, environmental justice proponents assert that minority and low income communities bear a disproportionate share of the negative externalities associated with environmental toxins. A framework written by Hamilton and Viscusi (1999), but summarized here provides a practical and more explicit context for understanding how environmental inequities could come to fruition. The authors explain that (1) If education, labor, and housing markets were functioning perfectly, one would expect individuals with lower incomes to choose, other things being equal, to live in neighborhoods with lower levels of environmental protection because housing prices would be lower there. Excessive levels of minority and low income residents near toxic waste could indicate that some level of social injustice was at work, thereby signaling toxic disparities and discrimination. (2) Exposure of minority groups to environmental risks can sometimes result from influences other than efficient market forces. Patterns of residential location and risk may arise from discrimination in education, housing, and labor markets. If such factors give minority groups lower incomes or mobility, they may then be led to live in areas with greater levels of environmental risks. Living next to a Superfund site could thus be another manifestation of the damages arising from employment or housing discrimination. (3) Another explanation for Superfund toxic sites being located in neighborhoods with higher percentages of minority residents is political influence or participation. If residents vary in the degree that they engage in collective action, minority residents may end up living near externality-generating sites if they are less likely to translate their demands for compensation into costs that firms will face in the political process. Community differences in the potential for collective action thus translate into differences in environmental contamination and environmental cleanups (Hamilton & Viscusi, pp. 158-59, 1999).

In more theoretical terms, Martin N. Marger (1994) in delineating ***conflict theory*** speaks to its primary division, ***economic gain***. Under economic gain theory, the economic benefits result in profits for the dominant group that engages in prejudice and discrimination. Marger explains, "prejudice and discrimination ...are products of group interests and are used to protect and enhance those interests" (p. 102). Different groups can become the targets "as they present or are perceived as presenting a threat" to the interests of the dominant group, that can range from "enhanced prestige or political gain," to attenuated health risks, resulting from a cleaner environment in a given community (Marger, pp. 102-3). Several contemporary studies which cite excessive levels of pollution in minority and low income areas seem to corroborate the assumption of economic gain theory, which holds that "prejudice and discrimination against blacks continue[s] to benefit at least segments of the white population" (Marger, p. 103).

Many of the environmental justice advocates' contentions of environmental racism discussed in the literature review seem to rely on the postulates of "economic gain" branch of conflict theory. However, a sort of "poisoning of the well" aspect is evident too. Consider that if "economic gain theory" is assumed in combination with overtones of environmental elitism, a double edged, no-win situation takes form.

Environmental elitism theory postulates that poor and minority peoples view the environmental movement as an elitist movement, which uses its liberal views as a front for oppression (Schnailberg, 1983, pp. 200-19). A central component of the theory is the conflict between environmentalist and social justice advocates. Social justice advocates contend that some of the negative impacts of environmental reform proposals create, exacerbate, and sustain social inequalities. Environmental equity issues, when examined in the context of hazardous waste facility locations relative to race and socioeconomic composition and remediation, provide a theoretical context to examine whether environmental regulations are inherently regressive and discriminatory.

Taking these two views into consideration, environmental inequities would arise regardless of whether the toxins are in White or Nonwhite areas. For example: (1) if the sites are in low-income and minority communities, then these populations are disproportionately impacted by the pollution; and (2) if the hazardous sites are in non-minority communities and the sites receive public support for remediation, then theoretically it could be construed that the regulatory and remediation process favors the more affluent and more environmentally active non-minority population.

In an effort to overcome the dilemma presented by the contradictory tenets of environmental justice theory, this research examines whether racial and social class disparities exists in the areas surrounding Superfund site locations in Pennsylvania. A disproportionate number of Superfund sites in minority and low income areas would address the visceral concerns for environmental equity/justice advocates –proximity to hazardous waste.

Hypothesis

The main purpose of this study is to determine whether Superfund toxic waste sites in Pennsylvania are located disproportionately in Nonwhite and low-income areas. To accomplish this task the study will measure race and socioeconomic characteristics at varying concentric distances from NPL sites to determine if significant gradient variances exist between the distances.

Therefore, the following hypotheses are tested in this study to examine the location of NPL toxic waste sites and socioeconomic correlates of the spatial dimensions surrounding the sites. In general, the proposed hypotheses are expected to follow the relationships among the variables itemized below:

- As the distance from a Superfund site in Pennsylvania decreases, the Nonwhite population is expected to increase.
- As the distance from a Superfund site in Pennsylvania decreases, social class (income, education, poverty and housing value) is expected to decrease.

It is important to note that this study is a first step in determining whether proximity disparities exist among and between race and socioeconomic characteristics in the areas that surround Pennsylvania Superfund sites. This study in no way addresses the exposure, health or epidemiological impacts of the toxicities on the population relative to the proximity. Rather, this study is the first step in exploring whether high numbers of Nonwhite and poor residents live in closest proximity to Pennsylvania's most toxic sites. A high incidence of poor and minority populations living in close proximity to Superfund hazardous waste sites in Pennsylvania could indicate that social injustice and discrimination are at work in these area rather than market forces and economic dynamics. Should the results of this study indicate disproportionate levels of poor and minority residents, then further investigation would be required.

CHAPTER 4

RESEARCH DESIGN

Data

Two primary sources of data were required for this study: 1990 US Census Data and US EPA CERCLIS system data to provide the locations or the NPL or Superfund sites.

Census data is the most reliable and generally available data source for the demographic and geographic distribution of population in the United States. Census data is available for relatively small geographic units of analysis, including census tracts and block groups (Bowen, Salling, Haynes, & Cyran, 1995). The census data used in this study was the 1990 Census Summary Tape File 3 (STF3), and includes all persons and housing units in the United States. Summary Tape File 3 (STF 3) contains sample data weighted to represent the total population. In addition, the file contains 100-percent counts and unweighted sample counts for total persons and total housing units. Summary Tape File 3 is released as file 3A, file 3B, file 3C, and file 3D. The record layout is identical for all four files but the geographic coverage differs. Specifically, to obtain census tract data, this study relied on STF 3A

After some deliberation between block group level and tract level data, it was decided that tract level data, on the merits of it greater precision, would serve as the unit of analysis in this study. Census tracts are small, relatively permanent statistical subdivisions of a county. Overall, in 1990, Pennsylvania tracts had an average population of 3,744 persons and, a mean land area of 4.4 square miles. The spatial size of tracts varies widely depending on the density of the settlement. However, once delineated, the tract spatial dimensions are designed to last a long time so that statistical comparisons can be made from census to census. Although tracts are defined for the purposes of census enumerations, most tract boundaries follow existing neighborhoods in cities and community boundaries in rural areas. Tract data provides greater detail with a wider range of available variables than block group data and avoids the potential for sampling error as found with the smaller samples in block group data.

Another important decision revolved around whether to use 1990 tract data or 2000 tract data. After some investigation, it was found that of the 120 Superfund site examined in this study, only two (1.6%) of the Superfund site were discovered after 1990. The clear majority of the sites were discovered in the decade following the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) or Superfund law enactment in 1980, so it seemed the best choice from the data available was 1990 census data.

NPL sites or Superfund sites (the terms are used interchangeably and synonymously) as used in this study are EPA designated uncontrolled hazardous waste sites. Uncontrolled hazardous waste sites are identified by the EPA in the "Comprehensive Environmental Response, Compensation and Liability Act Information System" (CERCLIS). Those sites that meet a toxicity threshold and require long-term "remedial action" are listed on the EPA's National Priority List (NPL).. Only those sites listed on the NPL are eligible for federal cleanup funds under Superfund (CRJ, pp. 3-6). For a fuller discussion of the legislative and regulatory strictures governing toxic waste, see the explication of the Commission on Racial Justice study in the literature review of this study or refer to the EPA Superfund homepage (http://www.epa.gov/superfund/).

The 120 Superfund sites used in the study were obtained primarily from the EPA's CERCLIS database at http://cfpub.epa.gov/supercpad/cursites/srchsites.cfm. Additionally, a Freedom of Information Act written request was made to the EPA Region 3 office to obtain the longitude and latitude points for the Superfund sites in the study. The use of the longitude and latitude points provided much greater accuracy than using street address points when plotting the sites on a map in a GIS system.

Several important notes regarding Superfund sites and their use in this study follow. Pennsylvania had 120 Superfund sites in various stages of remediation as of November 2003. The majority of these sites (99%) have been on the list for a decade or two decades or longer because of the Superfund program's slow pace of remediation. The most recent site to be added to the list was discovered in 1998. Further, a portion of the Superfund sites in this study are federal sites and military bases. No distinction was made between the sites remediation status and/or whether it was a federal or non-federal facility.

Military bases were included in the study as well. While the EPA is very liberal in the information they provide on Superfund sites, it has restricted the information it provides on Military installations following the terrorist attacks of September 11, 2001. The research at hand seeks only to measure socioeconomic variables and not specific toxicities or risk factors. Consequently, the new limitation of information as it relates to Military sites did not substantively affect the study; therefore, these sites were included. Further, while over 35 additional Superfund sites located on the borders of the surrounding states of New York, Delaware, Maryland, West Virginia, and Ohio were examined as having a potential impact on Pennsylvania's population, only 23 of these sites were in close enough proximity, relative to the distance measures set out in the study, to be examined as having a potential affect Pennsylvania's population (see Appendix B Table M3 and Figure M1 for a complete list of the sites examined in the study along with a map of the site locations).

Variables

The variables used in this analysis, where applicable, represent the mean or median conditions for each of the 3,167 census tracts in the state of Pennsylvania. The dependent variables of interest were race and measures of social class. Social class includes elements such as: income and/or income by race; education by race; poverty status by race; and housing value, age, tenure and vacancy/occupancy. Population density measures were used as a check variable to ensure that statistical measures for the tracts were not skewed by densely populated urban areas or under-populated rural areas.

Race is supported in the literature by a longitudinal body of research comprised of more than 60 studies that demonstrates a relationship between various minority groups and increased levels of a variety of environmental harms (Lester, Allen & Hill, 2001, pp. 57-58). The Race variable employed in this study acts as a dependent variable and consists of the percent of the population that is either White or Nonwhite.

A social class (or socioeconomic status) dimension is supported in environmental justice literature as well, and will be the second categorical dependent variable. Class is an important variable because land values are comparably low in poor areas, conceivably because of an industrial presence. New industries often select these areas because the land is cheap, and the appropriate zoning and infrastructure are already in place. Additionally, more affluent, well-educated and wealthier areas "want to protect against decreasing property values; thus, polluting industries meet opposition when trying to locate in upscale areas." For these reasons, an extensive body of prior research has demonstrated a class dimension with regard to location, frequency and severity of a variety of environmental harms (Lester, Allen & Hill, 2001, p. 59).

Social Class is measured by the categories itemized immediately below. It should be noted that the dependent variables were used under the same operationalized definitions as offered by the US Census Bureau for STF3A. Only necessary changes were made to the data in preparation for measurement, such as collapsing categories and deriving percentages (means for one-way analysis of variance), but these changes in no way affected the original integrity of the data or changed the original definition of the variables as intended by the Census Bureau. The socioeconomic variables listed below contain descriptive notes as necessary – the full operationalized definitions for the variables are available with STF3A (parenthetical table references were added below to assist reader in locating the variable in the census documentation) or at the Bureau's web site at http://factfinder.census.gov.

Dependent Variables

Race

- *White Population* (P1 and P9)
- *Nonwhite Population* (P1 and P9): derived by subtracting the White population from the total population.

Race by Class

- *Per Capita Income by Race* (P115A): The use of White and Nonwhite categories proved to be prohibitive; therefore the categories of White and Black were selected as measures.
- *Race by Educational Attainment* (P58): minority categories for race were collapsed to gain a Nonwhite variable. To avoid a double counting of the

Hispanic population the "other race" category was used because Hispanics are counted in this category as well as in a separate "Hispanic" category. This variable included person 25 or over in age.

- *Poverty Status by Race by Age* (P119): minority categories for race were collapsed to gain a Nonwhite variable. To avoid a double counting of the Hispanic population the "other race" category was used because Hispanics are counted in this category as well as in a separate "Hispanic" category. This variable included person 18 or over in age. Further includes only the persons below the poverty status. Poverty status for a family of four was equivalent to $12,674 and $6,310 for one person. Note: poverty status as measured here by the Census Bureau used the universe of persons.

Class

- *Median Household Income* (P80A)
- *Median Year Structure Built* (P25A): This variable refers to the median year housing structures were built.
- *Median Value* (H61A): This variable refers to the median value of housing for owner occupied units.
- *Tenure* (H8): Provides owner and renter occupied units. A higher percentage of renter occupied units is an indicator of a low-income area because persons that rent are unable to afford or do not have the credit standing to obtain a mortgage. In addition, renter occupied housing in general speaks to a more transient population, while owner occupied speaks to a more stable and grounded population.
- *Occupancy Status* (H4): Provides vacant and occupied housing units. Referred to as Vacant Housing Units and Occupied Housing Units in the "Results" chapter of this study and measures the Vacancy/Occupancy rates of the zones.

Verification

- *Population Density*: Derived by calculating the number of persons in a tract, and then dividing by the area size of the tract measured in square miles.

Independent Variables or Factors

- *Distance from Site:* The independent variables are actually one single categorical variable and were derived from three concentric rings drawn by a Geographic Information System (GIS) at varying degrees around the toxic sites under examination in this study. A fourth element is comprised of the tracts or areas that are beyond the distances obtained from the concentric radii. The rings represent three mutually exclusive distances to ensure that no census tracts were double counted in the analysis. Further, the concentric zone measures represent the average distance from the toxic sites to the census tract centroids contained within the concentric periphery. The distances are provided by their coded name as was necessary to employ the statistical analysis in SPSS.

- ***Zone 1 - coded as 1.666*** represents the average distance from zero (0) to 1.666 miles from the site to the census tract centroids.. Zone 2 represents an area size of approximately 8.7 sq. miles.
- ***Zone 2 – coded as 3.333*** represents the average distance from 1.667 miles to 3.333 miles from the site to the census tract centroids. Zone 2 represents an area size of approximately 26.1 sq. miles.
- ***Zone 3 – coded as 4.999*** represents the average distance from 3.334 miles to 4.999 miles from the site to the census tract centroids and was originally postulated to serves as a comparison distance zone. Zone 3 represents an area size of approximately 43.6 sq. miles.
- ***Zone 4 coded as 9.999*** represents a distance greater than 4.999 miles from a site and is further representative of comparative areas that do not have NPL Superfund sites within five miles of their neighborhood or community.

The distance measures were derived from several factors and much deliberation. First very little existing research could be found using concentric gradient measure with tract level data. Hamilton and Viscusi (1999) conducted a national study addressing the exposure impact of Superfund toxicities (cancer rates) on surrounding communities using census *block data* and concentric measures ranging in size from 0.25 miles (0.25 increment to 1 mile) to four miles (from 1 mile to 4 miles in 1 mile increments). The unit of analysis (tracts) for this study made the small rings used by Hamilton and Viscusi prohibitive. For example, it is probable using census tracts as the unit of analysis, that one could draw three 0.25 mile concentric rings around a toxic site and never leave the tract hosting the site. Larger concentric measures appeared not only reasonable but necessary.

Anderton (1994) used a *single 2.5 mile* concentric measure with tract level data in studying environmental equity issues. Therefore, it seemed reasonable to expand the total concentric area to five miles since the total area would be stratified into three distance measures with the largest of the three rings being used as a comparative measure.

Next, as a commercial real estate professional, this researcher has spent the better part of the past decade working intimately with commercial real estate developments. Establishing areas that are likely to be impacted by a commercial site is a typical undertaking relative to the siting of a new office complex, factory or warehouse or retail complex. By far, the most typical sphere of influence assumed in the commercial real estate industry is five miles (stratified into three more/less rings), sometimes changing to three miles in densely populated urban areas. Using this well-tried measure, post hoc testing was conducted with a GIS system.

Concentric measures ranging in size from one to three miles, in increments of one-mile, often failed to capture more than the initial tract hosting the toxic site when the second ring was drawn. In general, three distinct rings with the largest ring having an area approximately five miles in circumference and functioning as a comparison ring seemed to be the soundest choice. So, in the end, the concentric measures were thoroughly analyzed and grounded in a review of the literature, experience and testing. Readers of this study are encouraged to think of the areas in which they live, and then to imagine whether they would feel impacted by a Superfund site if it was located from zero to 1.666 miles or 1.667 to 3.333 miles from their home. (see Figure M2 Appendix B for an aerial photograph with a concentric ring overlay of an NPL site in Moon Township, Allegheny County, Pennsylvania)

It is important to note that the distances derived from the three concentric rings represent an average range of distance for that given ring. In other word, not every census tract within a given ring is, for example, exactly 1.666 miles from the NPL Superfund site. Rather, the tracts that fall into the Zone 1 (1.666) category are between the range of zero and 1.666 miles from the site.

Methodologies and Measurements

This is a descriptive study (not causal) that seeks to determine the role of race and social class as they relate to the location of and the distance from NPL toxic waste sites in Pennsylvania. Simply, the study seeks to determine the gradient patterns of race and social class characteristics of the living at varying degrees of proximity to NPL sites in Pennsylvania and assess whether Nonwhite and poor persons are impacted disproportionately by the negative externalities related to a Superfund site's presence. Issues of social justice and discrimination in labor, education and housing (redlining) could all potentially play a role in the location of poor and minority residents living proximate to hazardous waste. Further, the demographic composition and geographic distribution of Nonwhite and poor persons are part of the primary intent of Executive Order 12898 which aims to address and remedy issues of environmental inequities as they relate to federal programs and policies such as those found within the Superfund program. The goal of the research is accomplished by analyzing the demographic and economic variables obtained from 1990 U.S. Housing and Population census data for the tracts that host and encompass the noxious sites.

A Geographic Information System (GIS), MapInfo is used to capture the spatial dimensions of the variables at 1.666, 3.333 and 4.999-mile radii from the NPL sites. As a comparison element, the tracts beyond 4.999 miles are examined as well, and are considered areas that do not have a Superfund site in their neighborhood areas. Tracts were included in the radii distance analysis only if their centroid fell within the bounds of the radii measure – tracts that fell partially within the radii but whose centroid was not captured by the distance measure were excluded from the distance measure.. Once gathered at the identified distances, the tracts were merged with the STF3A data file and demographic and economic profiles of the census tracts captured by the radii were analyzed by using descriptive statistics to authentic their validity. The number of tracts that fell within 4.999 miles of a NPL site in Pennsylvania initially equaled 1,312 or 41.4% of the 3,167 tracts that comprise Pennsylvania. The initial number tracts captured by the radii measure of the study attenuated by eight percent after outliers and tracts without data were removed. The final number of tracts employed in the study for areas both with and without sites within 4.999 miles were 2,898 following the elimination non-usable tracts. Maps were created to validate the data visually as well.

To test the hypotheses a *one-way analysis of variance* (ANOVA) model in SPSS was used to analyze the variability between populations at various distance from the NPL sites. ANOVA – An analytical technique aimed at determining whether the variables are related to each other is based on a comparison of differences between 3 or more subgroups of a single categorical variable and the variance on the same variable within each of the subgroups. For example: how income compares for Whites and Nonwhite at the four different distances. ANOVA allows testing of the *null hypothesis* that the real means are the same for the groups and examines the variability of the observations within each group as well as the variability of the group mean. If the group or groups are shown to be significantly different, then it is possible to conclude that the independent variables had an effect on the dependent variable. Additionally, several post hoc tests were conducted in SPSS to determine exactly which groups showed differences when the results where significant and to add a greater sensitivity to the one-way ANOVA tests.

CHAPTER 5

RESULTS

Chapter 5 presents the results[3] of a one-way ANOVA between the categorical independent variable (distance from site) and the dependent variables (race and social class). Additionally, the Scheffe, Bonferroni and Sidak post hoc tests are used to identify the specific differences between the means when the results of the ANOVA indicate that the null hypothesis is false. The post hoc tests also add a greater sensitivity to the analysis, and adjust for bias in the ANOVA procedure. Further, the combination of post hoc tests selected, aim at working harmoniously together to offset the risk of Type 1 errors.

- *Scheffe* performs simultaneous joint pairwise comparisons for all possible pairwise combinations of means, and uses the F sampling distribution. In addition, the Scheffe can be used to examine all possible linear combinations of group means, not just pairwise comparisons.
- *Bonferron*i uses t tests to perform pairwise comparisons between group means, but controls overall error rate by setting the error rate for each test to the experimentwise error rate divided by the total number of tests. Hence, the observed significance level is adjusted for the fact that multiple comparisons are being made.
- *Sidak* is a pairwise multiple comparison test based on a t statistic. Additionally, the Sidak adjusts the significance level for multiple comparisons and provides tighter bounds than Bonferroni
- (Karpinski, 2003).

[3] The reader may note that a somewhat redundant reporting element is employed to present the alternative point of view when Race, Education by Race and Vacant Housing are reported. These variables are accompanied by tables and graphs for their mirror image counterpart variables such as White, Nonwhite and Occupied, Vacant Housing etc.

ANOVA examines the null hypothesis; thus allowing for examination of the research hypothesis as indicated below.

Null Hypothesis: **H_0 : = $\mu_{1.666} = \mu_{3.333} = \mu_{4.999} = \mu_{9.999}$**

Research Hypothesis: **H_1 : Not all μ_i's are equal**

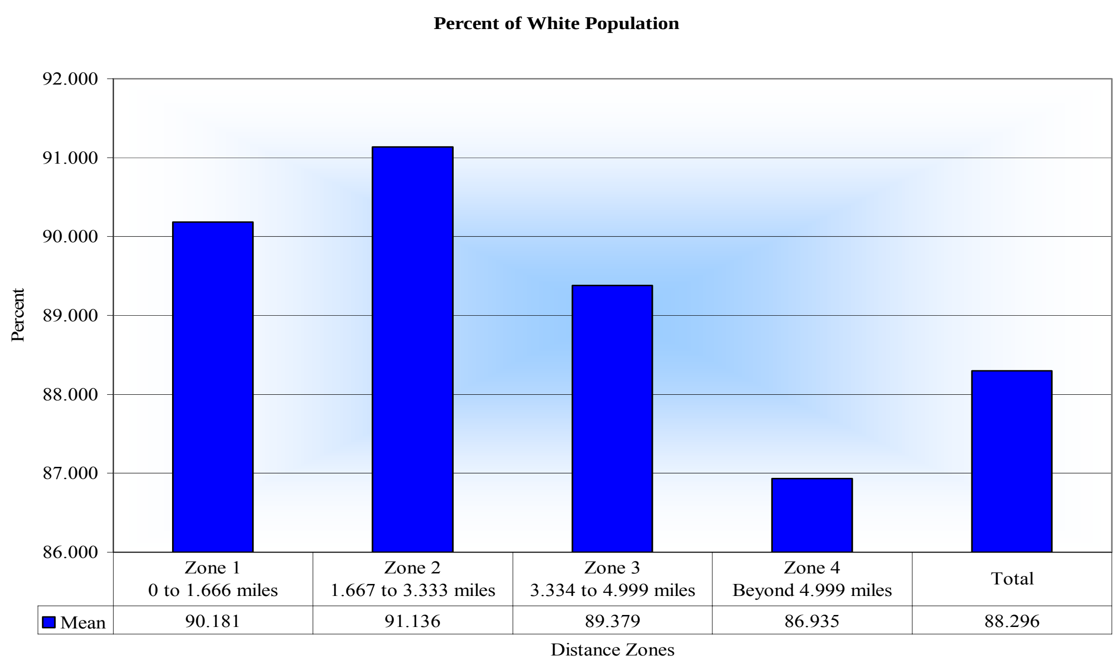
Percent of White Population: Table 1A indicates variance in the means of the dependent variable Percent of White Population as it relates to the categorical independent variable comprised of four gradient distance zones. Figure 1B illustrates the variance.

Table 1A 1

Descriptive Statistics - Percent of White Population								
					95% Confidence Interval for Mean			
Zones*	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
1.666	341	90.181	20.318	1.100	88.017	92.346	1.53	100.00
3.333	468	91.136	17.074	.789	89.586	92.687	1.21	100.00
4.999	405	89.379	20.886	1.038	87.339	91.419	.46	100.00
9.999	1771	86.935	25.775	.612	85.733	88.136	.24	100.00
Total	2985	88.296	23.425	.429	87.455	89.137	.24	100.00

* 1.666 = Zone 1 - (0.000 to 1.666 miles from NPL Site)
3.333 = Zone 2 – (1.667 to 3.333 miles from NPL Site)
4.999 = Zone 3 – (3.334 to 4.999 miles from NPL Site)
9.999 = Zone 4 – (Beyond 4.999 miles from NPL Site)

Figure 1B



Next, the research conducted a one-way ANOVA to determine if the variation in the means was significant enough to reject the null hypothesis that all means for Percent White Population are equal. The ANOVA results in Table 1C indicated that the null hypothesis could be rejected.

Table 1C

ANOVA Results - Percent of White Population

* The mean difference is significant at .05 level

	Sum of Squares	df	Mean Square	F	*Sig.
Between Groups	8745.611	3	2915.204	5.336	.001
Within Groups	1628611.578	2981	546.331		
Total	1637357.189	2984			

Since the ANOVA did not indicate which means differed from each other, the research conducted the Scheffe, Bonferroni and Sidak post hoc tests to identify the specific differences between the means. The results of the post hoc tests summarized in Table 1D, showed significant difference between 3.333 (Zone 2) and 9.999.(Zone 4). No other groups showed significance between each other – the differences between the non-significant means in fact may be due to sampling error. The null hypothesis was rejected. (Please see Appendix C, Table 1A1 for detailed post hoc test results)

Table 1D

Post Hoc Test Results - Summary of Multiple Comparisons Percent of White Population

* The mean difference is significant at .05 level

(I) Distance from Site	(J) Distance from Site	Scheffe	Bonferroni	Sidak
1.666 (Zone 1)	3.333 (Zone 2)			
1.666 (Zone 1)	4.999 (Zone 3)			
1.666 (Zone 1)	9.999 (Zone 4)			
3.333 (Zone 2)	4.999 (Zone 3)			
3.333 (Zone 2)	9.999 (Zone 4)	*	*	*
4.999 (Zone 3)	9.999 (Zone 4)			

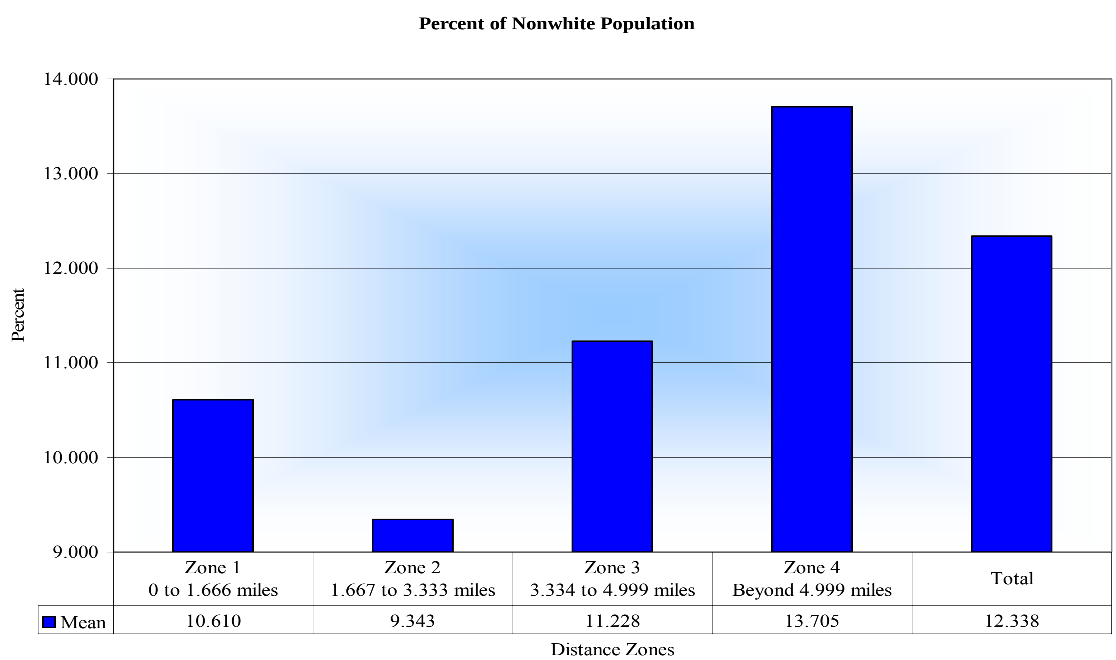
Percent of Nonwhite Population: Table 2A indicates variance in the means of the dependent variable Percent of Nonwhite Population as it relates to the categorical independent variable comprised of four gradient distance zones. Figure 2B illustrates the variance.

Table 2A

Descriptive Statistics – Percent of Nonwhite Population								
					95% Confidence Interval for Mean			
Zones*	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
1.666	325	10.610	21.275	1.180	8.288	12.931	.05	100.00
3.333	444	9.343	17.402	.826	7.720	10.966	.03	98.79
4.999	392	11.228	21.605	1.091	9.083	13.374	.04	100.00
9.999	1703	13.705	26.312	.638	12.454	14.955	.03	100.00
Total	2864	12.338	24.009	.449	11.459	13.218	.03	100.00

* 1.666 = Zone 1 - (0.000 to 1.666 miles from NPL Site)
3.333 = Zone 2 – (1.667 to 3.333 miles from NPL Site)
4.999 = Zone 3 – (3.334 to 4.999 miles from NPL Site)
9.999 = Zone 4 – (Beyond 4.999 miles from NPL Site)

Figure 2B



Next, the research conducted a one-way ANOVA to determine if the variation in the means was significant enough to reject the null hypothesis that all means for Percent of Nonwhite Population are equal. The ANOVA results in Table 2C indicated that the null hypothesis could be rejected.

Table 2C

ANOVA Results - Percent of Nonwhite Population * The mean difference is significant at .05 level					
	Sum of Squares	df	Mean Square	F	*Sig.
Between Groups	8617.468	3	2872.489	5.004	.002
Within Groups	1641649.301	2860	574.003		
Total	1650266.769	2863			

Since the ANOVA did not indicate which means differed from each other, the research conducted the Scheffe, Bonferroni and Sidak post hoc tests to identify the specific differences between the means. The results of the post hoc tests summarized in Table 2D, showed a significant difference between 3.333 (Zone 2) and 9.999 (Zone 4). No other groups showed significance between each other. The null hypothesis was rejected. (Please see Appendix C, Table 2A1 for detailed post hoc test results)

Table 2D

Post Hoc Test Results - Summary of Multiple Comparisons Percent of Nonwhite Population * The mean difference is significant at .05 level				
(I) Distance from Site	(J) Distance from Site	Scheffe	Bonferroni	Sidak
1.666 (Zone 1)	3.333 (Zone 2)			
1.666 (Zone 1)	4.999 (Zone 3)			
1.666 (Zone 1)	9.999 (Zone 4)			
3.333 (Zone 2)	4.999 (Zone 3)			
3.333 (Zone 2)	9.999 (Zone 4)	*	*	*
4.999 (Zone 3)	9.999 (Zone 4)			

Median Household Income: Table 3A indicates variance in the means of the dependent variable Median Household Income as it relates to the categorical independent variable comprised of four gradient distance zones. Figure 3B illustrates the variance.

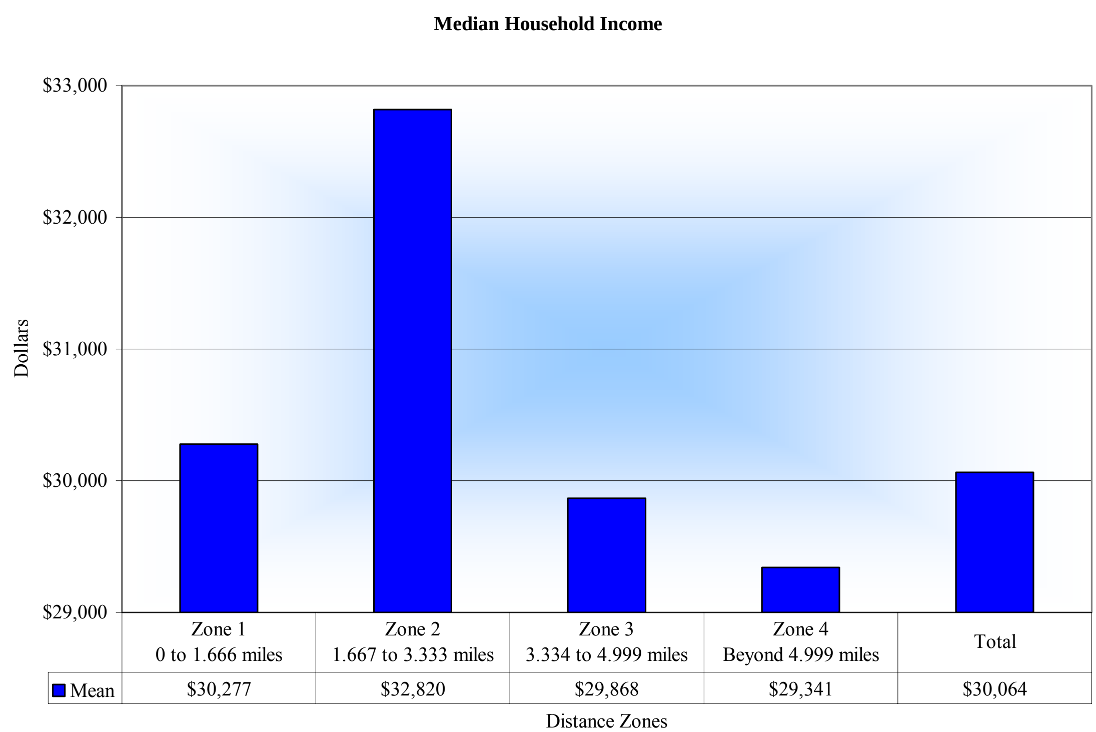
Table 3A

Descriptive Statistics – Median Household Income

					95% Confidence Interval for Mean			
Zones*	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
1.666	342	$30,277	$12,511	$677	$28,947	$31,608	$4,999	$75,269
3.333	467	$32,820	$15,758	$729	$31,387	$34,253	$5,811	$123,138
4.999	405	$29,868	$12,173	$605	$28,679	$31,057	$5,209	$82,553
9.999	1771	$29,341	$12,082	$287	$28,778	$29,905	$4,999	$125,263
Total	2985	$30,064	$12,839	$235	$29,604	$30,525	$4,999	$125,263

* 1.666 = Zone 1 - (0.000 to 1.666 miles from NPL Site)
3.333 = Zone 2 – (1.667 to 3.333 miles from NPL Site)
4.999 = Zone 3 – (3.334 to 4.999 miles from NPL Site)
9.999 = Zone 4 – (Beyond 4.999 miles from NPL Site)

Figure 3B



Next, the research conducted a one-way ANOVA to determine if the variation in the means was significant enough to reject the null hypothesis that all means for Median Household Income are equal. The ANOVA results in Table 3C indicated that the null hypothesis could be rejected.

Table 3C

ANOVA Results – Median Household Income * The mean difference is significant at .05 level					
	Sum of Squares	df	Mean Square	F	*Sig.
Between Groups	4503129487.123	3	1501043162.374	9.181	.000
Within Groups	487356521267.981	2981	163487595.192		
Total	491859650755.104	2984			

Since the ANOVA did not indicate which means differed from each other, the research conducted three post hoc tests to identify the specific differences between the means. All three tests as indicated in Table 3D, showed significant differences between 3.333 (Zone 2) and the other zones - only the Scheffe was not significant between 3.333 (Zone 2) and 1.666 (Zone 1). Accordingly, the null hypothesis was rejected. (Please see Appendix C, Table 3A1 for detailed post hoc test results)

Table 3D

Post Hoc Test Results - Summary of Multiple Comparisons Median Household Income * The mean difference is significant at .05 level				
(I) Distance from Site	(J) Distance from Site	Scheffe	Bonferroni	Sidak
1.666 (Zone 1)	3.333 (Zone 2)		*	*
1.666 (Zone 1)	4.999 (Zone 3)			
1.666 (Zone 1)	9.999 (Zone 4)			
3.333 (Zone 2)	4.999 (Zone 3)	*	*	*
3.333 (Zone 2)	9.999 (Zone 4)	*	*	*
4.999 (Zone 3)	9.999 (Zone 4)			

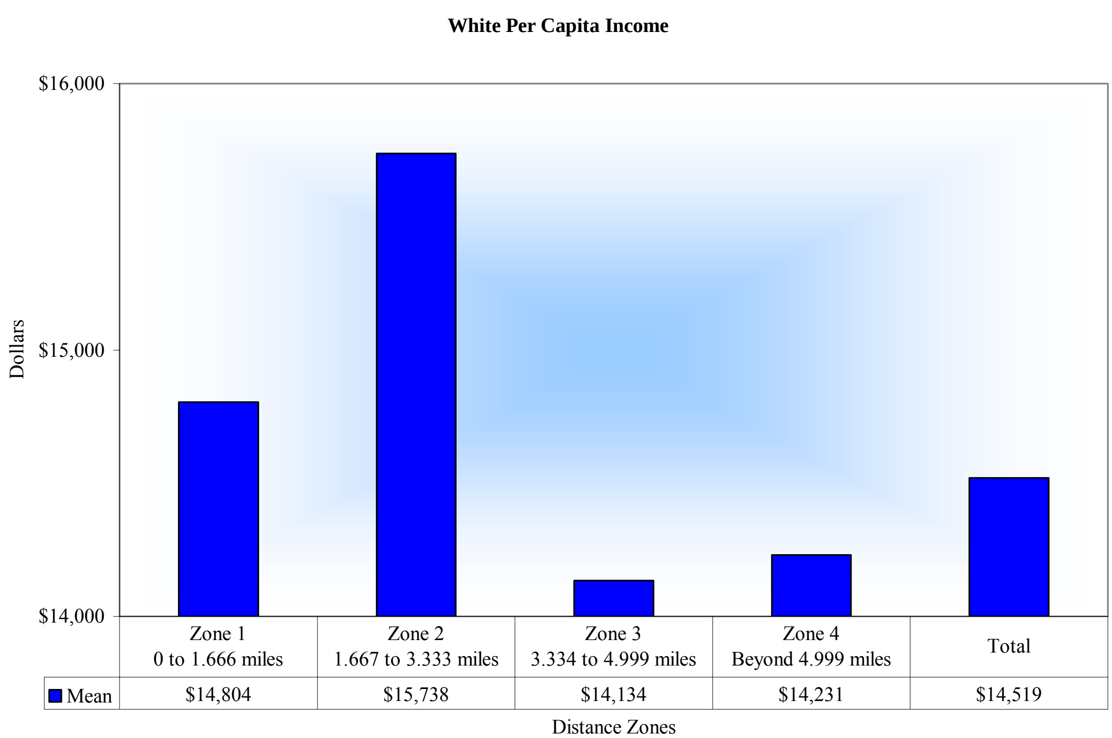
White Per Capita Income: Table 4A indicates variance in the means of the dependent variable White Per Capita Income as it relates to the categorical independent variable comprised of four gradient distance zones. Figure 4B illustrates the variance.

Table 4A

Descriptive Statistics - White Per Capita Income								
					95% Confidence Interval for Mean			
Zones*	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
1.666	340	$14,804	$7,946	$431	$13,956	$15,651	$3,051	$118,242
3.333	467	$15,738	$7,378	$341	$15,067	$16,409	$2,879	$68,515
4.999	405	$14,134	$5,301	$263	$13,616	$14,652	$1,713	$43,039
9.999	1771	$14,231	$6,438	$153	$13,931	$14,531	$1,555	$69,145
Total	2983	$14,519	$6,663	$122	$14,280	$14,758	$1,555	$118,242

* 1.666 = Zone 1 - (0.000 to 1.666 miles from NPL Site)
3.333 = Zone 2 – (1.667 to 3.333 miles from NPL Site)
4.999 = Zone 3 – (3.334 to 4.999 miles from NPL Site)
9.999 = Zone 4 – (Beyond 4.999 miles from NPL Site)

Figure 4B



Next, the research conducted a one-way ANOVA to determine if the variation in the means was significant enough to reject the null hypothesis that all means for White Per Capital Income are equal. The ANOVA results in Table 4C, indicated that the null hypothesis could be rejected.

Table 4C

ANOVA Results - White Per Capita Income

* The mean difference is significant at .05 level

	Sum of Squares	df	Mean Square	F	*Sig.
Between Groups	928914961.798	3	309638320.599	7.016	.000
Within Groups	131475732501.903	2979	44134183.451		
Total	132404647463.700	2982			

Since the ANOVA did not indicate which means differed from each other, the research conducted the Scheffe, Bonferroni and Sidak post hoc tests to identify the specific differences between the means. The results of the post hoc tests summarized in Table 4D, showed significant differences between 3.333 (Zone 2) and Zones 4.999 (Zone 3) and 9.999 (Zone 4). No other groups showed significance between each other. The null hypothesis was rejected. (Please see Appendix C, Table 4A1 for detailed post hoc test results)

Table 4D

Post Hoc Test Results - Summary of Multiple Comparisons White Per Capita Income

* The mean difference is significant at .05 level

(I) Distance from Site	(J) Distance from Site	Scheffe	Bonferroni	Sidak
1.666 (Zone 1)	3.333 (Zone 2)			
1.666 (Zone 1)	4.999 (Zone 3)			
1.666 (Zone 1)	9.999 (Zone 4)			
3.333 (Zone 2)	4.999 (Zone 3)	*	*	*
3.333 (Zone 2)	9.999 (Zone 4)	*	*	*
4.999 (Zone 3)	9.999 (Zone 4)			

Black Per Capita Income: Table 5A indicates variance in the means of the dependent variable Black Per Capita Income as it relates to the categorical independent variable comprised of four gradient distance zones. Figure 5B illustrates the variance.

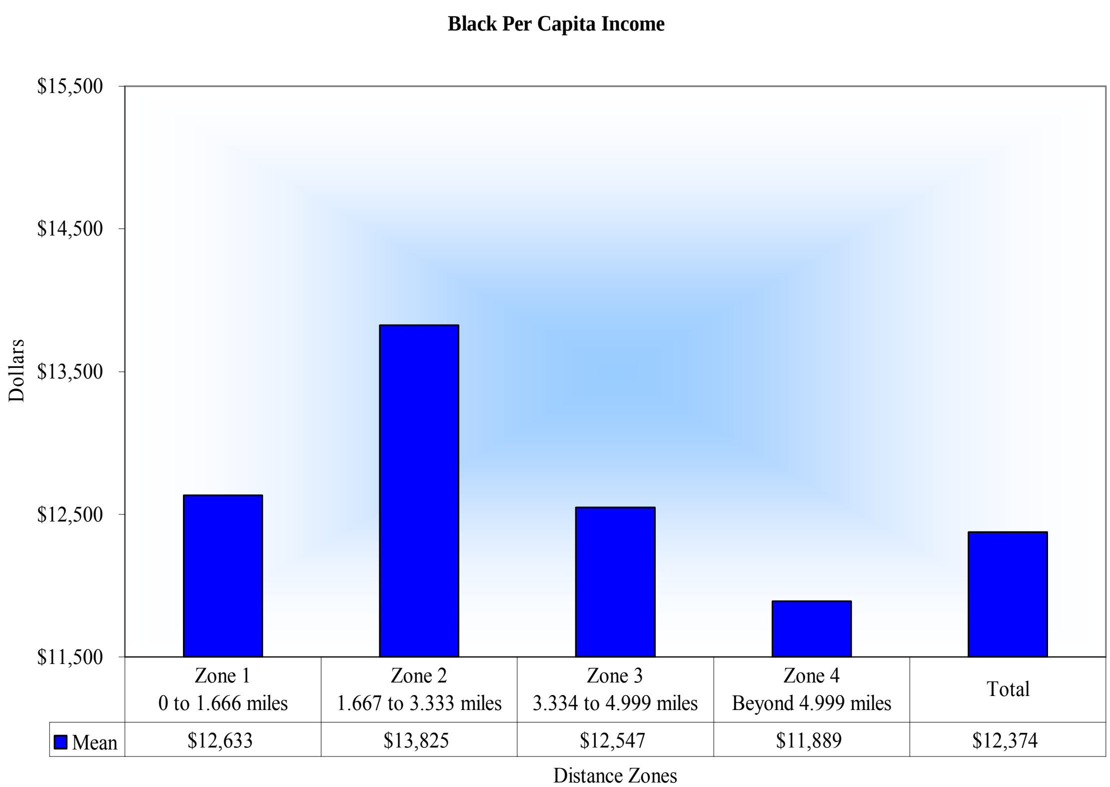
Table 5A

Descriptive Statistics - Black Per Capita Income

					95% Confidence Interval for Mean			
Zones*	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
1.666	270	$12,633	$10,010	$609	$11,434	$13,833	$395	$83,200
3.333	361	$13,825	$20,120	$1,059	$11,742	$15,907	$175	$359,900
4.999	323	$12,547	$12,383	$689	$11,192	$13,903	$149	$166,360
9.999	1340	$11,889	$9,438	$258	$11,384	$12,395	$26	$77,976
Total	2294	$12,374	$12,221	$255	$11,874	$12,874	$26	$359,900

* 1.666 = Zone 1 - (0.000 to 1.666 miles from NPL Site)
3.333 = Zone 2 – (1.667 to 3.333 miles from NPL Site)
4.999 = Zone 3 – (3.334 to 4.999 miles from NPL Site)
9.999 = Zone 4 – (Beyond 4.999 miles from NPL Site)

Figure 5B



Next, the research conducted a one-way ANOVA to determine if the variation in the means was significant enough to reject the null hypothesis that all means for Black Per Capital Income are equal. The ANOVA results in Table 5C, indicated that the null hypothesis could not be rejected.

Table 5C

ANOVA Results - Black Per Capita Income * The mean difference is significant at .05 level					
	Sum of Squares	df	Mean Square	F	*Sig.
Between Groups	1101977569.766	3	367325856.589	2.464	.061
Within Groups	341340976472.152	2290	149057194.966		
Total	342442954041.918	2293			

Since the ANOVA did not result in a significant difference between the means, no further analysis was necessary. The variance in the means that exists could be the result of sampling error.

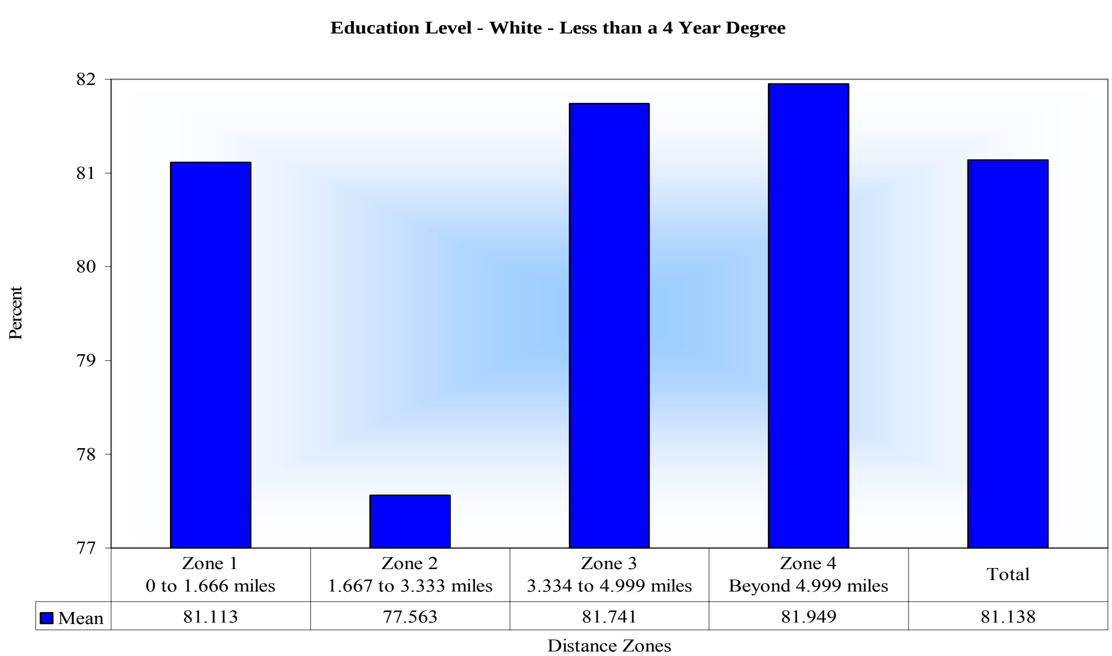
Education Level - White - Less than 4 Year Degree: Table 6A indicates variance in the means of the dependent variable Education Level - White - Less than a 4 Year Degree as it relates to the categorical independent variable comprised of four gradient distance zones. Figure 6B illustrates the variance.

Table 6A

Descriptive Statistics - Education Level - White - Less than a 4 Year Degree								
					95% Confidence Interval for Mean			
Zones*	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
1.666	341	81.113	15.294	.828	79.484	82.742	8.22	100.00
3.333	467	77.563	17.033	.788	76.014	79.111	17.59	100.00
4.999	404	81.741	14.287	.711	80.344	83.139	.00	100.00
9.999	1770	81.949	15.431	.367	81.230	82.668	.00	100.00
Total	2982	81.138	15.600	.286	80.578	81.698	.00	100.00

* 1.666 = Zone 1 - (0.000 to 1.666 miles from NPL Site)
3.333 = Zone 2 – (1.667 to 3.333 miles from NPL Site)
4.999 = Zone 3 – (3.334 to 4.999 miles from NPL Site)
9.999 = Zone 4 – (Beyond 4.999 miles from NPL Site)

Figure 6B



Next, the research conducted a one-way ANOVA to determine if the variation in the means was significant enough to reject the null hypothesis that all means for Education Level - White - Less than a 4 Year Degree are equal. The ANOVA results in Table 6C indicated that the null hypothesis could be rejected.

Table 6C

ANOVA Results - Education Level - White - Less than a 4 Year Degree * The mean difference is significant at .05 level					
	Sum of Squares	df	Mean Square	F	*Sig.
Between Groups	7281.661	3	2427.220	10.064	.000
Within Groups	718220.841	2978	241.176		
Total	725502.502	2981			

Since the ANOVA did not indicate which means differed from each other, the research conducted the Scheffe, Bonferroni and Sidak post hoc tests to identify the specific differences between the means. The results of the post hoc tests summarized in Table 6D, showed significant differences between 3.333 (Zone 2) and all other Zones. No other groups showed significance between each other – the differences between the non-significant means in fact may be due to sampling error. The null hypothesis was rejected. (Please see Appendix C, Table 6A1 for detailed post hoc test results)

Table 6D

Post Hoc Test Results - Summary of Multiple Comparisons Education Level – White – Less than a 4 Year Degree * The mean difference is significant at .05 level				
(I) Distance from Site	(J) Distance from Site	Scheffe	Bonferroni	Sidak
1.666 (Zone 1)	3.333 (Zone 2)	*	*	*
1.666 (Zone 1)	4.999 (Zone 3)			
1.666 (Zone 1)	9.999 (Zone 4)			
3.333 (Zone 2)	4.999 (Zone 3)	*	*	*
3.333 (Zone 2)	9.999 (Zone 4)	*	*	*
4.999 (Zone 3)	9.999 (Zone 4)			

Education Level - White - 4 Year Degree or Greater: Table 7A indicates variance in the means of the dependent variable Education Level - White - 4 Year Degree or Greater as it relates to the categorical independent variable comprised of four gradient distance zones. Figure 7B illustrates the variance.

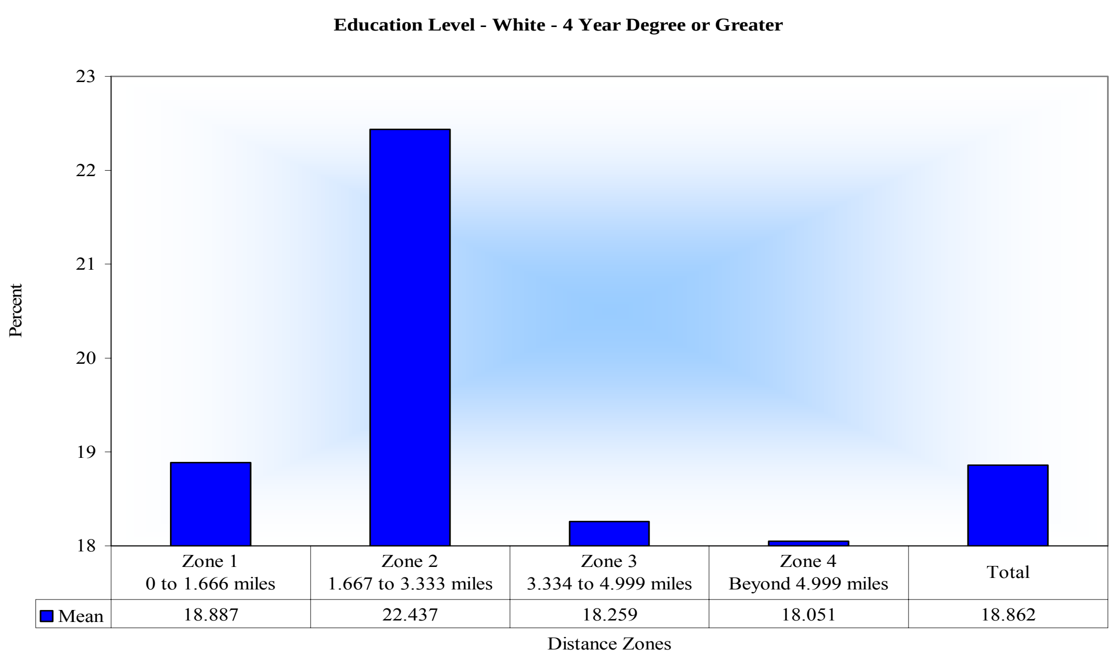
Table 7A

Descriptive Statistics - Education Level - White - 4 Year Degree or Greater

					95% Confidence Interval for Mean			
Zones*	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
1.666	341	18.887	15.294	.828	17.258	20.516	.00	91.78
3.333	467	22.437	17.033	.788	20.889	23.986	.00	82.41
4.999	404	18.259	14.287	.711	16.861	19.656	.00	100.00
9.999	1770	18.051	15.431	.367	17.332	18.770	.00	100.00
Total	2982	18.862	15.600	.286	18.302	19.422	.00	100.00

* 1.666 = Zone 1 - (0.000 to 1.666 miles from NPL Site)
3.333 = Zone 2 – (1.667 to 3.333 miles from NPL Site)
4.999 = Zone 3 – (3.334 to 4.999 miles from NPL Site)
9.999 = Zone 4 – (Beyond 4.999 miles from NPL Site)

Figure 7B



Next, the research conducted a one-way ANOVA to determine if the variation in the means was significant enough to reject the null hypothesis that all means for Education Level - White - 4 Year Degree or Greater are equal. The ANOVA results in Table 7C indicated that the null hypothesis could be rejected.

Table 7C

ANOVA Results - Education Level - White - 4 Year Degree or Greater

* The mean difference is significant at .05 level

	Sum of Squares	df	Mean Square	F	*Sig.
Between Groups	7281.661	3	2427.220	10.064	.000
Within Groups	718220.841	2978	241.176		
Total	725502.502	2981			

Since the ANOVA did not indicate which means differed from each other, the research conducted the Scheffe, Bonferroni and Sidak post hoc tests to identify the specific differences between the means. The results of the post hoc tests summarized in Table 7D, showed significant differences between 3.333 (Zone 2) and all other Zones. No other groups showed significance between each other. The null hypothesis was rejected. (Please see Appendix C, Table 7A1 for detailed post hoc test results)

Table 7D

Post Hoc Test Results - Summary of Multiple Comparisons
Education Level - White - 4 Year Degree or Greater

* The mean difference is significant at .05 level

(I) Distance from Site	(J) Distance from Site	Scheffe	Bonferroni	Sidak
1.666 (Zone 1)	3.333 (Zone 2)	*	*	*
1.666 (Zone 1)	4.999 (Zone 3)			
1.666 (Zone 1)	9.999 (Zone 4)			
3.333 (Zone 2)	4.999 (Zone 3)	*	*	*
3.333 (Zone 2)	9.999 (Zone 4)	*	*	*
4.999 (Zone 3)	9.999 (Zone 4)			

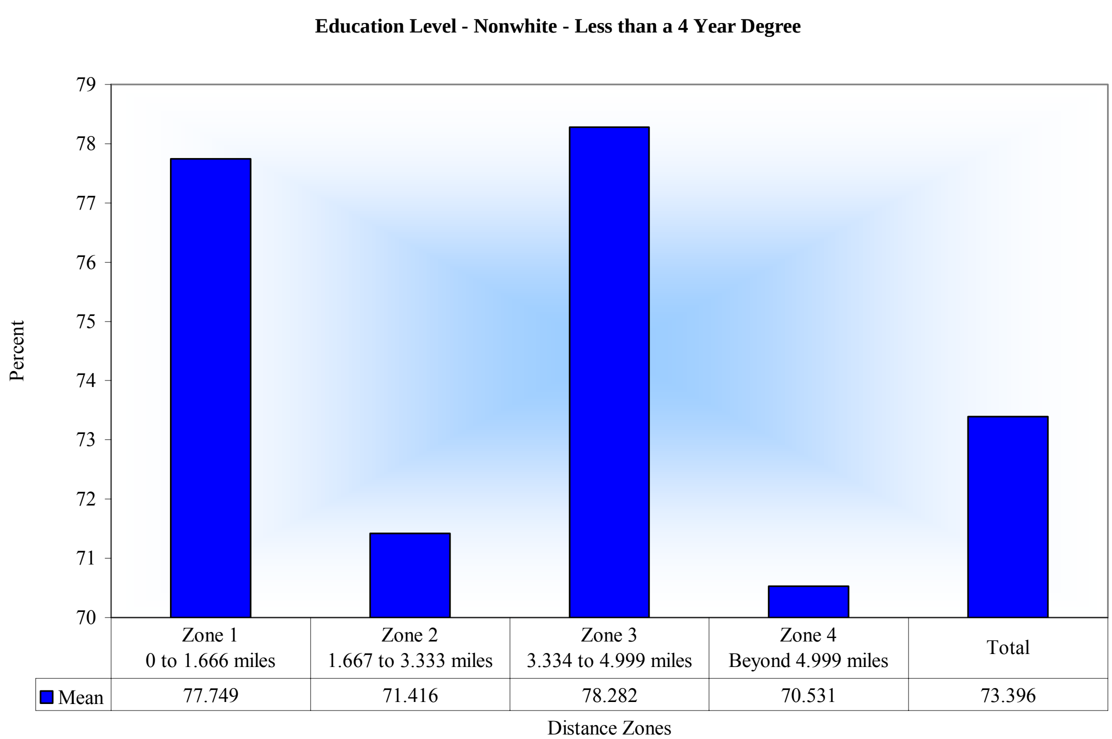
Education Level – Nonwhite – Less than a 4 Year Degree: Table 8A indicates variance in the means of the dependent variable Education Level – Nonwhite – Less than a 4 Year Degree as it relates to the categorical independent variable comprised of four gradient distance zones. Figure 8B illustrates the variance.

Table 8A

Descriptive Stats. - Education Level – Nonwhite – Less than a 4 Year Degree								
					95% Confidence Interval for Mean			
Zones*	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
1.666	313	77.749	26.329	1.488	74.821	80.677	.00	100.00
3.333	429	71.416	30.550	1.475	68.517	74.315	.00	100.00
4.999	356	78.282	26.570	1.408	75.513	81.052	.00	100.00
9.999	786	70.531	35.379	1.262	68.053	73.008	.00	100.00
Total	1884	73.396	31.526	.726	71.972	74.821	.00	100.00

* 1.666 = Zone 1 - (0.000 to 1.666 miles from NPL Site)
3.333 = Zone 2 – (1.667 to 3.333 miles from NPL Site)
4.999 = Zone 3 – (3.334 to 4.999 miles from NPL Site)
9.999 = Zone 4 – (Beyond 4.999 miles from NPL Site)

Figure 8B



Next, the research conducted a one-way ANOVA to determine if the variation in the means was significant enough to reject the null hypothesis that all means for Education Level – Nonwhite – Less than a 4 Year Degree are equal. The ANOVA results in Table 8C indicated that the null hypothesis could be rejected.

Table 8C

ANOVA Results - Education Level – Nonwhite – Less than a 4 Year Degree * The mean difference is significant at .05 level					
	Sum of Squares	df	Mean Square	F	*Sig.
Between Groups	22566.064	3	7522.021	7.648	.000
Within Groups	1848923.190	1880	983.470		
Total	1871489.254	1883			

Since the ANOVA did not indicate which means differed from each other, the research conducted the Scheffe, Bonferroni and Sidak post hoc tests to identify the specific differences between the means. The results of the post hoc tests summarized in Table 8D, showed a significant difference between 3.333 (Zone 2) and all other Zones. The Bonferroni and Sidak showed significant differences between 1.666 (Zone 1) and 3.333 (Zone 2) and 9.999 (Zone 4). The null hypothesis was rejected. (Please see Appendix C, Table 8A1 for detailed post hoc test results)

Table 8D

Post Hoc Test Results - Summary of Multiple Comparisons Education Level – Nonwhite – Less than a 4 Year Degree * The mean difference is significant at .05 level				
(I) Distance from Site	(J) Distance from Site	Scheffe	Bonferroni	Sidak
1.666 (Zone 1)	3.333 (Zone 2)		*	*
1.666 (Zone 1)	4.999 (Zone 3)			
1.666 (Zone 1)	9.999 (Zone 4)	*	*	*
3.333 (Zone 2)	4.999 (Zone 3)	*	*	*
3.333 (Zone 2)	9.999 (Zone 4)	*	*	*
4.999 (Zone 3)	9.999 (Zone 4)	*	*	*

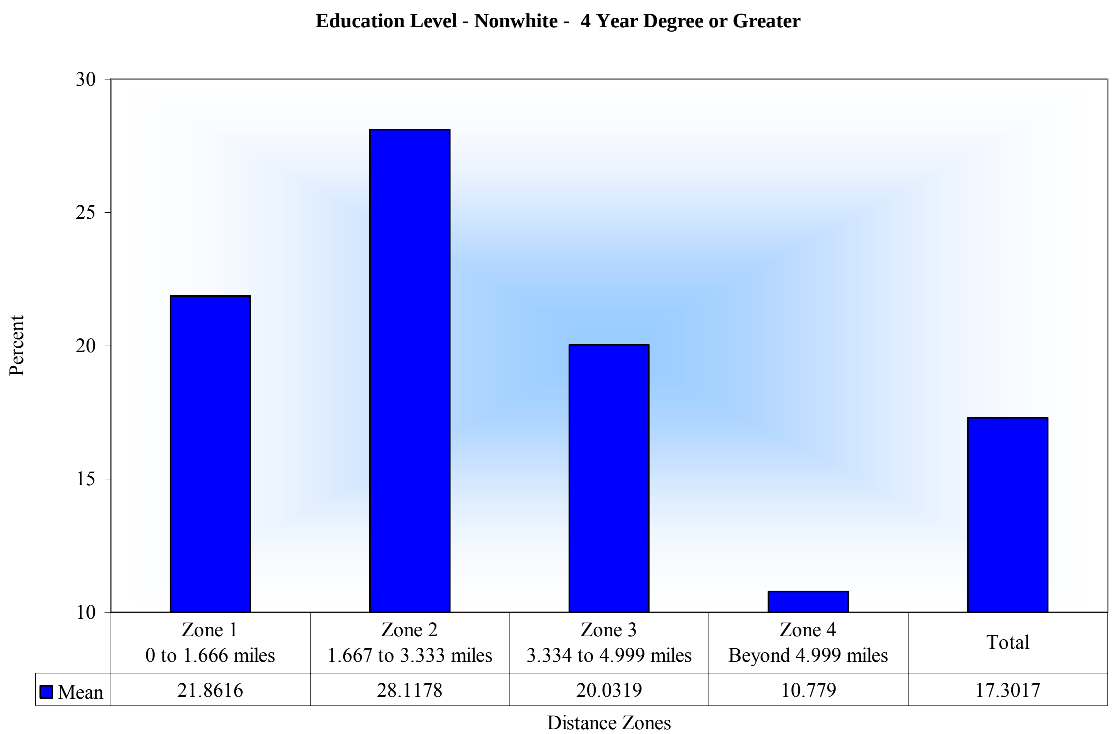
Education Level – Nonwhite – 4 Year Degree or Greater: Table 9A indicates variance in the means of the dependent variable Education Level – Nonwhite – 4 Year Degree or Greater as it relates to the categorical independent variable comprised of four gradient distance zones. Figure 9B illustrates the variance.

Table 9A

Descriptive Stats. - Education Level – Nonwhite – 4 Year Degree or Greater								
					95% Confidence Interval for Mean			
Zones*	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
1.666	314	21.8616	25.97514	1.46586	18.9774	24.7458	.00	100.00
3.333	429	28.1178	30.21737	1.45891	25.2503	30.9853	.00	100.00
4.999	361	20.0319	24.92565	1.31188	17.4520	22.6118	.00	100.00
9.999	1082	10.7790	18.98057	.57703	9.6468	11.9113	.00	100.00
Total	2186	17.3017	24.58381	.52580	16.2706	18.3328	.00	100.00

* 1.666 = Zone 1 - (0.000 to 1.666 miles from NPL Site)
3.333 = Zone 2 – (1.667 to 3.333 miles from NPL Site)
4.999 = Zone 3 – (3.334 to 4.999 miles from NPL Site)
9.999 = Zone 4 – (Beyond 4.999 miles from NPL Site)

Figure 9B



Next, the research conducted a one-way ANOVA to determine if the variation in the means was significant enough to reject the null hypothesis that all means for Education Level – Nonwhite – 4 Year Degree or Greater are equal. The ANOVA results in Table 9C indicated that the null hypothesis could be rejected.

Table 9C

ANOVA Results - Education Level – Nonwhite – 4 Year Degree or Greater * The mean difference is significant at .05 level					
	Sum of Squares	df	Mean Square	F	*Sig.
Between Groups	105441.562	3	35147.187	63.115	.000
Within Groups	1215092.769	2182	556.871		
Total	1320534.331	2185			

Since the ANOVA did not indicate which means differed from each other, the research conducted the Scheffe, Bonferroni and Sidak post hoc tests to identify the specific differences between the means. The results of the post hoc tests summarized in Table 9D, showed a significant differences between 3.333 (Zone 2) and all other Zones. In addition, all three tests showed significant differences between Zones1 and 3 and the fourth Zone 9.999 (Zone 4). The null hypothesis was rejected. (Please see Appendix C, Table 9A1 for detailed post hoc test results)

Table 9D

Post Hoc Test Results - Summary of Multiple Comparisons Education Level – Nonwhite – 4 Year Degree or Greater * The mean difference is significant at .05 level				
(I) Distance from Site	(J) Distance from Site	Scheffe	Bonferroni	Sidak
1.666 (Zone 1)	3.333 (Zone 2)	*	*	*
1.666 (Zone 1)	4.999 (Zone 3)			
1.666 (Zone 1)	9.999 (Zone 4)	*	*	*
3.333 (Zone 2)	4.999 (Zone 3)	*	*	*
3.333 (Zone 2)	9.999 (Zone 4)	*	*	*
4.999 (Zone 3)	9.999 (Zone 4)	*	*	*

Percent White Below Poverty Level: Table 10A indicates variance in the means of the dependent variable Percent White Below Poverty Level as it relates to the categorical independent variable comprised of four gradient distance zones. Figure 10B illustrates the variance.

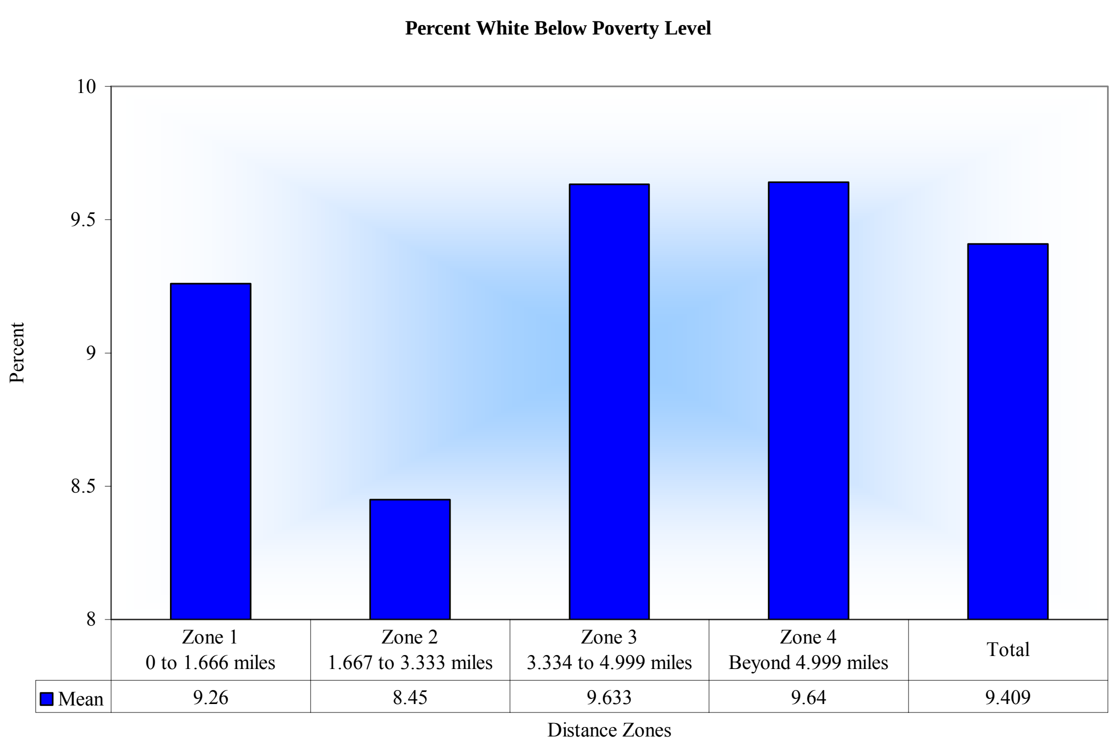
Table 10A

Descriptive Statistics - Percent White Below Poverty Level

					95% Confidence Interval for Mean			
Zones*	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
1.666	341	9.260	9.222	.499	8.278	10.243	.00	100.00
3.333	467	8.450	8.825	.408	7.648	9.253	.00	73.88
4.999	405	9.633	11.183	.556	8.540	10.725	.00	100.00
9.999	1771	9.640	9.335	.222	9.205	10.075	.00	100.00
Total	2984	9.409	9.523	.174	9.067	9.751	.00	100.00

* 1.666 = Zone 1 - (0.000 to 1.666 miles from NPL Site)
3.333 = Zone 2 – (1.667 to 3.333 miles from NPL Site)
4.999 = Zone 3 – (3.334 to 4.999 miles from NPL Site)
9.999 = Zone 4 – (Beyond 4.999 miles from NPL Site)

Figure 10B



Next, the research conducted a one-way ANOVA to determine if the variation in the means was significant enough to reject the null hypothesis that all means for Percent White Below Poverty Level are equal. The ANOVA results in Table 10C indicated that the null hypothesis could not be rejected.

Table 10C

ANOVA Results - Percent White Below Poverty Level * The mean difference is significant at .05 level					
	Sum of Squares	df	Mean Square	F	*Sig.
Between Groups	551.356	3	183.785	2.029	.108
Within Groups	269969.309	2980	90.594		
Total	270520.665	2983			

Since the ANOVA did not result in a significant difference between the means, no further analysis was necessary.

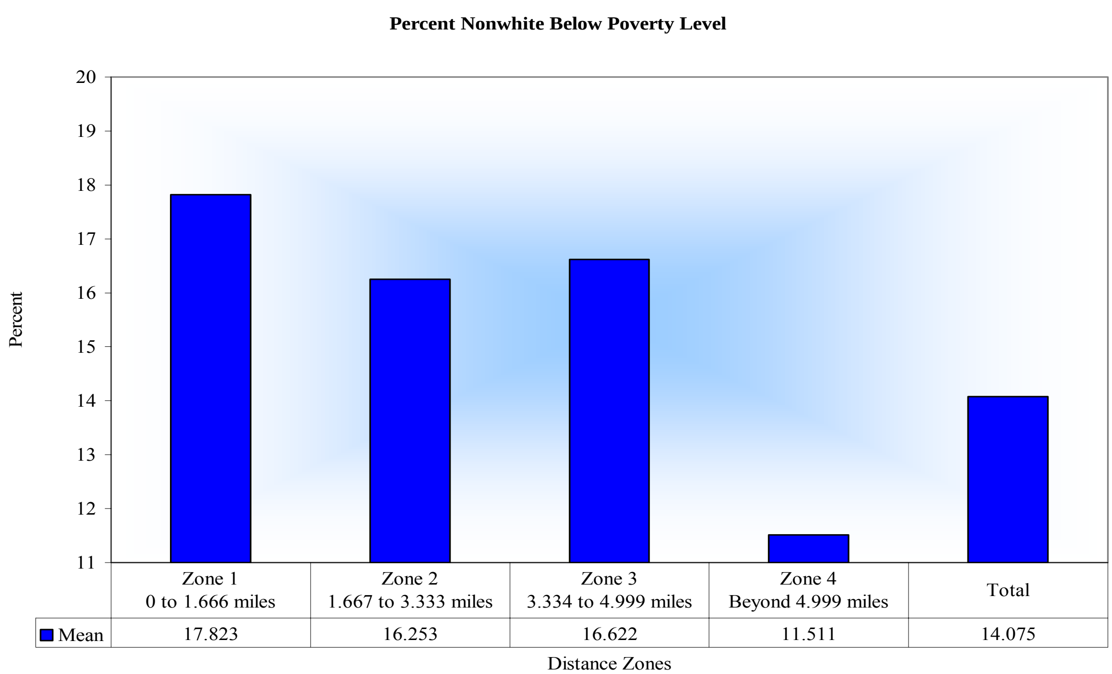
Percent Nonwhite Below Poverty Level: Table 11A indicates variance in the means of the dependent variable Percent Nonwhite Below Poverty Level as it relates to the categorical independent variable comprised of four gradient distance zones. Figure 11B illustrates the variance.

Table 11A

Descriptive Statistics - Percent Nonwhite Below Poverty Level								
					95% Confidence Interval for Mean			
Zones*	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
1.666	319	17.823	22.285	1.248	15.369	20.278	.00	100.00
3.333	435	16.253	22.871	1.097	14.097	18.408	.00	100.00
4.999	364	16.622	21.133	1.108	14.443	18.800	.00	100.00
9.999	1197	11.511	19.067	.551	10.430	12.592	.00	100.00
Total	2315	14.075	20.774	.432	13.229	14.922	.00	100.00

* 1.666 = Zone 1 - (0.000 to 1.666 miles from NPL Site)
3.333 = Zone 2 – (1.667 to 3.333 miles from NPL Site)
4.999 = Zone 3 – (3.334 to 4.999 miles from NPL Site)
9.999 = Zone 4 – (Beyond 4.999 miles from NPL Site)

Figure 11B



Next, the research conducted a one-way ANOVA to determine if the variation in the means was significant enough to reject the null hypothesis that all means for Percent Nonwhite Below Poverty Level are equal. The ANOVA results in Table 11C indicated that the null hypothesis could be rejected.

Table 11C

ANOVA Results - Percent Nonwhite Below Poverty Level * The mean difference is significant at .05 level					
	Sum of Squares	df	Mean Square	F	*Sig.
Between Groups	16774.482	3	5591.494	13.161	.000
Within Groups	981862.912	2311	424.865		
Total	998637.394	2314			

Since the ANOVA did not indicate which means differed from each other, the research conducted the Scheffe, Bonferroni and Sidak post hoc tests to identify the specific differences between the means. The results of the post hoc tests summarized in Table 11D, showed significant differences between 9.999 (Zone 4) and all other Zones. No other groups showed significance between each other. The null hypothesis was rejected. (Please see Appendix C, Table 11A1 for detailed post hoc test results)

Table 11D

Post Hoc Test Results - Summary of Multiple Comparisons Percent Nonwhite Below Poverty Level * The mean difference is significant at .05 level				
(I) Distance from Site	(J) Distance from Site	Scheffe	Bonferroni	Sidak
1.666 (Zone 1)	3.333 (Zone 2)			
1.666 (Zone 1)	4.999 (Zone 3)			
1.666 (Zone 1)	9.999 (Zone 4)	*	*	*
3.333 (Zone 2)	4.999 (Zone 3)			
3.333 (Zone 2)	9.999 (Zone 4)	*	*	*
4.999 (Zone 3)	9.999 (Zone 4)	*	*	*

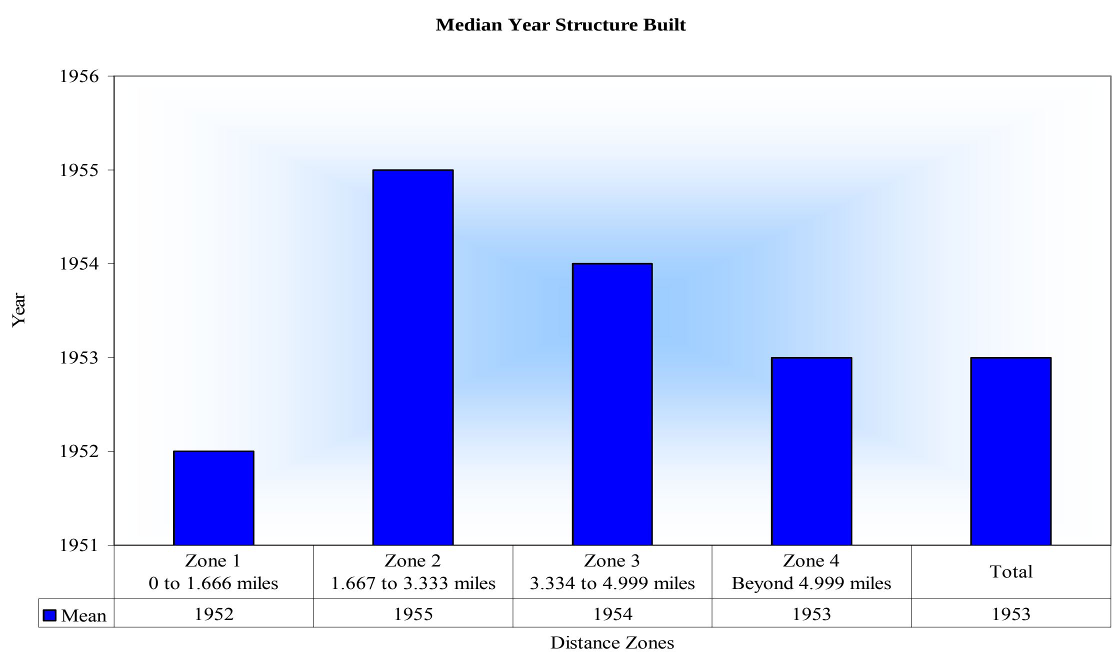
Median Year Structure Built: Table 12A indicates variance in the means of the dependent variable Median Year Structure Built as it relates to the categorical independent variable comprised of four gradient distance zones. Figure 12B illustrates the variance.

Table 12A

Descriptive Statistics – Median Year Structure Built								
					95% Confidence Interval for Mean			
Zones*	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
1.666	342	1952	12	1	1951	1954	1939	1983
3.333	467	1955	13	1	1954	1956	1939	1986
4.999	405	1954	12	1	1952	1955	1939	1986
9.999	1771	1953	13	0	1952	1954	1939	1986
Total	2985	1953	13	0	1953	1954	1939	1986

* 1.666 = Zone 1 - (0.000 to 1.666 miles from NPL Site)
3.333 = Zone 2 – (1.667 to 3.333 miles from NPL Site)
4.999 = Zone 3 – (3.334 to 4.999 miles from NPL Site)
9.999 = Zone 4 – (Beyond 4.999 miles from NPL Site)

Figure 12B



Next, the research conducted a one-way ANOVA to determine if the variation in the means was significant enough to reject the null hypothesis that all means for Median Year Structure Built are equal. The ANOVA results in Table 12C indicated that the null hypothesis could be rejected.

Table 12C

ANOVA Results - Median Year Structure Built * The mean difference is significant at .05 level					
	Sum of Squares	df	Mean Square	F	*Sig.
Between Groups	2040.846	3	680.282	4.255	.005
Within Groups	476543.249	2981	159.860		
Total	478584.095	2984			

Since the ANOVA did not indicate which means differed from each other, the research conducted the Scheffe, Bonferroni and Sidak post hoc tests to identify the specific differences between the means. The results of the post hoc tests summarized in Table 12D, showed significant differences between 3.333 (Zone 2) and Zone 1 and Zone 4. No other groups showed significance between each other. The null hypothesis was rejected. (Please see Appendix C, Table 12A1 for detailed post hoc test results)

Table 12D

Post Hoc Test Results - Summary of Multiple Comparisons Median Year Structure Built * The mean difference is significant at .05 level				
(I) Distance from Site	(J) Distance from Site	Scheffe	Bonferroni	Sidak
1.666 (Zone 1)	3.333 (Zone 2)	*	*	*
1.666 (Zone 1)	4.999 (Zone 3)			
1.666 (Zone 1)	9.999 (Zone 4)			
3.333 (Zone 2)	4.999 (Zone 3)			
3.333 (Zone 2)	9.999 (Zone 4)	*	*	*
4.999 (Zone 3)	9.999 (Zone 4)			

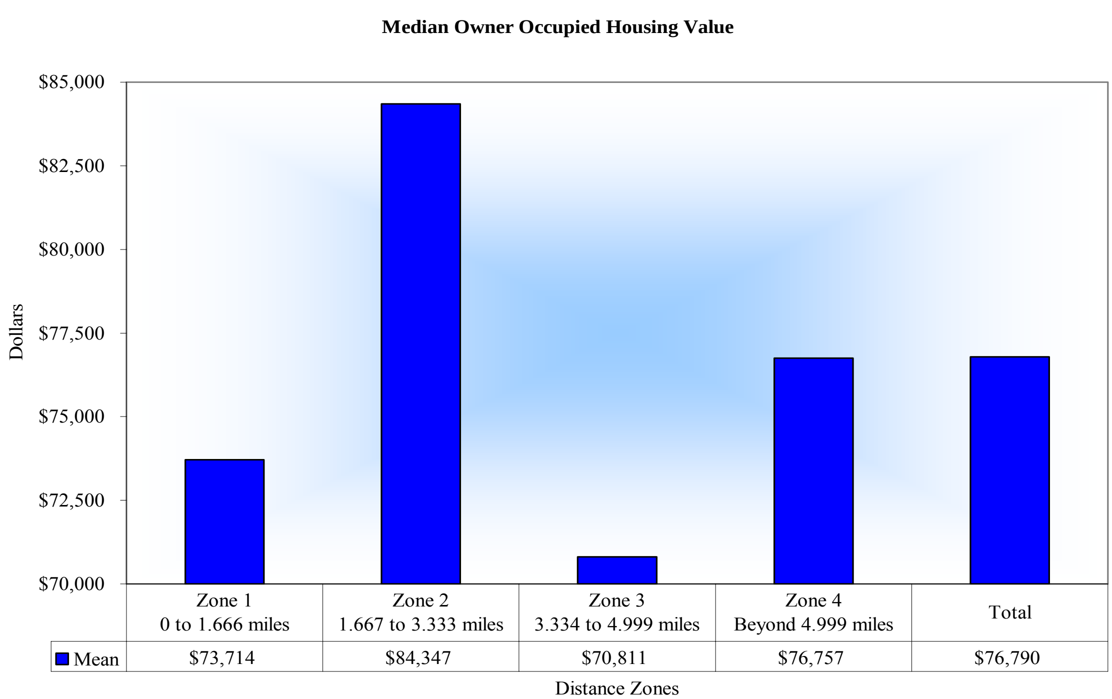
Median Owner Occupied Housing Value: Table 13A indicates variance in the means of the dependent variable Median Owner Occupied Housing Value as it relates to the categorical independent variable comprised of four gradient distance zones. Figure 13B illustrates the variance.

Table 13A

Descriptive Statistics - Median Owner Occupied Housing Value								
					95% Confidence Interval for Mean			
Zones*	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
1.666	342	$73,714	$49,633	$2,684	$68,435	$78,993	$14,999	$257,500
3.333	465	$84,347	$59,352	$2,752	$78,938	$89,756	$15,000	$407,600
4.999	402	$70,811	$42,536	$2,122	$66,640	$74,981	$15,000	$251,600
9.999	1765	$76,757	$52,408	$1,247	$74,310	$79,204	$14,999	$500,001
Total	2974	$76,790	$52,162	$957	$74,915	$78,666	$14,999	$500,001

* 1.666 = Zone 1 - (0.000 to 1.666 miles from NPL Site)
3.333 = Zone 2 – (1.667 to 3.333 miles from NPL Site)
4.999 = Zone 3 – (3.334 to 4.999 miles from NPL Site)
9.999 = Zone 4 – (Beyond 4.999 miles from NPL Site)

Figure 13B



Next, the research conducted a one-way ANOVA to determine if the variation in the means was significant enough to reject the null hypothesis that all means for Median Owner Occupied Housing Value are equal. The ANOVA results in Table 13C indicated that the null hypothesis could be rejected.

Table 13C

ANOVA Results - Median Owner Occupied Housing Value * The mean difference is significant at .05 level					
	Sum of Squares	Df	Mean Square	F	*Sig.
Between Groups	44166138180.109	3	14722046060.036	5.435	.001
Within Groups	8045073851068.740	2970	2708779074.434		
Total	8089239989248.850	2973			

Since the ANOVA did not indicate which means differed from each other, the research conducted the Scheffe, Bonferroni and Sidak post hoc tests to identify the specific differences between the means. The results of the post hoc tests summarized in Table 13D, showed significant differences between 3.333 (Zone 2) and all other zones. No other groups showed significance between each other. The null hypothesis was rejected. (Please see Appendix C, Table 13A1 for detailed post hoc test results)

Table 13D

Post Hoc Test Results - Summary of Multiple Comparisons Median Owner Occupied Housing Value * The mean difference is significant at .05 level				
(I) Distance from Site	(J) Distance from Site	Scheffe	Bonferroni	Sidak
1.666 (Zone 1)	3.333 (Zone 2)	*	*	*
1.666 (Zone 1)	4.999 (Zone 3)			
1.666 (Zone 1)	9.999 (Zone 4)			
3.333 (Zone 2)	4.999 (Zone 3)	*	*	*
3.333 (Zone 2)	9.999 (Zone 4)	*	*	*
4.999 (Zone 3)	9.999 (Zone 4)			

Renter Occupied Housing: Table 14A indicates variance in the means of the dependent variable Renter Occupied Housing as it relates to the categorical independent variable comprised of four gradient distance zones. Figure 14B illustrates the variance.

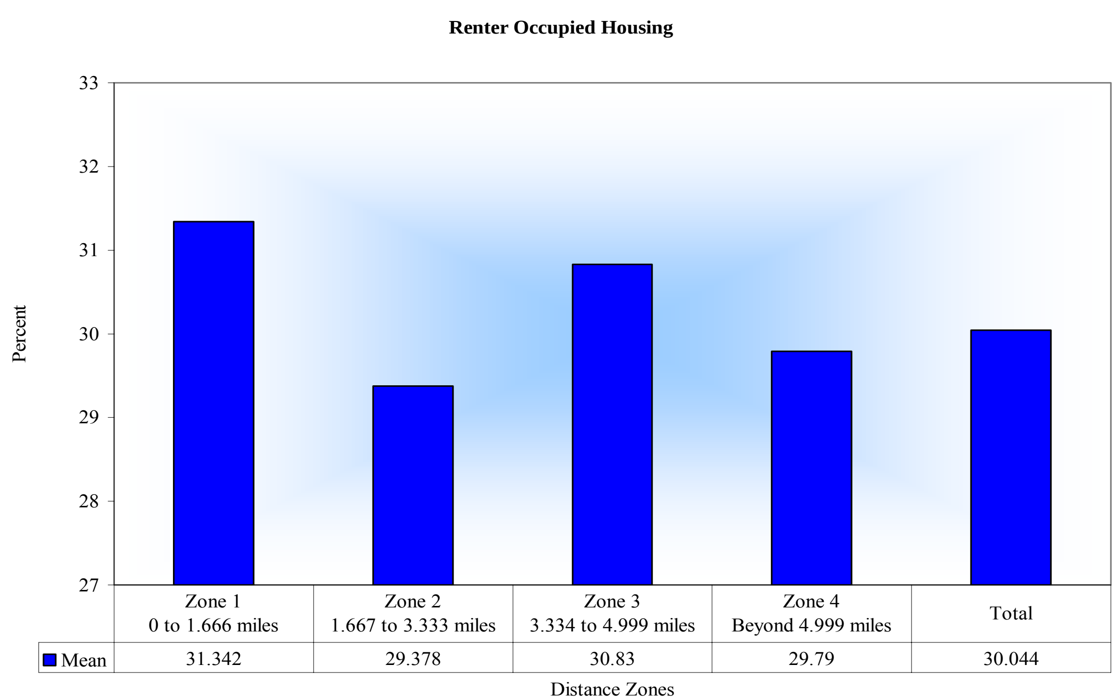
Table 14A

Descriptive Statistics - Renter Occupied Housing

					95% Confidence Interval for Mean			
Zones*	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
1.666	342	31.342	18.432	.997	29.382	33.303	1.05	95.89
3.333	466	29.378	19.440	.901	27.608	31.148	1.31	100.00
4.999	404	30.830	21.000	1.045	28.776	32.884	.73	100.00
9.999	1769	29.790	17.995	.428	28.950	30.629	1.08	100.00
Total	2981	30.044	18.708	.343	29.373	30.716	.73	100.00

* 1.666 = Zone 1 - (0.000 to 1.666 miles from NPL Site)
3.333 = Zone 2 – (1.667 to 3.333 miles from NPL Site)
4.999 = Zone 3 – (3.334 to 4.999 miles from NPL Site)
9.999 = Zone 4 – (Beyond 4.999 miles from NPL Site)

Figure 14B



Next, the research conducted a one-way ANOVA to determine if the variation in the means was significant enough to reject the null hypothesis that all means for Renter Occupied Housing are equal. The ANOVA results in Table 14C indicated that the null hypothesis could not be rejected.

Table 14C

ANOVA Results - Renter Occupied Housing

* The mean difference is significant at .05 level

	Sum of Squares	Df	Mean Square	F	*Sig.
Between Groups	1146.991	3	382.330	1.092	.351
Within Groups	1041835.345	2977	349.961		
Total	1042982.336	2980			

Since the ANOVA did not indicate a significant difference between the means, no further analysis was required.

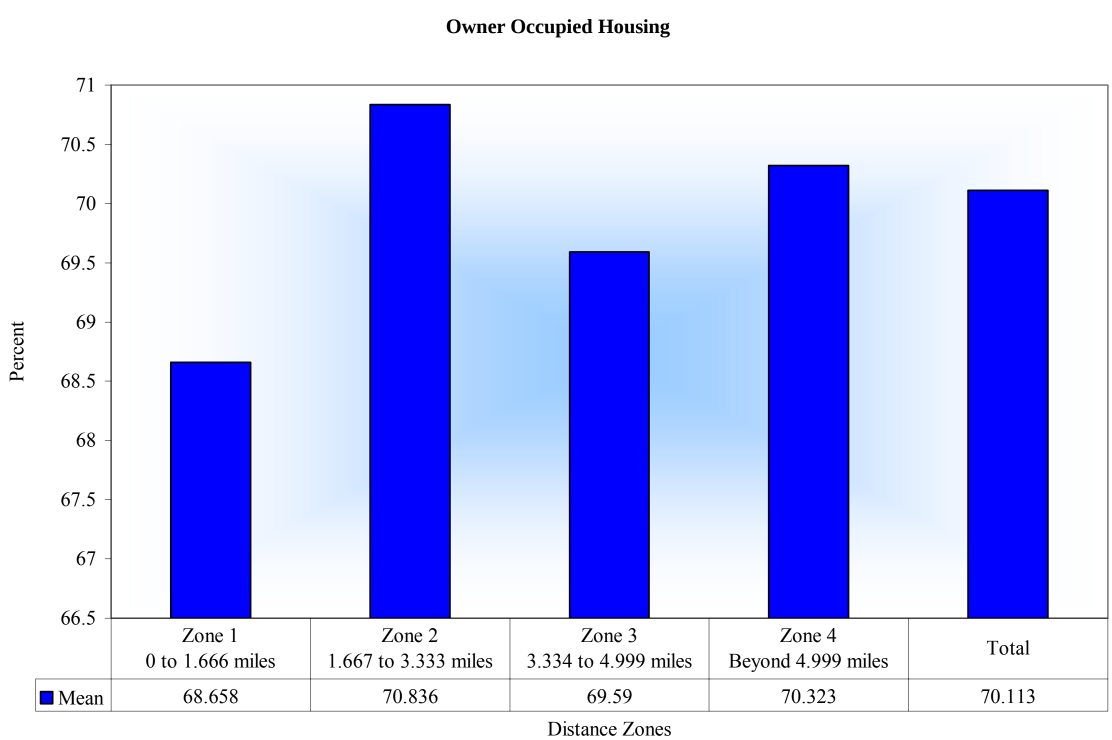
Owner Occupied Housing: Table 15A indicates variance in the means of the dependent variable Owner Occupied Housing as it relates to the categorical independent variable comprised of four gradient distance zones. Figure 15B illustrates the variance.

Table 15A

Descriptive Statistics - Owner Occupied Housing								
					95% Confidence Interval for Mean			
Zones*	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
1.666	342	68.658	18.432	.997	66.697	70.618	4.11	98.95
3.333	466	70.836	19.210	.890	69.088	72.585	1.40	100.00
4.999	403	69.590	20.506	1.021	67.582	71.598	2.26	100.00
9.999	1769	70.323	17.867	.425	69.490	71.157	.60	100.00
Total	2980	70.113	18.523	.339	69.448	70.779	.60	100.00

* 1.666 = Zone 1 - (0.000 to 1.666 miles from NPL Site)
3.333 = Zone 2 – (1.667 to 3.333 miles from NPL Site)
4.999 = Zone 3 – (3.334 to 4.999 miles from NPL Site)
9.999 = Zone 4 – (Beyond 4.999 miles from NPL Site)

Figure 15B



Next, the research conducted a one-way ANOVA to determine if the variation in the means was significant enough to reject the null hypothesis that all means for Owner Occupied Housing are equal. The ANOVA results in Table 15C indicated that the null hypothesis could not be rejected.

Table 15C

ANOVA Results - Owner Occupied Housing

* The mean difference is significant at .05 level

	Sum of Squares	Df	Mean Square	F	*Sig.
Between Groups	1156.812	3	385.604	1.124	.338
Within Groups	1020893.132	2976	343.042		
Total	1022049.944	2979			

Since the ANOVA did not indicate a significant difference between the means, no further analysis was required.

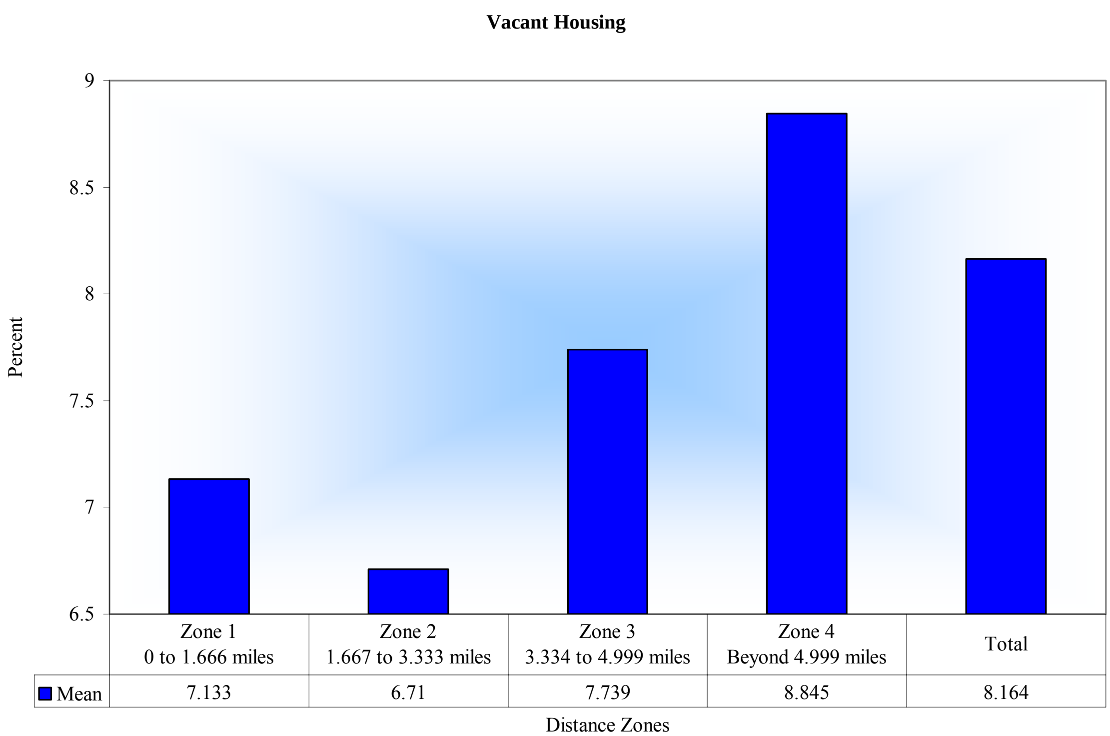
Vacant Housing: Table 16A indicates variance in the means of the dependent variable Vacant Housing as it relates to the categorical independent variable comprised of four gradient distance zones. Figure 16B illustrates the variance.

Table 16A

Descriptive Statistics - Vacant Housing								
					95% Confidence Interval for Mean			
Zones*	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
1.666	340	7.133	5.831	.316	6.511	7.755	.23	52.42
3.333	465	6.710	5.547	.257	6.204	7.215	.50	59.75
4.999	399	7.739	7.140	.357	7.036	8.442	.55	66.95
9.999	1758	8.845	10.236	.244	8.366	9.324	.31	87.68
Total	2962	8.164	8.860	.163	7.845	8.483	.23	87.68

* 1.666 = Zone 1 - (0.000 to 1.666 miles from NPL Site)
3.333 = Zone 2 – (1.667 to 3.333 miles from NPL Site)
4.999 = Zone 3 – (3.334 to 4.999 miles from NPL Site)
9.999 = Zone 4 – (Beyond 4.999 miles from NPL Site)

Figure 16B



Next, the research conducted a one-way ANOVA to determine if the variation in the means was significant enough to reject the null hypothesis that all means for Vacant Housing are equal. The ANOVA results in Table 16C indicated that the null hypothesis could be rejected.

Table 16C

ANOVA Results - Vacant Housing

* The mean difference is significant at .05 level

	Sum of Squares	Df	Mean Square	F	*Sig.
Between Groups	2231.622	3	743.874	9.559	.000
Within Groups	230187.290	2958	77.819		
Total	232418.913	2961			

Since the ANOVA did not indicate which means differed from each other, the research conducted the Scheffe, Bonferroni and Sidak post hoc tests to identify the specific differences between the means. The results of the post hoc tests summarized in Table 16D, showed significant differences between both the 1.666 (Zone 1) and the 3.333 (Zone 2) and the fourth Zone 9.999 (Zone 4). The null hypothesis was rejected. (Please see Appendix C, Table 16A1 for detailed post hoc test results)

Table 16D

Post Hoc Test Results - Summary of Multiple Comparisons
Vacant Housing

* The mean difference is significant at .05 level

(I) Distance from Site	(J) Distance from Site	Scheffe	Bonferroni	Sidak
1.666 (Zone 1)	3.333 (Zone 2)			
1.666 (Zone 1)	4.999 (Zone 3)			
1.666 (Zone 1)	9.999 (Zone 4)	*	*	*
3.333 (Zone 2)	4.999 (Zone 3)			
3.333 (Zone 2)	9.999 (Zone 4)	*	*	*
4.999 (Zone 3)	9.999 (Zone 4)			

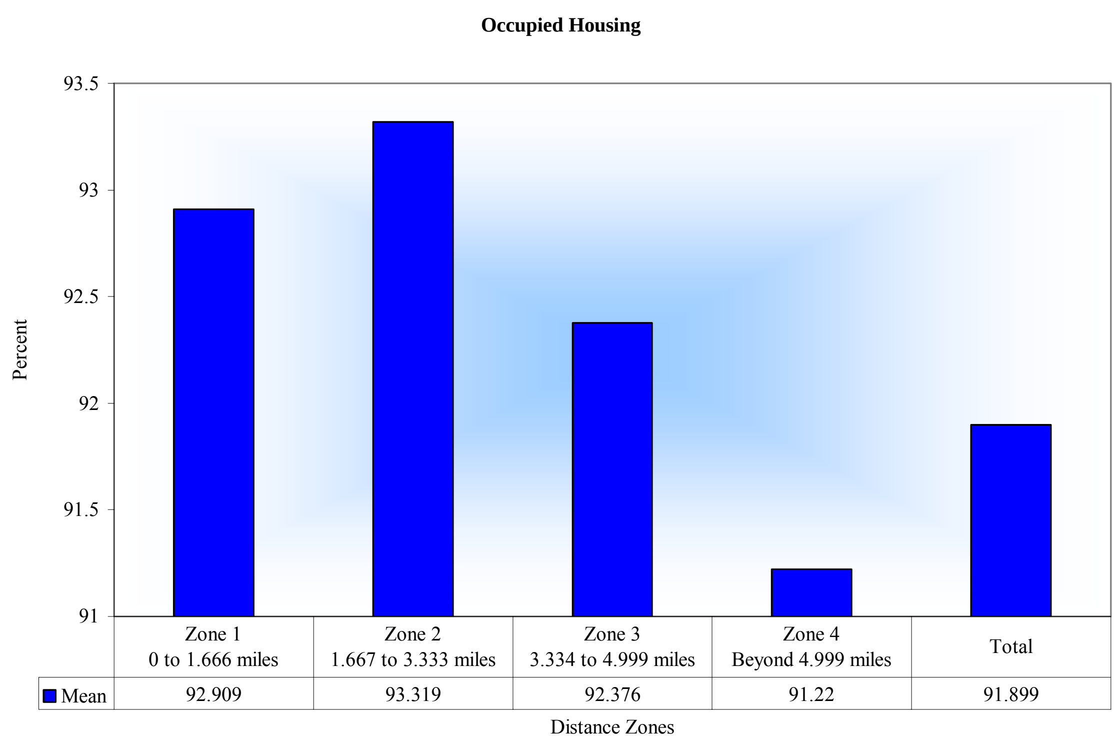
Occupied Housing: Table 17A indicates variance in the means of the dependent variable Occupied Housing as it relates to the categorical independent variable comprised of four gradient distance zones. Figure 17B illustrates the variance.

Table 17A

Descriptive Statistics - Occupied Housing								
					95% Confidence Interval for Mean			
Zones*	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
1.666	342	92.909	5.840	.316	92.287	93.530	47.582	100.000
3.333	467	93.319	5.553	.257	92.814	93.824	40.254	100.000
4.999	405	92.376	7.148	.355	91.677	93.074	33.050	100.000
9.999	1771	91.220	10.226	.243	90.743	91.697	12.321	100.000
Total	2985	91.899	8.854	.162	91.581	92.216	12.321	100.000

* 1.666 = Zone 1 - (0.000 to 1.666 miles from NPL Site)
3.333 = Zone 2 – (1.667 to 3.333 miles from NPL Site)
4.999 = Zone 3 – (3.334 to 4.999 miles from NPL Site)
9.999 = Zone 4 – (Beyond 4.999 miles from NPL Site)

Figure 17B



Next, the research conducted a one-way ANOVA to determine if the variation in the means was significant enough to reject the null hypothesis that all means for Occupied Housing are equal. The ANOVA results in Table 17C indicated that the null hypothesis could be rejected.

Table 17C

ANOVA Results - Occupied Housing * The mean difference is significant at .05 level					
	Sum of Squares	Df	Mean Square	F	*Sig.
Between Groups	2198.460	3	732.820	9.427	.000
Within Groups	231741.695	2981	77.740		
Total	233940.156	2984			

Since the ANOVA did not indicate which means differed from each other, the research conducted the Scheffe, Bonferroni and Sidak post hoc tests to identify the specific differences between the means. The results of the post hoc tests summarized in Table 17D, showed significant differences between both the 1.666 (Zone 1) and the 3.333 (Zone 2) and the fourth Zone 9.999 (Zone 4). The null hypothesis was rejected. (Please see Appendix C, Table 17A1 for detailed post hoc test results)

Table 17D

Post Hoc Test Results - Summary of Multiple Comparisons Occupied Housing * The mean difference is significant at .05 level				
(I) Distance from Site	(J) Distance from Site	Scheffe	Bonferroni	Sidak
1.666 (Zone 1)	3.333 (Zone 2)			
1.666 (Zone 1)	4.999 (Zone 3)			
1.666 (Zone 1)	9.999 (Zone 4)	*	*	*
3.333 (Zone 2)	4.999 (Zone 3)			
3.333 (Zone 2)	9.999 (Zone 4)	*	*	*
4.999 (Zone 3)	9.999 (Zone 4)			

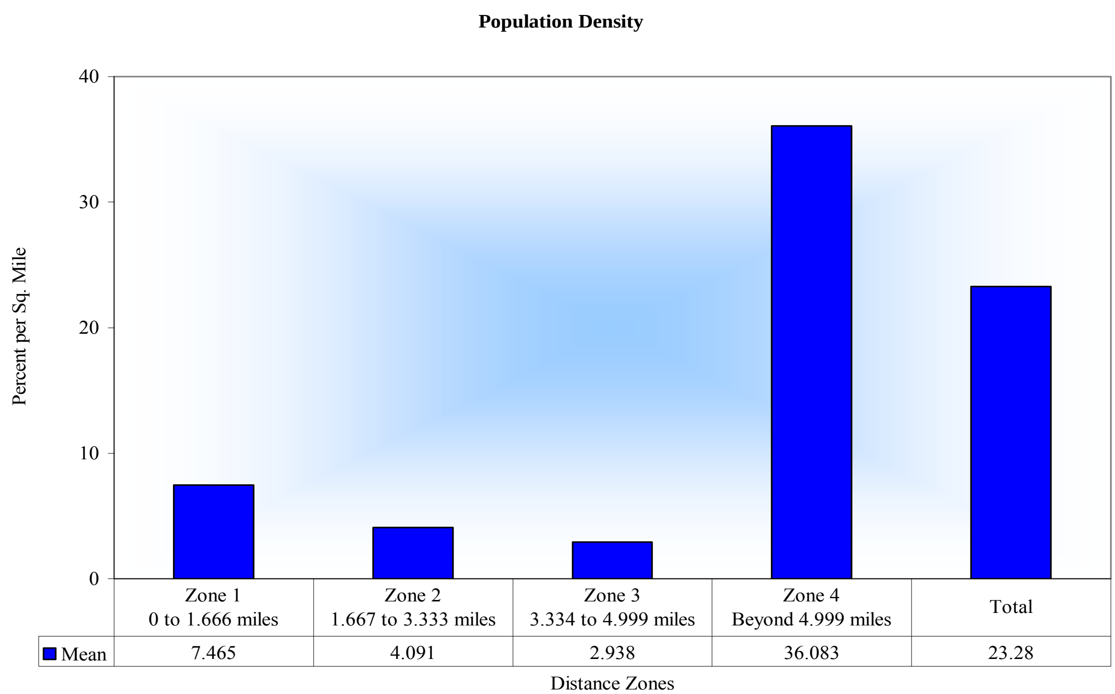
Population Density: Table 18A indicates variance in the means of the dependent variable Population Density as it relates to the categorical independent variable comprised of four gradient distance zones. Figure 18B illustrates the variance.

Table 18A

Descriptive Statistics - Population Density								
					95% Confidence Interval for Mean			
Zones*	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
1.666	342	7.465	57.032	3.084	1.399	13.531	.00	954.23
3.333	468	4.091	16.929	.783	2.553	5.629	.00	310.30
4.999	406	2.938	6.706	.333	2.284	3.592	.00	53.16
9.999	1769	36.083	607.499	14.444	7.754	64.412	.01	14581.70
Total	2985	23.280	468.322	8.572	6.473	40.088	.00	14581.70

* 1.666 = Zone 1 - (0.000 to 1.666 miles from NPL Site)
3.333 = Zone 2 – (1.667 to 3.333 miles from NPL Site)
4.999 = Zone 3 – (3.334 to 4.999 miles from NPL Site)
9.999 = Zone 4 – (Beyond 4.999 miles from NPL Site)

Figure 18B



Next, the research conducted a one-way ANOVA to determine if the variation in the means was significant enough to reject the null hypothesis that all means for Population Density are equal. The ANOVA results in Table 18C indicated that the null hypothesis could not be rejected.

Table 18C

ANOVA Results - Population Density

* The mean difference is significant at .05 level

	Sum of Squares	Df	Mean Square	F	*Sig.
Between Groups	715840.609	3	238613.536	1.088	.353
Within Groups	653750838.322	2981	219305.883		
Total	654466678.931	2984			

Since the ANOVA did not indicate a significant difference between the means, no further analysis was required.

The next chapter offers a discussion of the results reported above.

CHAPTER 6

DISCUSSION

Summary of Results

From the 18 variable examined in this study, 10 variables indicated that Zone 2 (3.333) had significantly different mean values than the other zones examined. When the mirror image variables are excluded, the results become more robust with nine out of 13 variables showing significantly different means for Zone 2 (3.333) than all other zones.

Zone 2 (3.333) was more White, more educated, more wealthy and had newer and more valuable homes with lower vacancy rates than virtually all of the other Zones. The significance in the means between Zone 2 (3.333) and the other Zones was inconsistent with the research hypotheses, which in general states *as the distance to the site decreases the Nonwhite Population is expected to increase and Social Class is expected to decrease*.

Five variables showed no significant difference between their means as the null hypotheses were true. Again, these results were consistent with a pattern that contradicts the research hypotheses. In order to be consistent with the research hypotheses, one would expect significance between the means for Per Capita Income Black (decreasing), Poverty White (increasing), Renter Occupied Housing (increasing) and Owner Occupied Housing (decreasing). The null hypothesis for Population Density was true as well, thereby upholding the notion that the NPL sites are located in areas of similar population and area size.

The results diverged from emergent data pattern discussed thus far, and indicated an anomalous pattern for Nonwhite Poverty that was consistent with the pattern expected by the research hypothesis. Zone 4 (9.999) showed significantly lower levels of Nonwhite Poverty than Zones 1 (1.666), 2 (3.333) and 3 (4.999). Hence, the data suggests that while Zone 2 (3.333) has a more affluent population than all other Zones, there are higher means of Nonwhites below the poverty level in Zones 1 (1.666), 2 (3.333) and 3 (9.999) than in Zone 4 (9.999) or the areas without an NPL site within 4.999 miles.

The mean for Nonwhite Education Level Less Than a 4 Year Degree showed significance between Zone 4 (9.999) and Zone 2 (3.333); and Zones 1 (1.666) and 3 (4.999). These higher rates of lower education levels stand in contrast to the higher means of its sister and mirror variable Nonwhite Education Level 4 Year Degree or Greater. The mean for Nonwhites with a 4 Year Degree or Greater was significantly higher for Zone 2 (3.333) as compared to Zone 4 (4.999). While the higher mean for Nonwhites with Less Than a 4 Year Degree seems to support the research hypothesis, the much higher mean for more educated Nonwhites seems to strongly contradict its significance. It seems appropriate to offer a summary of the results (Table 19A below) prior to proceeding with the discussion.

Table 19A

Summary of Results

Notes - 1.666 = Z1 or Zone 1
3.333 = Z2 or Zone 2
4.999 = Z3 or Zone 3
9.999 = Z4 or Zone 4

Variables	Null Hypotheses	Sig. at Zone 2 (3.333) & Other Zones	Sig. at Zones other than Zone 2 (3.333)	Consistent with Research Hypotheses
1) White Pop.	False	Yes	No	No
2) Nonwhite Pop.	False	Yes	No	No
3) Med HH Inc	False	Yes	No	No
4) PCI White	False	Yes	No	No
5) PCI Black	True	Na	na	No
6) Educ. Lev. White < 4	False	Yes	No	No
7) Educ. Lev. White ≥ 4	False	Yes	No	No
8) Educ. Lev. Nonwhite < 4	False	Yes	Z4:Z1 & Z4:Z3	Yes
9) Educ. Lev. Nonwhite ≥ 4	False	Yes	Z4:Z1 & Z4:Z3	No
10) Poverty White	True	Na	na	No
11) Poverty Nonwhite	False	No	Z4:Z1, Z2 & Z3	Yes
12). Med. Yr. Built	False	Yes	No	No
13) Med. House Val	False	Yes	No	No
14) Renter Occupied	True	Na	na	No
15) Owner Occupied	True	Na	na	No
16) Vacant Housing	False	No	Z4:Z1 & Z4:A2	No
17) Occupied Housing	False	No	Z4:Z1 & Z4:A2	No
18) Population Density	True	Na	na	na

Other Factors at Work

This research postulated that Zones 1 and 2 would be the areas mostly likely to experience the potential negative social and economic externalities that result from the stigma and potential hazard of having a NPL site within the confines of that area or neighborhood. The rather robust results of Zone 2 (3.333) being characterized as more White and more affluent stands in contradiction to not only what the environmental justice research hypotheses predicts, but also what common and/or economic sense would predict. Consequently, the results of this research open up the possibility that other factors could be at work concerning NPL Superfund sites in the Commonwealth of Pennsylvania.

This research did not test a *political mobilization hypothesis*, but the results of this study raise the possibilities that political activism is at work in the areas surrounding Pennsylvania NPL Superfund sites. The racial and socioeconomic attributes of the population residing in Zone 2 (3.333) of this study are consistent with the postulates of political mobilization as found in the research and writings of other scholars. The works of two authors, briefly explicated below, seem to support the notion that political activism could be playing a role significant enough to warrant future investigation.

First, John Hird (1993) found that more economically advantaged counties were likely to have more Superfund sites. Hird concluded: the geographic distribution of Superfund sites suggests that the likely beneficiaries of program expenditures live in counties that are on average both wealthier and more highly educated than the rest, and also have lower rates of poverty (Hird, p. 333). Hird's results for county level data are consistent with the findings of this study which suggest that more affluent census tracts surround Pennsylvania Superfund sites

Next, an excerpt from Walter A. Rosenbaum (1998) is directly on point and supports the profile of an affluent population and the use of political activism as it relates to Superfund and the NIMBY (not in my back yard) problem.

> He appears most often as a White-collar professional or executive, articulate, well educated, politically sophisticated. She is often a housewife, an executive,

> or a professional. They personify the members of a growing citizen resistance movement known as NIMBYism. NIMBY is all too familiar to federal, state, and local officials attempting to implement state programs for permitting hazardous waste sites as required by RCRA, or trying to plan for the designation or cleanup of a Superfund site … NIMBYism thrives because of the numerous, and still increasing, state and federal laws that empower citizen activism in the implementation of many different federal laws and regulations (Rosenbaum, pp 252-53).

An affluent population, with the knowledge and skills to raise and set an agenda, coupled with statues and regulations that empower and indeed can reward citizen activism, seem to provide the ways and means to the end, which in this and other cases could be a Superfund designation.

There is a certain logic to the notion that socioeconomic status causes Superfund sites. Despite the fact that Superfund sites are the most toxic sites known to exist; in the realm of hazardous waste, a Superfund designation is not necessarily a *bad* thing. Indeed, if a person lives in a community that hosts a toxic site, a Superfund designation could be viewed as an amenity, because the federal government and its full resources and deep pockets assumes responsibility for the cleanup of the site. Further, a Superfund designation ensures that no new pollution will be added to the site and that unknowing citizens are kept from it noxious confines.

In conclusion, the results of this study do not seem to offer strong evidence that environmental inequities exist in the areas surrounding Pennsylvania Superfund sites at the specified distances. The level of poverty for Nonwhites did show significance and should be reexamined in future research. However, the results for the bulk of the dependent variables for race and social class at Zone 2 were robust and consistent across income, education and housing factors. These results contradicted the general core assertion that poor and minority populations bear disproportionate amounts of environmental burdens.

Further, it was the goal of this research to add to the cumulative pool of studies in the area of environmental equity and justice. It is the sincere hope of this researcher, that readers of this document will find the goal complete.

Beyond the Data

Obviously, the expected spatial pattern for the environmental equity gradient does not hold true in Pennsylvania as it relates to the location of Superfund sites. Rather, a second new pattern emerges which shows that significantly more affluent Whites live proximate to Pennsylvania Superfund sites than do poor and minority populations. In fact, the poor and minority populations closest to the sites were not characteristically different than the areas without sites. Further, it is unlikely that using smaller units of analysis or distance measures would cause these results to fluctuate considering the validity and sensitivity of the methods employed and the robust nature of the results. While only 18 variables were reported in the text of this study, well over 60 detailed level variables were examined for income, housing value and education levels, none of which diverted from the pattern presented herein.

The policy implications related to the results to this study are not necessarily salient. One would have to logically conclude that both policy makers and environmental justice advocates would be pleased to learn that environmental inequities are not prevalent in the areas surrounding Pennsylvania Superfund sites. However, the results of this study and others (Anderton, 1994, Bowen, 1995 and Hird, 1993) report evidence that at a minimum contradicts the underlying motive which gave rise to swift and notable environmental justice policy solutions introduced by, then US President, William J. Clinton. In more practical policy terms, contradictory evidence creates a situation that makes it increasingly more difficult for Congress to implement significant environmental justice policy changes over the long-term. Therein, lays the irony for environmental justice advocates. The acceptance of empirical evidence that refutes the occurrence of environmental discrimination is not necessarily consistent with politically savvy, when one considers that the acceptance of such evidence may in fact help to preclude the initiation of idealistic statutory policies by US policymakers.

When the issue of environmental justice policy is viewed in this regard, this author concurs with Christopher H. Foreman’s (1998) contention that environmental justice advocacy may direct community attention away from those problems posing the greatest risks and may therefore have the ironic effect of undermining public health in precisely those communities it endeavors to help. Further, this author can not disagree that these issues arise for the environmental justice movement because they seek to use environmental policy solutions to address community empowerment, social justice and public health concerns (Foreman, 1998).

CHAPTER 7

LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

Limitations

This research was limited by the scope of the sample size selected. For example, this analysis focused on the population of census tracts surrounding Pennsylvania NPL sites which then were assigned a zone based on their proximity to the site. The EPA as of March 2003 had 1,560 sites on its National Priority List located throughout the United States that could be studied in the manner set forth herein. Additionally, the units of analysis could be expanded or replaced by units of analysis that addressed varying levels of data such as State, County, PMSA, MCD, Block etc. or a combination of the preceding.

This study used mutually exclusive concentric distance measure that served as zones of the population surrounding the sites. In order to avoid double counting of tracts and commit aggregation errors, these zones used the tract closest to the site as part of its population group when the concentric rings overlapped and certain tracts had the potential to be counted more than once. This method, while recommended and the most valid and appropriate approach, did not take into account or provide additional weight to the tracts that were impacted by multiple sites.

It is important to note that this study was limited in that it makes no scientific claims related to proximity and the danger of toxicity. Such claims would be based on the reasoning that those living in close proximity to the sites are susceptible to increased health risks because of toxic exposure. While this proposition may appear logical, no scientific data was produced in this study to make claims on toxicity and proximity. As noted by Perlin (1995), it is important to recognize that demographic studies of residential proximity, such as those reviewed and proposed by this study, do not "relate to actual exposures of people to toxins" (Perlin et al, p. 69).

This study is further limited by engaging primarily in quantitative analysis. The nature, full history, necessity and validity of Environmental Justice Policy was not examined in a concentrated and in depth way by this research. Further, a "richness of meaning" can often be added to quantitative data using qualitative analysis. For example, *triangulation* could have been employed to gain valuable data from the observation of *focus groups* in combination with *opinion surveys* (obtained by interviews and/or questionnaires) aimed at measuring the attitudes of those neighboring the sites.

A further enumeration of limitations could be presented, but those presented here seem the most relevant. One further mention, however, should be made on the reliability and validity of the tract data utilized in this study. Census data, like all other data is imperfect, and it is affected by factors ranging from, answers not being provided on the instrument, to the level of participation not being at a perfect 100-percent. Presently, this researcher feels that a full and detailed explication of the reliability and validity of the census data herein, is beyond the scope of the task. However, a detailed summary of the reliability and validity of all census tract variables can be easily referenced through the 1990 census reports, which are produced by the U.S. Department of Commerce, and are typically accessible at most libraries and through the Internet (www.uscensus.gov).

Before moving to suggested directions for future research, it is worth noting that one of the same qualities (state scale v. national scale), which gives rise to the limitations of this study, also adds a certain advantage. For example, the methodologies and data used in this study could be readily made to accommodate future studies at larger regional or national levels. In addition, census tract level data lends the added benefit of attenuating the risk of allowing aggregation errors and ecological fallacies to occur. In the future, a similar study aimed at expansion, would be well poised to do so with the data from this study.

Suggested Directions for Future Research

In working intimately with the data of this study for the past eight months and studying the issue of environmental equity for more than a decade many directions for future research have come to mind, but here, I mention only three.

First, many if not all of the researchers that have engaged the study of environmental equity/justice have wrestled with the notion of “community” or probably more precisely stated, the area of impact on the population that reside in the areas immediately surrounding toxic sites. In other words, what is a reasonable area that can be said to be the area of impact on the population that lives in the areas immediately surrounding toxicities? In this study, the researcher chose in an a priori manner, based on years of experience working in the private commercial real estate industry, measures comprised of concentric distance rings appropriate not only to the units of analysis, but also appropriate relative to the areas likely to be impacted by an industrial site and the negative externalities inherent to such a site. With that said, it is the suggestion of the author of this study that future research model and substantiate with valid and replicable data, "communities" or areas, considered to be the impact zones surrounding toxic sites. Such a model would create a benchmark from which future studies could be derived and then the results could be compared in an even and consistent manner.

Second, and perhaps the most obvious based on the results of this research, future researchers should address whether political activism plays a role in Superfund site designation and/or remediation in Pennsylvania. The results of this study open the doors to these possibilities.

Finally, it is recommended that future research address the comparative rate of remediation of Pennsylvania NPL Superfund sites relative to their racial and socioeconomic composition. It seems particularly timely on the heels of this study, which seems to suggest that political activism could play a significant role in the Pennsylvania Superfund designation process. In other words, future research should seek to determine whether the same factors are at work for site designation as for the pace of site remediation and does race and social class play a role in either or both.

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APPENDIX A

Executive Order 12898

EXECUTIVE ORDER 12898

FEDERAL ACTIONS TO ADDRESS ENVIRONMENTAL JUSTICE IN MINORITY POPULATIONS AND LOW-INCOME POPULATIONS

By the authority vested in me as President by the Constitution and the laws of the United States of America, it hereby ordered as follows:

Section 1-1. Implementation.

1-101. Agency Responsibilities. To the greatest extent practicable and permitted by law, and consistent with the principles set forth in the report on the National Performance Review, each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories and possessions, the District of Columbia, the Commonwealth of Puerto Rico, and the Commonwealth of the Mariana Islands.

1-102. Creation of an Interagency Working Group on Environmental Justice. (a) Within 3 months of the date of this order, the Administrator of the Environmental Protection Agency ("Administrator") or the Administrator's designee shall convene an interagency Federal Working Group on Environmental Justice ("Working Group"). The Working Group shall comprise the heads of the following executive agencies and offices, or their designees: (a) Department of Defense; (b) Department of Health and Human Services; (c) Department of Housing and Urban Development; (d) Department of Labor; (e) Department of Agriculture; (f) Department of Transportation; (g) Department of Justice; (h) Department of the Interior; (i) Department of Commerce; (j) Department of Energy; (k) Environmental Protection Agency; (l) Office of Management and Budget; (m) Office of Science and Technology Policy; (n) Office of the Deputy Assistant to the President for Environmental Policy; (o) Office of the Assistant to the President for Domestic Policy; (p) National Economic Council; (q) Council of Economic Advisers; and (r) other such Government officials as the President may designate. The Working Group shall report to the President through the Deputy through the Deputy Assistant to the President for Environmental Policy and the Assistant to the President for Domestic Policy.

(b) The Working Group shall: (1) provide guidance to Federal agencies on criteria for identifying disproportionately high and adverse human health or environmental effects on minority populations and low-income populations.

(2) coordinate with, provide guidance to, and serve as a clearinghouse for, each Federal agency as it develops an environmental justice strategy as required by section 1-103 of this order, in order to ensure that the administration, interpretation and enforcement of programs, activities and policies are undertaken in a consistent manner;

(3) assist in coordinating research by, and stimulating cooperation among, the Environmental Protection Agency, the Department of Health and Human Services, the Department of Housing and Urban Development, and other agencies conducting research or other activities in accordance with section 3-3 of this order;

(4) assist in coordinating data collection, required by this order;

(5) examine existing data and studies on environmental justice;

(6) hold public meetings as required in section 5-502(d) of this order; and

(7) develop interagency model projects on environmental justice that evidence cooperation among Federal agencies.

1-103. Development of Agency Strategies. (a) Except as provided in section 6-605 of this order, each Federal agency shall develop an agency-wide environmental justice strategy, as set forth in subsections (b)-(e) of this section that identifies and addresses disproportionately high and adverse human health or environmental effects of its programs, policies, or activities on minority populations and low-income populations. The environmental justice strategy shall list programs, policies, planning and public participation practices, enforcement and/or rulemakings related to human health or the environment that should be revised to, at a minimum: (1) promote enforcement of all health and environmental statutes in areas with minority populations and low-income populations; (2) ensure greater public participation; (3) improve research and data collection relating to the health of and environment of minority populations and low-income populations; and (4) identify differential patterns of consumption of natural resources among minority populations and low-income populations. In addition, the environmental justice strategy shall include, where appropriate, a timetable for undertaking identified revisions and consideration of economic and social implications of the revisions.

(b) Within 4 months of the date of this order, each Federal agency shall identify an internal administrative process for developing its environmental justice strategy, and shall inform the Working Group of the process.

(c) Within 6 months of the date of this order, each Federal agency shall provide the Working Group with an outline of its proposed environmental justice strategy.

(d) Within 10 months of the date of this order, each Federal agency shall provide the Working Group with its proposed environmental justice strategy.

(e) Within 12 months of the date of this order, each Federal agency shall finalize its environmental justice strategy and provide a copy and written description of its strategy to the Working Group. During the 12-month period from the date of this order, each Federal agency, as part of its environmental justice strategy, shall identify several specific projects that can be promptly undertaken to address particular concerns identified during the development of the proposed environmental justice strategy, and a schedule for implementing those projects.

(f) Within 24 months of the date of this order, each Federal agency shall report to the Working Group on its progress in implementing its agency-wide environmental justice strategy.

(g) Federal agencies shall provide additional periodic reports to the Working Group.

1-104. Reports to the President. Within 14 months of the date of this order, the Working Group shall submit to the President, through the Office of the Deputy Assistant to the President for Environmental Policy and the Office of the Assistant to the President for Domestic Policy, a report that describes the implementation of this order, and includes the final environmental justice strategies described in section 1-103(e) of this order.

Sec. 2-2. Federal Agency Responsibilities for Federal Programs. Each Federal agency shall conduct its programs, policies, and activities that substantially effect human health or the environment, in a manner that ensures that such programs, policies, and activities do not have the effect of excluding persons (including populations) from participation in, denying persons (including populations) the benefits of, or subjecting persons (including populations) to discrimination under, such programs, policies, and activities, because of their race, color, or national origin.

Sec. 3-3. Research, Data Collection, and Analysis.

3-301. Human Health and Environmental Research and Analysis. (a) Environmental human health research, whenever practicable and appropriate, shall include diverse segments of the population in epidemiological and clinical studies, including segments at high risk from environmental hazards, such as minority populations, low-income populations and workers who may be exposed to substantial environmental hazards.

(b) Environmental human health analyses, whenever practicable and appropriate, shall identify multiple and cumulative exposures.

(c) Federal agencies shall provide minority populations and low-income populations the opportunity to comment on the development and design of research strategies undertaken pursuant to this order.

3-302. Human Health and Environmental Data Collection and Analysis. To the extent permitted by existing law, including the Privacy Act, as amended (5 U.S.C. section 552a): (a) each Federal agency, whenever practicable and appropriate, shall collect, maintain, and analyze information assessing and comparing environmental and human health risks borne by populations identified by race, national origin, or income. To the extent practicable and appropriate, Federal agencies shall use this information to determine whether their programs, policies, and activities have disproportionately high and adverse human health or environmental effects on minority populations and low-income populations.

(b) In connection with the development and implementation of agency strategies in section 1-103 of this order, each Federal agency, whenever practicable and appropriate, shall collect, maintain and analyze information on the race, national origin, income level, and other readily accessible and appropriate information for areas surrounding facilities or sites expected to have a substantial environmental, human health, or economic effect on the surrounding populations, when such facilities or sites become the subject of a substantial Federal environmental administrative or judicial action. Such information shall be made available to the public, unless prohibited by law: and

(c) Each Federal agency, whenever practicable and appropriate, shall collect, maintain, and analyze information on the race, national origin, income level, and other readily accessible and appropriate information for areas surrounding Federal facilities that are: (1) subject to the reporting requirements under the Emergency Planning and Community Right-to-Know Act, 42 U.S.C. section 11001-11050 as mandated in Executive Order No. 12856; and (2) expected to have a substantial environmental, human health, or economic effect on surrounding populations.

(d) In carrying out the responsibilities in this section, each Federal agency, whenever practicable and appropriate, shall share information and eliminate unnecessary duplication of efforts through the use of existing data systems and cooperative agreements among Federal agencies and with States, local, and tribal governments.

Sec. 4-4. Subsistence Consumption of Fish and Wildlife.

4-401. Consumption Patterns. In order to assist in identifying the need for ensuring protection of populations with differential patterns of subsistence consumption of fish and wildlife, Federal agencies, whenever practicable and appropriate, shall collect, maintain, and analyze information on the consumption patterns of populations who principally rely on fish and/or wildlife for subsistence. Federal agencies shall communicate to the public the risk of those consumption patterns.

4-402. Guidance. Federal agencies, whenever practicable and appropriate, shall work in a coordinated manner to publish guidance reflecting the latest scientific information available concerning methods for evaluating the human health risks associated with the consumption of pollutant-bearing fish or wildlife. Agencies shall consider such guidance in developing their policies and rules.

Sec. 5-5. Public Participation and Access to Information. (a) The public may submit recommendations to Federal agencies relating to the incorporation of environmental justice principles into Federal agency programs or policies. Each Federal agency shall convey such recommendations to the Working Group.

(b) Each Federal agency may, whenever practicable and appropriate, translate crucial public documents, notices and hearings relating to human health or the environment for limited English-speaking populations.

(c) Each Federal agency shall work to ensure that public documents, notices, and hearings relating to human health or the environment are concise, understandable, and readily accessible to the public.

(d) The Working Group shall hold public meetings, as appropriate, for the purpose of fact-finding, receiving public comments, and conducting inquiries concerning environmental justice. The Working Group shall prepare for public review a summary of the contents and recommendations discussed at the public meetings.

Sec. 6-6. General Provisions.

6-601. Responsibility for Agency Implementation. The head of each Federal agency shall be responsible for ensuring compliance with this order. Each Federal agency shall conduct internal reviews and take such other steps as may be necessary to monitor compliance with this order.

6-602. Executive Order No. 12250. This Executive Order is intended to supplement but not supersede Executive Order No. 12250, which requires consistent and effective implementation of various laws prohibiting discriminatory practices in programs receiving Federal financial assistance. Nothing herein shall limit the effect or mandate of Executive Order No. 12250.

6-603. Executive Order No. 12875. This Executive Order is not intended to limit the effect or mandate of Executive Order No. 12875.

6-604. Scope. For the purposes of this order, Federal agency means any agency on the Working Group, and such other agencies as may be designated by the President, that conducts any Federal program or activity that substantially effects human health or the environment. Independent agencies are requested to comply with the provisions of this order.

6-605. Petitions for Exemptions. The head of a Federal agency may petition the President for an exemption from the requirements of this order on the grounds that all or some of the petitioning agency's programs or activities should not be subject to the requirements of this order.

6-606. Native American Programs. Each Federal agency responsibility set forth under this order shall apply equally to Native American programs. In addition, the Department of the Interior, in coordination with the Working Group, and after consultation with tribal leaders, shall coordinate steps to be taken pursuant to this order that address Federally-recognized Indian tribes.

6-607. Costs. Unless otherwise provided by law, Federal agencies shall assume the financial costs of complying with this order.

6-608. General. Federal agencies shall implement this order consistent with, and to the extent permitted by, existing law.

6-609. Judicial Review. This order is intended only to improve the internal management of the executive branch and is not intended to, nor does it create any right, benefit, or trust responsibility, substantive or procedural, enforceable at law or equity by a party against the United States, its agencies, its officers, or any person. This order shall not be construed to create any right to judicial review involving the compliance or noncompliance of the United States, its agencies, its officers, or any other person with this order.

WILLIAM J. CLINTON

THE WHITE HOUSE

February 11, 1994.

# # #

APPENDIX B

List of sites, Map of Sites and Aerial View of Concentric Rings

Table M3

Pennsylvania and Non-Pennsylvania NPL Sites Examined in Study

#	Site Name	County	State	CERCLIS ID	NPL Status
1	HUNTERSTOWN ROAD	ADAMS	PA	PAD980830897	Final
2	WESTINGHOUSE ELEVATOR CO. PLANT	ADAMS	PA	PAD043882281	Final
3	SHRIVER'S CORNER	ADAMS	PA	PAD980830889	Final
4	RESIN DISPOSAL	ALLEGHENY	PA	PAD063766828	Deleted
5	BRESLUBE-PENN, INC	ALLEGHENY	PA	PAD089667695	Final
6	OHIO RIVER PARK	ALLEGHENY	PA	PAD980508816	Final
7	LINDANE DUMP	ALLEGHENY	PA	PAD980712798	Final
8	CRAIG FARM DRUM	ARMSTRONG	PA	PAD980508527	Final
9	DOUGLASSVILLE DISPOSAL	BERKS	PA	PAD002384865	Final
10	BERKS LANDFILL	BERKS	PA	PAD000651810	Final
11	CRYOCHEM, INC.	BERKS	PA	PAD002360444	Final
12	BALLY GROUND WATER CONTAMINATION	BERKS	PA	PAD061105128	Final
13	CROSSLEY FARM	BERKS	PA	PAD981740061	Final
14	BERKS SAND PIT	BERKS	PA	PAD980691794	Final
15	BROWN'S BATTERY BREAKING	BERKS	PA	PAD980831812	Final
16	DORNEY ROAD LANDFILL	BERKS	PA	PAD980508832	Final
17	DELTA QUARRIES & DISP./STOTLER LANDFILL	BLAIR	PA	PAD981038052	Final
18	BELL LANDFILL	BRADFORD	PA	PAD980705107	Final
19	CROYDON TCE	BUCKS	PA	PAD981035009	Final
20	ROHM AND HAAS CO. LANDFILL	BUCKS	PA	PAD091637975	Removed
21	FISCHER & PORTER CO.	BUCKS	PA	PAD002345817	Final
22	NAVAL AIR DEVELOPMENT CENTER(8 AREAS)	BUCKS	PA	PA6170024545	Final
23	DUBLIN TCE SITE	BUCKS	PA	PAD981740004	Final
24	WATSON JOHNSON LANDFILL	Bucks	PA	PAD980706824	Final
25	REVERE CHEMICAL CO.	BUCKS	PA	PAD051395499	Final
26	BOARHEAD FARMS	BUCKS	PA	PAD047726161	Final
27	HRANICA LANDFILL	BUTLER	PA	PAD980508618	Deleted
28	BRUIN LAGOON	BUTLER	PA	PAD980712855	Deleted
29	PALMERTON ZINC PILE	CARBON	PA	PAD002395887	Final
30	TONOLLI CORP.	CARBON	PA	PAD073613663	Final
31	CENTRE COUNTY KEPONE	CENTRE	PA	PAD000436261	Final
32	STRASBURG LANDFILL	CHESTER	PA	PAD000441337	Final
33	OLD WILMINGTON ROAD GW CONTAMINATION	CHESTER	PA	PAD981938939	Proposed
34	BLOSENSKI LANDFILL	CHESTER	PA	PAD980539985	Final

35	A.I.W. FRANK/MID-COUNTY MUSTANG	CHESTER	PA	PAD004351003	Final
36	FOOTE MINERAL CO.	CHESTER	PA	PAD077087989	Final
37	WILLIAM DICK LAGOONS	CHESTER	PA	PAD980537773	Final
38	PAOLI RAIL YARD	CHESTER	PA	PAD980692594	Final
39	MALVERN TCE	CHESTER	PA	PAD014353445	Final
40	WALSH LANDFILL	CHESTER	PA	PAD980829527	Final
41	KIMBERTON SITE	CHESTER	PA	PAD980691703	Final
42	RECTICON/ALLIED STEEL CORP.	CHESTER	PA	PAD002353969	Final
43	DRAKE CHEMICAL	CLINTON	PA	PAD003058047	Final
44	SAEGERTOWN INDUSTRIAL AREA	CRAWFORD	PA	PAD980692487	Final
45	NAVY SHIPS PARTS CONTROL CENTER	CUMBERLAND	PA	PA3170022104	Final
46	MIDDLETOWN AIR FIELD	DAUPHIN	PA	PAD980538763	Deleted
47	EAST TENTH STREET	DELAWARE	PA	PAD987323458	Proposed
48	WADE (ABM)	DELAWARE	PA	PAD980539407	Deleted
49	LOWER DARBY CREEK AREA	Delaware	PA	PASFN0305521	Final
50	LANSDOWNE RADIATION SITE	DELAWARE	PA	PAD980830921	Deleted
51	AUSTIN AVENUE RADIATION SITE	DELAWARE	PA	PAD987341716	Deleted
52	HAVERTOWN PCP	DELAWARE	PA	PAD002338010	Final
53	LORD-SHOPE LANDFILL	ERIE	PA	PAD980508931	Final
54	MILL CREEK DUMP	ERIE	PA	PAD980231690	Final
55	PRESQUE ISLE	ERIE	PA	PAD980508865	Deleted
56	LETTERKENNY ARMY DEPOT (PDO AREA)	FRANKLIN	PA	PA2210090054	Final
57	LETTERKENNY ARMY DEPOT (SE AREA)	FRANKLIN	PA	PA6213820503	Final
58	LEHIGH ELECTRIC & ENGINEERING CO.	LACKAWANNA	PA	PAD980712731	Deleted
59	LACKAWANNA REFUSE	LACKAWANNA	PA	PAD980508667	Deleted
60	TAYLOR BOROUGH DUMP	LACKAWANNA	PA	PAD980693907	Deleted
61	KEYSER AVENUE BOREHOLE	LACKAWANNA	PA	PAD981036049	Removed
62	ALADDIN PLATING	LACKAWANNA	PA	PAD075993378	Deleted
63	UGI COLUMBIA GAS PLANT	LANCASTER	PA	PAD980539126	Final
64	ELIZABETHTOWN LANDFILL	LANCASTER	PA	PAD980539712	Final
65	BERKLEY PRODUCTS CO. DUMP	LANCASTER	PA	PAD980538649	Final
66	WHITMOYER LABORATORIES	LEBANON	PA	PAD003005014	Final
67	RODALE MANUFACTURING CO., INC.	LEHIGH	PA	PAD981033285	Final
68	VOORTMAN FARM	LEHIGH	PA	PAD980692719	Deleted
69	HEBELKA AUTO SALVAGE YARD	LEHIGH	PA	PAD980829329	Deleted

70	REESER'S LANDFILL	LEHIGH	PA	PAD980829261	Deleted
71	NOVAK SANITARY LANDFILL	LEHIGH	PA	PAD079160842	Final
72	HELEVA LANDFILL	LEHIGH	PA	PAD980537716	Final
73	VALMONT TCE SITE (FORMER - VALMONT INDUSTRIAL PARK)	Luzerne	PA	PAD982363970	Final
74	C & D RECYCLING	LUZERNE	PA	PAD021449244	Final
75	BUTLER MINE TUNNEL	LUZERNE	PA	PAD980508451	Final
76	AVCO LYCOMING (WILLIAMSPORT DIVISION)	LYCOMING	PA	PAD003053709	Final
77	WESTLINE SITE	MCKEAN	PA	PAD980692537	Deleted
78	OSBORNE LANDFILL	MERCER	PA	PAD980712673	Final
79	SHARON STEEL CORP(FARRELL WKS DISP AREA)	MERCER	PA	PAD001933175	Final
80	WESTINGHOUSE ELECTRONIC (SHARON PLANT)	MERCER	PA	PAD005000575	Final
81	RIVER ROAD LANDFILL/WASTE MNGMNT, INC.	MERCER	PA	PAD000439083	Final
82	JACKS CREEK/SITKIN SMELTING AND REFINERY	MIFFLIN	PA	PAD980829493	Final
83	BRODHEAD CREEK	MONROE	PA	PAD980691760	Deleted
84	BUTZ LANDFILL	MONROE	PA	PAD981034705	Final
85	ROUTE 940 DRUM DUMP	MONROE	PA	PAD981034630	Deleted
86	TOBYHANNA ARMY DEPOT	MONROE	PA	PA5213820892	Final
87	CRATER RESOURCES/KEYSTONE COKE/ALAN WOOD	MONTGOMERY	PA	PAD980419097	Final
88	STANLEY KESSLER	MONTGOMERY	PA	PAD014269971	Final
89	HENDERSON ROAD	MONTGOMERY	PA	PAD009862939	Final
90	TYSONS DUMP	MONTGOMERY	PA	PAD980692024	Final
91	COMMODORE SEMICONDUCTOR GROUP	MONTGOMERY	PA	PAD093730174	Final
92	AMBLER ASBESTOS PILES	MONTGOMERY	PA	PAD000436436	Deleted
93	MOYERS LANDFILL	MONTGOMERY	PA	PAD980508766	Final
94	RAYMARK	MONTGOMERY	PA	PAD039017694	Final
95	NORTH PENN - AREA 12	MONTGOMERY	PA	PAD057152365	Final
96	WILLOW GROVE NAVAL AIR & AIR RES. STN.	MONTGOMERY	PA	PAD987277837	Final
97	NORTH PENN - AREA 7	MONTGOMERY	PA	PAD002498632	Final
98	OCCIDENTAL CHEMICAL CORP./FIRESTONE TIRE	MONTGOMERY	PA	PAD980229298	Final
99	NORTH PENN - AREA 6	MONTGOMERY	PA	PAD980926976	Final
100	SALFORD QUARRY	MONTGOMERY	PA	PAD980693204	Proposed
101	NORTH PENN - AREA 5	MONTGOMERY	PA	PAD980692693	Final
102	NORTH PENN - AREA 2	MONTGOMERY	PA	PAD002342475	Final

103	NORTH PENN - AREA 1	MONTGOMERY	PA	PAD096834494	Final
104	MW MANUFACTURING	MONTOUR	PA	PAD980691372	Final
105	HELLERTOWN MANUFACTURING CO.	NORTHAMPTON	PA	PAD002390748	Final
106	INDUSTRIAL LANE	NORTHAMPTON	PA	PAD980508493	Final
107	ENTERPRISE AVENUE	PHILADELPHIA	PA	PAD980552913	Deleted
108	PUBLICKER INDUSTRIES INC.	PHILADELPHIA	PA	PAD981939200	Deleted
109	FRANKLIN SLAG PILE (MDC)	Philadelphia	PA	PASFN0305549	Final
110	METAL BANKS	PHILADELPHIA	PA	PAD046557096	Final
111	METROPOLITAN MIRROR AND GLASS	SCHUYLKILL	PA	PAD982366957	Final
112	EASTERN DIVERSIFIED METALS	SCHUYLKILL	PA	PAD980830533	Final
113	MCADOO ASSOCIATES	SCHUYLKILL	PA	PAD980712616	Deleted
114	BENDIX FLIGHT SYSTEMS DIVISION	SUSQUEHANNA	PA	PAD003047974	Final
115	KEYSTONE SANITATION LANDFILL	YORK	PA	PAD054142781	Final
116	YORK COUNTY SOLID WASTE/REFUSE LANDFILL	YORK	PA	PAD980830715	Final
117	AMP, INC. (GLEN ROCK FACILITY)	YORK	PA	PAD041421223	Deleted
118	OLD CITY OF YORK LANDFILL	YORK	PA	PAD980692420	Final
119	MODERN SANITATION LANDFILL	YORK	PA	PAD980539068	Final
120	EAST MOUNT ZION	YORK	PA	PAD980690549	Final
122	COSDEN CHEMICAL COATINGS CORP.	BURLINGTON	NJ	NJD000565531	Final
123	BRIDGEPORT RENTAL & OIL SERVICES	GLOUCESTER	NJ	NJD053292652	Final
124	CHEMICAL LEAMAN TANK LINES, INC.	GLOUCESTER	NJ	NJD047321443	Final
125	HERCULES, INC. (GIBBSTOWN PLANT)	GLOUCESTER	NJ	NJD002349058	Final
126	WELSBACH & GENERAL GAS MANTLE (CAMDEN RADIATION)	CAMDEN	NJ	NJD986620995	Final
127	NL INDUSTRIES	SALEM	NJ	NJD061843249	Final
128	CINNAMISON TOWNSHIP (BLOCK 702) GROUND WATER CONTAMINATION	BURLINGTON	NJ	NJD980785638	Final
129	MATLACK, INC.	GLOUCESTER	NJ	NJD043584101	Removed
130	MARTIN AARON, INC.	CAMDEN	NJ	NJD014623854	Final
131	PUCHACK WELL FIELD	CAMDEN	NJ	NJD981084767	Final
132	SWOPE OIL & CHEMICAL CO.	CAMDEN	NJ	NJD041743220	Final
133	FLORENCE LAND RECONTOURING, INC., LANDFILL	BURLINGTON	NJ	NJD980529143	Final

134	ROEBLING STEEL CO.	BURLINGTON	NJ	NJD073732257	Final
135	DE REWAL CHEMICAL CO.	HUNTERDON	NJ	NJD980761373	Final
136	CORTESE LANDFILL	SULLIVAN	NY	NYD980528475	Final
137	CARROLL & DUBIES SEWAGE DISPOSAL	ORANGE	NY	NYD010968014	Final
138	CONKLIN DUMPS	BROOME	NY	NYD981486947	Deleted
139	VESTAL WATER SUPPLY WELL 1-1	BROOME	NY	NYD980763767	Final
140	OLEAN WELL FIELD	CATTARAUGUS	NY	NYD980528657	Final
141	CENTRAL CHEMICAL (HAGERSTOWN)	WASHINGTON	MD	MDD003061447	Final
142	SPECTRON, INC.	CECIL	MD	MDD000218008	Final
143	FOLLANSBEE	BROOKE	WV	WVD004336749	Deleted

Figure M1

Map of Sites

Please note that the map of the sites is not contained within the electronic version of this study. A hard copy of this study which contains the map can accessed at:

Duquesne University
Gumberg Library
600 Forbes Avenue
Pittsburgh, PA 15282

Figure M2

Aerial Photo of Concentric Rings

Please note that the aerial view of the concentric rings is not contained within the electronic version of this study. A hard copy of this study which contains the aerial view of the concentric rings can accessed at:

Duquesne University
Gumberg Library
600 Forbes Avenue
Pittsburgh, PA 15282

APPENDIX C

Detailed Post Hoc Test Results

Table 1A1 Post Hoc Tests - Multiple Comparisons

Dependent Variable: Pct_White

	(I) Distance From Site	(J) Distance From Site	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Scheffe	1.666	3.333	-.955	1.664	.954	-5.6100	3.6997
		4.999	.802	1.718	.975	-4.0026	5.6075
		9.999	3.247	1.382	.138	-.6195	7.1131
	3.333	1.666	.955	1.664	.954	-3.6997	5.6100
		4.999	1.758	1.586	.746	-2.6794	6.1946
		9.999	4.202(*)	1.215	.008	.8039	7.6000
	4.999	1.666	-.802	1.718	.975	-5.6075	4.0026
		3.333	-1.758	1.586	.746	-6.1946	2.6794
		9.999	2.444	1.287	.308	-1.1567	6.0453
	9.999	1.666	-3.247	1.382	.138	-7.1131	.6195
		3.333	-4.202(*)	1.215	.008	-7.6000	-.8039
		4.999	-2.444	1.287	.308	-6.0453	1.1567
Bonferroni	1.666	3.333	-.955	1.664	1.000	-5.3486	3.4383
		4.999	.802	1.718	1.000	-3.7328	5.3377
		9.999	3.247	1.382	.113	-.4024	6.8960
	3.333	1.666	.955	1.664	1.000	-3.4383	5.3486
		4.999	1.758	1.586	1.000	-2.4302	5.9455
		9.999	4.202(*)	1.215	.003	.9947	7.4092
	4.999	1.666	-.802	1.718	1.000	-5.3377	3.7328
		3.333	-1.758	1.586	1.000	-5.9455	2.4302
		9.999	2.444	1.287	.346	-.9545	5.8431
	9.999	1.666	-3.247	1.382	.113	-6.8960	.4024
		3.333	-4.202(*)	1.215	.003	-7.4092	-.9947
		4.999	-2.444	1.287	.346	-5.8431	.9545
Sidak	1.666	3.333	-.955	1.664	.993	-5.3366	3.4263
		4.999	.802	1.718	.998	-3.7203	5.3253
		9.999	3.247	1.382	.108	-.3924	6.8860
	3.333	1.666	.955	1.664	.993	-3.4263	5.3366
		4.999	1.758	1.586	.846	-2.4188	5.9340
		9.999	4.202(*)	1.215	.003	1.0035	7.4004
	4.999	1.666	-.802	1.718	.998	-5.3253	3.7203
		3.333	-1.758	1.586	.846	-5.9340	2.4188
		9.999	2.444	1.287	.300	-.9452	5.8338
	9.999	1.666	-3.247	1.382	.108	-6.8860	.3924
		3.333	-4.202(*)	1.215	.003	-7.4004	-1.0035
		4.999	-2.444	1.287	.300	-5.8338	.9452

* The mean difference is significant at the .05 level.

Table 2A1

Post Hoc Tests - Multiple Comparisons

Dependent Variable: Pct_Nonwhite

	(I) Distance From Site	(J) Distance From Site	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Scheffe	1.666	3.333	1.267	1.749	.913	-3.6251	6.1593
		4.999	-.619	1.797	.990	-5.6462	4.4087
		9.999	-3.095	1.450	.208	-7.1514	.9617
	3.333	1.666	-1.267	1.749	.913	-6.1593	3.6251
		4.999	-1.886	1.660	.732	-6.5304	2.7587
		9.999	-4.362(*)	1.277	.009	-7.9330	-.7910
	4.999	1.666	.619	1.797	.990	-4.4087	5.6462
		3.333	1.886	1.660	.732	-2.7587	6.5304
		9.999	-2.476	1.342	.334	-6.2303	1.2781
	9.999	1.666	3.095	1.450	.208	-.9617	7.1514
		3.333	4.362(*)	1.277	.009	.7910	7.9330
		4.999	2.476	1.342	.334	-1.2781	6.2303
Bonferroni	1.666	3.333	1.267	1.749	1.000	-3.3504	5.8846
		4.999	-.619	1.797	1.000	-5.3639	4.1264
		9.999	-3.095	1.450	.198	-6.9236	.7339
	3.333	1.666	-1.267	1.749	1.000	-5.8846	3.3504
		4.999	-1.886	1.660	1.000	-6.2696	2.4979
		9.999	-4.362(*)	1.277	.004	-7.7325	-.9915
	4.999	1.666	.619	1.797	1.000	-4.1264	5.3639
		3.333	1.886	1.660	1.000	-2.4979	6.2696
		9.999	-2.476	1.342	.391	-6.0195	1.0673
	9.999	1.666	3.095	1.450	.198	-.7339	6.9236
		3.333	4.362(*)	1.277	.004	.9915	7.7325
		4.999	2.476	1.342	.391	-1.0673	6.0195
Sidak	1.666	3.333	1.267	1.749	.978	-3.3377	5.8720
		4.999	-.619	1.797	1.000	-5.3509	4.1134
		9.999	-3.095	1.450	.182	-6.9132	.7234
	3.333	1.666	-1.267	1.749	.978	-5.8720	3.3377
		4.999	-1.886	1.660	.831	-6.2576	2.4859
		9.999	-4.362(*)	1.277	.004	-7.7232	-1.0007
	4.999	1.666	.619	1.797	1.000	-4.1134	5.3509
		3.333	1.886	1.660	.831	-2.4859	6.2576
		9.999	-2.476	1.342	.333	-6.0098	1.0576
	9.999	1.666	3.095	1.450	.182	-.7234	6.9132
		3.333	4.362(*)	1.277	.004	1.0007	7.7232
		4.999	2.476	1.342	.333	-1.0576	6.0098

* The mean difference is significant at the .05 level.

Table 3A1

Post Hoc Tests - Multiple Comparisons

Dependent Variable: Median HH Income

	(I) Distance From Site	(J) Distance From Site	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
Scheffe	1.666	3.333	-$2,542.72	$910.01	.050	-$5,088.09	$2.65
		4.999	$409.64	$938.99	.979	-$2,216.80	$3,036.08
		9.999	$935.92	$755.21	.674	-$1,176.47	$3,048.32
	3.333	1.666	$2,542.72	$910.01	.050	-$2.65	$5,088.09
		4.999	$2,952.36(*)	$868.19	.009	$523.96	$5,380.76
		9.999	$3,478.64(*)	$665.13	.000	$1,618.23	$5,339.06
	4.999	1.666	-$409.64	$938.99	.979	-$3,036.08	$2,216.80
		3.333	-$2,952.36(*)	$868.19	.009	-$5,380.76	-$523.96
		9.999	$526.29	$704.26	.906	-$1,443.60	$2,496.17
	9.999	1.666	-$935.92	$755.21	.674	-$3,048.32	$1,176.47
		3.333	-$3,478.64(*)	$665.13	.000	-$5,339.06	-$1,618.23
		4.999	-$526.29	$704.26	.906	-$2,496.17	$1,443.60
Bonferroni	1.666	3.333	-$2,542.72(*)	$910.01	.031	-$4,945.16	-$140.28
		4.999	$409.64	$938.99	1.000	-$2,069.32	$2,888.60
		9.999	$935.92	$755.21	1.000	-$1,057.85	$2,929.70
	3.333	1.666	$2,542.72(*)	$910.01	.031	$140.28	$4,945.16
		4.999	$2,952.36(*)	$868.19	.004	$660.32	$5,244.40
		9.999	$3,478.64(*)	$665.13	.000	$1,722.70	$5,234.59
	4.999	1.666	-$409.64	$938.99	1.000	-$2,888.60	$2,069.32
		3.333	-$2,952.36(*)	$868.19	.004	-$5,244.40	-$660.32
		9.999	$526.29	$704.26	1.000	-$1,332.98	$2,385.55
	9.999	1.666	-$935.92	$755.21	1.000	-$2,929.70	$1,057.85
		3.333	-$3,478.64(*)	$665.13	.000	-$5,234.59	-$1,722.70
		4.999	-$526.29	$704.26	1.000	-$2,385.55	$1,332.98
Sidak	1.666	3.333	-$2,542.72(*)	$910.01	.031	-$4,938.58	-$146.86
		4.999	$409.64	$938.99	.999	-$2,062.53	$2,881.81
		9.999	$935.92	$755.21	.767	-$1,052.39	$2,924.24
	3.333	1.666	$2,542.72(*)	$910.01	.031	$146.86	$4,938.58
		4.999	$2,952.36(*)	$868.19	.004	$666.60	$5,238.12
		9.999	$3,478.64(*)	$665.13	.000	$1,727.51	$5,229.78
	4.999	1.666	-$409.64	$938.99	.999	-$2,881.81	$2,062.53
		3.333	-$2,952.36(*)	$868.19	.004	-$5,238.12	-$666.60
		9.999	$526.29	$704.26	.974	-$1,327.89	$2,380.46
	9.999	1.666	-$935.92	$755.21	.767	-$2,924.24	$1,052.39
		3.333	-$3,478.64(*)	$665.13	.000	-$5,229.78	-$1,727.51
		4.999	-$526.29	$704.26	.974	-$2,380.46	$1,327.89

* The mean difference is significant at the .05 level.

Table 4A1

Post Hoc Tests - Multiple Comparisons

Dependent Variable: White Per Capita Income by Race

						95% Confidence Interval	
	(I) Distance From Site	(J) Distance From Site	Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
Scheffe	1.666	3.333	-$934.21	$473.62	.274	-$2,258.95	$390.54
		4.999	$670.08	$488.65	.598	-$696.72	$2,036.87
		9.999	$573.17	$393.35	.547	-$527.08	$1,673.41
	3.333	1.666	$934.21	$473.62	.274	-$390.54	$2,258.95
		4.999	$1,604.28(*)	$451.09	.006	$342.56	$2,866.01
		9.999	$1,507.37(*)	$345.58	.000	$540.75	$2,473.99
	4.999	1.666	-$670.08	$488.65	.598	-$2,036.87	$696.72
		3.333	-$1,604.28(*)	$451.09	.006	-$2,866.01	-$342.56
		9.999	-$96.91	$365.91	.995	-$1,120.41	$926.58
	9.999	1.666	-$573.17	$393.35	.547	-$1,673.41	$527.08
		3.333	-$1,507.37(*)	$345.58	.000	-$2,473.99	-$540.75
		4.999	$96.91	$365.91	.995	-$926.58	$1,120.41
Bonferroni	1.666	3.333	-$934.21	$473.62	.292	-$2,184.56	$316.15
		4.999	$670.08	$488.65	1.000	-$619.97	$1,960.13
		9.999	$573.17	$393.35	.871	-$465.30	$1,611.63
	3.333	1.666	$934.21	$473.62	.292	-$316.15	$2,184.56
		4.999	$1,604.28(*)	$451.09	.002	$413.41	$2,795.16
		9.999	$1,507.37(*)	$345.58	.000	$595.03	$2,419.71
	4.999	1.666	-$670.08	$488.65	1.000	-$1,960.13	$619.97
		3.333	-$1,604.28(*)	$451.09	.002	-$2,795.16	-$413.41
		9.999	-$96.91	$365.91	1.000	-$1,062.93	$869.11
	9.999	1.666	-$573.17	$393.35	.871	-$1,611.63	$465.30
		3.333	-$1,507.37(*)	$345.58	.000	-$2,419.71	-$595.03
		4.999	$96.91	$365.91	1.000	-$869.11	$1,062.93
Sidak	1.666	3.333	-$934.21	$473.62	.259	-$2,181.14	$312.72
		4.999	$670.08	$488.65	.674	-$616.44	$1,956.59
		9.999	$573.17	$393.35	.610	-$462.45	$1,608.78
	3.333	1.666	$934.21	$473.62	.259	-$312.72	$2,181.14
		4.999	$1,604.28(*)	$451.09	.002	$416.67	$2,791.90
		9.999	$1,507.37(*)	$345.58	.000	$597.53	$2,417.22
	4.999	1.666	-$670.08	$488.65	.674	-$1,956.59	$616.44
		3.333	-$1,604.28(*)	$451.09	.002	-$2,791.90	-$416.67
		9.999	-$96.91	$365.91	1.000	-$1,060.29	$866.47
	9.999	1.666	-$573.17	$393.35	.610	-$1,608.78	$462.45
		3.333	-$1,507.37(*)	$345.58	.000	-$2,417.22	-$597.53
		4.999	$96.91	$365.91	1.000	-$866.47	$1,060.29

* The mean difference is significant at the .05 level.

Table 6A1

Post Hoc Tests - Multiple Comparisons

Dependent Variable: WHITE_LESSthan_4YR_Degree

	(I) Distance From Site	(J) Distance From Site	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
Scheffe	1.666	3.333	3.550(*)	1.106	.016	.4563	6.6446
		4.999	-.628	1.142	.959	-3.8228	2.5659
		9.999	-.836	.918	.843	-3.4049	1.7329
	3.333	1.666	-3.550(*)	1.106	.016	-6.6446	-.4563
		4.999	-4.179(*)	1.055	.001	-7.1304	-1.2275
		9.999	-4.386(*)	.808	.000	-6.6462	-2.1267
	4.999	1.666	.628	1.142	.959	-2.5659	3.8228
		3.333	4.179(*)	1.055	.001	1.2275	7.1304
		9.999	-.208	.856	.996	-2.6026	2.1876
	9.999	1.666	.836	.918	.843	-1.7329	3.4049
		3.333	4.386(*)	.808	.000	2.1267	6.6462
		4.999	.208	.856	.996	-2.1876	2.6026
Bonferroni	1.666	3.333	3.550(*)	1.106	.008	.6301	6.4709
		4.999	-.628	1.142	1.000	-3.6435	2.3865
		9.999	-.836	.918	1.000	-3.2607	1.5887
	3.333	1.666	-3.550(*)	1.106	.008	-6.4709	-.6301
		4.999	-4.179(*)	1.055	.000	-6.9647	-1.3933
		9.999	-4.386(*)	.808	.000	-6.5193	-2.2536
	4.999	1.666	.628	1.142	1.000	-2.3865	3.6435
		3.333	4.179(*)	1.055	.000	1.3933	6.9647
		9.999	-.208	.856	1.000	-2.4681	2.0531
	9.999	1.666	.836	.918	1.000	-1.5887	3.2607
		3.333	4.386(*)	.808	.000	2.2536	6.5193
		4.999	.208	.856	1.000	-2.0531	2.4681
Sidak	1.666	3.333	3.550(*)	1.106	.008	.6381	6.4629
		4.999	-.628	1.142	.995	-3.6352	2.3782
		9.999	-.836	.918	.933	-3.2540	1.5820
	3.333	1.666	-3.550(*)	1.106	.008	-6.4629	-.6381
		4.999	-4.179(*)	1.055	.000	-6.9570	-1.4009
		9.999	-4.386(*)	.808	.000	-6.5135	-2.2595
	4.999	1.666	.628	1.142	.995	-2.3782	3.6352
		3.333	4.179(*)	1.055	.000	1.4009	6.9570
		9.999	-.208	.856	1.000	-2.4619	2.0469
	9.999	1.666	.836	.918	.933	-1.5820	3.2540
		3.333	4.386(*)	.808	.000	2.2595	6.5135
		4.999	.208	.856	1.000	-2.0469	2.4619

* The mean difference is significant at the .05 level.

Table 7A1

Post Hoc Tests - Multiple Comparisons

Dependent Variable: Education Level White Greater than a Four Year Degree

	(I) Distance From Site	(J) Distance From Site	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
Scheffe	1.666	3.333	-3.55049(*)	1.10621	.016	-6.6446	-.4563
		4.999	.62849	1.14203	.959	-2.5659	3.8228
		9.999	.83599	.91843	.843	-1.7329	3.4049
	3.333	1.666	3.55049(*)	1.10621	.016	.4563	6.6446
		4.999	4.17897(*)	1.05518	.001	1.2275	7.1304
		9.999	4.38648(*)	.80789	.000	2.1267	6.6462
	4.999	1.666	-.62849	1.14203	.959	-3.8228	2.5659
		3.333	-4.17897(*)	1.05518	.001	-7.1304	-1.2275
		9.999	.20750	.85629	.996	-2.1876	2.6026
	9.999	1.666	-.83599	.91843	.843	-3.4049	1.7329
		3.333	-4.38648(*)	.80789	.000	-6.6462	-2.1267
		4.999	-.20750	.85629	.996	-2.6026	2.1876
Bonferroni	1.666	3.333	-3.55049(*)	1.10621	.008	-6.4709	-.6301
		4.999	.62849	1.14203	1.000	-2.3865	3.6435
		9.999	.83599	.91843	1.000	-1.5887	3.2607
	3.333	1.666	3.55049(*)	1.10621	.008	.6301	6.4709
		4.999	4.17897(*)	1.05518	.000	1.3933	6.9647
		9.999	4.38648(*)	.80789	.000	2.2536	6.5193
	4.999	1.666	-.62849	1.14203	1.000	-3.6435	2.3865
		3.333	-4.17897(*)	1.05518	.000	-6.9647	-1.3933
		9.999	.20750	.85629	1.000	-2.0531	2.4681
	9.999	1.666	-.83599	.91843	1.000	-3.2607	1.5887
		3.333	-4.38648(*)	.80789	.000	-6.5193	-2.2536
		4.999	-.20750	.85629	1.000	-2.4681	2.0531
Sidak	1.666	3.333	-3.55049(*)	1.10621	.008	-6.4629	-.6381
		4.999	.62849	1.14203	.995	-2.3782	3.6352
		9.999	.83599	.91843	.933	-1.5820	3.2540
	3.333	1.666	3.55049(*)	1.10621	.008	.6381	6.4629
		4.999	4.17897(*)	1.05518	.000	1.4009	6.9570
		9.999	4.38648(*)	.80789	.000	2.2595	6.5135
	4.999	1.666	-.62849	1.14203	.995	-3.6352	2.3782
		3.333	-4.17897(*)	1.05518	.000	-6.9570	-1.4009
		9.999	.20750	.85629	1.000	-2.0469	2.4619
	9.999	1.666	-.83599	.91843	.933	-3.2540	1.5820
		3.333	-4.38648(*)	.80789	.000	-6.5135	-2.2595
		4.999	-.20750	.85629	1.000	-2.4619	2.0469

* The mean difference is significant at the .05 level.

Table 8A1

Post Hoc Tests - Multiple Comparisons

Dependent Variable: NONWHITE_LESSthan4YR_DEGREE

	(I) Distance From Site	(J) Distance From Site	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
Scheffe	1.666	3.333	6.333	2.331	.061	-.190	12.856
		4.999	-.533	2.430	.997	-7.332	6.266
		9.999	7.218(*)	2.096	.008	1.354	13.083
	3.333	1.666	-6.333	2.331	.061	-12.856	.190
		4.999	-6.866(*)	2.248	.025	-13.157	-.575
		9.999	.885	1.882	.974	-4.382	6.153
	4.999	1.666	.533	2.430	.997	-6.266	7.332
		3.333	6.866(*)	2.248	.025	.575	13.157
		9.999	7.752(*)	2.003	.002	2.146	13.357
	9.999	1.666	-7.218(*)	2.096	.008	-13.083	-1.354
		3.333	-.885	1.882	.974	-6.153	4.382
		4.999	-7.752(*)	2.003	.002	-13.357	-2.146
Bonferroni	1.666	3.333	6.333(*)	2.331	.040	.176	12.490
		4.999	-.533	2.430	1.000	-6.951	5.884
		9.999	7.218(*)	2.096	.004	1.683	12.754
	3.333	1.666	-6.333(*)	2.331	.040	-12.490	-.176
		4.999	-6.866(*)	2.248	.014	-12.804	-.928
		9.999	.885	1.882	1.000	-4.086	5.857
	4.999	1.666	.533	2.430	1.000	-5.884	6.951
		3.333	6.866(*)	2.248	.014	.928	12.804
		9.999	7.752(*)	2.003	.001	2.460	13.043
	9.999	1.666	-7.218(*)	2.096	.004	-12.754	-1.683
		3.333	-.885	1.882	1.000	-5.857	4.086
		4.999	-7.752(*)	2.003	.001	-13.043	-2.460
Sidak	1.666	3.333	6.333(*)	2.331	.039	.193	12.473
		4.999	-.533	2.430	1.000	-6.933	5.867
		9.999	7.218(*)	2.096	.004	1.698	12.739
	3.333	1.666	-6.333(*)	2.331	.039	-12.473	-.193
		4.999	-6.866(*)	2.248	.014	-12.788	-.945
		9.999	.885	1.882	.998	-4.073	5.843
	4.999	1.666	.533	2.430	1.000	-5.867	6.933
		3.333	6.866(*)	2.248	.014	.945	12.788
		9.999	7.752(*)	2.003	.001	2.475	13.028
	9.999	1.666	-7.218(*)	2.096	.004	-12.739	-1.698
		3.333	-.885	1.882	.998	-5.843	4.073
		4.999	-7.752(*)	2.003	.001	-13.028	-2.475

* The mean difference is significant at the .05 level.

Table 9A1

Post Hoc Tests - Multiple Comparisons

Dependent Variable: NONWHITE_BACHELOR_Degree_or GREATER

	(I) Distance From Site	(J) Distance From Site	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Scheffe	1.666	3.333	-6.25626(*)	1.75258	.005	-11.1594	-1.3531
		4.999	1.82966	1.82100	.799	-3.2649	6.9242
		9.999	11.08252(*)	1.51266	.000	6.8506	15.3144
	3.333	1.666	6.25626(*)	1.75258	.005	1.3531	11.1594
		4.999	8.08592(*)	1.68542	.000	3.3707	12.8012
		9.999	17.33878(*)	1.34638	.000	13.5721	21.1055
	4.999	1.666	-1.82966	1.82100	.799	-6.9242	3.2649
		3.333	-8.08592(*)	1.68542	.000	-12.8012	-3.3707
		9.999	9.25286(*)	1.43431	.000	5.2401	13.2656
	9.999	1.666	-11.08252(*)	1.51266	.000	-15.3144	-6.8506
		3.333	-17.33878(*)	1.34638	.000	-21.1055	-13.5721
		4.999	-9.25286(*)	1.43431	.000	-13.2656	-5.2401
Bonferroni	1.666	3.333	-6.25626(*)	1.75258	.002	-10.8842	-1.6283
		4.999	1.82966	1.82100	1.000	-2.9790	6.6383
		9.999	11.08252(*)	1.51266	.000	7.0881	15.0770
	3.333	1.666	6.25626(*)	1.75258	.002	1.6283	10.8842
		4.999	8.08592(*)	1.68542	.000	3.6353	12.5366
		9.999	17.33878(*)	1.34638	.000	13.7834	20.8941
	4.999	1.666	-1.82966	1.82100	1.000	-6.6383	2.9790
		3.333	-8.08592(*)	1.68542	.000	-12.5366	-3.6353
		9.999	9.25286(*)	1.43431	.000	5.4653	13.0404
	9.999	1.666	-11.08252(*)	1.51266	.000	-15.0770	-7.0881
		3.333	-17.33878(*)	1.34638	.000	-20.8941	-13.7834
		4.999	-9.25286(*)	1.43431	.000	-13.0404	-5.4653
Sidak	1.666	3.333	-6.25626(*)	1.75258	.002	-10.8716	-1.6410
		4.999	1.82966	1.82100	.897	-2.9658	6.6251
		9.999	11.08252(*)	1.51266	.000	7.0990	15.0660
	3.333	1.666	6.25626(*)	1.75258	.002	1.6410	10.8716
		4.999	8.08592(*)	1.68542	.000	3.6475	12.5244
		9.999	17.33878(*)	1.34638	.000	13.7932	20.8844
	4.999	1.666	-1.82966	1.82100	.897	-6.6251	2.9658
		3.333	-8.08592(*)	1.68542	.000	-12.5244	-3.6475
		9.999	9.25286(*)	1.43431	.000	5.4757	13.0300
	9.999	1.666	-11.08252(*)	1.51266	.000	-15.0660	-7.0990
		3.333	-17.33878(*)	1.34638	.000	-20.8844	-13.7932
		4.999	-9.25286(*)	1.43431	.000	-13.0300	-5.4757

* The mean difference is significant at the .05 level.

Table 11A1

Post Hoc Tests - Multiple Comparisons

Dependent Variable: NONWHITE_BELOW_POVERTY

	(I) Distance From Site	(J) Distance From Site	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
Scheffe	1.666	3.333	1.571	1.519	.785	-2.680	5.821
		4.999	1.202	1.581	.901	-3.221	5.624
		9.999	6.312(*)	1.299	.000	2.679	9.946
	3.333	1.666	-1.571	1.519	.785	-5.821	2.680
		4.999	-.369	1.464	.996	-4.465	3.727
		9.999	4.742(*)	1.154	.001	1.513	7.970
	4.999	1.666	-1.202	1.581	.901	-5.624	3.221
		3.333	.369	1.464	.996	-3.727	4.465
		9.999	5.111(*)	1.234	.001	1.659	8.562
	9.999	1.666	-6.312(*)	1.299	.000	-9.946	-2.679
		3.333	-4.742(*)	1.154	.001	-7.970	-1.513
		4.999	-5.111(*)	1.234	.001	-8.562	-1.659
Bonferroni	1.666	3.333	1.571	1.519	1.000	-2.441	5.583
		4.999	1.202	1.581	1.000	-2.973	5.376
		9.999	6.312(*)	1.299	.000	2.883	9.742
	3.333	1.666	-1.571	1.519	1.000	-5.583	2.441
		4.999	-.369	1.464	1.000	-4.235	3.497
		9.999	4.742(*)	1.154	.000	1.694	7.789
	4.999	1.666	-1.202	1.581	1.000	-5.376	2.973
		3.333	.369	1.464	1.000	-3.497	4.235
		9.999	5.111(*)	1.234	.000	1.853	8.368
	9.999	1.666	-6.312(*)	1.299	.000	-9.742	-2.883
		3.333	-4.742(*)	1.154	.000	-7.789	-1.694
		4.999	-5.111(*)	1.234	.000	-8.368	-1.853
Sidak	1.666	3.333	1.571	1.519	.884	-2.430	5.572
		4.999	1.202	1.581	.971	-2.961	5.365
		9.999	6.312(*)	1.299	.000	2.892	9.732
	3.333	1.666	-1.571	1.519	.884	-5.572	2.430
		4.999	-.369	1.464	1.000	-4.225	3.487
		9.999	4.742(*)	1.154	.000	1.703	7.780
	4.999	1.666	-1.202	1.581	.971	-5.365	2.961
		3.333	.369	1.464	1.000	-3.487	4.225
		9.999	5.111(*)	1.234	.000	1.862	8.359
	9.999	1.666	-6.312(*)	1.299	.000	-9.732	-2.892
		3.333	-4.742(*)	1.154	.000	-7.780	-1.703
		4.999	-5.111(*)	1.234	.000	-8.359	-1.862

* The mean difference is significant at the .05 level.

Table 12A1

Post Hoc Tests - Multiple Comparisons

Dependent Variable: Med Yr Struct Built

	(I) Distance From Site	(J) Distance From Site	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Scheffe	1.666	3.333	-2.666(*)	.900	.033	-5.18	-.15
		4.999	-1.149	.929	.675	-3.75	1.45
		9.999	-.499	.747	.931	-2.59	1.59
	3.333	1.666	2.666(*)	.900	.033	.15	5.18
		4.999	1.517	.859	.373	-.88	3.92
		9.999	2.167(*)	.658	.013	.33	4.01
	4.999	1.666	1.149	.929	.675	-1.45	3.75
		3.333	-1.517	.859	.373	-3.92	.88
		9.999	.650	.696	.832	-1.30	2.60
	9.999	1.666	.499	.747	.931	-1.59	2.59
		3.333	-2.167(*)	.658	.013	-4.01	-.33
		4.999	-.650	.696	.832	-2.60	1.30
Bonferroni	1.666	3.333	-2.666(*)	.900	.018	-5.04	-.29
		4.999	-1.149	.929	1.000	-3.60	1.30
		9.999	-.499	.747	1.000	-2.47	1.47
	3.333	1.666	2.666(*)	.900	.018	.29	5.04
		4.999	1.517	.859	.464	-.75	3.78
		9.999	2.167(*)	.658	.006	.43	3.90
	4.999	1.666	1.149	.929	1.000	-1.30	3.60
		3.333	-1.517	.859	.464	-3.78	.75
		9.999	.650	.696	1.000	-1.19	2.49
	9.999	1.666	.499	.747	1.000	-1.47	2.47
		3.333	-2.167(*)	.658	.006	-3.90	-.43
		4.999	-.650	.696	1.000	-2.49	1.19
Sidak	1.666	3.333	-2.666(*)	.900	.018	-5.04	-.30
		4.999	-1.149	.929	.768	-3.59	1.30
		9.999	-.499	.747	.985	-2.46	1.47
	3.333	1.666	2.666(*)	.900	.018	.30	5.04
		4.999	1.517	.859	.383	-.74	3.78
		9.999	2.167(*)	.658	.006	.44	3.90
	4.999	1.666	1.149	.929	.768	-1.30	3.59
		3.333	-1.517	.859	.383	-3.78	.74
		9.999	.650	.696	.925	-1.18	2.48
	9.999	1.666	.499	.747	.985	-1.47	2.46
		3.333	-2.167(*)	.658	.006	-3.90	-.44
		4.999	-.650	.696	.925	-2.48	1.18

* The mean difference is significant at the .05 level.

Table 13A1

Post Hoc Tests - Multiple Comparisons

Dependent Variable: Med Val OO Struct

	(I) Distance From Site	(J) Distance From Site	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
Scheffe	1.666	3.333	-$10,633(*)	$3,708	.042	-$21,003.34	-$262.80
		4.999	$2,903	$3,829	.902	-$7,805.77	$13,612.44
		9.999	-$3,043	$3,075	.806	-$11,643.77	$5,557.86
	3.333	1.666	$10,633(*)	$3,708	.042	$262.80	$21,003.34
		4.999	$13,536(*)	$3,545	.002	$3,622.08	$23,450.72
		9.999	$7,590(*)	$2,713	.050	$1.78	$15,178.45
	4.999	1.666	-$2,903	$3,829	.902	-$13,612.44	$7,805.77
		3.333	-$13,536(*)	$3,545	.002	-$23,450.72	-$3,622.08
		9.999	-$5,946	$2,876	.234	-$13,991.49	$2,098.92
	9.999	1.666	$3,043	$3,075	.806	-$5,557.86	$11,643.77
		3.333	-$7,590(*)	$2,713	.050	-$15,178.45	-$1.78
		4.999	$5,946	$2,876	.234	-$2,098.92	$13,991.49
Bonferroni	1.666	3.333	-$10,633(*)	$3,708	.025	-$20,421.03	-$845.11
		4.999	$2,903	$3,829	1.000	-$7,204.44	$13,011.10
		9.999	-$3,043	$3,075	1.000	-$11,160.82	$5,074.91
	3.333	1.666	$10,633(*)	$3,708	.025	$845.11	$20,421.03
		4.999	$13,536(*)	$3,545	.001	$4,178.79	$22,894.01
		9.999	$7,590(*)	$2,713	.031	$427.88	$14,752.35
	4.999	1.666	-$2,903	$3,829	1.000	-$13,011.10	$7,204.44
		3.333	-$13,536(*)	$3,545	.001	-$22,894.01	-$4,178.79
		9.999	-$5,946	$2,876	.233	-$13,539.73	$1,647.16
	9.999	1.666	$3,043	$3,075	1.000	-$5,074.91	$11,160.82
		3.333	-$7,590(*)	$2,713	.031	-$14,752.35	-$427.88
		4.999	$5,946	$2,876	.233	-$1,647.16	$13,539.73
Sidak	1.666	3.333	-$10,633(*)	$3,708	.025	-$20,394.22	-$871.92
		4.999	$2,903	$3,829	.972	-$7,176.75	$12,983.41
		9.999	-$3,043	$3,075	.903	-$11,138.58	$5,052.67
	3.333	1.666	$10,633(*)	$3,708	.025	$871.92	$20,394.22
		4.999	$13,536(*)	$3,545	.001	$4,204.42	$22,868.38
		9.999	$7,590(*)	$2,713	.031	$447.50	$14,732.73
	4.999	1.666	-$2,903	$3,829	.972	-$12,983.41	$7,176.75
		3.333	-$13,536(*)	$3,545	.001	-$22,868.38	-$4,204.42
		9.999	-$5,946	$2,876	.211	-$13,518.93	$1,626.36
	9.999	1.666	$3,043	$3,075	.903	-$5,052.67	$11,138.58
		3.333	-$7,590(*)	$2,713	.031	-$14,732.73	-$447.50
		4.999	$5,946	$2,876	.211	-$1,626.36	$13,518.93

* The mean difference is significant at the .05 level.

Table 16A1

Post Hoc Tests - Multiple Comparisons

Dependent Variable: Percent_Vacant_Housing Units

	(I) Distance From Site	(J) Distance From Site	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
Scheffe	1.666	3.333	.423	.629	.929	-1.337	2.184
		4.999	-.606	.651	.834	-2.427	1.215
		9.999	-1.712(*)	.523	.013	-3.174	-.250
	3.333	1.666	-.423	.629	.929	-2.184	1.337
		4.999	-1.029	.602	.404	-2.713	.654
		9.999	-2.135(*)	.460	.000	-3.422	-.848
	4.999	1.666	.606	.651	.834	-1.215	2.427
		3.333	1.029	.602	.404	-.654	2.713
		9.999	-1.106	.489	.164	-2.474	.263
	9.999	1.666	1.712(*)	.523	.013	.250	3.174
		3.333	2.135(*)	.460	.000	.848	3.422
		4.999	1.106	.489	.164	-.263	2.474
Bonferroni	1.666	3.333	.423	.629	1.000	-1.238	2.085
		4.999	-.606	.651	1.000	-2.325	1.113
		9.999	-1.712(*)	.523	.006	-3.091	-.332
	3.333	1.666	-.423	.629	1.000	-2.085	1.238
		4.999	-1.029	.602	.524	-2.619	.560
		9.999	-2.135(*)	.460	.000	-3.350	-.921
	4.999	1.666	.606	.651	1.000	-1.113	2.325
		3.333	1.029	.602	.524	-.560	2.619
		9.999	-1.106	.489	.143	-2.397	.186
	9.999	1.666	1.712(*)	.523	.006	.332	3.091
		3.333	2.135(*)	.460	.000	.921	3.350
		4.999	1.106	.489	.143	-.186	2.397
Sidak	1.666	3.333	.423	.629	.985	-1.234	2.081
		4.999	-.606	.651	.926	-2.320	1.108
		9.999	-1.712(*)	.523	.006	-3.088	-.336
	3.333	1.666	-.423	.629	.985	-2.081	1.234
		4.999	-1.029	.602	.422	-2.614	.555
		9.999	-2.135(*)	.460	.000	-3.346	-.924
	4.999	1.666	.606	.651	.926	-1.108	2.320
		3.333	1.029	.602	.422	-.555	2.614
		9.999	-1.106	.489	.135	-2.394	.182
	9.999	1.666	1.712(*)	.523	.006	.336	3.088
		3.333	2.135(*)	.460	.000	.924	3.346
		4.999	1.106	.489	.135	-.182	2.394

* The mean difference is significant at the .05 level.

Table 17A1

Post Hoc Tests - Multiple Comparisons

Dependent Variable: Percent_Occupied_Housing

	(I) Distance From Site	(J) Distance From Site	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
Scheffe	1.666	3.333	-.410	.628	.934	-2.166	1.345
		4.999	.533	.648	.878	-1.278	2.344
		9.999	1.688(*)	.521	.015	.232	3.145
	3.333	1.666	.410	.628	.934	-1.345	2.166
		4.999	.943	.599	.478	-.731	2.618
		9.999	2.099(*)	.459	.000	.816	3.382
	4.999	1.666	-.533	.648	.878	-2.344	1.278
		3.333	-.943	.599	.478	-2.618	.731
		9.999	1.155	.486	.130	-.203	2.514
	9.999	1.666	-1.688(*)	.521	.015	-3.145	-.232
		3.333	-2.099(*)	.459	.000	-3.382	-.816
		4.999	-1.155	.486	.130	-2.514	.203
Bonferroni	1.666	3.333	-.410	.628	1.000	-2.067	1.246
		4.999	.533	.648	1.000	-1.176	2.242
		9.999	1.688(*)	.521	.007	.314	3.063
	3.333	1.666	.410	.628	1.000	-1.246	2.067
		4.999	.943	.599	.691	-.637	2.524
		9.999	2.099(*)	.459	.000	.888	3.310
	4.999	1.666	-.533	.648	1.000	-2.242	1.176
		3.333	-.943	.599	.691	-2.524	.637
		9.999	1.155	.486	.104	-.127	2.438
	9.999	1.666	-1.688(*)	.521	.007	-3.063	-.314
		3.333	-2.099(*)	.459	.000	-3.310	-.888
		4.999	-1.155	.486	.104	-2.438	.127
Sidak	1.666	3.333	-.410	.628	.987	-2.063	1.242
		4.999	.533	.648	.958	-1.172	2.238
		9.999	1.688(*)	.521	.007	.317	3.060
	3.333	1.666	.410	.628	.987	-1.242	2.063
		4.999	.943	.599	.520	-.633	2.520
		9.999	2.099(*)	.459	.000	.891	3.306
	4.999	1.666	-.533	.648	.958	-2.238	1.172
		3.333	-.943	.599	.520	-2.520	.633
		9.999	1.155	.486	.100	-.123	2.434
	9.999	1.666	-1.688(*)	.521	.007	-3.060	-.317
		3.333	-2.099(*)	.459	.000	-3.306	-.891
		4.999	-1.155	.486	.100	-2.434	.123

* The mean difference is significant at the .05 level.