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Segregating Cities, Separating Environments: A Look At The Relationship Between Redlining And Polluting Facilities In Philadelphia

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SEGREGATING CITIES, SEPARATING ENVIRONMENTS: A LOOK AT THE RELATIONSHIP BETWEEN REDLINING AND POLLUTING FACILITIES IN PHILADELPHIA

by

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Abstract

This thesis explores the relationship between federal redlining policy and the siting of air polluting facilities, using a dual approach of geospatial analysis and historiography on Philadelphia as a case study. Geographic Information System (GIS) tools are applied to Environmental Protection Agency (EPA) data on air polluting facilities and the Home Owners' Loan Corporation (HOLC) Residential Security Maps. This analysis is used to determine the number of facilities within redlined neighborhoods and their patterns of density. Findings suggest that higher concentrations of polluting facilities are present in those neighborhoods ranked lowest by the HOLC, while neighborhoods ranked highest show remarkably fewer facilities. Historiography is then used to assess the processes of industrial and residential development over time, and determine connections between redlining and shifting land use patterns in Philadelphia. Overall, historiography reveals that redlining reaffirmed pre-existing socio-spatial patterns, and served to advance processes of disinvestment in redlined neighborhoods and the concentration of polluting facilities in these regions. The work of this paper indicates that both formal and informal practices around redlining contributed to stigmatization of lowest ranked neighborhoods, and suggests a proximate relationship between marginalized communities and sources of pollution.

Introduction

Since the 1980s, activists and academics alike have been calling attention to the crisis of environmental racism. Under the umbrella of the environmental justice movement, activists argue that marginalized communities in the US disproportionately face the effects of environmental crises, ranging from lead in their water to toxic air in their neighborhoods –

environmental racism is the term used to label this harm.[1] This disproportionate exposure to pollutants, woven into the fabric of the American landscape, is not without consequence: Air pollution in particular can contribute to asthma, lung disease, and other chronic health issues.[2] Given the serious health ramifications that pollutants pose, and the growing body of evidence that Black and brown communities face disproportionate exposure to air pollutants,[3] it is necessary to understand the structural causes of environmental racism in order to better address the inequities in our environment. This paper seeks to contribute to the process of understanding structural causes of environmental racism by looking at the relationships between historical housing policy and air pollution exposures. Specifically, this research focuses on drawing connections between the federal practice of redlining in the 1930s and the siting of air polluting facilities, using the city of Philadelphia as a case study to explore this relationship. While the role of redlining in residential segregation is well understood, we must also begin to unpack whether these historical policies have also served as tools of environmental segregation.

Understanding Redlining

The practice of redlining was part of a larger series of policies introduced in the 1930s to increase homeownership in the United States. At the time, the Franklin Delano Roosevelt (FDR) administration viewed homeownership, which had been on the decline since the Great Depression, as a tool to boost the wealth of the struggling American middle class.[4] In 1933, FDR passed the Home Owners' Loan Act, which resulted in the formation of Home Owners' Loan

[1] Kravitz-Wirtz et al., "THE LONG-TERM DYNAMICS OF RACIAL/ETHNIC INEQUALITY IN NEIGHBORHOOD AIR POLLUTION EXPOSURE, 1990-2009."
[2] EPA, "Criteria Air Pollutants."
[3] Kravitz-Wirtz et al., "THE LONG-TERM DYNAMICS OF RACIAL/ETHNIC INEQUALITY IN NEIGHBORHOOD AIR POLLUTION EXPOSURE, 1990-2009."
[4] Rothstein, *The Color of Law*.

Corporation (HOLC).[5] The HOLC was responsible for "purchas[ing] existing mortgages that were subject to imminent foreclosure and then issu[ing] new mortgages with repayment schedules."[6] In order to ensure that regular payments would be met, and that borrowers would not default, the HOLC sought to assess the risk of their investments. Risk assessments were based on factors such as the condition of the house, the surrounding neighborhood, and the likelihood of property value decline/increase.[7] Needing to standardize the practice of appraisals that would ultimately be done by local real estate agents, the HOLC devised a system of color-coded maps that would rank neighborhoods based on risk. Neighborhoods were ranked A (green, "best"), B (blue, "still desirable"), C (yellow, "declining"), or D (red, "hazardous").[8] The determination of 'risk' became highly racialized during this process of ranking neighborhoods, and the presence of Black residents in a neighborhood became a marker for the lowest rankings: "A neighborhood earned a red color if African Americans lived in it, even if it was a solid middle-class neighborhood of single-family homes."[9] A series of these color-coded maps, named Residential Security Maps, were commissioned and kept by the HOLC to depict the rankings in most major US cities.[10] The HOLC made loan decisions based on these rankings – those living in D-grade neighborhoods would not have access to the loans and homeownership opportunities the HOLC was subsidizing. By ranking Black neighborhoods as "D," coloring them red, the HOLC created a system in which Black Americans (and some immigrant communities as well) would be denied access to home loans and confined to neighborhoods that would become sites of disinvestment. The practice of grading neighborhoods and the resulting policy entrenchment of urban segregation is called "redlining," in reference to the red color-coding on the HOLC maps.

[5] King, *Separate and Unequal*, 190.
[6] Rothstein, *The Color of Law*.
[7] Rothstein, *The Color of Law*; Orlando, *Keeping Races in Their Places*, 57.
[8] Orlando, *Keeping Races in Their Places*, 57.; Rothstein, *The Color of Law*.; King, *Separate and Unequal*.
[9] Rothstein, *The Color of Law*.
[10] Orlando, *Keeping Races in Their Places*, 57.

The Federal Housing Administration (FHA), created in 1934 via the Housing Act, engaged in the practice of redlining as well. The FHA was tasked with insuring mortgages; the agency created their *Underwriting Manual* in order to standardize FHA appraisals.[11] Until 1947, the *Underwriting Manual* included specific racial language describing FHA goals to maintain segregation in order to promote "stability," and when explicitly segregationist language was removed, implicitly racialized suggestions around "stability" remained.[12] A 1939 edition of the *Underwriting Manual* stated, "If a neighborhood is to retain stability, it is necessary that properties shall continue to be occupied by the same social and racial classes."[13] The *Underwriting Manual* described Black Americans as "unreliable and undesirable buyers," and, like the HOLC, the FHA graded neighborhoods from A to D, with racial makeup of neighborhoods as a key factor in these rankings.[14] Both the HOLC and FHA wrote into federal policy the segregation of neighborhoods and the denial of loans to Black Americans through their ranking systems. Public policy expert Anthony Orlando writes in his book on segregation, "These subjective judgments, formed in the mid-1930s, would freeze the industry's assessment of these neighborhoods for decades to come."[15]

For the purposes of this paper, it is important not only to understand what redlining is and where it came from, but also to appreciate the effect of broader practices associated with redlined neighborhoods. The term redlining is frequently used as an umbrella term for a variety of tools to enforce geospatial divisions. Though the term originated with the HOLC and its neighborhood rankings, the practices that are borne out of redlining both predate and extend beyond the denial

[11] Rothstein, *The Color of Law*.
[12] Rothstein, *The Color of Law*.
[13] Orlando, *Keeping Races in Their Places*, 66.
[14] King, *Separate and Unequal*, 191.
[15] Orlando, *Keeping Races in Their Places*, 57.

of home loans/mortgages/insurance from the HOLC and FHA in the 1930s.[16] The HOLC and FHA's rankings were part of federal policy, and played a significant role in guiding federal actions related to housing development (redlined neighborhoods were often neglected in these development projects). In addition, practices that coincided with and were related to the drawing of redlined maps include the limitation in private loan access, racial zoning, and other local segregation tactics. Zoning is a policy tool used to direct land use and development – determining whether land can be used for residencies, industry, commerce, etc. Black neighborhoods were often targeted with zoning for low-quality multi-family housing, as well as commercial and industrial development, while white neighborhoods were more likely to be zoned for single-family homes.[17] The practice of explicitly racial zoning was an extension of traditional zoning, using the tools of land use policy to segregate neighborhoods by preventing Black individuals from purchasing homes in white neighborhoods, and vice versa.[18] In addition to racial zoning, local real estate agencies, banks, and policymakers engaged in a variety of informal behaviors to maintain residential segregation, including blockbusting (panicking white families into selling their homes), residential covenants denying Black residents access to white neighborhoods, and real estate agents refusing to show homes in white neighborhoods to Black buyers.[19] While redlining refers specifically to the Residential Security Maps and neighborhood rankings originating with the HOLC, we can understand a variety of practices around residential segregation as being part of the system of redlining, meant to uphold it and carry out the residential divisions it instructs.

[16] Rothstein, *The Color of Law*.; King, *Separate and Unequal*.
[17] Rothstein, *The Color of Law*.
[18] Rothstein, *The Color of Law*.; Taylor, *Toxic Communities*, 150-151.
[19] Rothstein, *The Color of Law*.; Taylor, *Toxic Communities*.

Literature Review

In order to better understand the part that redlining might play in industrial pollution and facility siting, it is important to understand the foundational academic literature that investigates redlining's role and functionality. Academics have developed varying hypotheses on the purposes and outcomes of redlining, primarily focusing on intentions related to segregation, white wealth accumulation, and quality-of-life outcomes. In his book, *The Color of Law*, Richard Rothstein frames redlining within the broader history of residential segregation, arguing that redlining is one of many housing policy tools (including zoning, housing development projects, etc.) used to enact a white supremacist vision of segregated land use. More specifically, redlining was used to create and reinforce residential segregation as part of a larger agenda in federal, state, and local governments to pursue and maintain the separation of white and Black people.[20] While this kind of white supremacist intent is also a part of other hypotheses on the purpose of redlining – one could consider outcomes of redlining such as denying the Black community economic opportunities, access to schools, etc., part of a white supremacist and segregationist agenda – Rothstein's analysis is focused on the residential segregation of Black and white communities in order to separate and maintain the 'purity' of white neighborhoods. Rothstein cites several federal policymakers responsible for developing policies like redlining, who explicitly state their belief that whites and Blacks should remain residentially separate as part of the natural order of a stable society.[21] His analysis of residential segregation also includes some recognition of the 'slumification' of Black neighborhoods, but this line of thinking focuses more on disinvestment and the zoning of so-called "undesirable" businesses (e.g., taverns, nightclubs, liquor stores) in Black neighborhoods, rather than a focus on environmental degradation in

[20] Rothstein, *The Color of Law*.
[21] Rothstein, *The Color of Law*.

relation to redlined neighborhoods.[22] Rothstein's argument, ultimately, is about how policies like redlining became vehicles for white supremacist beliefs in the separation of Black and white people, and the way that redlining privileged white access to high quality housing. Laura Pulido explains the concept of land use policy that benefits white communities as "white privilege."[23] While Pulido's research focuses more broadly on environmental racism, the concept of white privilege, meaning "the privileges and benefits that accrue to white people by virtue of their whiteness" is an important part of both her and Rothstein's thinking when it comes to residential segregation.[24] Pulido, like Rothstein, outlines housing policy as a mechanism to, above all else, protect the segregationist interests of white communities.

Complementary to hypotheses on residential segregation and white privilege, other scholars focus their analyses of redlining on its economic implications and role in the development of white wealth. In their book *Black Wealth, White Wealth*, Melvin Oliver and Thomas Shapiro argue that the homeownership program that included redlining was, "the greatest mass-based opportunity for wealth accumulation in American history."[25] Oliver and Shapiro focus on historicizing the economic function of redlining; the FDR administration created the HOLC in order to encourage homeownership and grow the wealth of the American middle class. Understanding redlining as a tool borne out of this mission, the exclusion of Black Americans from the benefits of FDR's housing policy is an explicitly economic act that propelled white wealth and depressed Black wealth. By preventing Black Americans from participating in homeownership, and confining their housing options to the redlined neighborhoods that had been written off as depreciating in value, the FHA and HOLC excluded Black people from the

[22] Rothstein, *The Color of Law*.
[23] Pulido, "Rethinking Environmental Racism," 13.
[24] Pulido, "Rethinking Environmental Racism," 13.
[25] Oliver and Shapiro, *Black Wealth, White Wealth*, 18.

development of middle class wealth and upward economic mobility.[26] Unlike Rothstein's argument that redlining is part of a broad history of urban segregation, Oliver and Shapiro see redlining as part of a broad history of wealth development, in which the federal government denied Black people the tools provided to white people chasing upward mobility.

More recently, researchers have shifted from a historiographical narrative of redlining's purpose, to instead focus on empirical studies of city-specific redlining maps, as a means of determining the structural outcomes of redlining in relation to present-day quality-of-life issues. This style of research tends to use redlining maps to draw out empirical observations around inequality in fields like healthcare, education, and even environmental issues like access to greenspace. Researchers in this line of work use statistical evidence to draw connections between structural racism and inequalities in 'quality-of-life' fields, where redlining serves as a proxy for structural racism. Examples of this work include Linde et al.'s research on the relationship between redlined neighborhoods and high diabetes mortality,[27] White et al.'s research on the association between redlined neighborhoods and poor access to educational resources for students with disabilities,[28] and Nardone et al.'s research on the lack of greenspace in lowest-grade neighborhoods.[29] In a paper focusing on environmental quality in redlined neighborhoods, Lane et al. find that C- and D-grade neighborhoods exhibit higher levels of $PM_{2.5}$ and NO_2 air pollutants, but they decline to further investigate explanatory mechanisms that might indicate why higher pollutant levels appear in these regions.[30] The emphasis on empirical evidence in these quality-of-life studies often reveals a relationship between present-day

[26] Oliver and Shapiro, *Black Wealth, White Wealth*, 16-18.
[27] Linde et al., "Historic Residential Redlining and Present-Day Diabetes Mortality and Years of Life Lost."
[28] White et al., "Same As It Ever Was."
[29] Nardone et al., "Redlines and Greenspace."
[30] Lane et al., "Historical Redlining Is Associated with Present-Day Air Pollution Disparities in U.S. Cities."

outcomes and structural racism embedded in redlining, but researchers forgo a deeper explanation of how these relationships came to be.

While this specific paper will focus on redlining as the starting point for analysis, industrial facility siting as a topic of environmental justice (EJ) research has significant precedent. Researchers using EJ as the basis of their analysis often include zoning and facility siting policy in arguments about differential pollution exposure, but the specific relationship between siting and redlined neighborhoods has been overlooked. In her case study on industrial facilities in Louisiana, Mizutani touches on siting as an environmental justice issue and the potential for environmental degradation targeting Black communities.[31] However, her analysis focuses on EJ arguments around siting that are unrelated to redlining – paying attention to the lack of political power neighborhoods wield, limited community input, and (like Oliver and Shapiro) economic arguments about property value in urban regions, rather than historical federal policy.[32] Specifically, Mizutani draws out a connection between Black neighborhoods targeted by environmental racism due to a lack of political and economic means, rather than looking at the structural impact of redlining as a tool of environmental injustice.

Methods

This paper seeks to use spatial analysis and historiography of a case study, in order to understand redlining not just as a tool of residential segregation, but also a tool in separating environmental quality. More specifically, this paper will explore disproportionate siting of air polluting facilities using both Geographic Information System (GIS) mapping and historiography

[31] Mizutani, "In the Backyard of Segregated Neighborhoods: An Environmental Justice Case Study of Louisiana," 365.
[32] Mizutani, "In the Backyard of Segregated Neighborhoods: An Environmental Justice Case Study of Louisiana," 365-366.

of land use. While the studies on redlining discussed in the literature review focus on either quantitative data analysis or historical analysis, this paper is modeled after Laura Pulido's argument that the study of environmental justice requires both geospatial analysis (hence the use of GIS) and historiography, in order to capture environmental racism as both socio-spatial and structural.[33] This dual analysis is intended to address a variety of questions, including whether those neighborhoods ranked lowest by the HOLC contain more polluting facilities than high ranking neighborhoods, how industrial neighborhoods developed over time, and an overarching understanding of the relationship between redlined neighborhoods and polluting facilities. GIS offers some insight into understanding the number of facilities in neighborhoods, the density of industrial siting, and other geospatial factors in the present, but historiography is necessary in order to understand the temporal impact of redlining in relation to industrial development, and the dynamics of land use policy that cannot be captured solely through current facility data. For the purposes of this paper, a meaningful relationship between redlining and industrial facility siting is evidenced by large numbers of industrial facilities in red neighborhoods, in combination with historical analysis indicating that industrial development targeted those lowest-ranked neighborhoods after the institution of federal redlining policies. GIS presents qualitative and quantitative geospatial data that indicates where the historical impact of redlining remains relevant. Historiography can reveal whether industrial facilities followed the HOLC's demarcations of low value neighborhoods, whether the HOLC's map instead merely reinforced the low residential value of industrial regions, or whether redlining functioned somewhere in between these two possibilities – reinforcing pre-existing industrial neighborhoods during the 1930s, and serving as a marker to concentrate and guide industrial siting into these areas for decades to come. Understanding this change over time is crucial to understanding the

[33] Pulido, "Rethinking Environmental Racism."

functionality of redlining as a tool of environmental segregation, which is why both the geospatial and the historiographical analysis is required.

The GIS portion of analysis in this paper draws on both Environmental Protection Agency (EPA) data and HOLC maps. Using data identifying ICIS-AIR facilities published by the EPA's Shared Enterprise and Geodata Services (SEGS) on ArcGIS,[34] in combination with Esri's published HOLC Residential Security Maps,[35] this paper identifies those ICIS-AIR facilities that are within the boundaries of the HOLC maps. ICIS-AIR facilities are defined by the EPA as "stationary sources of air pollution (such as electric power plants, steel mills, factories, and universities) regulated by EPA, state and local air pollution agencies."[36] The ICIS-AIR map reflects the most recent EPA data as of November 2022, although EPA data includes both actively operating facilities, and closed facilities still being monitored (such as Superfund sites). In ArcGIS Pro, the ICIS-AIR facility map is joined to the HOLC Residential Security Map to determine how many facilities overlap with the polygons of the HOLC maps of each city.[37] This allows ArcGIS Pro to calculate the number of facilities within each neighborhood ranking, and compare facility numbers per ranking in order to determine trends of disproportionate siting. Due to limitations in the scope of this paper and the amount of data available in the HOLC map, this process was only done with the fifteen largest cities at the time of the creation of the HOLC

[34] Shared Enterprise Geodata & Services, "Integrated Compliance Information System (ICIS) for Air (AIR) Facilities in the United States and Its Territories."
[35] Lavery, "Home Owners' Loan Corporation (HOLC) Neighborhood Redlining Grade."
[36] US EPA, "ICIS-AIR Overview."
[37] Note: In some cities, HOLC maps extend beyond city lines to include the entirety of the metropolitan region being assessed. The full extent of these metropolitan regions, as determined by the HOLC's data, is included in this paper's GIS analysis in order to better capture trends of residential divide and industrial development. This applies to Philadelphia (including parts of Camden), New York (including all boroughs, Essex County, Lower Westchester, Hudson County, and Bergen County), and Boston (including Arlington, Braintree, Brookline, Cambridge, Chelsea, Dedham, Everett, Malden, Medford, Melrose, Milton, Needham, Newton, Quincy, Revere, Saugus, Somerville, Waltham, Watertown, Winchester, Winthrop).

maps.[38] In order to select case studies to explore further through historiography, cases needed to have enough data accessible to conduct further study. Out of the fifteen cities, seven did not have enough overlapping facility and HOLC data to provide substantial material for further investigation (Los Angeles, San Francisco, Milwaukee, Buffalo, Minneapolis, New Orleans, Detroit), due to limited scope in the HOLC maps of these cities. Four cities had facility data too concentrated to be studied effectively in GIS for the scope of this paper (New York City, Chicago, St. Louis, Baltimore). The remaining four cities, Philadelphia, Cleveland, Boston, and Pittsburgh, were left as suitable case studies, sharing similar sizes in their HOLC data, the number of facilities captured by HOLC maps, and fitting with the scope of this paper. Philadelphia was chosen randomly out of these four cities as the case study of focus for further GIS analysis and historiographical research. While variations in evidence may be found by analyzing different case studies, and each city may have unique aspects of their historiography, the purpose of this paper is to use a case study to explore larger trends in the association between redlining and facility siting. In this exploration of Philadelphia, historiography is used to trace whether redlining was a process that designated already industrial regions as the lowest ranked neighborhoods, directed polluting facilities into Black residential regions, a combination of these two processes, or none of the above. Furthermore, this historiography will investigate how land use developed over time, and whether that process is related to tools of redlining.

An Overview of Redlining in Philadelphia

Before delving into the GIS analysis of Philadelphia's redlining map and industrial siting, it is necessary to contextualize the HOLC Residential Security Map in Philadelphia and the city's

[38] U.S. Bureau of the Census, "Population of the 100 Largest Urban Places: 1930."; Note: the data identifying the largest cities in the US at the time comes from the Census Bureau's 1930s report on city populations. While Washington, D.C. is identified as the fifteenth largest city in this list, there is no HOLC map for the city in Esri's data, so the sixteenth largest city, New Orleans, was used instead to carry out the methodology.

residential segregation. Prior to the creation of the HOLC in 1933, Philadelphia engaged in the practice of using racially restrictive covenants to prevent Black people from occupying homes in white neighborhoods. The Federal Reserve Bank of Philadelphia's exploration of segregation in the city found that there were at least 4000 "instances in which a racial covenant was included in a property deed" from 1920 to 1932.[39] Their findings indicate that racial covenants were predominantly used in neighborhoods that the HOLC would later rank B and C, which the authors suggest represents the desire to keep upwardly mobile Black Philadelphians out of neighborhoods within their price range, while A neighborhoods were likely to be prohibitively expensive. Despite Supreme Court rulings against racial covenants and practices such as racial zoning,[40] they still remained commonplace, conducted informally until the introduction of the HOLC's racially-informed Residential Security Map. Later, when the HOLC's guidelines fell out of use in the early 1950s, the practices it had encouraged continued to be used in Philadelphia through the 1970s, particularly via banks and the denial of loans in the private sector.[41]

[39] Santucci, "How Prevalent Were Racially Restrictive Covenants in 20th Century Philadelphia?," 3.
[40] Racial zoning is defined by Rothstein in *The Color of Law* as those practices instituted by law to prevent racial mixing of neighborhoods (e.g., preventing whites from buying homes in predominantly Black neighborhoods and vice versa). Racial zoning was outlawed by the Supreme Court in 1917.
[41] Sicotte, *From Workshop to Waste Magnet*, 91.

Figure 1. This map depicts the HOLC's Residential Security Map of Philadelphia, along with neighborhoods and landmarks noteworthy for the purposes of this paper. Layers for this map were provided courtesy of Esri.[42]

The HOLC map of Philadelphia reaffirms historical accounts of redlining and the history of residential communities in the city. Figure 1, shown above, depicts the HOLC Residential

[42] Lavery, "Home Owners' Loan Corporation (HOLC) Neighborhood Redlining Grade."; Nelson, "Khaki Map."

Security Map of Philadelphia, along with those neighborhoods particularly noteworthy for the purposes of this paper. The red neighborhoods just north and just south of Center City – known as South Philadelphia and Lower North Philadelphia – were historically occupied by Black communities at the time of the HOLC's mapmaking.[43] The neighborhoods adjacent to the Delaware River, particularly around the Port of Philadelphia (located in the Richmond neighborhood), would have been occupied by white immigrants from Eastern Europe.[44] The HOLC map reflects decisions in which Black neighborhoods, some white ethnic immigrant neighborhoods, and industrial neighborhoods are designated as the most hazardous and risky in the Philadelphia metropolitan region. In addition, the Port of Philadelphia, the Port of Camden, and western portions of Gloucester City were all highly industrialized regions captured by the HOLC's assignment of D-grades. The A and B rankings of areas in the west and northwest reflect the white, suburbanized outskirts of the city, a trend in land use dating back to the 19th century.[45] Overall, the HOLC's map of Philadelphia is consistent with historical accounts of the HOLC's approach to appraisal and neighborhood ranking.

GIS Data and Analysis

Moving forward with the GIS analysis of the relationship between redlining and polluting facilities, the following map, Figure 2, depicts the ICIS-AIR facilities that overlap with the HOLC Residential Security Map in the Philadelphia Metropolitan Region.[46] Distinctive patterns in the location of facilities are not immediately obvious, though clusters of overlapping facility

[43] Sicotte, *From Workshop to Waste Magnet*.; Adams et al., *Philadelphia*.
[44] Sicotte, *From Workshop to Waste Magnet*.; Adams et al., *Philadelphia*.
[45] Sicotte, *From Workshop to Waste Magnet*.
[46] The Delaware River that cuts through Philadelphia serves as the dividing line between Pennsylvania and New Jersey. For the purposes of this paper, the New Jersey portions of the HOLC Map are used to accurately reflect how the entirety of the region is treated as a singular metropolitan area. Ignoring Camden and the New Jersey neighborhoods that make up part of the Philadelphia area would neglect significant portions of relevant economic, political, and social history.

points appear in Camden, the Port of Philadelphia east of Kensington, and South Philadelphia (labeled as Point Breeze, a South Philadelphia neighborhood, on Figure 2). The D- and C-grade neighborhoods appear to have denser concentrations of facilities, while A-grade neighborhoods to the north, and B-grade neighborhoods in the southeast (in New Jersey) appear to have fewer facilities. However, given the lack of obvious visible patterns, GIS can be used to determine the exact number of facilities in each color-coded neighborhood, and the qualities of those facilities.

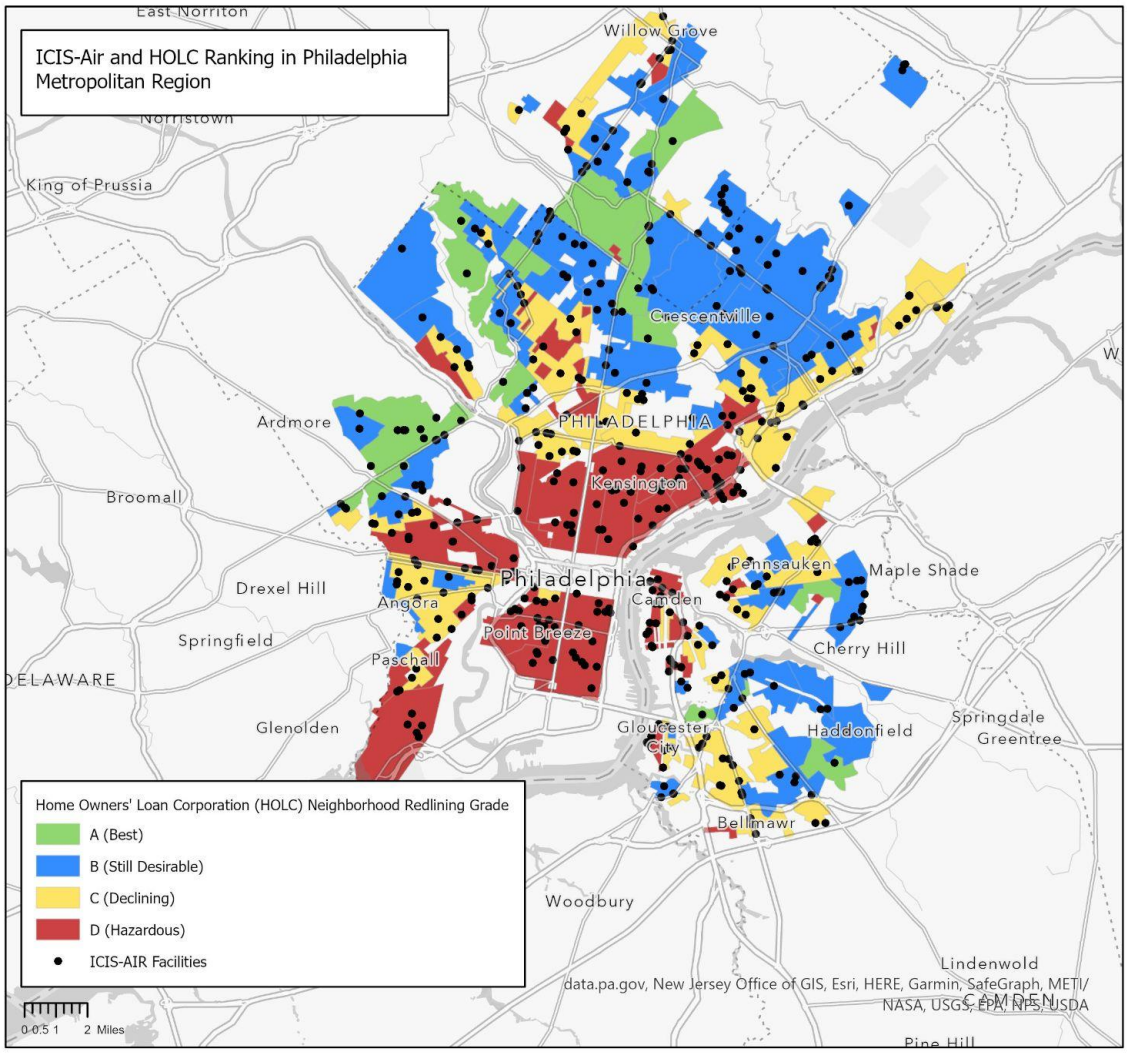

Figure 2. This map shows ICIS-Air facilities, overlaid with a historical residential security map from the Home Owners' Loan Corporation. Layers for this map were provided courtesy of the Environmental Protection Agency and Esri.[47]

The number of facilities within each individual grade is shown in Figure 3 below, constructed using ArcGIS Pro. Based on the overlay of the HOLC map and EPA facility map shown in Figure 2, grade A neighborhoods contained 23 facilities, B neighborhoods contained 151 facilities, C neighborhoods contained 142 facilities, and D neighborhoods contained 168 facilities. Overall, the A neighborhoods, ranked the highest by the HOLC, have by far the fewest facilities. The D neighborhoods hold a slimmer majority in facilities compared to B and C neighborhoods. The low number of facilities in A neighborhoods compared to the high number of facilities in D neighborhoods reflects Laura Pulido's assertion that an important dynamic of socio-spatial environmental racism is not just the high pollution burden in Black and brown communities (D neighborhoods) but the general lack of pollution burden in white communities (A neighborhoods).[48] In addition, EPA data on each facility shows that the facilities in B- and C-grade neighborhoods are more likely to be "minor" polluters – 79% and 74% of facilities are "minor" polluters in the B and C neighborhoods, respectively, while only 62% of facilities in D neighborhoods are "minor."

[47] Shared Enterprise Geodata & Services, "Integrated Compliance Information System (ICIS) for Air (AIR) Facilities in the United States and Its Territories."; Lavery, "Home Owners' Loan Corporation (HOLC) Neighborhood Redlining Grade."
[48] Pulido, "Rethinking Environmental Racism."

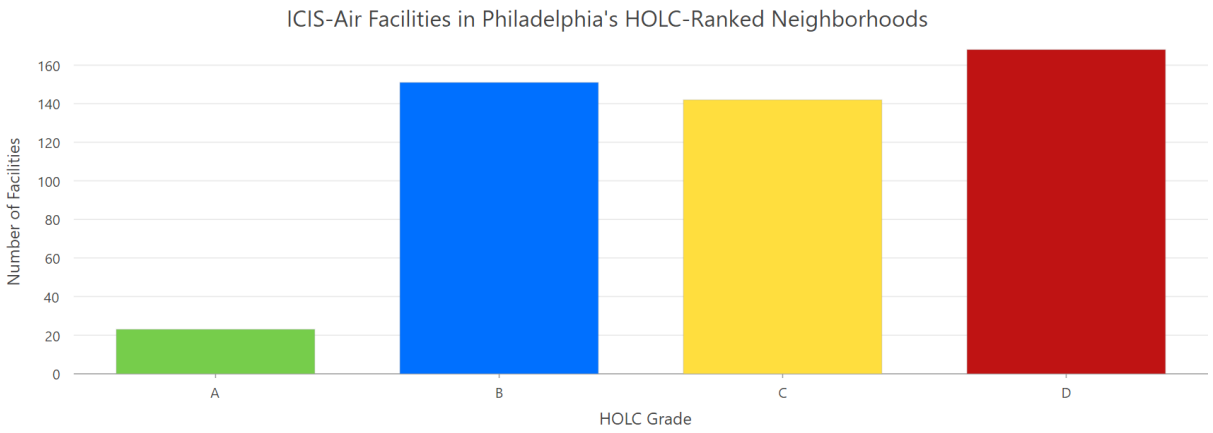

Figure 3. This chart depicts the number of ICIS-AIR facilities located within each neighborhood rank, according to the map shown in Figure 2. Data and the graphic shown above were produced through ArcGIS Pro.

Additionally, a heat map of facilities further reveals which neighborhoods have the highest concentrations of ICIS-AIR facilities. Figure 4, shown below, depicts the density of facilities that fall within the HOLC's Residential Security Map of Philadelphia. While facilities appear to be scattered throughout the city, as evidenced in Figure 2, Figure 4 shows that facilities are more concentrated in the areas around the Port of Philadelphia, the Port of Camden, and in South Philadelphia. The pattern of slightly elevated density that extends westward and northwest from the South Philadelphia region mirrors the path of commuter train lines exiting the city (ranked C and D just west of the Schuylkill River). Overall, the heaviest concentrations of facilities generally fall in line with the HOLC mapping of red neighborhoods in the Kensington/Richmond area, South Philadelphia, and Port of Camden.

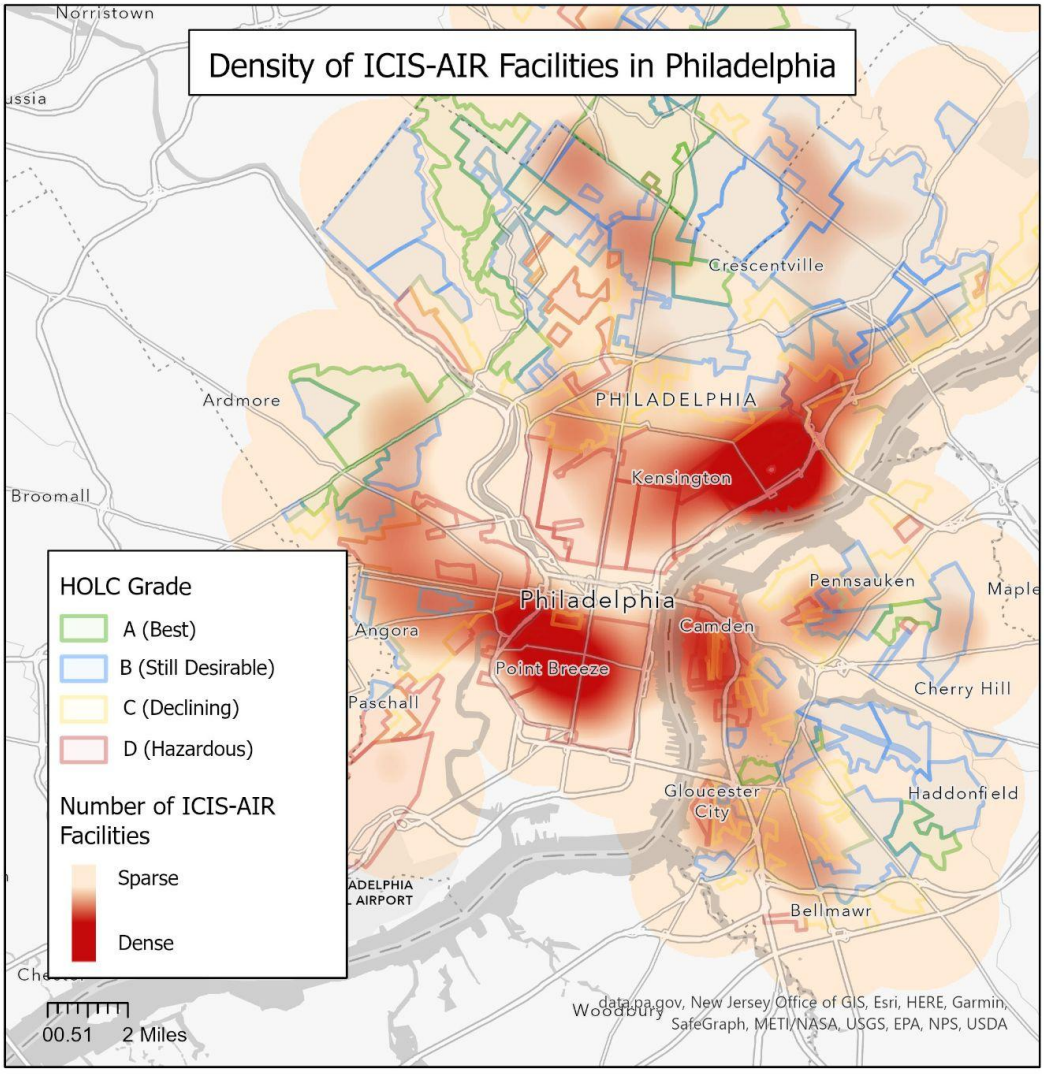

Figure 4. This map shows the density of ICIS-AIR facilities located within Philadelphia's redlined neighborhoods. Layers for this map were provided courtesy of the Environmental Protection Agency and Esri.[49]

While density mapping offers insight into the current concentration of facilities in relation to the 1930s HOLC maps, understanding the temporal dynamic of polluting facility sitings can reveal changes in industrial neighborhoods over time, and the potential influence that redlining policy may have had in either reaffirming existing industrial boundaries, concentrating

[49] Shared Enterprise Geodata & Services, "Integrated Compliance Information System (ICIS) for Air (AIR) Facilities in the United States and Its Territories."; Lavery, "Home Owners' Loan Corporation (HOLC) Neighborhood Redlining Grade."

industry into these areas, or a different effect altogether. The EPA's data attached to their ICIS-AIR facility map did not include the date that each facility opened or the date that the EPA first began its monitoring of the facility's pollution. Data related to the origin of these facilities is difficult to find, as most monitoring began in the 1970s following the formation of the EPA and its mandate to monitor pollution. However, using EPA data providing facility and company names, as well as exact addresses, an online search yielded some results on the timeline of facility siting in the D-grade redlined neighborhoods.[50] Of the 168 facilities within the D-grade/red neighborhoods of Philadelphia, only 79 could be identified with approximate dates of origin. Of the facilities whose dates of origin could not be identified, 13 were located in and around the Camden port region. Though the date that these facilities were opened remains unknown, we can infer that their location in Camden's ports is a continuation of the industrial use of that region since the mid-19th century, which will be explored later in this paper. In addition to the undated Camden facilities, half of all undated facilities were small-scale dry cleaning operations. Table 1, shown below, displays how many air polluting facilities were cited in D-grade neighborhoods over a given time period. For facilities that had multiple dates attached to their businesses due to changes in ownership over time, Table 1 defaults to the earlier date found, in order to reflect the earliest use of these spaces for industrial purposes and their historical precedent as sources of pollution.

Year	Number of Facilities Located
Prior to 1900	7
1901-1920	8
1921-1940	5

[50] See Appendix B for detailed information on each facility.

1941-1960	9
1961-1980	15
1981-2000	24
2001-2020	11

Table 1. Data from EPA SEGS, "Integrated Compliance Information System (ICIS) for Air (AIR) facilities in the United States and its territories."; See Appendix B for additional information.

At a very basic level, we see a rising number of facilities located in redlined neighborhoods in the second half of the 20th century, following the development of the HOLC and the federal policy of ranking neighborhoods. This trend continued from the 1940s through the 1990s, despite deindustrialization that began in Philadelphia's manufacturing sector around the 1960s.[51] While a cursory assessment of this trend in siting might suggest that redlining served as an indicator to polluting businesses to move into D-grade neighborhoods, hence the growing number of facilities over time, there are a number of factors complicating that assumption. Given the limited pool of data, it is challenging to draw any conclusions based on the date of facility development alone. Furthermore, the EPA data set being used reflects the agency's present-day monitoring practices. One might expect that facilities and manufacturers still running today are more likely to be newer businesses that developed to meet more recent economic demands, while older industrial and polluting businesses may have closed down prior to EPA data collection, and would therefore not necessarily be reflected in the EPA's map or data tables.[52] GIS analysis suggests possible connections between redlining and polluting facilities, but further analysis through historiography is necessary to better understand the temporal dynamic and structural roots of this relationship. In order to address these gaps and better understand the relationship

[51] Adams et al., *Philadelphia*.
[52] Note: A limited number of the facilities being monitored by the EPA are businesses no longer in operation, but still pose pollution risks and therefore continue to be monitored. However, this group is limited to a select few facilities and does not capture all those facilities that emitted pollutants prior to the EPA's monitoring.

between redlining and facility siting over time, this paper will further explore Philadelphia's industrial polluting facilities and the siting of these businesses through historiography, revealing trends in the spatial organization of industrial development.

Historical Analysis of Philadelphia

Pre-HOLC Land Use Patterns

While the GIS maps offer insight into land use after 1930, the HOLC's decisions did not occur in a vacuum, and we must therefore consider spatial developments prior to 1930 – specifically the concentration of industrial and residential neighborhoods – in order to understand how the HOLC map reinforced and/or changed existing patterns of land use. Many of the neighborhoods in Philadelphia that were sites of the city's industrial boom were first established and developed as factory neighborhoods around 1820.[53] Metal galvanizing operations, textile manufacturers, chemical manufacturers, and coke for steel plants developed around the Port of Philadelphia, with easy access to the Delaware River.[54] The towns that made up and surrounded this industrial center, like Richmond, Kensington, and Bridesburg, were occupied mainly by white ethnic immigrants from Eastern Europe. Neighborhoods in Center City, on the other hand, were occupied by wealthy white Philadelphians, who also owned summer homes in the more rural peripheral neighborhoods in the far northwest.[55] The 19th century industrial map reflects a smaller Philadelphia – places like Richmond were on the edge of the city, so industrial developments in these regions did not disrupt the wealthy residential Center City. However, as Philadelphia continued to grow in population and size, residents sought housing further and further from Center City. The shifting residential patterns of the 20th century would also alter

[53] Sicotte, *From Workshop to Waste Magnet*, 2.
[54] Sicotte, *From Workshop to Waste Magnet*, 60.; Adams et al., *Philadelphia*, 6.
[55] Sicotte, *From Workshop to Waste Magnet*, 62.

attitudes around industry, as these facilities were no longer peripheral, but concentrated in the center of a growing metropolitan region.

One particularly noteworthy transition in Philadelphia's land use during the pre-HOLC era was the creation of Fairmount Park, which serves as an example of how the politics of white privilege enabled early divisions in land usage. Fairmount park was created in 1867, inspired by the project of Central Park in New York City, to protect natural land and greenspace in urban centers.[56] The location and timing of Fairmount Park's creation was strategically significant – wealthy residents of Philadelphia with homes in both Center City and the developing suburban areas in the northwest had a number of growing concerns related to land use. During the 19th century, the city had been growing in size, industry had been expanding along the Delaware and Schuylkill rivers, and there was increasing awareness that water quality was declining as a result of industrial pollution. As Sicotte writes in her history of pollution in Philadelphia, "The wealthy used their economic power to create Fairmount Park, which functioned as a buffer zone against the encroachment of noxious industry on the drinking water of the Schuylkill River and on their vacation homes."[57] The pursuit of the Fairmount Park Act in 1867, which would use the Pennsylvania legislature to secure land along the Schuylkill River as the site of a park, was a strategic decision on the part of Philadelphia's elite in order to ensure protection for their estates from the encroaching threat of industrial manufacturing facilities and other unwanted land uses. Furthermore, it protected that swath of the Schuylkill from the waste water that plagued other parts of the city. This decision in the 19th century has had a lasting impact. Not only would the protection of Fairmount Park stymie industrial development in the far northwest region of the city for years to come (therefore ensuring industrial concentration along the Delaware River and

[56] Sicotte, *From Workshop to Waste Magnet*, 68.
[57] Sicotte, *From Workshop to Waste Magnet*, 80.

the more central neighborhoods of the city), but it also became a landmark for the HOLC's neighborhood rankings. In their designation of neighborhood rankings in the 1930s, the HOLC graded those neighborhoods west of Fairmount Park as "A" and "B" neighborhoods, protecting them again as the Fairmount Park Act had in the past.[58] As Laura Pulido writes in "Rethinking Environmental Racism," attention must be paid to how white communities leverage their political, economic, and social privileges in order to maintain the absence of pollutants in their environments.[59] In the case of Philadelphia's Fairmount Park, wealthy white elites, inspired by Central Park and fearing the encroachment of industry, were able to lobby and ensure through legislation that the land around their homes would be protected from industrial pollution.

Shifting Land Use Patterns Under the HOLC

Moving forward in this historiography, the period from the 1920s through the 1940s was marked by shifting population demographics, residential segregation made into federal law by the HOLC, and rising industrial development in response to the World Wars. As the Black population of Philadelphia grew during the Great Migration, Black communities began to spread into neighborhoods that had once been exclusively made up of white immigrants.[60] Prior to the 1920s, most of Philadelphia's Black residents occupied the small Seventh Ward neighborhood in South Philadelphia, but with a growing population, Black communities began to expand further throughout South Philadelphia and into Lower North Philadelphia.[61] Communities of white ethnic immigrants from Poland, Lithuania, and other European countries remained concentrated in the neighborhoods they had historically occupied since the 1880s, such as Bridesburg, Kensington, Richmond, and other neighborhoods north and northwest of Center City that

[58] Sicotte, *From Workshop to Waste Magnet*, 76.
[59] Pulido, "Rethinking Environmental Racism."
[60] Sicotte, *From Workshop to Waste Magnet*, 74.
[61] Sicotte, *From Workshop to Waste Magnet*, 73-75.; Adams et al., *Philadelphia*, 75.

surrounded the Port of Philadelphia. With an understanding that HOLC maps would have targeted Black neighborhoods with the lowest grades, it makes sense that South Philadelphia and Lower North Philadelphia were both ranked D by the HOLC's Residential Security Map. While the neighborhoods surrounding the Port of Philadelphia were historically white, their demographic makeup being that of white ethnic immigrant communities meant these neighborhoods also received D grades from the HOLC. In addition, Black families had begun moving towards these white ethnic immigrant communities, compounding the logic of the HOLC's designation.[62] Conveniently, the industrial neighborhoods throughout and adjacent to white ethnic immigrant neighborhoods were also captured by the HOLC's redlining. Overall, the HOLC's map undoubtedly shows a clear pattern of targeting stigmatized and marginalized communities with its lowest neighborhood designations.

On the industrial front, geopolitical conflict during this period had expedited growth in manufacturing, which continued to be regionally concentrated in historically industrial neighborhoods. At the outset of World War II, manufacturing companies in the city received $1 billion in defense contracts and increased manufacturing by 33%.[63] Industrial production in the region had diversified since the 19th century to include the manufacturing of pesticides and plastics, both of which increased wastewater levels being discharged into the rivers surrounding Philadelphia. The most pollution-intensive industries during this time were chemical manufacturing, fabrication of metals, production of paper products, petroleum refining, rubber/plastic manufacturing, and primary metal manufacturing, all of which were particularly concentrated along the Delaware River.[64] Unlike industrial facilities, waste disposal sites such as

[62] Sicotte, *From Workshop to Waste Magnet*, 74.
[63] Sicotte, *From Workshop to Waste Magnet*, 78.
[64] Sicotte, *From Workshop to Waste Magnet*, 87.

incinerators and dumps were scattered fairly evenly throughout the city, regardless of neighborhood makeup or precedents in land use, in order to create a more efficient waste management system.[65] However, the overarching pattern in industrial development in Philadelphia was to continue concentration around ports, rivers, and railways – the regions that also happened to be occupied by Black Philadelphians and white, working-class immigrants.

Post-HOLC Land Use Patterns

Following the dissolution of the HOLC in the beginning of the 1950s, industrial and residential development was influenced by declining industry, concentration of polluting facilities into redlined neighborhoods, and a redevelopment process steeped in the language and ideology of redlining. Around the time that the HOLC's formal redlining processes began to slow down, Philadelphia's industrial boom reached its peak, and in the years following, the manufacturing industries that served as the basis for the local economy began to decline and slowly leave the city. Manufacturers sought contractors outside of the city where space and transportation needs could be better met,[66] and the density of industrial neighborhoods had made it difficult for companies to purchase and renovate facilities in these areas. As industries trickled out, so too did industrial jobs, but many residents of industrial neighborhoods remained – either priced out of the suburbs that others fled to, or prevented from accessing the kinds of home loans that white counterparts were offered.[67] The local Philadelphia government would pursue a variety of redevelopment programs to revitalize the Philadelphia economy and its neighborhoods, a process that will be explored later in this paper.

[65] Sicotte, *From Workshop to Waste Magnet*, 83.
[66] Adams et al., *Philadelphia*, 42.
[67] Adams et al., *Philadelphia*, 82.

Concurrent with the deindustrialization of Philadelphia throughout the latter half of the 20th century, the remaining sources of pollution began to concentrate in historically redlined neighborhoods. Prior to the 1950s, waste disposal facilities had been evenly spread throughout the city. However, in the years following, they became increasingly concentrated in those historically Black communities of South Philadelphia that the HOLC had given D grades. By the late 1950s, 37% of all waste disposal facilities were located in the South Philadelphia neighborhood, and 23% in Southwest Philadelphia.[68] This kind of concentration of environmentally undesirable land uses would continue throughout the 1960s, and by 1969 twenty two city-owned dumps had consolidated into just three landfills, all located in South Philadelphia or along the waterfront.[69] The rise of environmental legislation in the 1970s and growing concern about toxins in the communities made these industry-heavy neighborhoods highly stigmatized both socially and economically, as they had been previously under the HOLC's reign.

Redevelopment

To combat the decline in industry, Philadelphia's leaders sought commercial and residential redevelopment projects to revitalize the city's economy, a process that exemplified the lasting stigmatization of the HOLC's neighborhood rankings. Economic downturn and declining housing quality left both government and private investors focused on "redevelopment"; removing "blighted" housing and abandoned factories, and replacing those undesirable land uses with high quality housing or commercial districts. Since the 1950s, residents and businesses had been leaving the city – people (usually upwardly mobile white Philadelphians) moved to the suburbs, and manufacturing headed overseas. In order to combat the emptying of Philadelphia, the local government's redevelopment plan involved clearing "blighted" neighborhoods, to be

[68] Sicotte, *From Workshop to Waste Magnet*, 98-99.
[69] Sicotte, *From Workshop to Waste Magnet*.

replaced with improved housing stock, shopping, cultural sites, and convention centers to attract new residents and tourists.[70] According to Adams et al., at the outset of the redevelopment process there were four types of Philadelphia neighborhoods: (1) the "urban core" filled with renters occupying multifamily walkups, apartments, and "slums" (South Philadelphia and Lower North Philadelphia); (2) working class industrial neighborhoods clustered around freight routes and rivers (Kensington, Richmond, Bridesburg, etc.); (3) Streetcar suburbs built in the 18th century, whose occupants had a better financial standing than those living in homes in categories 1 and 2; and, (4) fashionable downtown areas like Rittenhouse Square (located by Center City) which had been historically occupied by elites and continued to house the wealthiest Philadelphians in the highest quality of housing.[71] Following through with the redevelopment plan, "downtown factories and warehouses, old railroad tracks and stations, narrow streets and alleys were replaced with skyscrapers surrounded by broad plazas, modern office buildings, attracting hotels and restaurants, and new retail outlets."[72] Existing industrial infrastructure such as the ports, airport, and railroads were also improved and expanded as part of this redevelopment program. To those familiar with Philadelphia's current downtown region, this description of redevelopment would not be surprising, as the project was largely successful in central parts of the city.

However, 20th century redevelopment was not a universal success, and the parts of the city that were neglected by the revitalization efforts were those historically industrial and redlined neighborhoods most in need of investment. In their assessment of 20th century redevelopment, Adams et al. indicate that one of the implicit intentions of the redevelopment

[70] Adams et al., *Philadelphia*, 104.
[71] Adams et al., *Philadelphia*, 73.
[72] Adams et al., *Philadelphia*, 104.

plan was to, “increase Philadelphia’s white middle-class population and thereby lessen the proportion of the poor, unemployed, and minority groups living in the city,”[73] but this attempt at gentrification could not overcome the HOLC’s negative rankings made decades earlier. Initially, city leaders had started their redevelopment efforts with a focus on improving housing in the “slums" of Philadelphia, specifically Black neighborhoods in Lower North Philadelphia. The city had blocks of housing cleared, but private developers the city was relying on to rebuild these communities refused to buy the cleared land in the North Philadelphia and Lower North Philadelphia neighborhoods.[74] Developers expressed anxiety about investing in these regions, emphasizing that they were “risky,” “hazardous,” and likely unprofitable, just as the HOLC had said years earlier.[75] Instead, they turned their sights on the historically white and wealthy Center City, which was viewed as profitable and a more worthwhile site for investment. The city had already cleared the slums of Lower North Philadelphia, so in its place they constructed low-quality public housing.[76] Some of the public housing construction that remains standing in the Philadelphia region is monitored by the EPA as part of the ICIS-AIR tracking, due to pollution levels in those buildings and communities.[77] In 1980, well after redevelopment had begun, 58.8% of all houses in the city had been built prior to 1939,[78] meaning the quality of housing stock reflected not only the lack of improvement the Philadelphia redevelopment plan had promised, but also deeply entrenched patterns dating back to the post WWI era. While both Center City and Lower North Philadelphia were targeted for redevelopment, the Center City

[73] Adams et al., *Philadelphia*, 104.
[74] Adams et al., *Philadelphia*, 105.
[75] Adams et al., *Philadelphia*, 122-123.
[76] Adams et al., *Philadelphia*, 109.
[77] Shared Enterprise Geodata & Services, “Integrated Compliance Information System (ICIS) for Air (AIR) Facilities in the United States and Its Territories.”
[78] Adams et al., *Philadelphia*, 73.

project had been wildly successful in revitalizing an abandoned portion of the city, while the Lower North Philadelphia projects had reinforced the status quo.

Zoning

With an understanding of Philadelphia's industrial and socio-spatial patterns in the post-HOLC era, we can examine the tool of zoning, which effectively embedded the stigmatization of redlined and industrial neighborhoods into the political process of land use and development. Philadelphia's first zoning code – dictating what land uses would be allowed in what parts of the city – was created in 1933, but it largely reinforced the existing patterns of land use in the city. It was not until 1962 that a new zoning plan was put in place, intended to organize and streamline the zoning and development processes.[79] However, a copy of the 1962 zoning map created by the Bureau of Engineering Surveys and Zoning in Pennsylvania reveals how the 1933 model remained the basis for zoning decision-making.[80] The 1962 map, called the Philadelphia Land Use Map, is divided into rectangles (called "plates) that cover numerous city blocks in which each individual lot of land is designated for residential, industrial, or commercial land uses. A full analysis of this map is beyond the scope of this paper, but inspection of individual plates suggests that they reaffirm existing land use patterns,[81] unsurprising given that the map is explicitly based on the 1933 zoning ordinance despite being drawn nearly 30 years later. Sections of the map such as Plate 5B-4, a series of city blocks in residential Richmond just outside the Port of Philadelphia (that was given a grade of D on the HOLC map), feature dense

[79] Sicotte, *From Workshop to Waste Magnet*, 100.
[80] "Philadelphia Land Use Map, 1962."; Note: The Library of Philadelphia provides an interactive version of the Philadelphia Land Use Map of 1962 through the Greater Philadelphia GeoHistory Network (https://www.philageohistory.org/rdic-images/view-image.cfm/LUM1962.Index). This paper is not able to include images of the Philadelphia Land Use Map of 1962 due to issues in the quality of reproductions of map images. For access to the map and related imagery, see the link above.
[81] "Philadelphia Land Use Map, 1962."

blocks of residential housing mixed with industrial zoning and existing manufacturing businesses. On the other hand, areas like Plate 7-2, located near Fairmount Park along A- and B-grade neighborhoods in the northwest, have less densely packed houses, detached rather than row homes, with very few non-residential uses in these zones.[82]

Philadelphia's zoning policy, as in most cities, is hierarchical. This means that land uses are ranked, divided into those that are "upper level" and those that are "lower level." Upper level land uses are to be protected from any other uses that could be "hazardous or incompatible," while lower level land uses do not have the same protection.[83] It makes sense then that residential land use falls in the upper level category, in order to protect residents from things like pollution and excessive noise, while lower level land uses include manufacturing and industry. For the city of Philadelphia, this means that you cannot build a factory in a neighborhood or on a plot designated as "residential" in zoning plans, because that neighborhood is protected by its upper level status. However, housing could be built in areas zoned for "industrial" use, because those zones are not a protected ranking.[84] While it is not common to build housing in industrial areas, this kind of hierarchical zoning creates protections for residential neighborhoods and suburbs to prevent industrial and even commercial intrusion, but for those homes in industrial and commercial regions, residents are not afforded the same kinds of protections. It's important to note that this zoning policy was commonplace in the 1930s through 1960s, but growing awareness of environmental hazards in the 1970s created increased concern about living in proximity to polluting industries, and shifted approaches to zoning homes and industry.

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[82] "Philadelphia Land Use Map, 1962."; Note: See the Greater Philadelphia GeoHistory Network's Philadelphia Land Use Map, 1962 (https://www.philageohistory.org/rdic-images/view-image.cfm/LUM1962.Index) for detailed images of plates 5B-4 and 7-2.
[83] Sicotte, *From Workshop to Waste Magnet*, 100.; Asabere and Huffman, "Zoning and Industrial Land Values," 155.
[84] Sicotte, *From Workshop to Waste Magnet*, 100.; Asabere and Huffman, "Zoning and Industrial Land Values," 155.

To understand zoning's impacts, we must recognize not only its immediate functions as the governmental tool to determine land use, but also how zoning engages in a long term process of entrenching land use patterns. According to Dara Roithmayr's theory of "locking-in" inequality, institutional processes like zoning formally incorporate factors like race and racism into the structure and procedure of government and city functioning.[85] Legal scholars Charles Lord and Keaton Norquist explore the locked-in theory as it applies to Black proximity to factories in Baltimore, but their findings are relevant to cities everywhere (including Philadelphia) in which zoning, race, and industrial development are related. Some of Lord and Norquist's universal findings include the identification of how zoning establishes a legal right to use land in specific ways, and how these uses become entrenched by the judicial system that defaults to zoning designations when settling legal disputes.[86] This manifests in a legal protection for industrial facilities that, as a result of modern zoning practices, no longer face the same level of pressure from residential neighbors filing private nuisance lawsuits as they might have in the past: "Industrial zoning designations…would help remove this [nuisance lawsuit] impediment because courts deferred to legislative declarations that particular areas should be used for industrial purposes."[87] Based on Lord and Norquist's work, it appears that residents of industrial neighborhoods have limited legal recourse to protect their communities from noxious factories and facilities, so long as the land these factories are on has already been designated for industrial use. Another significant conclusion of the Lord and Norquist analysis of zoning is that the past uses of land will be deferred to in present day decision making.[88] This approach is based on both the idea of "appropriateness" (that land is already appropriate for industrial, commercial, or

[85] Lord and Norquist, "CITIES AS EMERGENT SYSTEMS," 584.
[86] Lord and Norquist, "CITIES AS EMERGENT SYSTEMS," 584-585.
[87] Lord and Norquist, "CITIES AS EMERGENT SYSTEMS," 585.
[88] Lord and Norquist, "CITIES AS EMERGENT SYSTEMS," 590.

residential use due to its history of such uses), and the idea that the history of "risky" or "hazardous" parcels of land should continue to be zoned for environmentally or socially detrimental land uses.[89] It is worth noting, again, that the language of the HOLC's rankings is being used to characterize neighborhoods with histories of undesirable land use. The default to ideas about "appropriateness" and precedent in land use decision-making means that even if land has been re-zoned for residential use, a history of industrial use (particularly in redlined neighborhoods) makes courts and local governments more likely to allow special use permits/exceptions for industry seeking to site their facilities in these areas.[90] The result, as Roithmayr suggests in her theory about "locked-in" racialization of zoning, is a compounding effect. This emphasis on historical precedent and early zoning maps results in land use decision-making where industrial neighborhoods become legally and politically entrenched as such, to the detriment of those living around the industry. If we understand Lord and Norquist's analysis in the context of Philadelphia, we can see how a history of industrial land use in redlined neighborhoods became "locked-in" to the fabric of Philadelphia's zoning policy and approach to land use policy-making.

Modern Issues

While the historiography of this paper is focused on the 20th century in order to determine the impacts of redlining in the 1930s, these processes of redlining and industrial development remain relevant today. Philadelphia's economy is less manufacturing-based than it was during the 20th century, but historic manufacturing facilities continue to have environmental impacts on their neighbors. One such example is the John T. Lewis site, also known as the Anzon

[89] Lord and Norquist, "CITIES AS EMERGENT SYSTEMS," 590.
[90] Lord and Norquist, "CITIES AS EMERGENT SYSTEMS."

site, the location of a former lead paint factory in the Kensington neighborhood of Philadelphia.[91] From 1849 to 1996, a lead paint factory operated at the site, exposing the surrounding community to lead through normal operation, as well as fires and industrial accidents, until it closed and was replaced with a commercial complex.[92] A 2012 investigation by USA Today found that in the residential neighborhood surrounding the site, soil contained higher than average levels of lead.[93] Prompted by the USA Today investigation, the CDC conducted a 2014 study testing the blood lead levels of children living near the former factory, finding that between 11-13% of the children surveyed had elevated lead levels in their blood.[94] The CDC and city of Philadelphia concluded that while there were elevated lead levels in the soil of households near the facility and in the entryways to homes, lead levels did not surpass EPA guidelines, and the study did not detect a relationship between elevated blood lead levels and proximity to the facility.[95] While residents hoped the EPA would step in to steer cleanup efforts at the John T. Lewis site and the affected homes, the EPA has thus far refused to do so, stating that cleanup does not fall under their responsibility because it is not clear whether the excess lead is actually from the John T. Lewis site (which they bear legal responsibility for).[96] With cleanup unlikely, residents of the Kensington neighborhood around the John T. Lewis site live with constant anxiety that their families are being exposed to high lead levels, and the stigmatization of a neighborhood still associated with environmental pollution.

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[91] "ATSDR | John T. Lewis Community Childhood Blood Lead Study | Overview."
[92] "ATSDR | John T. Lewis Community Childhood Blood Lead Study | Overview."
[93] Young, "More Evidence Children Harmed by Lead near Philadelphia 'Ghost Factory.'"
[94] Young, "More Evidence Children Harmed by Lead near Philadelphia 'Ghost Factory.'"
[95] "ATSDR | John T. Lewis Community Childhood Blood Lead Study | Overview."
[96] Young, "More Evidence Children Harmed by Lead near Philadelphia 'Ghost Factory.'"

Discussion

Philadelphia as a case study in the processes of redlining and industrial development seemingly exemplifies how historical and political processes around land use entrench a relationship of proximity between polluting industrial facilities and neighborhoods that have been historically categorized as hazardous (due in large part to their racial makeup). GIS data reveals the high number of polluting facilities located in the neighborhoods ranked lowest by the HOLC, particularly notable compared to the small number of facilities in the A grade neighborhoods. This dynamic is unsurprising if we consider Pulido's theory on environmental justice and pollution, which states that instances of environmental justice become clearest when we assess how white communities are protected from pollution, rather than simply on how Black and brown communities are exposed to it.[97] While this evidence suggests some kind of lingering relationship between redlined neighborhoods and polluting facilities in the present, it does not give much sense of how the process of redlining might have influenced the siting of industrial facilities, nor does it provide clarity on any structural dynamics entrenching this observed pattern. According to current EPA data, many of the current factories located in these red neighborhoods arrived in these region following the HOLC designation, which at face value suggests that the HOLC rankings served as a guide or marker to industry and government that these are the regions where polluting facilities can most easily be cited, due to their low residential value. However, given that the EPA data used to identify these facilities was collected in the year 2022, it is possible that older industries operating prior to the 1930s when the HOLC first made its map have closed in the time since. Furthermore, we see facilities concentrated in places along the Delaware River like Gloucester, Camden, and Richmond, which have a history

[97] Pulido, "Rethinking Environmental Racism."

of 19th century industrial use, and thus would have had high concentrations of polluting facilities pre-dating HOLC rankings, even if the companies identified in those regions today were only founded in the 1950s or later. Due to these weaknesses in the data available, historiography offers further insight into the various actors and processes that would have enabled present-day levels of polluting facilities in the redlined neighborhoods.

A closer look at Philadelphia's history of land use, and the political actions taken to designate uses, reveals how industry became entrenched in those neighborhoods ranked with the HOLC's lowest grade. Since the early industrialization of Philadelphia, manufacturing had been concentrated around both the Schuylkill and Delaware River, but began to spread outwards as the city expanded. In response, wealthy elites successfully lobbied for the Fairmount Park Act, which designated a large swath of land on the Schuylkill River as a park, preventing further industrial development.[98] Manufacturing was nudged eastward, concentrating along the Delaware River as a result. White ethnic immigrants occupied the neighborhoods surrounding these industrial areas, and lacked the economic means to live further from the polluting factories where they worked. During the course of the Great Migration, Black people once confined solely to South Philadelphia's Seventh Ward neighborhood began to move into Lower North Philadelphia and the adjacent industrial neighborhoods. When the HOLC went to work in the mid-1930s ranking the neighborhoods of America's cities, it designated the Black neighborhoods north and south of Center City, and the industrial regions made up of white ethnic immigrant communities, as its D-grade, "risky" and "hazardous" regions. We can see from the historiography that wealthy white elites had already used the political tools available to them to protect their land in the west, concentrating pollution in the east. Yet, the HOLC's work marks

[98] Sicotte, *From Workshop to Waste Magnet*, 68.

the formal political codification of these existing dynamics of race, ethnicity, and land use, with designations that encapsulated not only stigmatized racial communities, but also stigmatized industrial communities, with the lowest HOLC ranking.

The post-war period further reveals the reverberations of the HOLC's designations. Deindustrialization was slowly devastating Philadelphia's manufacturing economy, and as businesses began to move elsewhere, white residents – taking advantage of the homeownership and wealth building opportunities made accessible by federal policy[99] – sought homes in the west and northwest suburbs that had historically been protected from industry. Many residents of industrial and redlined neighborhoods remained in the city, locked out of the federal scheme to increase homeownership, suburbanization, and wealth.[100] Redlining, still being practiced informally by banks refusing to provide loans to Black people or those seeking homes in red neighborhoods,[101] reinforced the residential status quo, despite the loss of job opportunities and declining quality of housing that had pushed other Philadelphians out of the city. Even as companies shuttered, their pollutants remained. When community leaders began to push for redevelopment, lingering stigmatization against those polluted and "undesirable" neighborhoods prevented revitalization in those areas most maligned and ignored. In their retelling of Philadelphia history, Adams et al. explicitly use the language of the HOLC to describe the attitudes of wary investors who refused to build in the North Philadelphia neighborhoods that the local government of Philadelphia had begun to bulldoze: "investors could not be persuaded to invest in redevelopment of [Lower North Philadelphia neighborhoods] because they had already been deemed unprofitable or risky."[102] The designations of these regions as unprofitable

[99] Rothstein, *The Color of Law*.; Oliver and Shapiro, *Black Wealth, White Wealth*, 16-18.; Adams et al., *Philadelphia*, 75.; Sicotte, *From Workshop to Waste Magnet*, 2.
[100] Adams et al., *Philadelphia*, 82.
[101] Adams et al., *Philadelphia*, 91.
[102] Adams et al., *Philadelphia*, 122-123.

remained inescapable, even in the second half of the 20th century. Investors invoked the ideas set forth by the HOLC, that places like Lower North Philadelphia were risky and hazardous investments, in the justification for their refusal to improve the housing and land uses in these regions. Communities abandoned by traditional industries and ignored by investors ended up seeking out polluting waste disposal facility contracts, their only way to revitalize desperate local economies.[103] We see this dynamic reflected in the concentration of waste disposal facilities in South Philadelphia and Camden,[104] which feature prominently in the density map (Figure 4) of present day ICIS-AIR facilities. Given our understanding about how land use policy works, the reinforcement of stigmatization is unsurprising. Throughout the historiography of Philadelphia, we see again and again how patterns of proximity between industrial polluting facilities and those communities most marginalized socially were reinforced through policy. The HOLC's development of Residential Security Maps seemingly marks the first formal policy act of "locking in" the proximate relationship between industry and minoritized communities – a process that is compounded throughout the 20th century through zoning, redevelopment plans, and informal redlining practices. While other dynamics of industrial and residential development processes certainly also play a role in this dynamic, there is value in understanding this structural relationship between redlining and industrial facility siting.

Conclusion

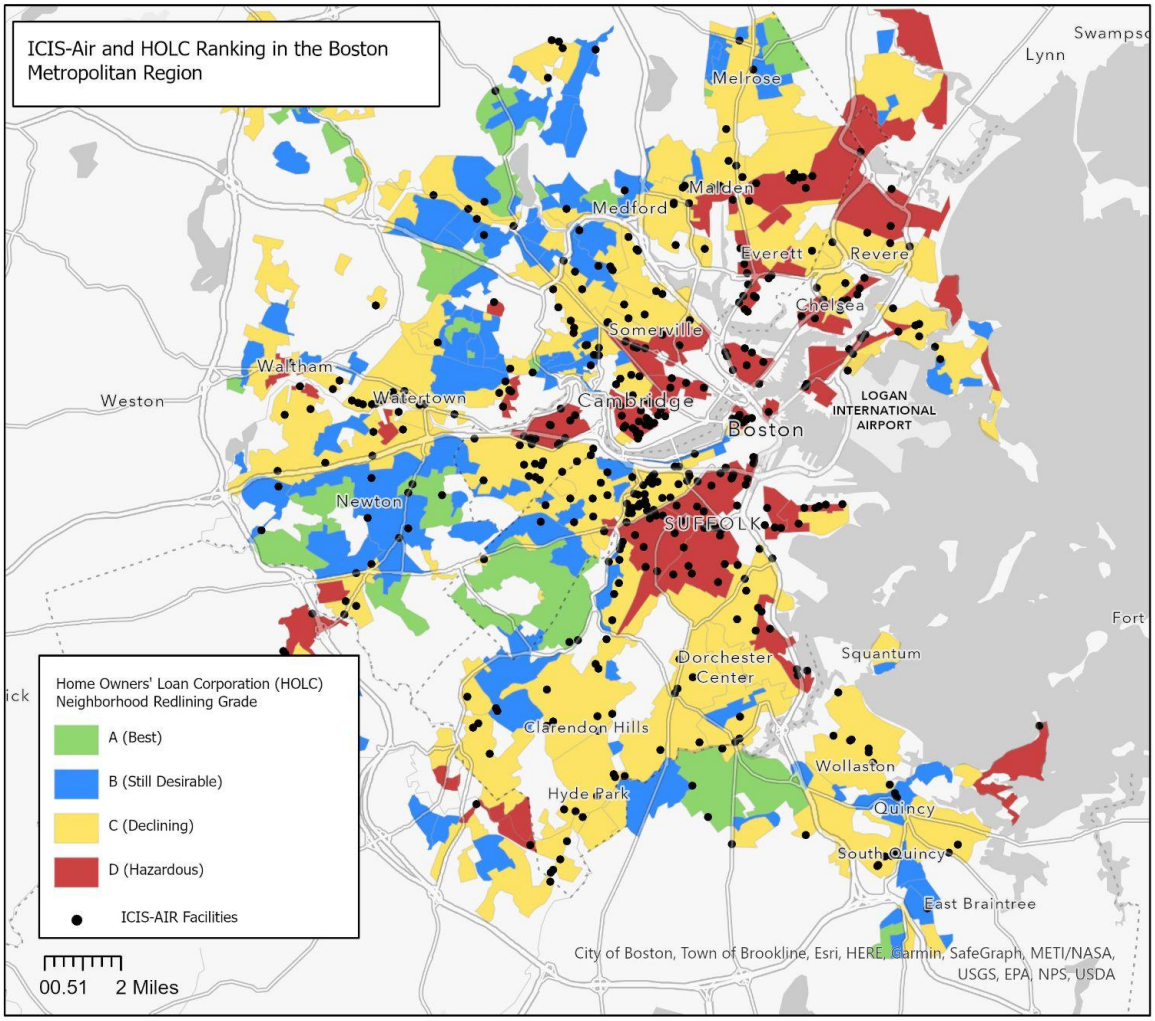
The combination of GIS analysis and historiography offers insight into the way that racist policymaking has shaped uneven distributions of environmental burden. In Philadelphia, patterns of industrial concentration in proximity to white ethnic immigrant communities pre-dates the creation of the HOLC and its Residential Security Maps in the 1930s. However, the institution of

[103] Sicotte, *From Workshop to Waste Magnet*, 130.
[104] Sicotte, *From Workshop to Waste Magnet*, 130.

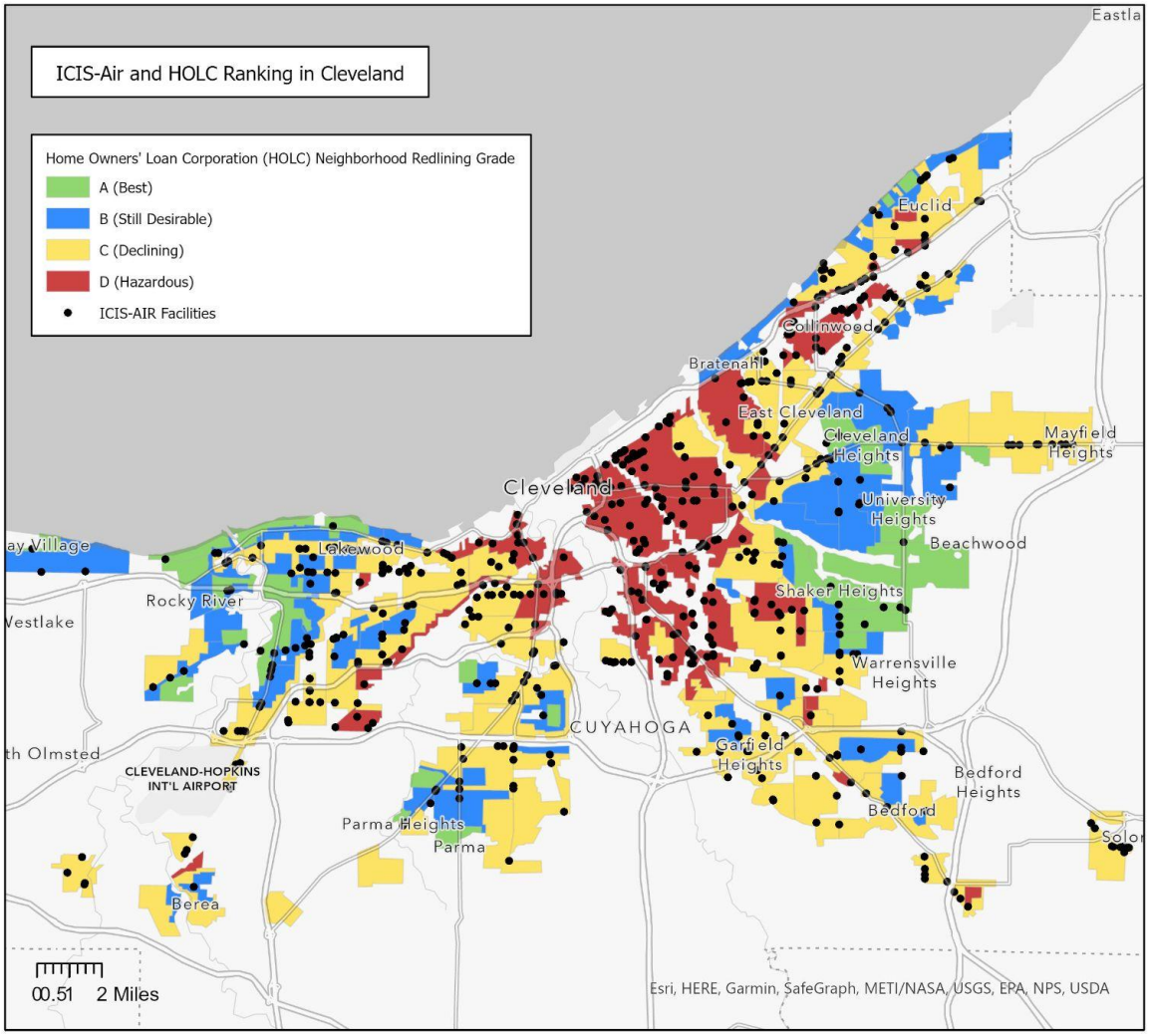
redlining reaffirmed a relationship between socio-spatial and industrial boundaries, in ways that had lasting impacts. By designating the neighborhoods of marginalized communities as "hazardous" and risky, the HOLC marked these areas as sights for disinvestment and undesirable land use. Even after formal redlining ended, the behaviors and politics of redlining were embedded into the system of land use. Whether that meant zoning codes, siting of waste disposal facilities in the "blighted" South Philadelphia neighborhoods, continued industrial development around the Port of Philadelphia, or the refusal of investors to develop in Lower North Philadelphia, the reverberations of redlining are felt repeatedly. While redlining alone is not the only factor responsible for the concentration of polluting facilities in historically redlined neighborhoods, it is certainly part of a larger picture in which the practices of structural racism manifest in environmental inequalities. Further research could explore the statistical significance of the proportion of polluting facilities in redlined neighborhoods, not just in Philadelphia, but in cities throughout the US that the HOLC operated in, in order to better capture the ongoing effects of redlining on environmental burden. This kind of analysis, in combination with study of the history of residential segregation, provides avenues for reparative policy approaches. Importantly, this paper suggests that for many Philadelphians the legacy of industrial facilities, even those no longer open, continues to impact their lives through exposure to damaging pollutants. To remedy the violence of environmental inequality, it is necessary to understand the structural dynamics that create our present day socio-spatial organization – drawing out the connections between industrial facilities and segregationist housing policy like redlining is just one step in understanding how environmental burden became segregated as well. The harms of redlining as a force for not only segregation, but for racist and classist divisions of environmental burden, must be understood and undone in order to create a more just environment for all.

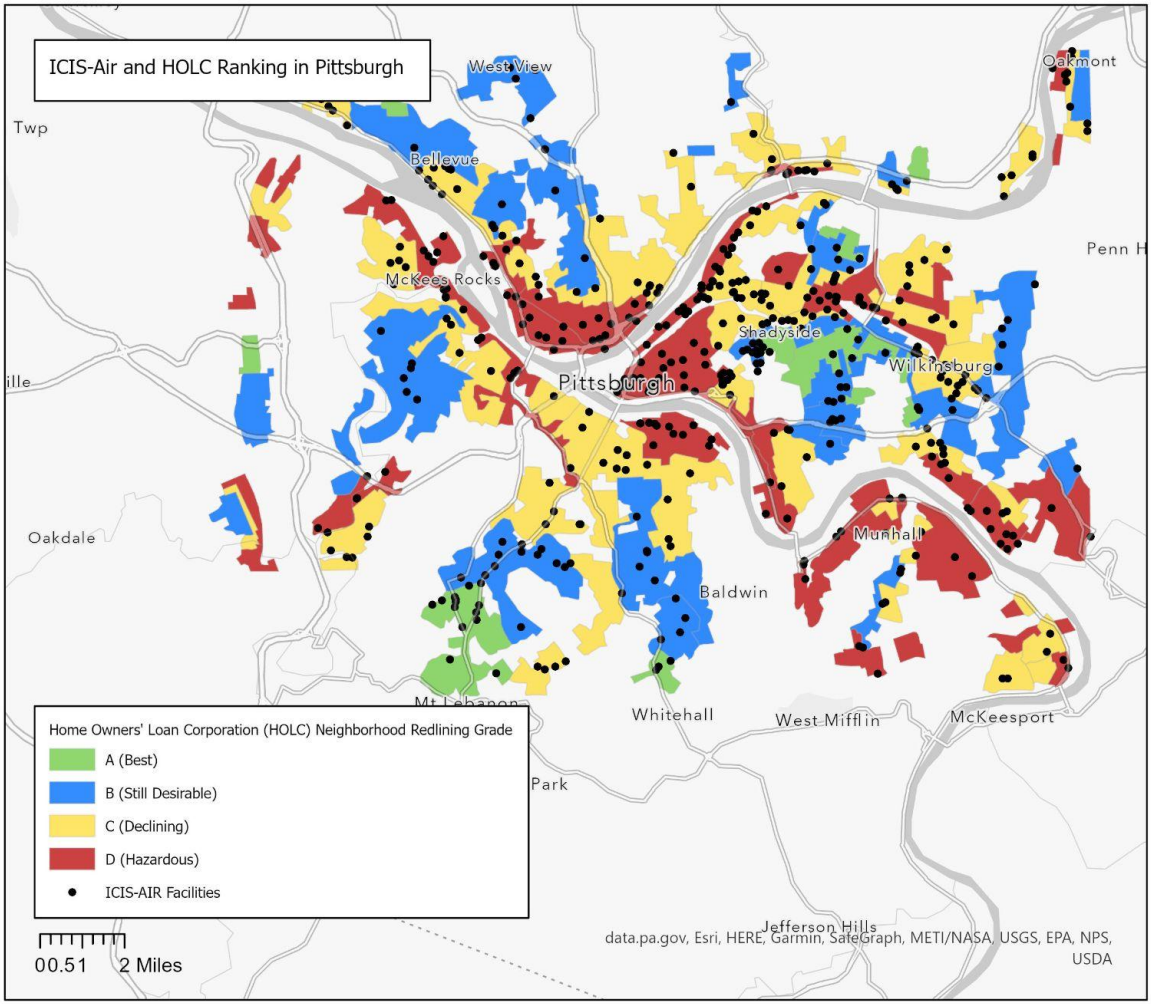
Appendix A

The following maps depict the HOLC Residential Security Maps and EPA ICIS-AIR facility data for Boston, Cleveland, and Pittsburgh, those cities not selected as case studies for further exploration.[105]



[105] Shared Enterprise Geodata & Services, "Integrated Compliance Information System (ICIS) for Air (AIR) Facilities in the United States and Its Territories."; Lavery, "Home Owners' Loan Corporation (HOLC) Neighborhood Redlining Grade."


ICIS-Air and HOLC Ranking in Cleveland
Home Owners' Loan Corporation (HOLC) Neighborhood Redlining Grade
A (Best)
B (Still Desirable)
C (Declining)
D (Hazardous)
ICIS-AIR Facilities
Eastla
Euclid
Collinwood
Bratenahl
East Cleveland
Cleveland Heights
Mayfield Heights
Cleveland
University Heights
Beachwood
Lakewood
Rocky River
Shaker Heights
Warrensville Heights
CUYAHOGA
Garfield Heights
Bedford Heights
Bedford
CLEVELAND-HOPKINS INT'L AIRPORT
Parma Heights
Parma
Berea
0 0.5 1 2 Miles
Esri, HERE, Garmin, SafeGraph, METI/NASA, USGS, EPA, NPS, USDA


ICIS-Air and HOLC Ranking in Pittsburgh
West View
Oakmont
Twp
Bellevue
Penn H
McKees Rocks
Shadyside
Wilkinsburg
Pittsburgh
Oakdale
Munhall
Baldwin
Whitehall
West Mifflin
McKeesport
Park
Jefferson Hills
Home Owners' Loan Corporation (HOLC) Neighborhood Redlining Grade
A (Best)
B (Still Desirable)
C (Declining)
D (Hazardous)
ICIS-AIR Facilities
0 0.5 1 2 Miles
data.pa.gov, Esri, HERE, Garmin, SafeGraph, METI/NASA, USGS, EPA, NPS, USDA

Appendix B

This table includes the EPA data on each facility, made available through GIS. In addition, sources for the approximate age of each facility are included in this table.

Name	Year	Source
WOODLEE INC		
CAMDEN IRON & METAL NORTHERN BRAND	2012	https://www.recyclingtoday.com/article/camden-iron-relocates-operations/
PATRICK KELLY DRUMS INC	1985	https://www.kellydrums.com/
GLOUCESTER TERMINALS LLC		
CANUSO CO		
AMERICAN CORRUGATE CONT		
U.S. COAST GUARD CAPTAIN OF THE PORT GLOUCESTER CITY, NJ	1889	https://coastguard.togetherweserved.com/uscg/servlet/tws.webapp.WebApp?cmd=PublicUnit&type=Unit&ID=13077
BLUEKNIGHT MATERIALS - GLOUCESTER CITY		
ALPHA PLASTICS		
NORTHGATE APARTMENTS	1962	https://www.tapinto.net/towns/camden/articles/troubled-northgate-one-apartments-may-get-new-owner-33-million-rehab
PSE&G CGPM		
WILLIAM J JONES & SONS INC	1970	https://jonesdrums.com/
MITCHELL H COHEN US COURTHOUSE ANNEX	1994	https://www.gsa.gov/about-us/regions/welcome-to-the-midatlantic-region-3/buildings-and-facilities/new-jersey/mitchell-h-cohen-us-courthouse-annex
CAMDEN FIRE DEPT		
FW WINTER INC & CO	1983	https://www.fwwinter.com/
HALPERN METALS		
FW WINTER INC & CO	1983	https://www.fwwinter.com/
PEERLESS CASTING	1963	https://www.dandb.com/businessdirectory/peerlesscastingmachineco-camden-nj-122849.html
CAMDEN INSURANCE		
NAVIERA BILBINA CO @ BECKETT STREET TERMINAL		
CLEMENT COVERALL CO	1990; pre-1900	https://www.homefacts.com/environmentalhazards/New-Jersey/Camden-County/Camden/Polluter-Clement-Coverall-Co-08104clmnt623va.html; https://www.nj.gov/dep/srp/community/ej/camdensouth/003460.htm
JERSEY CORE SUPPLY CO INC	2003	http://www.usa.com/frs/jersey-core-supply-co-inc.html
PENN JERSEY RECYCLING		
STATE METAL INDUSTRIES, INC.	1984	http://www.statemetalindustries.com/
BECKETT STREET TERMINAL		
CPI FIBERGALSS INC		
AABCO STEEL DRUM,INC	1981	https://www.epa.gov/system/files/documents/202209/Drum_Reconditioner_Report_Final_Sept_2022_508.pdf
TURPS WASTE MATERIAL		
CAMDEN CITY HOUSING AUTH ROOSEVELT MANOR		
RUTGERS UNIV		
ST. MARIA GORETTI RCHS		
CONRAIL/S PHILA MATERIAL BULKYARD		
MOUNT SINAI HOSPITAL		
NIGRO INC	1983	https://nigrosautobody.com/
J-BRITE CLEANERS		
J-BRITE CLEANERS		
T&I CLEANERS		
RIFF TAILORING		
SYE'S FABRIC CARE INC.	1995	https://www.dandb.com/businessdirectory/syesfabriccareinc-philadelphia-pa-26737818.html
BUNNY CLEANERS	1964	https://www.dandb.com/businessdirectory/bunnycleaners-philadelphia-pa-13094926.html)
BUNNY CLEANERS	1964	https://www.dandb.com/businessdirectory/bunnycleaners-philadelphia-pa-13094926.html
THOMAS JEFFERSON UNIV/PHILA		
BOB'S PLACE CLEANERS		
SUNNY CLEANERS		
PAYLESS CLEANERS	1996	https://dry-cleaners.cmac.ws/payless-cleaners-inc/47570/
BUILDING BOK LP	2014; 1936	https://www.buildingbok.com/history
BOBBY SCHORRS CLEANERS		
SEPTA WOODLAND TROLLEY SHOP	1940	https://www.xome.com/realestate/4901-woodland-ave-philadelphia-pa-19143-136344686
GOOD HUMOR CORPORATION		
GIRARD MED CTR/PHILA		

TEMPLE UNIVERSITY MAIN CAMPUS FACILITIES		
ALEXANDER WOODWORK	1999	https://www.fastbackgroundcheck.com/people/alexanderwoodwork/id/f063301999862556926 1
PHILA. HOUSING AUTHORITY-RAYMOND ROSEN	1954	https://hiddencityphila.org/2014/09/bidding-farewell-to-queen-lane-looking-ahead-for-pha/
ST. JOSEPH PREPARATORY SCHOOL		
GIRARD COLL/BOARDING SCH		
VERIZON POPLAR CENTRAL		
ARBILL INDUSTRIES	1982	https://spiritnews.org/articles/hazmat-laundromat-whats-up-with-this-solvent-leak-at-a-glenwood-ave-industrial-site/
TOPPER ONE HOUR CLEANER		
ST JOSEPH HOSPITAL	1849	https://libwww.freelibrary.org/digital/item/44641
NU JAYLON CLNR		
HALPERN PROCESSING INC.		
IMPERIAL METAL & CHEMICAL CO	1915	https://snaccooperative.org/ark:/99166/w6617gz1
PETROLEUM RECYCLING CORP		
BIG SAVE CLEANERS		
PHILA GAS WORKS RICHMOND PLT	1969	https://kleinmanenergy.upenn.edu/wp-content/uploads/2020/08/PGW-LNG-Expansion-Efforts-FINAL-2-1.pdf
LA COLOMBE - TIOGA	2012	https://philly.eater.com/2012/3/27/6601773/la-colombe-opening-decaffeination-plant-in-philly
NORTHEAST WPCP	2012	https://www.ameresco.com/ameresco-philadelphia-water-department-announce-northeast-water-pollution-control-plant-biogas-project/
LA COLOMBE - TIOGA	2012	https://philly.eater.com/2012/3/27/6601773/la-colombe-opening-decaffeination-plant-in-philly
SUNOCO GAS STATION		
ALDAN RUBBER CO	1951	https://www.govinfo.gov/content/pkg/FR-1951-05-11/pdf/FR-1951-05-11.pdf
SJA CONSTRUCTION, INC.		
RIVERSIDE SPECIALTY CHEMICALS		
GRYPHIN CO	1994; 1906	https://hiddencityphila.org/2012/01/paint-it-black/

CALPINE PHILA (NE) FKA O'BRIEN COGEN		
NUPRO INDUSTRIES CORP	1981	https://opencorporates.com/companies/us_pa/733855
NUPRO INDUSTRIES CORP	1981	https://opencorporates.com/companies/us_pa/733855
SMITH- EDWARDS- DUNLAP COMPANY	1920	http://www.sed.com/
RIVERSIDE MATERIALS INC/ASPHALT PLT	1990	https://riversidemat.com/
EDWARD E GOLDBERG & SONS		
DEL VAL WOOL SCOURNG	1962	https://casetext.com/case/valentine-unempl-compensation-case
FRANKLIN SMELTING & REFINING CORP	1950	https://cumulis.epa.gov/supercpad/SiteProfiles/index.cfm?fuseaction=second.cleanup&id=0305549
CHESAPEAKE CORPORATION		
S. D. RICHMAN SONS, INC.	1966	https://www.scrapmonster.com/company/sd-richman-sons/14670
S. D. RICHMAN SONS, INC.	1966	https://www.scrapmonster.com/company/sd-richman-sons/14670
STELLA'S ONE HOUR CLEANERS		
RHONE POULENC INCORPORATED	1998	https://www.epa.gov/sips-pa/pennsylvania-sip-source-specific-requirement-rhone-poulenc-rorer-pharmaceutical-inc
PIONEER LEIMEL FABRICS	1978	https://opencorporates.com/companies/us_nc/0115148
CRAMCO INC.	1956	https://www.dandb.com/businessdirectory/cramcoinc-philadelphia-pa-115643.html
PTR BALER AND COMPACTOR	1977	https://ptrco.com/
CALBAR INC.	1925	https://opencorporates.com/companies/us_pa/52795
CALEDONIAN DYE WORKS	1911	https://caldye.com/about-us/
JAMES ABBOTT INCORPORATED	1976	https://www.manta.com/c/mm2rwsg/abbott-s-plating
COLONIAL CLEANER		
ROYAL-PIONEER INDUSTRIES CO.	1984	https://start.cortera.com/company/research/k3r0oxj9q/royalpioneer-industries-inc/
NORMAN APPLIANCES	1985	https://major-appliance-repair-services.cmac.ws/normans-appliance-service/10778/
QUALITY CONTAINER CORP		
NICHOLAS SCRAP METAL INC	1990	https://www.nicholasscrapmetal.com/
TASTEPOINT	2015; 1885	https://ir.iff.com/news-releases/news-release-details/iff-acquire-ottens-flavors-strengthen-north-american-business
US POSTAL SERVICE		

FOX CLEANERS		
RECON AUTOMOTIVE MFG	1973	https://www.aftermarketnews.com/obituary-recon-automotive-remanufacturers-founder-armand-j-mancini-dies/
INTEGRATED POWER SVC	2007	https://www.ips.us/about/history-and-milestones/
PEARL PRESSMAN LIBERTY INC/SUFFOLK AVE	1957	https://www.piworld.com/article/pearl-pressman-liberty-communications-group-and-8212-remaking-history-26150/all/
SEPTA - CALLOWHILL BUS FACILITY	1913	https://hiddencityphila.org/2013/08/a-hundred-years-at-callowhill-depot/
VIP CLEANERS	2006	https://www.allbiz.com/business/vip-cleaners_1758-215-972-0115
CONSOLIDATED DRAKE PRESS	1965	https://www.manta.com/c/mmb543l/consolidated-drake-press
PARKSIDE CLEANERS		
LAUREL LINEN SERVICE INC	1934	https://yourlinenservice.com/laurellinen-philadelphia/
SEPTA - POWELTON AVE RR YARD	1929	https://history.amtrak.com/blogs/blog/a-closer-look-philadelphia-30th-street-station
CHRIS'S CLEANERS		
DREXEL UNIVERSITY	1891; 1983	https://www.library.drexel.edu/archives/drexel-history-resources/du-history-reference-tools/timeline-drexel-buildings/
PRESB MED CTR/PHILA	1871	https://archives.upenn.edu/exhibits/penn-history/medical-history/merged/#:~:text=Presbyterian%20Medical%20Center-,Brief%20History%3A,was%20donated%20by%20Ephraim%20D
COYNE TEXTILE SERVICES		
VILLAGE CLEANERS		
BELL CLNRS & DYERS		
SEPTA - CALLOWHILL BUS DEPOT	1913	https://hiddencityphila.org/2013/08/a-hundred-years-at-callowhill-depot/
ONE HOUR CLEANERS		
AMERICAN VALET SERVICE		
WAYNE JUNCTION DRY CLEANERS		
EASTERN CREAMATORY	1972	https://easterncasket.com/about.html
SEPTA WAYNE JUNCTION CAR HOUSE	1901	https://www.transit.dot.gov/about/news/federal-transit-administration-celebrates-modernized-fully-ada-compliant-wayne-junction
PROFESSIONAL DRY CLEANERS		
BRIGHT SUN CLEANERS		
TEMPLE UNIVERSITY HOSPITAL EPISCOPAL DIVISION	1870	https://www.templehealth.org/locations/episcopal-campus-tuh/about
CINDERELLA CLEANERS		
LEE'S CLEANERS		
SUGARHOUSE CASINO	2010	https://www.cbsnews.com/philadelphia/news/sugarhouse-casino-opens-for-business/
AMERICAN CLEANERS		
DO WELL CLEANERS		
JWS DELAVAU CO		
KWAK'S DRY CLEANERS		
NEXT FAB AMERICAN	2020	https://nextfab.com/location/north-philadelphia/
NEXT FAB AMERICAN	2020	https://nextfab.com/location/north-philadelphia/
PEARL PRESSMAN LIBERTY	1985	https://start.cortera.com/company/research/-k5s1szs9k/pearlpressmanliberty-communications-group/
ALL-BRITE METAL FINISHING INC	1950	https://www.bbb.org/us/pa/philadelphia/profile/auto-repair/all-brite-metal-finishing-inc-0241-80012638
V & S CATTIE GALVANIZING CO		
ANZON INC	1865	https://www.usatoday.com/story/news/2015/10/12/philadelphia-lead-factory-john-t-lewis-anzon/73688256/
ROIS MFG CO.		
FISHTOWN CLEANERS		
OLYMPIC CLEANERS		
ANCHOR DYEING	2000	http://www.usa.com/frs/anchor-dyeing-finishing.html
DOMESTIC LINEN SUPPLY CO INC		
DICKS AUTO BODY/WILLOW GROVE		
RON'S ONE HOUR CLEANERS		
RON'S ONE HOUR CLEANERS		
GRAYS FERRY COGENERATION	1997	http://www.energyjustice.net/map/displayfacility-68400.htm
GRAYS FERRY COGENERATION	1997	http://www.energyjustice.net/map/displayfacility-68400.htm
GRAYS FERRY COGENERATION	1997	http://www.energyjustice.net/map/displayfacility-68400.htm
NATIONAL PUBLISHING CO	1911	https://www.americanbuildings.org/pab/app/-pj_display_alldates.cfm/276680
PHILA THERMAL DEVELOPMENT CORP		

RIMS CLEANERS		
FRANKFORD CANDY CO	1947	https://www.frankfordcandy.com/meet-frankford
HELLEN'S CLEANERS		
SEAGULL LIGHTING		
AT&T CORPORATION	2006	https://opengovus.com/philadelphia-business/285179
SAM'S CLEANERS		
EXELON CORP SCHUYLKILL GENERATING STATION	1954	https://www.inquirer.com/philly/business/20121214_Exelon_will_retire_oil-fired_Schuylkill_Generating_Station_in_Grays_Ferry.html
EXELON CORP SCHUYLKILL GENERATING STATION	1954	https://www.inquirer.com/philly/business/20121214_Exelon_will_retire_oil-fired_Schuylkill_Generating_Station_in_Grays_Ferry.html
JER-MAR METAL CO		
SAM'S CLEANERS & DYERS		
DENARDO AUTO BODY CARSTAR		
NU-WAY CLEANERS		
NU-WAY CLEANERS		
819 CLEANER'S		
LINN 1 HR CLEANERS		
LINN 1 HR CLEANERS		
RAYS DRY CLEANERS		

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