Impacts of *CTrail* Hartford Line on Real Estate and Urban Economic Development: Phase 1

Final Report

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Report Number:
CT-2314-F-22-4

June 30, 2022

Research Project:
SPR-2314

University of Connecticut
Connecticut Transportation Institute, &
Center for Real Estate and Urban Economic Studies

Submitted to:
Connecticut Department of Transportation
Bureau of Policy and Planning
Research Unit

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Transportation Supervising Planner

TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No. CT-2314-F-22-4	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle Impacts of *CTrail* Hartford Line on Real Estate and Urban Economic Development: Phase 1		5. Report Date June 30, 2022 6. Performing Organization Code SPR-2314
7. Author(s) Jeffrey P. Cohen, Ph.D.; Awanti Acharya, Ph.D., Wenjie Wang, Ph.D., Yunhe Cui, Ph.D. candidate, Daniel Kraemer, Ph.D. candidate, Donald A. Larsen, PE		8. Performing Organization Report No.
9. Performing Organization Name and Address University of Connecticut Connecticut Transportation Institute, and Center for Real Estate and Urban Economic Studies Storrs, CT 06269 USA		10. Work Unit No. (TRIS) N/A 11. Contract or Grant No. SPR-2314 13. Type of Report and Period Covered Final Report August 15, 2018-October 31, 2019
12. Sponsoring Agency Name and Address Connecticut Department of Transportation 2800 Berlin Turnpike Newington, CT 06131-7546		14. Sponsoring Agency Code SPR-2314

15. Supplementary Notes
A study conducted in cooperation with the U.S. Department of Transportation, Federal Transit Administration

16. Abstract
The Hartford Line, a heavy rail commuter line connecting New Haven, Hartford, CT, and Springfield, MA, with stations built and/or planned for in eleven Connecticut municipalities, received final funding approval in 2012 and opened for service in June 2018. This new commuter service may be encouraging additional transit-oriented development (TOD) along the existing Springfield-Hartford-New Haven rail corridor, including retail stores, restaurants, office space and housing. These potential impacts along the Hartford Line are expected to affect property values. However, *a priori,* the magnitude of the impact is unknown. The overall aim of this study is to measure the impact of the Hartford Line on real estate and urban economic development in these eleven municipalities. This project (Phase 1) collects data for both Period 1 and Period 2. *Period 1* covers pre-2012 (baseline conditions): The time period before the formation of the State of CT's Interagency Workgroup on Transit Oriented Development (TOD). *Period 2* covers 2012 – 2018: The period between the formation of the Interagency Workgroup on TOD (2012) and the opening of the *CTrail* Hartford Line in 2018. A later project (Phase 2) will collect data for Period 3 (Post-2018: The period following the opening of the *CTrail* Hartford Line in 2018). This later Phase 2 project will occur approximately 5 years after the opening of service to allow a sufficient amount time for development and real estate markets to adjust and respond to the presence of the new rail service. The objective of this first phase of this project – the focus of this report – involves collecting the data for periods 1 and 2 that will be used in the statistical analysis of Phase 2 (which will include data from periods 1, 2, and 3).

17. Key Words	18. Distribution Statement
CTrail Hartford Line, commuter heavy rail, real estate, economic development	No restrictions. This document is available to the public through the National Technical Information Service, Springfield, VA. 22161. The report is available on-line from National Transportation Library at http://ntl.bts.gov

19. Security Classif. (Of this report)	20. Security Classif. (Of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	175	N/A

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ACKNOWLEDGMENTS

This report was prepared by the University of Connecticut, in cooperation with the Connecticut Department of Transportation and the United States Department of Transportation, Federal Transit Administration. The opinions, findings and conclusions expressed in the publication are those of the authors and not necessarily those of the Connecticut Department of Transportation or the Federal Highway Administration. This publication is based upon publicly supported research and is copyrighted. It may be reproduced in part or in full, but it is requested that there be customary crediting of the source.

The following organizations provided assistance, data and/or other information that was helpful in this project: Capitol Region Council of Governments (CRCOG); South Central Regional Council of Governments (SCRCOG); Connecticut Department of Transportation (CTDOT); United States Department of Transportation (US DOT); United States Census Bureau; Federal Housing Finance Agency (FHFA); United States Environmental Protection Agency (EPA); United States Postal Service (USPS); United States Department of Housing and Urban Development (HUD); Connecticut Housing Finance Authority (CHFA); Connecticut Department of Housing (CT DOH); Connecticut's Department of Economic and Community Development (DECD); Connecticut Department of Energy and Environmental Protection (CT DEEP); Connecticut's Office of Policy and Management (OPM); City of Hartford's Assessment Division; City of Hartford's Department of Development; Town of West Hartford Assessor's Office; Town of West Hartford's Economic Development Department; Town of Newington Assessor's Office; Town of Newington's Information Systems and Technology Department; ; Town of Windsor Assessor's Department; Town of Windsor Locks Assessor's Office; Town of Windsor Locks Assessor's Office; Town of Berlin Assessor's Office; Town of Meriden Assessor's Office; Town of Wallingford Assessor's Office; City of New Haven Assessor's Office; Town of North Haven Assessor's Office; Town of Enfield Assessor's Office.

METRIC CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS				
SYMBOL	**WHEN YOU KNOW**	**MULTIPLY BY**	**TO FIND**	**SYMBOL**
LENGTH				
in	inches	25.4	Millimeters	mm
ft	feet	0.305	Meters	m
yd	yards	0.914	Meters	m
mi	miles	1.61	Kilometers	km
AREA				
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yard	0.836	square meters	m^2
ac	acres	0.405	Hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
VOLUME				
fl oz	fluid ounces	29.57	Milliliters	mL
gal	gallons	3.785	Liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
NOTE: volumes greater than 1000 L shall be shown in m^3				
MASS				
oz	ounces	28.35	Grams	g
lb	pounds	0.454	Kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
TEMPERATURE (exact degrees)				
°F	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	°C
ILLUMINATION				
fc	foot-candles	10.76	Lux	Lx
fl	foot-Lamberts	3.426	candela/m^2	cd/m^2
FORCE and PRESSURE or STRESS				
lbf	poundforce	4.45	Newtons	N
lbf/in^2	poundforce per square inch	6.89	Kilopascals	kPa

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Executive Summary

With the beginning of the Hartford Line service in June 2018, passenger rail service connecting downtown Hartford, CT,with New Haven, CT, and Springfield, MA, has become a reality. The new service provides many residents and businesses with faster and more reliable travel times between Hartford and New Haven, and is hoped to alleviate road traffic congestion along I-91. In conjunction with the construction and operation of the Hartford Line, the Connecticut Department of Transportation (CTDOT) sought to encourage Transit-Oriented Development (TOD) in the neighborhoods surrounding the rail stations, including retail shops, restaurants, office space, and housing. The Hartford Line has the potential to improve the lives of residents by reducing the financial, temporal, and psychological costs of commuting to work, shopping, and recreation.

All these potential impacts can be related to changes in property values. One way to measure the Hartford Line's impact is to examine how property values have changed before versus after the commencement of service, and before versus after the decision to encourage TOD. While there have been other studies of passenger rail impacts on real estate, none of these studies focus on a before versus after assessment of a specific commuter rail project in Connecticut. As a result, the impacts of the Hartford Line on real estate are being studied and analyzed in two Phases. Phase 1 includes two periods of time: Period 1 - Pre 2012, which is being labeled as the "baseline conditions," and Period 2 - 2012-2018, the period between the formation of an Interagency Workgroup on TOD by former Governor Dannel Malloy and the opening of the Hartford Line. Phase 2 (covering Period 3) is a later study, which is projected to be for the period post-2018. This report covers Phase 1.

The primary focus of this Phase 1 study is to begin collecting much of the "baseline" data. This data can be used 5 years after the start of rail services, for the "Phase 2" analysis on the potential to create "value" for property owners, businesses, residents, and towns in the areas surrounding the stations. In addition to the direct property value effects, this can lead to additional local property tax revenues due to the property value increases, which, in turn, can induce further public spending and another round of property value increases.

This final report for Phase 1 consists of a literature review and a visual, written, and quantitative description of the data for each of Connecticut's 11 municipalities served by the Hartford Line. The literature review focuses on other studies examining the real estate impacts of commuter and passenger rail service as well as other forms of rapid transit. This report is accompanied by a geospatial database containing non-locational, locational, and land-use characteristics of parcels in the 11 municipalities with current or planned Hartford Line passenger rail service. These characteristics include: property values, property sales, walking/driving distance to nearest Hartford Line station, travel time and cost savings, area real estate values, tax revenue, rental properties, affordable housing, square footage, current plans or proposals for new real estate development, teardowns, remediated properties, aerial photographs, and vacancies. This database can be easily analyzed and updated using standard GIS software. There is a description of the data in the geospatial database that outlines the type of information, the source of the data, and in the cases where the data were generated by the authors of this report, the methodology used. The volume of maps and other visual information for all 11 municipalities is

too large to present in this report, and thus, much of the analysis in this report is focused on tables of descriptive statistics for all stations. However, the geospatial database was generated so that it can be used to analyze the impact of the Hartford Line on real estate and economic development in all of the municipalities with current stations (Hartford, Berlin, Wallingford, Meriden, New Haven, Windsor, Windsor Locks) and those with potential future stations (West Hartford, Newington, North Haven, and Enfield). Development in Springfield and surrounding communities in Massachusetts was not studied.

Key findings in this Phase 1 report include:

- Berlin, Meriden and West Hartford experienced notable drops in residential average assessed values between Period 1 and 2.
- New Haven, Wallingford and Windsor Locks experienced notable rises in residential average assessed values between Period 1 and 2.
- Average residential property tax revenues rose in all towns within 1 mile from the nearest station, with the exception of Berlin.
- With the exceptions of Newington and North Haven, average commercial assessed values rose in the other towns in all locations within two miles from the stations.
- New Haven and Windsor had the greatest number of residential teardowns (where an existing structure was demolished to replace it with a new one). Meriden, Windsor Locks and Berlin had the greatest number of teardowns that were condominiums. There were few commercial teardowns in any of the cities/towns with Hartford Line stations.
- Number of "assisted" housing units increased in several cities/towns (e.g., Hartford), while in others (such as West Hartford) it fell. This suggests possible evidence of gentrification.
- If one commuter from each household in the cities/towns with Hartford Line stations took the train instead of driving in a hypothetical commute to the XL Center in Hartford, total annual cost savings are estimated to be $21.1 million.
- If one commuter from each household in the cities/towns with Hartford Line stations took the train instead of driving in a hypothetical commute to the New Haven Green, total annual cost savings are estimated to be $19.7 million.

It is recommended that Phase 2 of this research project should include the re-analysis and updating of the following factors (along with a thorough statistical analysis of the data), for the 5-year period following the start of service (June 2018-June 2022): property values (assessed and sale values), land values, local property tax rates and revenues, the number of residential and commercial properties (i.e., including single-family, rental and affordable housing), square footage, and current plans or proposals for new real estate development and vacancies. While some of this analysis is included in this Phase 1 report for the period prior to 2012 (period 1) and 2012-2018 (period 2), a longer period of time in Phase 2 after the 2018 commencement of service (period 3) is warranted, especially because of the structural changes in transportation ridership and real estate markets that may have occurred at the onset of the Covid-19 pandemic that began in 2020. This longer time period of data following the opening of the Hartford Line is crucial for a statistical analysis of the causal impacts of the Hartford Line on real estate markets. Other factors that may also be considered at some future point include the characteristics that play a role in passenger rail service becoming capitalized into real estate values and urban economic

development, such as: urban design and placemaking, changes in travel costs, changes in modal choice, changes in emissions, environmental remediation, and changes in traffic noise.

The impacts will be analyzed in two different ways in Phase 2. One is through a visual representation of maps and aerial photography, to demonstrate how the neighborhoods in and around the Hartford Line stations have changed over time with a "before" and "after" visual analysis. The other suggested methodology for studying these impacts is statistical analysis, such as multivariate regression analysis and/or other statistical techniques. These techniques can be applied to the data stored in the geospatial database, such that annual changes in the aforementioned factors can be analyzed over the next several years for the three time periods: Period 1: prior to formation of the interagency workgroup on TOD in 2012; Period 2: before commencement of service, 2012-2018; and, Period 3: after the commencement of commuter service in 2018.

CHAPTER 1: Background

1.1 Introduction

Initial planning for the Hartford Line began in 2009, following Connecticut's (and partner states') presentations to the federal government. The Hartford Line service began 9 years later in June 2018, and provides many residents and businesses with faster and more reliable travel times between Springfield, MA, Hartford, CT, and New Haven, CT. It is hoped the Hartford Line will also provide reductions in road traffic congestion along I-91, which links the same three cities. In conjunction with the construction and operation of the Hartford Line, the Connecticut Department of Transportation (CTDOT) seeks to encourage Transit-Oriented Development (TOD) in the neighborhoods surrounding the rail stations, including retail shops, restaurants, office space, and housing. The Hartford Line has the potential to improve the lives of residents by reducing the financial, temporal, and psychological costs of commuting to work, shopping, and recreation. All of these impacts can also affect property values. One way to measure the Hartford Line's impact is to examine how property values have changed before versus after the commencement of service, and before versus after the decision to encourage TOD.

While there have been other studies of commuter rail impacts on real estate, which are summarized in greater detail in the next section of this report, none of these studies focuses on a before versus after assessment of a specific commuter rail project in Connecticut.

The impacts of the Hartford Line on real estate are studied and analyzed in two Phases. Phase 1 includes two periods of time: Pre 2012, which is being labeled as the "baseline conditions," and 2012-2018, the period between the formation of the Interagency Workgroup on TOD (see below) and the opening of the Hartford Line. Phase 2 is a later study, which is projected to be for the period post-2018.

This report covers Phase 1. The primary focus of this Phase 1 study is to begin collecting much of the "baseline" data. This data can be used 5 years in the future for the "Phase 2" analysis on the potential to create "value" for property owners, residents, and towns in the areas surrounding the stations. In addition to the direct property value effects, this can lead to additional local property tax revenues due to the property value increases, which in turn, can induce further public spending and another round of property value increases.

Background:

The Hartford Line differs from many other commuter rail service (CRS) lines in North America in several ways. First, the Hartford line was constructed by upgrading tracks along existing Amtrak service, which minimized the construction disruption to existing businesses and residential properties. Second, the Hartford line operates as a regional passenger rail line, as it provides rail service between towns and cities in two different states (CT and MA), rather than solely linking major population hubs in the manner of an inter-city rail line. Third, the Hartford Line differs from traditional urban rapid transit, which usually covers a compact inner-urban area and ranges outwards to only about 10 miles from the Central

Business District (CBD), operating with a high service frequency and typically on dedicated tracks. The Hartford Line also provides service between smaller communities along the line, and it has the additional advantages of connecting with other commuter services along the line (e.g., CTtransit Buses) as well as with long-distance passenger services at major interchange stations in Springfield and New Haven. The above-noted distinctions are important in that the effects on economic development of urban mass transit or inter-city long distance rail service likely differ from regional passenger rail service. For instance, transit services in New York City, or Washington, D.C., where there is frequent service, high ridership, and a large population, would be expected to produce different development and economic benefits adjacent to stations than regional rail service in the Hartford/New Haven/Springfield metropolitan area. The 62-mile Hartford Line corridor (New Haven, CT, to Springfield, MA) is currently served by 8 existing stations in Connecticut, plus Springfield, MA, and is planned in the future to include 4 additional Connecticut stations in Enfield, West Hartford, Newington and North Haven (see Figure 1). At the beginning of 2020, the Hartford Line operated 17 roundtrips per day south of Hartford and 12 round trips north of Hartford. The future planned level of service (i.e., if COVID 19 had not occurred) was for 25 daily roundtrips. The Hartford Line trains use Messerschmitt - Bolkow - Blohm (MBB) trainsets leased from the Massachusetts Bay Transit Authority (MBTA). The Hartford Line trains are powered by CTDOT-owned GP40 locomotives, which are also used on the Shore Line East service. The trainsets and locomotives are maintained by Amtrak®, as part of the Shore Line East contract, and operated by TransitAmerica Services and Alternate Concepts Inc. (TASI/ACI) under the Hartford Line Service Provider agreement (CTDOT (2019b)).

Hartford Line Station Locations in Connecticut

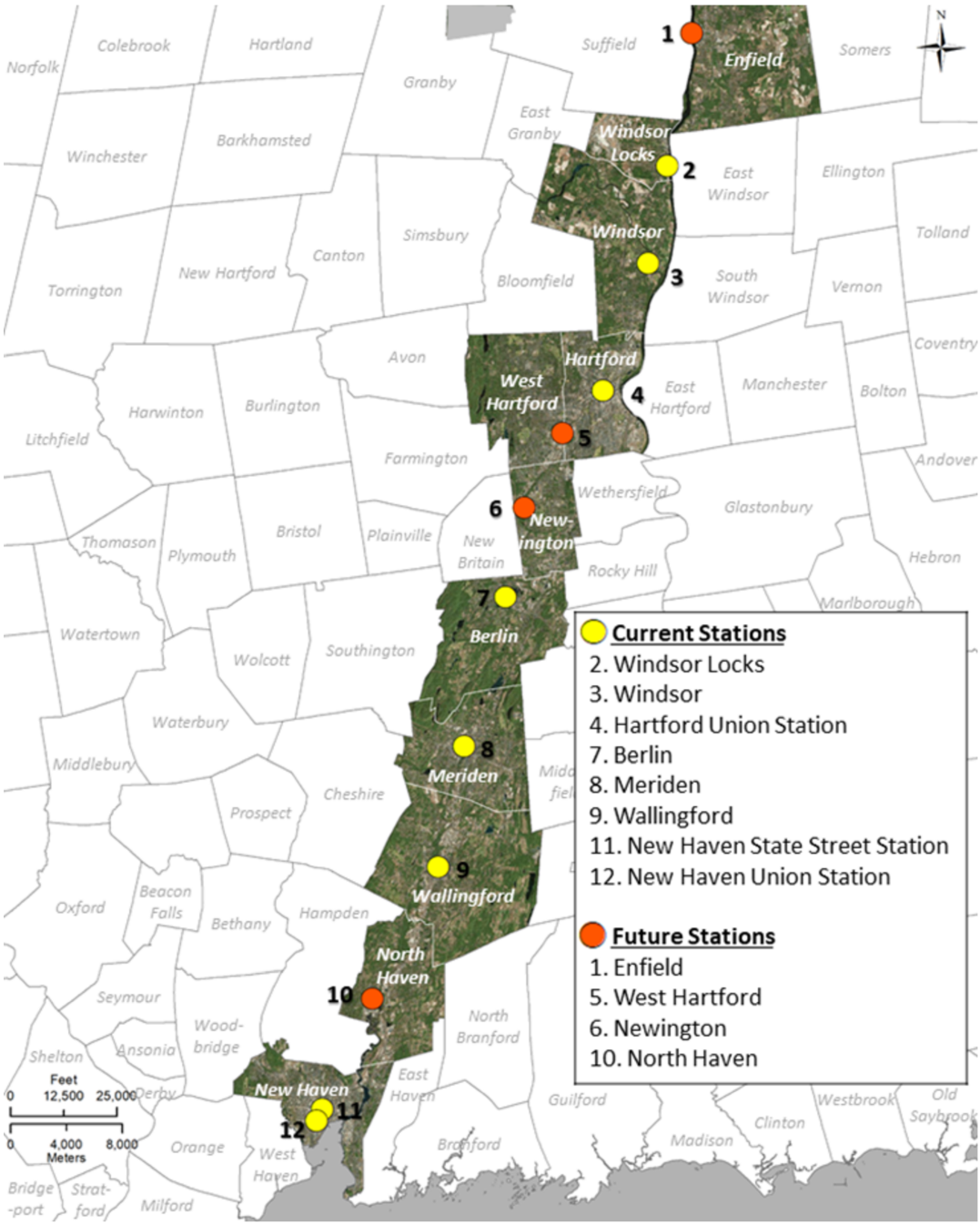

Figure 1. *The locations of the current (yellow dots) and future (orange dots) Hartford Line Train Stations in Connecticut as of January 2020, superimposed on 2016 aerial photography (sources: locational data of the Hartford Line from CTDOT and aerial photography from CTDEEP)*

1.2 Review of Existing Commuter Rail Service Literature

Overview:

The purpose of this section is to present a summary of the existing transportation and economics literature that focuses on the influence and impact of Commuter Rail Service (CRS) [or Commuter Rail Transit (CRT)] on economic development and nearby property values. This includes Transit-Oriented Development (TOD) in the neighborhoods surrounding commuter rail stations. The literature review draws upon sources that are primarily related to CRS and CRT. When appropriate, however, references pertaining to other forms of rapid transit [e.g., bus rapid transit (BRT), light-rail transit (LRT), heavy rail transit (HRT)] are cited. Pertinent general literature on transportation and economics also has been reviewed. It should be noted that even though the Hartford Line is officially defined as a "regional passenger rail service" most other rail transit systems are generally described in the literature as CRS or CRT. For ease of comprehension, the terms CRT, CRS are used generically in this literature summary.

Common expectations are that CRS stations will be associated with increases in local tax revenue, along with increases in the quantity of residential housing, commercial properties, rental properties, affordable housing, and plans or proposals for new real estate development. Similarly, the same line of thinking is that vacancies would be reduced. CTDOT has speculated that the Hartford Line would provide many of these benefits for Connecticut businesses, and residents. It has been found, however, that studies corroborating or disproving such expectations regarding vacancies are not very numerous, particularly for CRS or CRT in North America.

This literature review is divided into three sub-sections. The first sub-section focuses on the findings from studies of factors directly or primarily related to property values and economic development. This includes a discussion of the effects of CRS on property and land values (i.e., assessed and sales values of residential, commercial, and rental properties and affordable housing), square footage, local tax revenue, vacancies, teardowns, and plans or proposals for new real estate development.

The second sub-section focuses on factors that become capitalized into property values, such as changes in travel costs, changes in modal choice, environmental remediation, noise effects, urban design and placemaking (public spaces that promote personal health, happiness, and wellbeing), and TOD policies.

A third sub-section contains information about 22 specific commuter rail systems operating in the United States. These systems are listed in a Table contained in Appendix A. References to associated studies on most of these commuter systems are also included in the Table.

1.2.1 Factors directly or primarily related to property values and economic development

As noted previously, the introduction of any CRS, including the Hartford Line regional passenger rail service, with access to major points of interest is expected to increase demand for housing close to public transit stations, as well as raise property values near stations and shift real estate development plans away from suburban office parks and towards TOD. CRS stations might also be expected to increase local tax revenue, the quantity of residential housing, commercial properties, rental properties, affordable housing, teardowns and plans or proposals for new real estate development, as well as reduce vacancies.

The linkages and reciprocal effects of land-use patterns and transportation systems are well documented by transportation engineers, geographers, real estate analysts, and economists. Transportation investments, actual or even just planned, can affect the location decisions of households, firms, and government authorities and, hence, the market and assessed values of property and resulting property tax collections. Conversely, location choices and investment decisions by households, businesses, and governments can influence the volume and location of transportation investments. These reciprocal effects are interesting and potentially significant, but also complicated and often difficult to untangle in empirical studies

<u>Property and land values (assessed and sales values)</u>

Many studies of commuter, heavy and light-rail systems show that considerable variability exists in the estimated change in property and land values as a result of transit investments. Between 1972 and 2015, there are many studies of CRS, CRT, and LRT (also HRT and BRT) specific to North America that consider property values affected by transit stations and lines. Several of these, over this 40+ year time frame, find significant positive influences of transit stations on single- and multi-family property and land value: Boyce et al. (1972) (Philadelphia Speedline); Voith (1991) (Philadelphia-Camden NJ); Voith (1993); Cervero and Duncan (2002) (Santa Clara CA Caltrain); Garrett (2004) (St. Louis MO Metrolink); Duncan, (2008) (San Diego CA, Caltrain); and, Kim and Lahr (2013) (Hudson-Bergen NJ LRT). There are also several studies that find negative effects on property values. Some of these are: Skaburskis (1982) (San Francisco CA, North Oakland BART); Lewis-Workman and Brod (1997) (Portland OR, Eastside MAX); Bowes and Ihlanfeldt (2001) (Atlanta, GA, BART); Cervero (2004) (San Diego, CA, South Line, East Line, and Mission Valley Line); Hewitt and Hewitt (2012) (Ottawa ON O-Train); and, Pan (2013) (Houston TX MetroRail Red Line).

Higgins and Kanaroglou (2016) analyze and critique 60 studies of land value uplift associated with rapid transit systems in Canada and the United States that were performed during this time period. Higgins and Kanaroglou (2016) conclude that variation reported in property and land value for many of these 60 studies may be attributable to the nature of the data, rather than the transit system studied. Most importantly, they indicate that the use of proximity alone omits critical variables and other unobserved relationships that could lead to erroneous conclusions about the value of land captured for rapid transit systems. They state that if three additional factors are taken into consideration, namely relative

accessibility, transit-oriented development (TOD), and use of advanced hedonic modelling techniques, the resultant land value uplift or land value capture for many of the past studies would likely differ considerably from what is published in the literature.

Sixteen of the 60 studies identified in the Higgins and Kanaroglou (2016) review, which are specific to HRT, CRT and LRT, are rated by the authors as being of higher quality. The 16 studies (Chatman et al. (2012), Armstrong and Rodriguez (2006), Yan et al. (2012), Dubé et al. (2013), Duncan (2008), Garrett (2004), Atkinson-Palombo (2010), Diao and Ferreira (2010), Farooq et al. (2010), Goetz et al. (2010), Dubé et al. (2011), Duncan (2011a), Duncan (2011b), Hewitt and Hewitt (2012), Seo et al. (2014), and Diao (2015)) utilize (according to Higgins and Kanaroglou (2016)) state of the art modelling techniques to reach more reliable outcomes. The first four above-cited studies, which discuss land and housing values, are described below.

1) Economic Impacts-Home Appreciation – NJ Transit River Line – (Chatman et al., 2012)

The New Jersey Transit River Line, which started operation in 2004, is described in Chatman et al. (2012) as an 'interurban' line that runs 34 miles, some at high speeds between town centers, with 18 stops between Camden and Trenton, NJ. Even though the River Line is technically termed LRT, there are similarities between it and the Hartford Line, such as distance of transit service provided, distance between stations, and access to multiple towns that vary in character from suburban to urban.

This study considers the effect of the River Line on appreciation of owned homes (as opposed to commercial or rental properties), which also includes condominiums. The authors note that anecdotal evidence such as proposed condominiums near stations, an increase in building permits in towns with stations, and an upturn in multi-family housing near the line, is used by local newspapers to tout the River Line as an economic booster. However, initial announcements of the planned Line had raised concerns (primarily NIMBY-related [not in my backyard]) about crime, noise, and potential reductions in property values (Chatman et al. (2012)).

Chatman et al. (2012) uses repeat sales for the analysis of the River Line. An opinion expressed in Chatman et al. (2012) is that studies that evaluate variation between properties often contain unobservable variables that can bias coefficient estimates. Thus, the review notes that there is an advantage in using repeat sales data, namely a control for endogeneity and omitted variable bias. In less technical terms, endogeneity is sometimes referred to as the "chicken and the egg" problem, where it is difficult to ascertain which of two variables came first and caused the other. In the context of the Hartford Line analysis, it is not always clear whether neighborhoods with greater development potential were chosen for Hartford Line stations, or whether the Hartford Line stations being placed in a town had a significant impact on its property values and property markets more generally. A repeat sales regression analysis can mitigate these types of endogeneity concerns.

In the River Line study, Chatman et al. (2012) find that the economic impacts of the River Line are primarily redistributive: benefits to properties near stations are realized, but there is a reduction of property values somewhat farther away. This finding is derived using sales prices at two times, at groundbreaking and after operation began, and with the elimination of many unusable or undesirable records for various reasons, (e.g., missing data, vacant land classified as residential, transactions between family members, and duplicate transaction records). Chatman et al. (2012) note that "t*he cumulative net effect across all owned housing units in the five-mile radius around stations is slightly negative or at best neutral."* Furthermore, the authors note that confining the study to just those properties located within, for example, one mile of the rail line might overstate (net) positive impacts. The study findings suggest that using owned property value alone does not provide justification of the River Line investment. The study paper does speculate that commercial property owners and renters could be primary beneficiaries of rail investments (although owned-homes were the only properties studied by Chatman et al. (2012) in the study).

2) Commuter Rail Accessibility and-Residential Property Values– Boston, MA – (Armstrong and Rodriguez (2006))

While controlling for *"proximity-related negative externalities and other confounding influences,"* a paper by Armstrong and Rodriguez (2006) *"estimates spatial hedonic price functions to examine local and regional accessibility benefits of commuter rail service in… municipalities in eastern Massachusetts* (Armstrong and Rodriquez (2006), p.1). The data include single-family residential property values for three municipalities (Lexington, Hingham and Boxford, MA) that do not have access to commuter rail service, and for four towns (Needham, Norfolk, Acton and Winchester, MA) that do have access. The paper points out that "*negative effects related to proximity to rail right-of-way must be considered in order to properly quantify accessibility benefits* (the positive effects) *of commuter rail service."* Armstrong and Rodriguez (2006) also notes that if these negative externalities (e.g., visual intrusion, noise, emissions, and congestion) are not included in a hedonic model, the parameter estimates for accessibility will be biased (Armstrong and Rodriquez (2006), p.24).

Even how accessibility is defined can have significant bearing on the results. Dimitriou (1992) defines accessibility as having two components: a local component represented as ease of access to stations, and a regional component, which is the ability of commuter rail to bring riders to where they want to go. Armstrong and Rodriguez (2006) note further that the commuter rail must provide regional accessibility benefits that are above those provided by other modes, such as automobiles. Finally, Armstrong and Rodriguez (2006) hypothesize that residents of the study area need to value accessibility to commuter rail stations above and beyond the proximity-related deleterious effects, such as visual intrusion, noise, vehicular emissions, and traffic congestion, as well as other confounding influences.

With the inclusion of both local and regional accessibility factors, and other attributes such as parking availability, land use, access to highways, access to the Central Business District (CBD) and areas of employment, as well as several other factors, such as neighborhood

characteristics, Armstrong and Rodriguez (2006) conclude that "*some evidence of the capitalization of accessibility to commuter rail stations was found."* Specifically, the authors find that *"properties located in municipalities with commuter rail stations exhibit values that are between 9.6% and 10.1% higher than properties in municipalities without a commuter rail station."* However, the authors are not able to distinguish whether the presence of the stations or other attributes within the towns that contain the stations account for the property value differences. Armstrong and Rodriguez (2006) also find *"that properties located within a one-half mile buffer of a station have values that are 10.1% higher than properties located outside of this buffer area."* The results also indicate that close proximity to commuter rail right-of-way (not necessarily at stations) has a significant negative effect on property values.[1] For every 100 ft. in distance farther from the commuter rail right-of-way, property values are between $73.21 and $289.72 higher (approximately 1%) per house, with all else held equal. (Armstrong and Rodriquez, 2006, p. 40).

Armstrong and Rodriguez (2006) state that their study "*validated concerns about the effectiveness of commuter rail service as a catalyst for development"* because the accessibility benefits provided by the service studied in these four Massachusetts towns are only weakly reflected in property values. (Armstrong and Rodriquez (2006), p. 41). The authors note that localized variations in property appear to be significant and, therefore, making generalizations about the benefits of transit station accessibility as a catalyst for development of single-family housing does not appear to be sound.

3) Single-family Property Values – LYNX: Charlotte, NC – (Yan et al., 2012)

A paper by Yan et al. (2012) "*examines the impact of a new light rail system* (LYNX Blue Line) *on single-family housing values"* at a distance of up to one mile around stations in Charlotte, NC. (Yan et al. (2012), p.1). A hedonic price analysis is used for the study period (1997-2008). The technique is repeated for four time periods that correspond with four specific phases of the development of the LYNX Blue Line: pre-planning (1997-98), planning (1999-2005), construction (2005-2007), and operation (2007-2008). Groundbreaking for the LYNX Blue Line light rail system occurred in February 2005, and the line became operational in November 2007.

The line is 9.6 mi in length, located in a fairly low-density urban area, and uses the track of a former freight line. The completed line has 15 stations, with five in the CBD. The *average* impact across all stations is considered for the analysis.

[1] This is sometimes called a silo effect – very close to the rail line, effects on property values are very low due to noise and pollution; moving gradually further away, the noise effects disipate and property values rise due to accessibility benefits. Then beyond some critical distance, accessibility wanes, as well. For instance, if someone lives ½ mile from the station, the person would have the accessibility benefit that may outweigh the negative factors of noise, etc. However, if someone lives 1/10 of a mile from the nearest point on the rail line but cannot walk to the nearest station, the negative effects might outweigh the positive accessibility benefits.

A general conclusion presented in Yan et al. (2012) is that the rail investment does not affect single-family home prices in Charlotte until after the rail system begins operation. Yan et al. (2012) note that this conclusion differs from some other studies (Damm et al. (1980) (Washington Metro), and McMillen and McDonald (2004) (Chicago Midway)). The paper states that this might be attributable to Charlotte having less traffic congestion, or a possible limited awareness of public transportation in the Charlotte region. But also, because the light rail line is a former freight rail line surrounded by industry, the industrial uses likely have had a negative impact on the adjacent land in the past. The temporal change in housing value is postulated to have been affected by the change in use of the rail line. Yan et al. (2012) concludes that the negative influence of the freight line has likely dissipated over time with the introduction of the LYNX Blue Line light rail system.

4) Commuter Rail Accessibility- Single-family House Values – CRT/Montreal, Quebec, Canada – (Dubé et al. (2013))

Dubé et al. (2013) estimate the change in single family house prices (with improved accessibility to train stations (by foot as well as car)) for the Montreal to Mont-Saint-Hilaire CRT system in Montreal, Quebec, Canada). The rail infrastructure had already been in place, thereby leading to a fast implementation based solely on the opening of six new stations. Dubé et al. (2013) use a difference-in-differences (DID) approach with the hedonic price model for single family repeat house sales between 1992 and 2009. The authors state that a "*quasi-experiment approach and difference in differences estimator*" are used to assess the impact of the implementation of a commuter train service and the gradual opening of new stations over four years (2000 to 2003). They further note that "*the DID estimator associated to the hedonic price model generates a sophisticated version of repeat sales (RS) approach allowing to estimate the impact over time of a change in accessibility*" (Dubé et al., 2013, p.50). A sample of 23,978 pairs of observations (sale and resale) are used for model estimation. Approximately 13,900 pairs of observations potentially experience a change in access to train stations during the study period. However, the number of houses with change in access via pedestrian-foot travel (i.e., those within a 0.9 mi distance) is less than 600.

The study results indicate that a significant impact exists for houses located close to a rail station, but this effect also varies according to the distance from the CBD (the closer to the CBD, the less the effect). For areas with foot accessibility, the increase in mean sale price varies between 9.7% for houses within 0-0.3 miles of the station and 2.7% for houses 0.65-0.9 miles from the station.

Dubé et al. (2013) conclude that "*commuter rail transit positively affects real estate values",* and that *"public transit and land use regulation should be part of an integrated planning process to maximize sustainability and social welfare."* (Dubé et al. (2013), p. 64).

The above four studies are chosen due to their overall proximity to the northeast and the Hartford Line, and because of the findings that may be pertinent to the Hartford Line. In summary, the above four studies of housing property values are examples of the variation in results professed at the start of this chapter. The housing market varies according to many

specific factors, many of which cannot be identified for every property. However, there does appear to be a fine line between issues that constitute negative perceptions about owner occupied property such as crime, noise, and congestion, versus the benefits of access to transit stations, as well as the transit line's ability to transport users to desired destinations.

Local property tax revenue

Rising demand for housing and commercial properties near transit stations can lead to increases in local property tax revenue for surrounding communities. This is true in communities where transit stations are located near property that provides tax income for local governments, as is the case for the Hartford Line in Connecticut. For instance, it is reported that in Fairfax County, VA, Washington, D.C., Quebec City, Quebec, Canada, and designated 'transit villages' in New Jersey, (Fogarty et al. (2008); Dubé et al. (2011); Noland et al. (2012); Mohammad et al. (2013); and, Mathur (2015)) higher tax revenue collections are a result of those regions' transit systems.

Fogarty et al. (2008) note that the public sector can use value capture strategies *"to reclaim a portion of value for purposes such as transit capital costs or operations, affordable housing, or other improvements*" (see also Diao (2015), below). Commuter transit, TOD and surrounding services can be funded via financial strategies such as special assessments, joint development cooperation or developer fees, and/or Tax Increment Financing (TIF) (Fogarty et al. (2008); Zhao et al. (2010); and, Merriman (2018)). As Cohen and Danko (2017) explain, TIF can be used for a new proposed project by leveraging future gains in property tax revenue from that development to finance the transportation investment. Hence, the local communities or state agencies take on the financial risk. In order to justify the request for TIF, these same organizations need to be able to ensure that the estimated gains in tax revenue associated with the project materialize in a timely manner. As an example of TIF, Merriman (2018) notes that a 22-mile beltline rail system, (originally proposed by a Georgia graduate student), circling Atlanta, GA, and utilizing existing rail corridors, has become a more viable plan upon proponents demonstrating that more than 60% of the project costs could theoretically be generated from additional tax revenues without raising tax rates. Subsequent plans with a projected 2030 completion date for the Atlanta Beltline have a total cost of $4.4 billion. An Atlanta Beltline Tax Allocation District (TAD) was created to collect TAD funds, which are expected to be the most substantial source of funding, accounting for about 33% of the total cost (Merriman (2018)).

The Connecticut General Statutes allow Connecticut municipalities to implement TIF. These Statutes were updated in 2015 by Connecticut Public Act 15-57, to be more flexible, and to better meet the needs of a municipality. TIF can be used if *"properties within the area meet any one of three conditions: they are blighted; they require rehabilitation, redevelopment, or conservation; or they are suitable for industrial, commercial, residential, mixed-use, retail, downtown, or TOD*." (CTDOT (2018), p. 45).

Tax revenue is also a popular subject for local communities because they hope to capitalize on CRT-related property tax revenue to help fund other public programs (Panero et al.

(2012)). Many of these programs are intended to improve the quality of life for existing residents through revitalization of the communities where CRT systems are built, and to aid other areas in the municipality that do not directly benefit from the increased access or increased property values and development related to the transit system (Cohen and Danko (2017)).

Smith and Gihring (2020) provide an annotated bibliography on value capture for transit, which is publicly available (http://www.vtpi.org/smith.pdf). Smith and Gihring (2020) summarize numerous studies (more than 100 in Europe and North America) of transit property value gains and the feasibility of financing transit improvements through value capture. The findings indicate that proximity to transit often increases property values enough to offset some or all of transit system capital costs. (Smith and Gihring (2020))

Land Value Capture – MBTA: Boston, MA – (Diao (2015))

Diao (2015) states that "*capturing the increase in land value attributable to transit accessibility has become an increasingly examined alternative to fund transit systems*." (Diao (2015), p. 159). The author assesses the impact of the Massachusetts Bay Transportation Authority (MBTA) Boston subway system on single family property values, and the potential for value capture. In the study, two issues -- sample selection and spatial autocorrelation (the phenomenon by which a value observed in one location depends on the values in neighboring locations) -- are described as "*typically overlooked*" in conventional hedonic price analysis. Diao (2015) finds that "*failing to correct for sample selection and spatial autocorrelation results in significant bias in valuing transit accessibility*." (Diao (2015), p. 159)

This MBTA study includes transaction and stock data for 10,031 single-family housing transactions. A total of 1,198,031 observations (every single-family property parcel in Boston multiplied by the number of quarters the property was included in the assessment records), are considered. Differences between sold properties and the overall housing stock suggest that sold properties may not be representative of the overall housing stock. Diao (2015) reports that the sold properties exhibited, on average, smaller lot size, smaller gross area, more floors, more bathrooms, more fireplaces, older age and were more likely to have air conditioning. They tend to be located in neighborhoods with higher population density, higher land use mix, and had better accessibility to transit stations and highway exits.

When all housing (two-family, three-family, and condominiums) is considered, the value capture potential for the MBTA of Boston is estimated by Diao (2015) to be $700 million. Using the 2005 residential property tax rate, the annual property tax attributable to accessibility to subway stations is calculated to be $1.2 million for single family properties and $7.6 million for all residential properties. Diao (2015) notes that this value represents approximately 1.81% of the overall residential property tax in Boston for 2005. It also corresponds to 10% of the MBTA annual deficit that MBTA had been attempting to mitigate through fare increases at the time.

Capitalization of Transit Accessibility – Baltimore Central Light Rail – (Barry (2012))

This thesis study uses census tract data for median property values (rather than specific property values) to capture the regional effect of the Baltimore Central Light Rail Transit. The Baltimore Central Light Transit line was built in 1992, with some additional segments added through 2005. Barry (2012) indicates that economic development near the Baltimore Line stations has not materialized. The author postulates a number of reasons for this, one being the lack of concurrent pro-business and pro-economic development policies associated with the Line development, by city and state policymakers. He also notes that factors revolving around proximity to rail transit can be simultaneously both positive and negative; positive due to increased accessibility and ease of moving around the city, and negative due to nuisance effects of crime, noise, and vibration. Barry (2012) also cites other negative factors that could be hindering development, such as crime rates, local education rates, family income, race and social demographics and commuting patterns. Also, it is noted that for a proposed future transit line (e.g., proposed Red Line in Baltimore), any effective and efficient highway system running parallel to the line makes utilization of the transit less attractive. Barry (2012) concludes that using economic and community development to justify future light rail investment in the Baltimore region may not prove to be a wise policy.[2]

Residential, commercial and rental properties including affordable housing

Commuter rail service generally provides increased accessibility to 'desired destinations' (work, recreation, leisure, shopping) within a region. Therefore, in response to more demand, the quantity of adjacent residential, commercial, and rental properties, as well as affordable housing (assuming appropriate government intervention), are all expected to increase near transit stations (Fogarty et al. (2008)). Despite the fact that many studies focus on the impact of CRS/CRT on single-family housing, (see above earlier discussion) these types of properties are generally viewed to be less favorable near transit stations because they achieve the lowest premiums (Cohen and Danko (2017)). An increase in home value produces increased costs to owners for insurance and higher taxes. The benefits of increased value are only realized by the owner when the home is sold. Also, residents of single-family homes typically depend on private automobiles even when public transportation options are available (Billings (2011)). On the other hand, multi-family units, other rental housing, and commercial properties benefit most from a new transit option because these properties can capitalize the changes in their property values, for example, by raising rents when it comes time to renew leases (Cohen and Danko (2017)).

The authors of a study on DART LRT (Clower and Weinstein (2002)) use appraisal data to analyze the effects of light rail stations in the Dallas, TX, area on office, residential, and retail property valuations. Using 1997-2001 data, they find that median valuations rise almost 25% for office properties, more than double the figure for a control group of office properties. Single- and multi-family residential valuations near the light rail stations also

[2] Subsequently, the proposed red line was stopped by politicians in Maryland.

rise faster than in control areas, but retail property valuations are largely unaffected by the stations, and such stations may even discourage industrial use in nearby areas.

In British Columbia, Canada, Cohen and Brown (2017) find that the announcement of a new rail rapid transit line affects various commercial property prices differently. They note that nonparametric estimation methods illustrate the asymmetric response of commercial property prices to the announcement of rail rapid transit between Vancouver and Richmond, British Columbia, Canada. While many sites experience higher property values, reductions occur in some locations, probably due to anticipated disruptions, diversion of road funds, and higher taxes needed for rail expansion.

New real estate development

In the New Jersey Transit River Line study (Chatman et al. (2012)) and the Baltimore Central Light Rail (Barry (2012)) cited earlier, and in other reports (New Jersey Transit (1994)), it is found that CRT and LRT transit investments can produce both positive and negative effects for real estate development. State, regional and local planning agencies are influential in development outcomes, or lack of outcomes as cited by Barry (2012). Their early and continued involvement is important to ensure that development around CRS stations produces positive effects rather than merely less desirable changes, such as more traffic, more congestion or developments that provide pedestrian access to a very limited number of people, as in the case when only detached single-family houses exist. As what is reported by Cohen and Danko (2017) in the CT***fastrak*** Phase 1 study, successful planning tactics to attract desirable new development include:

1. outlining a basis for defining where growth, density and change should and should not occur;
2. ensuring that new stations and new developments help to establish and celebrate the local community identity;
3. promoting convenient retail that serves not only the transit riders but also the community at large;
4. improving connections for walkers and bicyclists between the community and the stations;
5. heightening the sense of shared responsibility for the interaction between transit owners/operators and the community; and,
6. bolstering a communal sense of security.

The types of development, services and uses that several reports identify (Cohen and Danko (2017); RPA (2017); and, CTOD (2008)) as having the potential for simultaneously meeting the needs of commuters, residents, and businesses, include housing, entertainment, open-space, civic, commercial, and retail, and also should have the following attributes:

- Developments located around stations that lower the impact of traffic.

- Uses that generate pedestrian activity such as points of interest located within an easy and interesting walking distance.
- Staging/gathering areas for public events.
- Information centers to serve all types of customers (business, tourists, residents, etc.).
- Safe, active, mixed variety of services, retail, residential and convenience facilities such as: coffee shops; private and government offices; employment centers; restaurants; school and health care facilities; day care centers;, grocery stores; entertainment and tourist destinations; parks and playgrounds; and, recreational sites.

Square Footage

Property values are often compared by only looking at the ratio of the property value to the square footage. However, when the value of properties with CRS access rises due to increasing demand, so does the value of the square footage (Cohen and Danko (2017)). Owners of rental units, as well as single-family homes can charge more rent or obtain a higher sales price if they expand the size of units. Thus, it would seem to be to their benefit to expand square footage. However, it is unclear whether such a scenario normally occurs. Cohen and Danko (2017) survey multiple studies over approximately the last fifteen years, and find only one that examines the change in built area as measured in square meters, whichs pertains to a BRT system (Bocarejo et al., 2013). Also, according to Danielson et al. (1999), 'smart growth' for housing specifically refers to land use patterns that include, among other things (p. 517):

- Encouragement for urban infill housing.
- Placement of higher density housing near commercial centers and transit lines.
- Maintaining housing affordability through mixed-income and mixed-tenure development.

The above does not necessarily encourage expansion of individual units, which in fact could be counterproductive to smart growth management.[3]

Vacancies

Improved access resulting from investments in transit services is expected to lead to increased demand for properties within walking distance of transit stations. Therefore, investments in transit should also be a factor in reducing both residential and commercial

[3] Increasing density (more dwelling units/acre) rather than actual square footage per unit is a preferable form of growth management and can, simultaneously, benefit a developer financially by increasing their returns through an increase in total number of units, rather than their total square footage footprint.

property vacancies. Vacancies include not only places with lower occupancy rates, but also older factory buildings that are merely struggling to find a competitive advantage, and foreclosed or abandoned industrial sites or commercial properties. Transit stations generally spur lower vacancy rates and high absorption rates of buildings that are partly vacant (Ryan (1999); Smith and Gihring (2020)). As an example, Cervero and Dai (2014) finds in Bogota, Columbia, that the availability of cheap vacant parcels helps explain high levels of construction near peripheral bus rapid transit feeder lines in previously undeveloped areas. Kittrell (2012) studies the 2008 commencement of service on the new Phoenix, AZ, Metro light rail line, to determine its effect on vacant property values. The researchers look at the sales volume and sales price of vacant land sold within 0.5 mile of each Phoenix Metro light rail station. The paper reports that at the Metro station areas, sales volume more than doubles for the first three years after the alignment and station areas are announced, and then returns to normal. Kittrell (2012) notes that this corresponds with published papers (Malpezzi and Wachter (2005); and, Case and Schiller (1989)) that theorize development cost and real estate market volatility are increased by land speculation. Kittrell (2012) notes that aligning this theory to transit results in "*areas with significant vacant land around announced transit station locations, land assembly and its associated speculation could create sharp initial property premium increases that will level off quickly*." (p.143)

However, once the areas become ripe for actual development, particularly where there is a focus on TOD, these parcels may further increase in value in the future. Initial increases in land value due to speculation can, in some cases, become an impediment to redevelopment. For example, Stanley (2015) indicates that land speculation represented a significant barrier to both public and private infill development efforts in Phoenix, AZ, in the mid-2000s.

In a 2017 *New York Times* article, Gose (2017) shares the results of interviews with developers about the lure of transit hubs. The author notes repeated accounts of developers in Boston, MA, Washington, DC, Chicago, IL, and Bellevue, WA, who indicate the crucial role that new transit stations play in their investment decisions. He shares multiple quotes from developers who state that they would not have otherwise been interested in former industrial buildings and neighborhoods had the transit infrastructure not existed (Cohen and Danko (2017)).

On the Hartford Line, in areas surrounding some of the existing and/or proposed stations (e.g., Berlin, North Haven, Meriden, Enfield), vacant or underutilized properties currently exist. Some of these properties contain previous freight rail sidings, or little-used commercial/industrial complexes that should see demand for development in the future. Whether for monitoring land value capture or for economic growth in general, changes in vacant land should be viewed as essential characteristics to monitor when analyzing the effects of new CRS stations (Cohen and Danko (2017)).

<u>Teardowns</u>

According to McMillen (2008), land values can be difficult to measure in urban areas because vacant land sales are not common. Sales of vacant land are often concentrated in a small number of places and may be unrepresentative of the overall market. Teardowns – properties that are demolished shortly after being purchased – are valued only for their land and location rather than for the characteristics of the structure. Teardowns provide direct information on land values in fully developed urban areas and offer another potentially attractive data source for estimating property values for transit studies (McMillen (2008)). Although unrelated to transit studies, teardowns are used to estimate land values for redevelopment in studies by Rosenthal and Helsley (1994); Munneke (1996); McGrath (2000); and Dye and McMillen (2007).

1.2.2 Factors that play a role in CRS becoming capitalized into real estate values and urban economic development

Typically, house and land prices reflect the many amenities and disamenities near individual properties. These can include travel accessibility, noise and pollution, and presence of amenities such as shopping and schools. When the price of real estate reflects these amenities/disamenities, this is called "capitalization". This subsection reviews the existing literature that focuses on the following factors that become capitalized into property values: travel costs, modal choice, environmental remediation, noise effects, urban design/placemaking and Transit-Oriented Development. These factors help explain why commuter and passenger rail services might affect property values and economic development.

<u>Changes in travel costs</u>

A fundamental premise of location theory is that highly accessible places provide travel cost savings, which in turn causes higher property values than in areas with less accessibility (Alonso (1964); and, Muth (1969)). New transit service options often reduce the cost of travel (out-of-pocket, time and accidents) and these savings can be capitalized into the value of real estate (Fogarty et al. (2008); Landis et al. (1994); Landis et al. (1995);, Armstrong (1995); Bohman et al. (2016); and, Hamidi et al. (2016)).

Litman (2021) defines accessibility as *"… people's overall ability to reach desired services and activities and therefore the time and money that people and businesses must devote to transportation.*" (Litman (2021), p. 2). A WisDOT (2003) study of the economic benefits of public transit defines consumer travel cost savings as consisting of three parts: out-of-pocket costs; time costs; and accident costs. Out-of-pocket vehicle operating costs typically include vehicle maintenance and repair, fuel, oil, and tires. Other out-of-pocket expenses could include vehicle depreciation, insurance, and registration fees. One study (VTPI (2020)) defines the cost of time spent on transport as the Value of Travel Time (VTT), and the benefits of faster travel that results in time savings as the Value of Travel Time Savings (VTTS).

For properties near accessible public transit, according to Duncan (2011), values increase until the travel cost savings become fully capitalized into the price of the property. Some additional out-of-pocket travel cost savings accrue for those who can reach transit stations by foot. These include savings in vehicle ownership and operating costs, and parking cost reductions. One could speculate that the greatest reductions in travel costs, as well as increases in property values, generally are associated with high-density neighborhoods having new transportation options, providing a high level of transit connectivity to top employers, shopping centers, and other recreational sites (McKenzie (2015)).

Changes in modal choice

The addition of a new passenger rail station in a neighborhood provides a new travel option for the community. However, for commuters and other travelers to find commuter rail travel viable, a number of incentives should exist. Some of these are that the stations must be easily accessed and within walking distance of the users' residences, and that the commuter line offers travel time and/or cost savings. As described in the previous section, travel costs can also be an important determinant of modal choice. Thus, spatially examining the interplay of proximity to stations, reduction of travel costs and property values is crucial to understanding the potential usage and impact of CRS on modal choice in nearby communities (Hamidi et al. (2016)).

A web-based survey of commuters in Austin, Texas (Bhat et al. (2006)) finds that time reliability of service is one important attribute to commuters, which affects their decision of travel mode choice. In this study, Bhat et al. (2006) express travel time reliability in terms of a travel uncertainty cost. As described in Noland and Small (1995), travel time reliability can be captured by '*Maximum Expected Utility*' theory, as well. According to this theory, an individual prefers and chooses the travel option alternative with the highest expected utility.

Bhat et al. (2006) also identify another important factor in modal choice, namely, whether an individual chains non-work stops with the commute, and/or pursues additional trips during the day while at work. Therefore, trip chaining (or stop-making) behavior is a critical determinant in commute modal choice, which may be overlooked in some analyses.

Environmental remediation

EPA defines brownfields as "*real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.*" (EPA (2021)). The end result of remediation, whether it is for ground pollution at the site of construction for commuter rail (denoted as Railfields in EPA (2005)), or at brownfields surrounding areas served by the transit service, is viewed as productive and positive. Interestingly, the Federal Transit Administration (FTA) notes on a website about the New Haven Line (FTA (2016)) (https://www.transit.dot.gov/regulations-and-guidance/environmental-remediation-and-clean) that "*railroad corridors have been used as dumping grounds by the Railroads and neighborhood communities. In addition, maintenance and repair shops as well as rail storage yards have been polluted by oil and*

diesel fuel, due to leakage from locomotive engines and spillage at fueling facilities. For several years of continuous railroad operations, fuel oils and other contaminants have accumulated inside the railroads right-of-way and facilities."

It should be noted that due to uncertainty, brownfields that have not been completely analyzed can reduce the attractiveness of properties adjacent to transit stations, as well. A brownfield site that has undergone a Phase 1 environmental site assessment to recognize possible contamination of the site, but has not yet identified the type or extent of contamination, may lead to future liability and create an environmental concern for a development. In CTDOT (2018) (p.47), it is noted that in the Parkville section of Hartford, brownfields near the CT***fastrak*** Flatbush station and the future Hartford Line station in West Hartford, recently (as of early 2018), fall into this category. The Connecticut DEEP maintains a list of brownfield sites by town at https://www.ct.gov/deep/cwp/view.asp?a=2715&q=325018&deepNav_GID=1626 . Those sites that are near the Hartford Line can be accessed and monitored for potential remediation and property development near the Hartford Line stations.

Changes in emissions

Emissions of carbon dioxide (CO_2), carbon monoxide (CO), particulate matter (PM), nitrous oxides (NO_X), and volatile organic compounds (VOCs) are of concern, and they are monitored and regulated by the US EPA. With the increasing certainty of global warming also comes a need to manage carbon (greenhouse gas) emissions. According to the US EPA (2016) transportation contributes around 28% of carbon emissions in the United States, with rail contributing 2% of this amount. Automobiles and trucks, however, contribute approximately 83% of the transportation portion of the emissions.

Commuter rail offers an opportunity for significant reductions in energy use, air pollution, and carbon emissions. Public transit ridership gains usually result in fewer vehicles on the road, decreases in congestion, noise and emissions and increased quality of life (Panero et al. (2012)). Gallivan et al. (2015) highlight the fact that the addition of a new station to a neighborhood without previous transit access generally increases activity density (i.e., a combination of population and employment density) by 9% and decreases vehicle miles of travel, transportation fuel use and transportation greenhouse emissions by 2% within a 1-mile radius of the new station.

Noise effects

The effects of noise—whether positive, negative or nonexistent--and other aspects of the station environment are potentially important factors when examining the impact of transit stations on property values and economic development (Currie (2006)). As noted in previous sections, noise and other negative factors, if ignored, can bias the results of economic impact studies toward the positive (Chatman et al. (2012) ; Armstrong and Rodriguez (2006); and, Yan et al. (2012)). Some studies use noise and other aspects of the station environment to determine which communities are more sensitive to real or perceived disamenities of station proximity (Munoz-Raskin (2010); and, Duncan (2011)).

According to Sklarz (2018) noise is among the most significant locational factors affecting the value of residential property. The paper also notes other published studies show that excessive noise due to exposure to vehicular traffic can lead to increases in blood pressure and strokes. In another study Beimer et al. (2017) review the impact of road noise exposure in Hamburg, Germany. They state that to obtain adequate coefficients for the impact of road noise, it is necessary to control for variables that might be correlated with road noise such as air pollution. But using models developed in a study by Andersson et al. (2015) they conclude that "*flight noise had the most negative effect on housing prices, and road and train noises had similar but smaller effects.*" (Beimer et al. (2017), p. 282).

In a hedonic model study published by Ozdenerol et al (2015) the hypothesis is that noise level has a significant adverse impact on housing values. The hypothesis is made based on similar findings from several other previous studies (Hughes and Sirmans (1992); Hughes and Sirmans (1993); Palmquist et al. (1991); Powe et al. (1995); Huang and Palmquist (2001); Wilhelmsson (2000); Theebe (2004); Jim and Chen (2007); and Blanco and Flindell (2011)). In Ozdenerol et al. (2015), the price impact of traffic noise on housing prices in Memphis and Shelby County, Tennessee is studied. Their results indicate that noise levels of 45, 50, and 55 dBA, and above, lead to respective discounts of 1.6%, 3.7%, and 4.3% on housing values, relative to housing in areas with lower noise levels (below 45dBA).

It is postulated by Sklarz (2018) that high levels of intermittent noise are worse than steady noise, which humans can sometimes filter out as white noise. Similarly, Andersson et al. (2015) find that in regions of Falköping and Hässleholm, Sweden, occasional noise levels are extreme and, therefore, are not properly considered in the average noise levels included for studies. The maximum noise level and the number of noise events may thus also be important. Unlike for road noise, Andersson et al. (2015) find that both the equivalent noise level and the maximum noise level are negatively influencing property prices near rail lines.

Urban design and placemaking

The environment immediately surrounding a transit station is largely a byproduct of urban design and placemaking, [where placemaking involves the planning, design, management and programming of public spaces that promote human health, happiness, and well-being (PPS (2009))]. With application of appropriate urban design, commuter rail station areas provide a sense of orientation, a feeling of safety and security, and an attractive and well-maintained environment that fosters an increased level of interest for residents, commuters, and workers (Cohen and Danko (2017)). Studies in New Jersey (New Jersey Transit (1994)) note that travelers' decisions to opt for public transit over private automobiles increases activity within the community. These decisions also help direct growth and change in the community, maximize the use of existing road systems, and reduce congestion resulting in shorter travel times and better air quality for the community.

Transit stations can build a sense of community by functioning as a venue for a wide range of community activities and events. Thus, they have the ability to bring people together by serving as the focus of communal life and a center of civic pride. Station areas shape the image of the community by becoming a visible point of identity for the neighborhoods, and

municipalities they serve. It is noted in New Jersey Transit (1994) that these sites also can enhance the economic vitality of local areas.

Transit-oriented development

Transit-oriented development (TOD) is defined in Connecticut General Statute Section 13b-79o as "*the development of residential, commercial, and employment centers within one-half mile of walking distance of public transportation facilities, including rail and bus rapid transit and services, that meet transit supportive standards for land uses, built environment densities, and walkable environments, in order to facilitate and encourage the use of those services."* A report by CTDOT (2017) more concisely describes TOD "*as compact, mixed-use development located within a short walk of a transit station,* with a *physical form that responds to - and is interrelated to - transit."* (p. 4). Over the past several years, CTDOT has made considerable effort to encourage TOD expansion in Connecticut. It is stated on CTDOT's TOD web page https://portal.ct.gov/DOT/Transit-Oriented-Development/Transit-Oriented-Development-Home-Page that CTDOT's role in supporting TOD is to ensure that Connecticut's public transportation network and facilities support the State, regional, and municipal goals of providing mobility choice, encouraging economic development, and creating more livable, sustainable communities.

A paper by Renne et al. (2016) explores affordability surrounding transit station areas within the United States. The authors specifically compare housing and transportation costs in approximately 4,400 fixed-route transit stations within the U.S. They classify each station area as either TOD; TAD (transit-adjacent development --property physically adjacent to transit that does not capitalize on its proximity); or a hybrid of these two classes. Based on this classification system, the authors find that TODs are expensive places to buy and rent housing, but more affordable than TAD and hybrid areas because the lower cost of transportation offsets higher housing costs. As such, it is recommended that housing and transportation officials should prioritize increasing the density and walkability of both hybrid and TAD station areas, which account for two-thirds of all station areas across the United States (Renne et al. (2016); and Cohen and Danko (2017)).

Atkinson-Palombo (2010) notes that the introduction of light rail transit is often used as an incentive to create urban environments that are sustainable. Under this scenario, the LRT is accompanied by overlay zoning that specifies density and type of future development. To achieve this, urban transport and land use planning are integrated to bring about densities and development mixes that are conducive to transit. Atkinson-Palombo (2010) does caution that it may be difficult to determine whether land value increases are caused by proximity to transit stops or by public policy incentives.

Atkinson-Palombo (2010) argues that "*more consideration needs to be given to comparability of neighborhoods in the hedonic modelling process.*" (p. 2411). The author notes a distinction should be made between communities with walk and ride and those that have primarily park and ride. In a study of different neighborhoods in Phoenix, AZ, Atkinson-Palombo (2010) estimates that "*amenity-dominated mixed-use neighborhoods with predominantly walk and ride"* access experience premiums of 6% for single family

houses and more than 20% for condominiums. However, *"residential neighborhoods with predominantly park and ride"* experience no capitalization benefits for houses, and a discount for condos. The author concludes that *"the neighborhoods that experience the strongest capitalization benefits are those most likely to evolve into TOD communities"* with a focus on pedestrian walkability and mixed use, and that condos within these neighborhoods may be more sought after than single family houses. (Atkinson-Palombo (2010), p.2421). This speaks to the difference between TOD and TAD.

Similarly, other cities in the US are finding that by concentrating government redevelopment efforts along a strategic transit corridor (for example, BRT, LRT), they are able to leverage new transit-oriented investment for each dollar invested into the transit system. According to ITDP (2013), this situation is documented to have occurred in Cleveland, OH, (Healthline BRT), Pittsburgh, PA, (Martin Luther King, Jr. East Busway) and in 12 other corridors where more than $1 of TOD investment resulted for each $1 of transit spent. In the case of the Healthline, more than $100 resulted per dollar spent (ITDP (2013)).

A CTDOT study (with support from FTA) identifies TOD opportunities along the Hartford Line corridor. The Part 1 report (CTDOT (2017)) and Part 2 report (CTDOT (2019a)) are available at the previously-referenced webpage. This TOD Action Plan intends *"to identify strategies to activate TOD in selected station areas (a half-mile radius from the location of a Hartford Line station) along the corridor by building upon local, regional, and statewide planning efforts*." (CTDOT (2017), p. 4). The report defines Part 1 activities of the action plan as a "*corridor-wide assessment of TOD potential, including the identification of station area typologies and an overview of the regional market; TOD Desire and Readiness workshops with selected station area municipalities; an assessment of each selected station area's TOD capacity based on a synthesis of the workshops; detailed market analyses of the selected station area municipalities; interviews with stakeholders that are active in the region; and tailored recommendations for each selected station area's TOD implementation."* Part 2 then "*enabled the project team to provide targeted technical assistance to the selected station area municipalities with the goal of continuing to move from planning to implementation. In collaboration with municipal leaders, one "key recommendation" for each municipality identified in Part One was advanced. (webpage)"*

1.2.3 Studies of Major CRS/CRT Lines in the United States

Many studies of transit systems are funded by an owner organization or associated operating agency to demonstrate the positive attributes and benefits associated with the transit system, particularly for use in marketing and public relations. The studies tend to be broad-based and report region-wide economic benefits rather than, for instance, local results for real estate valuation at specific transit stations. Information on 22 of the larger CRT/CRS commuter services in North America is provided in Table A1 of Appendix A. These commuter rail lines are listed in descending order of reported ridership by the American Public Transportation Association (APTA) for calendar year 2019. Some associated references for studies performed on these lines, are also given in the Table. The

information in the fifth column of Table A1 provides references and general comments on the studies for each CRT/CRS. Most of these studies provide a summary of aggregated or general effects of the rail transit on the metro areas served. The reader is referred to the references in Table A1 if more information is desired.

The majority of the CRT/CRS systems included in Appendix A are larger in size and capacity than the Hartford Line. For instance, the MTA Long Island Railroad lists 117 million unlinked passenger trips for 2019. Whereas, after 1 year of operation, the Hartford Line carried an estimated 630,000 unlinked annual passenger trips during 2019 (CTDOT (2019b)). The Shoreline East is also included in Table A1 to show ridership on this CTDOT line (approximately 600,000) relative to the other major systems reported.

One of the studies, from Table A1, SunRail in Orlando, FL, shares certain development characteristics with the Hartford Line, and is described below.

SunRail Commuter Rail Service – Orlando, FL

A study in Florida assesses *"development impacts and property tax increases that could be attributed to investments in the SunRail commuter rail system in the metropolitan Orlando area*." (Florida DOT (2016), p. 145). Florida DOT lists attributes of SunRail that they identify as potential hindrances to development. Many of these attributes are similar to some of the characteristics of the Hartford Line. These similarities include operation as a commuter rail line along an existing industrial rail corridor; less frequency of service; a corridor that was not designed from scratch to maximize ridership and development opportunities; and, a land use setting for most station areas that was not necessarily ideal for redevelopment. However, even with the above constraints, according to Florida DOT (2016), SunRail has produced an estimated $20 million plus in annual property tax increases in the early years (between May 2014 and 2016) when the commuter service began.

The report further states: "*The project team compared property value changes in SunRail station areas to control areas with similar land use mixes to try to isolate the effects of SunRail investments on land values." (*Florida DOT (2016), p. 145). The conclusion from the study is that over half of the SunRail stations outperform the control study areas*,* i.e., investments in the SunRail cause development that would otherwise not have occurred*.* On the other hand*,* case studies that were performed on selected SunRail station areas find wide variations for *"land use and market conditions; political response in support of (re)development interests; and, success in the promotion of TOD in areas nearby the rail stations."* According to the Florida DOT report, these *"case studies point to the importance of planning and regulatory reform to support and help promote redevelopment." (*Florida DOT (2016), p. 146).

1.2.4 Conclusions from Literature Review

The overall objective of this study is stated in the proposal as: "How, in what ways, and by how much, does the Hartford Line become capitalized into property values?"

In this literature search, the capitalization effects of properties surrounding commuter rail services (as well as light rail transit) stations in North America are found to be quite variable and complex. The many papers reviewed have findings that not only differ for various transit systems geographically, but also potentially differ for each station within a given transit service [e.g., Sunrail - Orlando – Florida DOT (2016)]. The timing of when the capitalization occurs is also non uniform, as cited in the example of the LYNX light rail line in Charlotte, NC, where there is a delay of capitalization benefits, likely due to a residual negative effect of previous freight rail traffic (Yan et al. (2012)). And not surprisingly, the results vary as a function of the level of government planning and encouragement for TOD. Duncan (2011) finds that in San Diego, condominiums near transit stations with TOD, and therefore good pedestrian access, have higher value than condos with good pedestrian access that are not near transit stations. Atkinson-Palombo (2010) finds in Phoenix that neighborhoods with the greatest capitalization are the most likely to evolve into TOD.

Although it appears that the general sense is that transit causes appreciation of property value, the level of change is highly dependent on distance and accessibility from the individual transit station, and varies as well by distance from the CBD in larger metropolitan areas.[4] In some cases, an increase in property value occurs such as in: Chicago, IL (McDonald and Osuji (1997); Toronto, Ontario, Canada (Farooq et al. (2010)); Metropolitan Boston, MA (Armstrong and Rodriguez (2006)); and Washington County, Oregon (Knapp et al. (2001)). But in some other cases, an increase is not detected, such as in: Baltimore, MD, Baltimore Central Light Rail Transit (Barry (2012)); Miami, FL, Miami Metrorail (Gatzlaff and Smith (1993)); and, Manchester, England, Metrolink, Manchester, England (Forrest et al. (1996)). Also, in the case of the New Jersey River Line, an overall neutral result is reported due to redistribution of value farther from the stations (Chatman et al. (2012)).

Areas surrounding the Hartford Line stations are expected to evolve for a number of years. This points to the importance of not only gathering datasets during this current phase 1 study for Period 1 (Pre-2012), and Period 2 (2012 - 2018), but also for the analyses to be performed during the future phase 2 study (for Period 3, post June 2018). Follow-up on TOD implementation in the various towns along the Hartford Line, particularly those defined in CTDOT (2017) as 'transit town centers' and 'emerging transit town centers', such as Berlin, Wallingford, Meriden and Windsor, should also be of paramount importance for future TOD designations in Connecticut.

[4] Typically, these types of real estate studies include controls for general price increases in housing markets, by adding a time trend in the statistical (regression) model, or by adding indicator variables for each of the various time periods in the model. To control for general price movements of the overall real estate markets, sometimes researchers use real estate price indices as deflators for the sales prices (and/or assessed values) over time.

1.3 Problem Statement

The costs of commuter rail services and other types of rapid transit are generally well understood; however, the potential benefits are often more challenging to quantify because they typically depend on local conditions. Therefore, the primary focus of this Phase 1 study is to begin collecting much of the "baseline" data on the *CTrail* Hartford Line needed for a future Phase 2 data analysis study on the potential to create "value" for property owners, businesses, residents, and towns in the areas surrounding the stations. In addition to the direct property value effects, this can lead to additional local property tax revenues due to the property value increases, which in turn can induce further public spending (or property tax rate reductions) and another round of property value increases.

In early 2012, CTDOT formed an Interagency Workgroup to try and coordinate efforts on TOD. Meriden was their first test case of having the Workgroup provide technical assistance to a town interested in promoting TOD at the proposed Meriden *CTrail* Hartford Line station. There already has been some development of new buildings since 2012 in Berlin and West Hartford, in addition to Meriden.

Since it typically takes several years for these TOD impacts to develop, the expected impacts on the property values, property tax revenues, and other related variables will be analyzed in a later project, "Phase 2", three to five years following the commencement of *CTrail* Hartford Line service.

In order to achieve the "Phase 2" analysis in the future, the objective of this "Phase 1" project is to develop a baseline of conditions existing before the formation of the Interagency Workgroup in 2012 (Period 1: Pre-2012), and before the commencement of *CTrail* Hartford Line service in June 2018 (Period 2: 2012 - 2018). In "Phase 2", conditions will be updated for the timeframe from 2018 up until the starting date of the "Phase 2" study, and then a new snapshot of conditions will be developed. All of the collected data will be merged, and a set of detailed statistical analyses of *CTrail* Hartford Line impacts on property values will be conducted later in the Phase 2 project. All data will be compiled into a geospatial database.

CHAPTER 2: Research Approach

This chapter focuses on the long-term objective of the present research and the necessary steps taken to achieve this objective as a part of the first phase of this project. This section outlines the research approach utilized in Phase 1 of this project; however, detailed descriptions of the data and presentations of selected baseline data maps and tables are contained in Chapter 3: Data and Methodology. While the tables and figures for all 11 municipalities with current and planned *CTrail* service are available in a geospatial database as an Appendix to this report, a comprehensive array of maps for all variables and all Hartford Line stations are too large to present here, and they are available upon request from CT DOT. The figures and tables presented in this report focus on all 11 municipalities with current and planned service by the Hartford Line.

2.1 Staging of the Study

Phase 1. This project (Phase 1) collects data for both Period 1 and Period 2.

Period 1: Pre-2012 (baseline conditions): The time period before the formation of the state's Interagency Workgroup on Transit Oriented Development (TOD).

Period 2: 2012 – 2018: The period between the formation of the Interagency Workgroup on TOD (2012) and the opening of the *CTrail* Hartford Line in 2018.

Phase 2. A later project (Phase 2) will collect data for Period 3, and perform statistical analyses of the data collected for all 3 periods. This later Phase 2 project will occur 3-5 years after the opening of service to allow a sufficient amount time for development and real estate markets to adjust and respond to the presence of the new rail service.

Period 3: Post-2018: The period following the opening of the *CTrail* Hartford Line in 2018.

The Phase 2 project will include a comprehensive statistical analysis performed for data collected in Phase 1 and Phase 2.

2.2 Objectives

Long-Term Objective

The long-term objective is to examine the question: How, in what ways, and by how much does the *CTrail* Hartford Line become capitalized into property values? Impacts on other related variables will also be assessed.

Phase 1 Steps in Achieving Objective

1. Determine what data are available for collection in "Phase 1: Periods 1 and 2".

All of the data sources necessary to complete subsequent phases of this research project have been identified. This includes data from local, state and federal government agencies as well as a few private agencies. This list of data sources includes municipal assessors, municipal economic development agencies, and municipal planning departments for the eleven towns that contain current or proposed Hartford Line train stations, Capitol Region Council of Governments (CRCOG), South Central Regional Council of Governments (SCRCOG), Connecticut Department of Transportation (CTDOT), United States Department of Transportation (USDOT), United States Census Bureau, Lincoln Institute of Land Policy, Federal Housing Finance Authority (FHFA), Connecticut Housing Finance Authority (CHFA), Connecticut Office of Policy and Management (OPM), United States Environmental Protection Agency (EPA), Connecticut Department of Economic Community Development (DECD), Connecticut Department of Energy and Environmental Protection (DEEP), Connecticut Department of Housing (CT DOH), and the United States Postal Service (USPS).

2. Set the "baseline" of the existing conditions for "Phase 1: Period 1." Also, this step will include a thorough literature review of commuter rail studies.

The data identified in the first step have been prepared to gain insight into "baseline" conditions of the eleven municipalities, both prior to the time of the Interagency Workgroup on TOD ("Phase 1: Period 1"), and close to the time of commencement of *CTrail* Hartford Line service in June 2018 ("Phase 1: Period 2"). Data have been prepared on a number of variables already highlighted in the literature review section of this report. This includes: assessed property values, sales values, estimated local property tax revenue, number of single-family properties, number of multifamily properties, number of rental properties (i.e., apartments and condos), number of commercial properties, number of affordable housing properties, square footage, number of vacant properties, travel cost differences before vs after the *CTrail* Hartford Line, current plans/proposals for new real estate development, and number of environmental remediation projects. In addition to these variables, aerial photographs have been reviewed and assembled to help illustrate what the *CTrail* Hartford Line station catchment areas looked like before the 2012 period and just prior to the 2018 commencement of service.

3. Collect data necessary to examine how property value changes are correlated with proximity to the *CTrail* Hartford Line stations for "Phase 1: Periods 1 and 2."

Some property value effects may be apparent due to the "expectations" that potential property owners formed close to the time of the announcement. Therefore, in this "Phase 1" study, property value data are collected from before the Interagency Workgroup on TOD (i.e., Period 1) and at the start of service in June 2018 (Period 2). The assessed property values and sales values are collected over time, covering 2011-2018, from each municipal assessor. The statistical software, Stata © (which is available at www.stata.com), has a routine titled STATA "osrmtime" developed by Huber and Rust (2016). The "osrmtime" code, which uses Open Source Routing Machine (OSRM) and open street maps to determine distance and travel time, is used in this report to determine such information about each nearest rail station. Throughout this report, attention is focused on properties within a ¾-mile radius of the *CTrail* Hartford Line stations.

4. Obtain sale prices of properties for "Phase 1: Periods 1 and 2."

An examination of actual sale prices is performed (with maps superimposed on aerial photography). It is of interest to visually demonstrate the extent to which buyers and sellers in the markets place value on the Hartford Line, and how these changes occur within relatively short periods. This is in addition to considering assessed value, which only changes once every several years.

5. Gather data on Metro area real estate values that will be useful in "controlling" for general price movements.

In examining property sales and assessed values over time, it can be helpful to attempt to "control" for general price movements (distinguishing between changes in property values due to the *CTrail* Hartford Line versus other unrelated factors, such as recessions or economic booms, or general inflation). This is done by adjusting the sales prices and adjusting the assessed values by a price index for Connecticut Metro-area housing and land in order to isolate the effects of the *CTrail* Hartford Line from metro-area wide business cycles. The metro-Hartford area "Land and Property Values" data from the Lincoln Institute of Land Policy and housing price indexes for the Hartford Metropolitan Statistical Area from the Federal Housing Finance Authority (FHFA) are used for these adjustments, and these are referred to as "deflators".

6. Obtain assessed residential property values for "Phase 1: Periods 1 and 2."

Data are collected on assessed values, which will be needed for Phase 2 analyses similar to those described above. Since properties in Connecticut are generally reassessed every three to five years, this assessment data will be collected again in Phase 2, to estimate the total wealth effect to landowners as a result of the announcement of and/or *CTrail* Hartford Line service. It will also be useful in Phase 2 for studying potential changes in local property tax revenues that may have accrued to the municipalities where the train stations have been located.

7. Determine the levels of local property tax revenues for "Phase 1: Periods 1 and 2" that accrue to the municipalities where the Hartford Line stations are located.

Current levels of local property tax revenues that accrue to the municipalities where the Hartford Line stations are located are calculated, for Period 1 and Period 2. This is accomplished by obtaining the "grand lists" from the town assessors where there is a Hartford Line station. The "mill rates" for each town are utilized to determine the expected property tax revenues at the current time. These are used, together with the assessed values data, to calculate local property tax revenues. Property tax revenues are calculated for subsections of cities/towns nearby the train stations. In Phase 2, this exercise will be repeated, to compare how the tax base has changes over the first several years of Hartford Line service.

8. Gather statistics on: a) the number of dwelling units within a given radius from the stations, for "Phase 1: Periods 1 and 2"; b) the share of these units that are rental properties; and, c) the share of these units that are considered "affordable housing."

This task addresses the questions: Using maps overlaid with rental property data, how does the distribution of rental properties look within a range of reasonable distances from the stations (i.e., ¾ mile)? At a municipal-wide level, how does "affordable housing" vary over time and across cities with Hartford Line stations? These data are collected from the Connecticut Housing Finance Authority and town officials. This includes information on the total number of "assisted units" (housing units assisted with special funding) from each municipality. The affordable housing data are available on a municipality-wide level, while the apartment rental data are available for individual apartment units.

9. Collect information for "Phase 1: Periods 1 and 2" on building square footage of commercial/retail and residential properties within a given radius of the *CTrail* Hartford Line stations.

The "baseline" square footage of commercial/retail and residential properties is collected for the municipalities in which the Hartford Line stations are located. Information is collected on total building square footage within a ¾-mile radius of the Hartford Line stations to develop the baseline for use in Phase 2, when changes in these figures will be examined. For each municipality, square footage data are obtained for properties as of 2017. This information is obtained from the municipal assessor offices.

10. Locate current plans/proposals for new real estate development.

This information is obtained from municipal economic development, town planning commission meeting minutes, and other town officials in Hartford, West Hartford, Newington, Meriden, Berlin, Wallingford, North Haven, New Haven, Windsor, Windsor locks and Enfield.

11. Collect existing brownfields data within a given radius of the Hartford Line stations for "Phase 1: Periods 1 and 2."

Data needed for a Phase 2 statistical analysis of environmental remediation effects on property values are collected during this Phase 1. A list of all remediated brownfield sites in the eleven municipalities is obtained from the U.S. Environmental Protection Agency (U.S. EPA) and the Connecticut Department of Economic and Community Development (DECD), and subsequently geocoded. In Phase 2, these data will be utilized (supplemented by updated data from the first five years of service) to conduct a "hedonic" property price analysis (as in McMillen and McDonald (2004)). This analysis in Phase 2 will enable a determination to be made of how prices of properties in proximity to the brownfields have changed before versus after the Hartford line commencement date.

12. Examine the role of vacancies. Collect data for "Phase 1: Periods 1 and 2" to set the baseline of how many vacant properties are in the Census tracts within a given radius of the Hartford Line stations.

Several databases on vacancies, with information at the Census tract level for all municipalities, and in some cases at the city level (but only available for New Haven and Hartford), are utilized in order to set the "Phase 1: Periods 1 and 2" levels of vacancies in the neighborhoods surrounding the Hartford Line stations. One database is compiled and maintained by the US Postal Service (USPS) and the US Department of Housing and Urban Development, and it is freely available to academic and nonprofit individuals. These USPS data are at the Census tract level, but they consist of all vacant addresses without distinguishing between owner-occupied opposed to rental properties. Another useful database is a part of the U.S. Census Bureau's American Community Survey, which breaks out the data for vacancies due to owner-occupied versus rental properties (but at a higher level of aggregation than the USPS dataset- including the county level for all counties, and the city level for only Hartford and New Haven). A part of this task is to calculate the "absorption rate" of residential properties, based on the ratio of number of residential sales to the number of residential listings per month in these cities and/or counties over the previous several months. These estimated absorption rates are calculated using data on total number of monthly listings and monthly sales data, for each municipality, obtained from Zillow ®.

13. Demonstrate how estimated travel costs would change for individuals switching from private automobile to Hartford Line service. This will be accomplished by using GIS and other software, and comparing travel costs by both modes, from residential properties within a given radius of Hartford Line stations to several specific Connecticut landmarks near other Hartford Line stations.

Typical assumptions on the value of passenger time, the cost of car ownership, parking costs, and any other relevant costs are obtained from various Transportation Research Board reports and handbooks (e.g., the US Department of Transportation's "Guidance on the Valuation of Travel Time in Economic Analysis"). Information on travel time from a given set of properties to downtown Hartford's XL Center, and separately, to the New Haven Green, is gathered. This is accomplished using the code for "osrmtime" (Huber and Rust (2016) with Stata © software to calculate drive time from a given set of properties to

downtown Hartford and New Haven. These properties are those that are located in neighborhoods within a ¾-mile radius of each of the Hartford Line stations. A number of assumptions are made about the following, using commonly accepted estimates from the literature: value of travel time savings (VTTS); the cost of riding the Hartford Line; the parking rate near the landmark destinations; and, the typical annual cost of car ownership in Connecticut. Using this approach, it is possible to visually depict the travel cost savings provided by the Hartford Line for those living near each of the stations to the landmarks that are included in this study. The landmarks used for the study are the XL Center in Hartford and the New Haven Green in New Haven.

14. Use aerial photography and/or remote sensing, to develop a snapshot of land use in the neighborhoods within a given radius of the stations for "Phase 1: Periods 1 and 2."

Aerial photographs and maps of the neighborhoods near the Hartford Line stations are acquired. After determining what resources were available in Task 1, relevant data are obtained from organizations such as the Connecticut Department of Energy and Environmental Protection (DEEP).

15. Develop a geospatial database. To the extent possible, data will be compiled into a parcel-level geospatial database that will facilitate easy tracking of changes in parcels and/or Census tracts over time (i.e., use, change in use, building type and square footage, sales, sale prices, assessed values, vacancies, etc.). Data from "Phase 1: Periods 1 and 2" will be included in the geospatial database.

All of the appropriate data are compiled into a parcel-level geospatial database that can be easily analyzed and updated using standard GIS software. The database facilitates easy tracking of changes in parcels (use, change in use, building type and square footage, sales, sale prices, assessed values, etc.). For example, the assessment data, the location of the Hartford Line stations and other variables of interest (e.g., remediated brownfields) are superimposed on top of multiple years of aerial photography to make maps that help readers visualize changes in the built environment and property values occurring near the stations over time. The parcel-level geospatial database is submitted to CTDOT as of the conclusion of "Phase 1" of this study, and CTDOT will be able to use it (and update it, if desired), and make it publicly available. After completion of Phase 2, this GIS data may be posted online to allow the public or other stakeholders to visualize built environment changes, calculate statistics, create customizable maps, and/or download via interactive mapping software. To aid non-GIS users, the data in the geospatial database are also included in a separate folder in tabular format to allow those who are not familiar with GIS to calculate statistics for a multitude of variables based on proximity to each of the Hartford Line stations. All described data are provided with an instructional 'readme' file for the geospatial database that are available upon request from CTDOT.

CHAPTER 3: Data and Methodology

This chapter focuses on the geographic extent of current studies of the impact of commuter rail service on real estate and economic development; the data used in these studies; and the associated methodology. The literature reviewed in this section is primarily from peer-reviewed sources. In addition to discussing other studies, this chapter introduces some of the data collected in the first phase of the present research and discusses some methodological recommendations for subsequent phases.

3.1 Geographic Extent of Subject Sites in Current Studies of the Impacts of Commuter Rail Service on Real Estate and Urban Economic Development

Previous research explores the impact of CRS and/or LRT on real estate in several areas in North America. Some of these, as discussed in the literature review of chapter 1, include: single family residential property values near New Jersey Transit River Line (Chatman et al. (2012)); Boston, MA MBTA (Armstrong and Rodriquez (2006); Diao and Ferreira (2010); Diao (2015)); LYNX LRT in Charlotte NC (Yan et al. (2012)); and CRT in Montreal, Quebec, Canada (Dube et al. (2013)); condominiums in San Diego, CA (Duncan (2011)); Phoenix, AZ, LRT (Atkinson-Palombo (2010)) and capitalization of transit access in Baltimore, MD, for the Baltimore Central Light rail (Barry (2012)).

The fact that the *CTrail* Hartford Line has been in existence only since June 2018 is the primary reason why there is little to no research on this rail service regarding its effect on property values and other aspects of economic development. There is another reason that is closely associated with the newness of the system that explains why little research exists on this subject: many changes associated with the *CTrail* Hartford line may not yet have materialized or been fully capitalized into property values. As previously mentioned, these effects are likely to require multiple years to develop and thus any current data analysis on the subject (as of the time of writing this report) would be premature.

3.2 Data Sources Used in Previous Studies of the Impact of Commuter Rail Service on Property Values

Studies focusing on the impact of CRS, CRT and/or BRT on property values and economic development have used a variety of data sources. Renne et al. (2016) utilize a combination of Zillow® (online real estate database company) sales and the United States Department of Housing and Urban Development Location Affordability Index. Litman (2018) notes that other studies have also used Zillow® rental index and Zillow® home value index. Perk and Catala (2009), Duncan (2011) and Cervero and Duncan (2001) analyze MetroScan® data (a comprehensive database of residential, commercial, industrial and vacant properties). Dubé et al (2011) and Chatman et al (2012) use data from the Multiple Listing Service (MLS.com ®). Many studies use data from the US Census (years 1990, 2000, or 2010) in combination with other sources, such as TRW REDI property data (Bowes and Ihlanfeldt (2001)), data

from local state government agencies, New Jersey Treasury, New Jersey DOT and NJ Labor (Noland et al. (2012)), the Warren Group (New England real estate and financial) data in conjunction with MassGIS (Diao and Ferreira (2010)), or Regional Planning Council and local real estate sales and property roles (Florida DOT (2016); Garrett (2004)). Others, such as McMillen andMcDonald (2004), also rely on a multitude of local sources of property value and sales data, such as the Illinois Department of Revenue and Cook County, IL. Finally, a number of studies make use of the US Census Bureau's American Community Survey (ACS), which is updated more frequently than the US Census (Barry (2012); EPA (2014)). There are a few studies, however, that do not clearly state the local sources that they use in their research (Perdomo (2011); Deng et al. (2016); Calvo (2017)).

In the present study, a variety of data is collected mainly from governmental sources and a few private entities if the data are not available from a government agency (e.g., a very limited set of publicly available information from Zillow ® for use in the absorption rate calculations). The data sources that are used in this study include: municipal assessor offices (for assessment data and property sales data, for example); municipal economic development agencies and municipal planning and zoning commission meeting minutes (for proposed and planned development data); municipal planning departments, Capitol Region Council of Governments (CRCOG) and Southern Connecticut Regional Council of Governments (SCROG), for the parcels data; Connecticut Department of Transportation (CTDOT); United States Department of Transportation (USDOT); Lincoln Institute of Land Policy and Federal Housing Finance Authority (FHFA) (for price index information that was used to "deflate" property values); Connecticut Housing Finance Authority (CHFA) and Connecticut Department of Economic and Community Development (DECD) (for numbers of "assisted units"); United States Environmental Protection Agency (EPA); Connecticut Department of Energy and Environmental Protection (DEEP) (for data on brownfield locations and remediated brownfields); and, the United States Postal Service (USPS), United States Census Bureau, and Zillow ® (for data used in vacancies and absorption rate analyses).

Below is a brief description of the data. Any calculations that are made to derive the data are outlined if any alterations were made to the original sources. Simultaneously, figures and tables are presented to illustrate the data that have been collected to depict the baseline conditions in the 11 towns where the existing and proposed Connecticut train stations are located. These figures and tables are also used to illustrate how these characteristics could possibly be documented and analyzed over time when comparing figures for Parts 1 and 2 of this Phase 1 of the project. Changes within ¾ mile from the stations are focused on in this report because the areas closest to the stations are expected to be affected more than those located further from the stations. However, in some circumstances (e.g., changes in affordable housing), municipal-level data is the only level of aggregation that is available.

The full set of figures for periods 1 and 2 for all Hartford Line train stations comprise approximately 1,000 maps.[5] Consequently, some of the figures and tables that focus on the ¾ mile radius around Meriden station are presented in this report. The full set of maps for all stations are in the geospatial database. The Meriden station is of particular interest for several reasons. First, with its central location within CT, Meriden residents near this station have much to gain in terms of travel time savings in traveling to both downtown Hartford and downtown New Haven, both of which are key employment destinations in the region. Second, Meriden is a focus of an interagency work group that was formed in 2012 to encourage TOD, so Meriden is of particular interest in terms of examining the potential effects of these earlier efforts. Finally, providing a full set of local maps and figures covering all (existing and proposed) Hartford Line stations is impractical due to size limitations of this report. The other supplemental figures and tables for all 11 municipalities are included in the geospatial database available from CTDOT.

The locations of the Hartford Line stations (Figure 1) are obtained from the Hartford Line website, and were supplemented by information on proposed stations from CT DOT. Measures of proximity to these stations were based on the aforementioned latitude and longitude of these stations and the use of the "osrmtime" tool (Huber and Rust (2016)).

Data pertaining to property values, sales price and square footage are also collected from the municipal assessors. The assessment data illustrates a wide range of values and sizes of residential properties near the Hartford Line stations.

Estimated local property tax revenue is calculated using the assessment data and the mill rates from the assessor's office. This is calculated based on the mill rates listed by the assessor's offices themselves (see Table 2 below). There is a substantial number of properties generating a relatively high amount of tax revenue near the Meriden station.

The number of single-family properties, number of multifamily properties, number of rental properties (i.e., apartments, boarding houses and condominiums), number of commercial properties, and number of affordable housing properties (or equivalently, assisted units) are created from data provided by the municipal assessors' offices, CHFA, CRCOG and SCRCOG. As previously mentioned, municipal-level information about affordable housing is the lowest level of aggregation that could be acquired. When mapped, this property type data shows that, for example, the area surrounding the Meriden Hartford Line station consists primarily of commercial properties and multi-family homes.

[5] Before moving to the maps and tables of the results for Phase 1, a clarification should be made regarding underlying data. Property counts in maps and their corresponding tables might not match in all instances, the reason is due to map elements (such as the legend) covering properties that are included in table calculations; and in some instances the properties are close together so they may appear as one property but in fact there are multiple properties at that location. Also, some revisions to the geocoding were done after the maps were developed, so that, for instance, some properties locations were moved from the center of the street to the side of the same street, which might result in the appearance of a different location of the properties in comparison with the numbers in some of the descriptive statistics tables.

In all maps in the geospatial database that have breakdowns of the relevant variable by quintiles, the data plotted in these maps use Jenks Natural Breaks Classification method to optimize the arrangement of sets of values into "natural" classes. Also, while a ¾-mile radius from the station is the area described as being encompassed by these maps, the area covered is rectangular. The ¾-mile refers to the shortest distance from the "star" (station location) to the midpoint on each side of the square.

3.3. Deflators

Properties in small local areas, such as near a Hartford Line station, are expected to appreciate due to anticipation and implementation of rail service. But it may be the case that all properties change for other reasons during the same timeframe in the municipality or in the metropolitan area. Adjusting real estate prices by deflators is one way to adjust for these types of metro-wide price changes.

For the sales data, the actual sale date for each property is known. Therefore, quarterly deflators from the FHFA are used to adjust the sales prices of each property. For assessment data, annual deflators are used from FHFA to adjust the assessed values data. Table 1 below indicates which deflators are used for which municipalities.

Table 1. *Deflators for Hartford and New Haven (from Federal Housing Financing Authority)*

Hartford (Quarterly Deflators) for sales	
2011 (Q1)	1
2011 (Q2)	0.986594
2011 (Q3)	0.982544
2011 (Q4)	0.992299
2017 (Q1)	0.979464
2017 (Q2)	0.995665
2017 (Q3)	1.003936
2017 (Q4)	0.997832

New Haven (Quarterly Deflators) for sales	
2011 (Q1)	1
2011 (Q2)	0.979139
2011 (Q3)	0.984698
2011 (Q4)	0.989707
2017 (Q1)	0.975176
2017 (Q2)	0.979414
2017 (Q3)	0.988551
2017 (Q4)	1.000661

Annual Hartford Deflator for assessments	
2011	1
2017	0.979464

Annual New Haven Deflator for assessments	
2011	1
2017	0.975176

Stations that used Hartford Deflators
Berlin
Enfield
Hartford
Newington
West Hartford
Windsor
Windsor Locks

Stations that used New Haven Deflators
Meriden
New Haven State Street
New Haven Union
North Haven
Wallingford

3.4 Mill Rates

In Connecticut, properties are generally assessed at 70% of their market value. Then a mill rate is applied to this assessed value, in order to obtain the property tax bill for each property. The mill rate used by each municipality in each of 2011 and 2017 is listed in Table 2 below.

Table 2. *Mill rates in Connecticut Municipalities with* CTrail *Hartford Line Stations, 2011 and 2017*

Municipality	2011 mill rate	2017 mill rate
Berlin	28.77	33.93
Enfield	23.88	31.43
Hartford	74.29	74.29
Meriden	34.70	43.21
New Haven	38.88	42.98
Newington	30.02	36.59
North Haven	26.54	30.53
Wallingford	25.98	28.55
West Hartford	35.75	41.00
Windsor	27.95	32.38
Windsor Locks	24.27	26.66

3.5 Teardowns

There are some properties in some municipalities (including Meriden) that have a new construction date between 2012 and 2018, but were also in the assessors' database as an existing property in 2011. In these cases, summarized for within ¾ miles of each station in Table 4, the properties are assumed to be teardowns (buildings that were demolished and then replaced with new structures on the same lot of land). Separate maps of these teardowns, for each property class that have some teardowns between 2012-2018, are included in this report for Meriden in Figures 16 and 17 (and in the geospatial database for the other municipalities).[6]

[6] In all municipalities, the assessors were able to provide the square footage of each property as of 2017. In cases where there are teardowns between 2012 and 2018, there is no available information on the square footage of the earlier property from before the teardown.

Table 3. *Properties with Construction Date Between 2012-2018 and a different structure in same location in 2011 (Teardowns)*

Within 3/4 Miles of Station:	Residential	Condominium	Commercial
Berlin	7	13	0
Enfield	0	0	1
Hartford	0	0	1
Meriden	0	22	1
New Haven State Street	6	0	1
New Haven Union	15	0	3
Newington	0	0	0
North Haven	1	0	0
Wallingford	1	0	0
West Hartford	1	0	0
Windsor	13	0	0
Windsor Locks	2	33	0

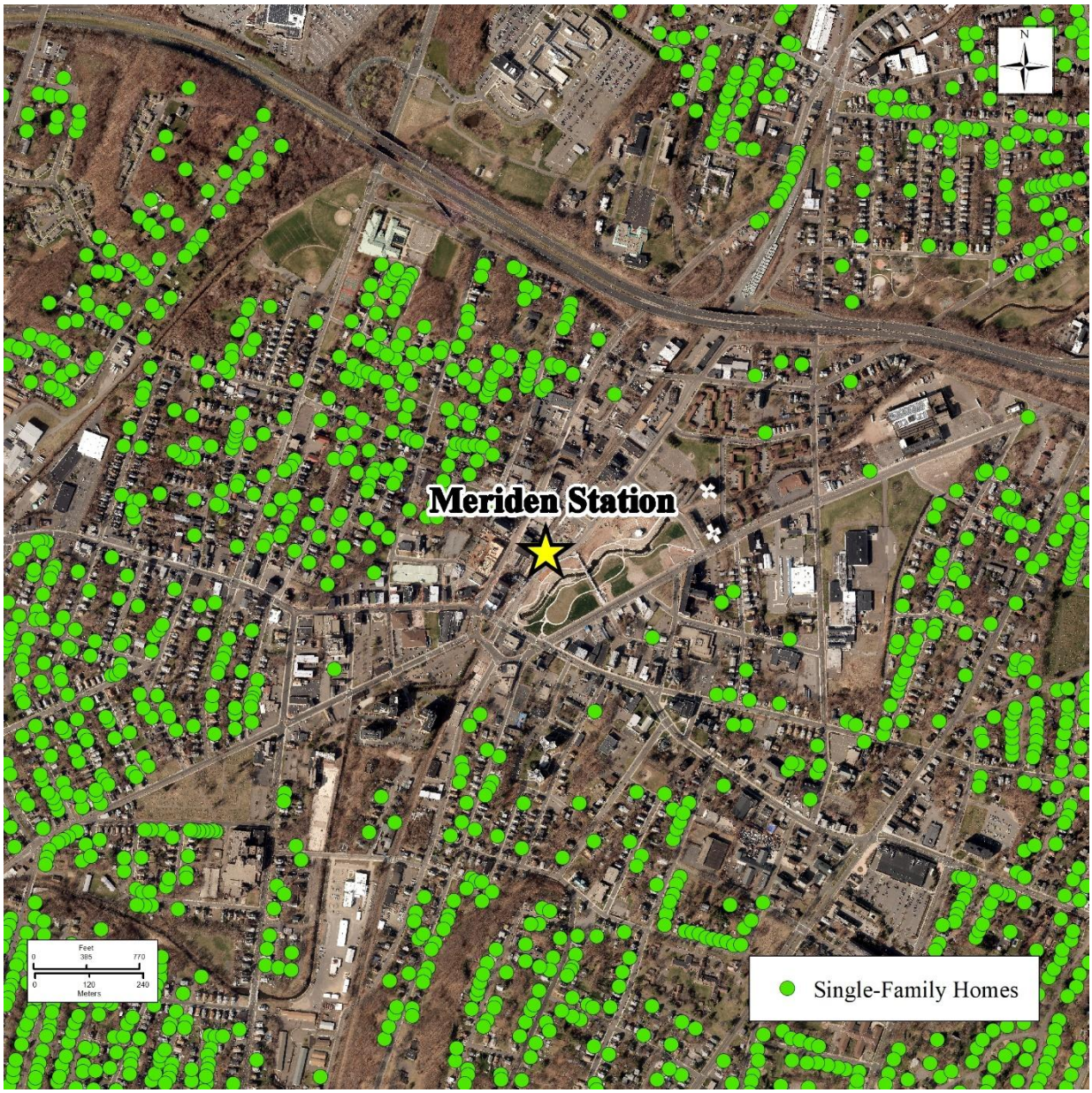

Figure 2. *Single-family homes near the Meriden CTrail station (yellow star) in 2017, superimposed on 2016 aerial photography (sources: property data from Meriden Assessor's Office and aerial photography from DEEP)*

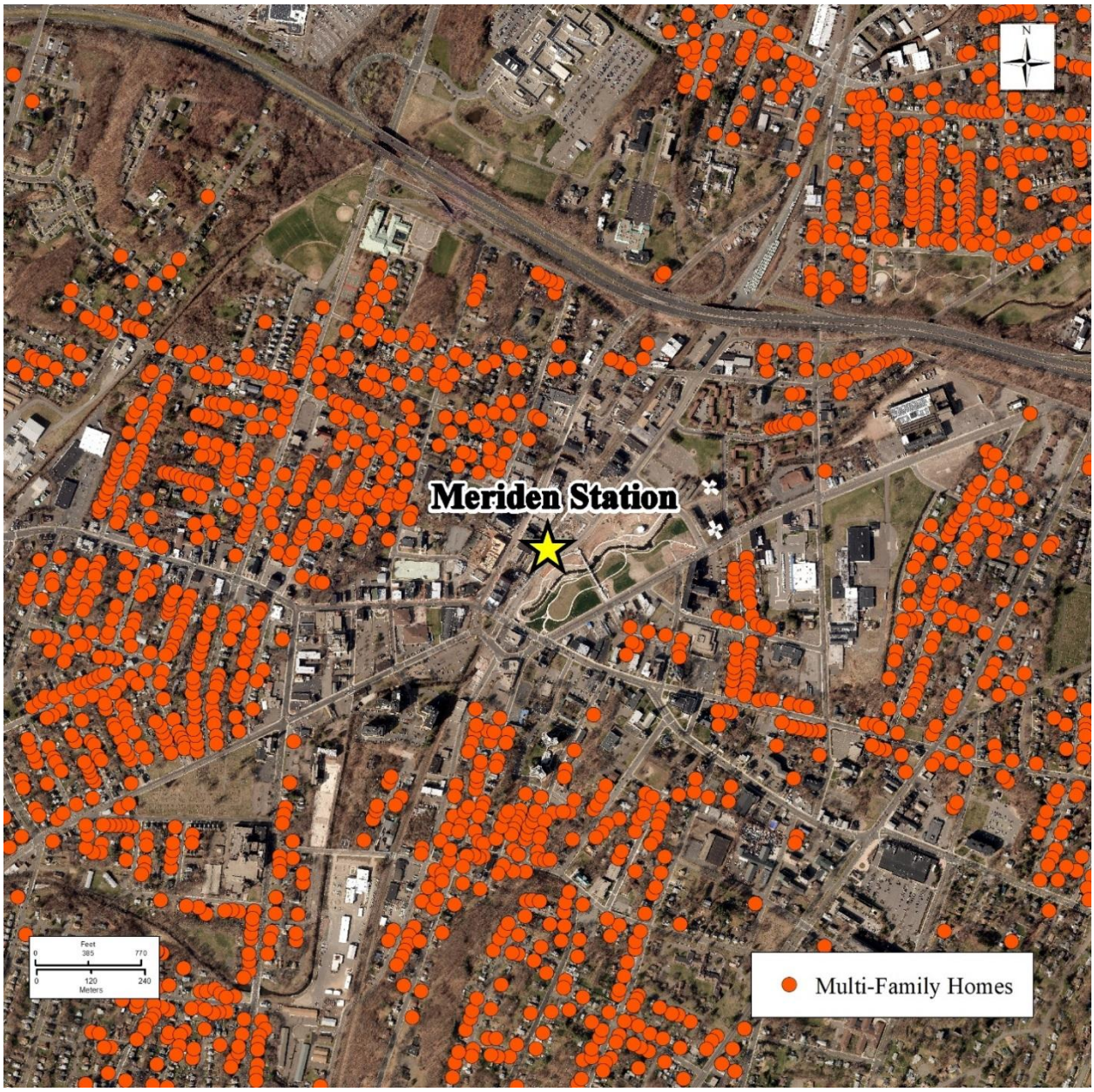

Figure 3. *Multi-family homes near the Meriden CTrail station (yellow star) in 2017, superimposed on 2016 aerial photography (sources: property data from Meriden Assessor's Office and aerial photography from DEEP)*

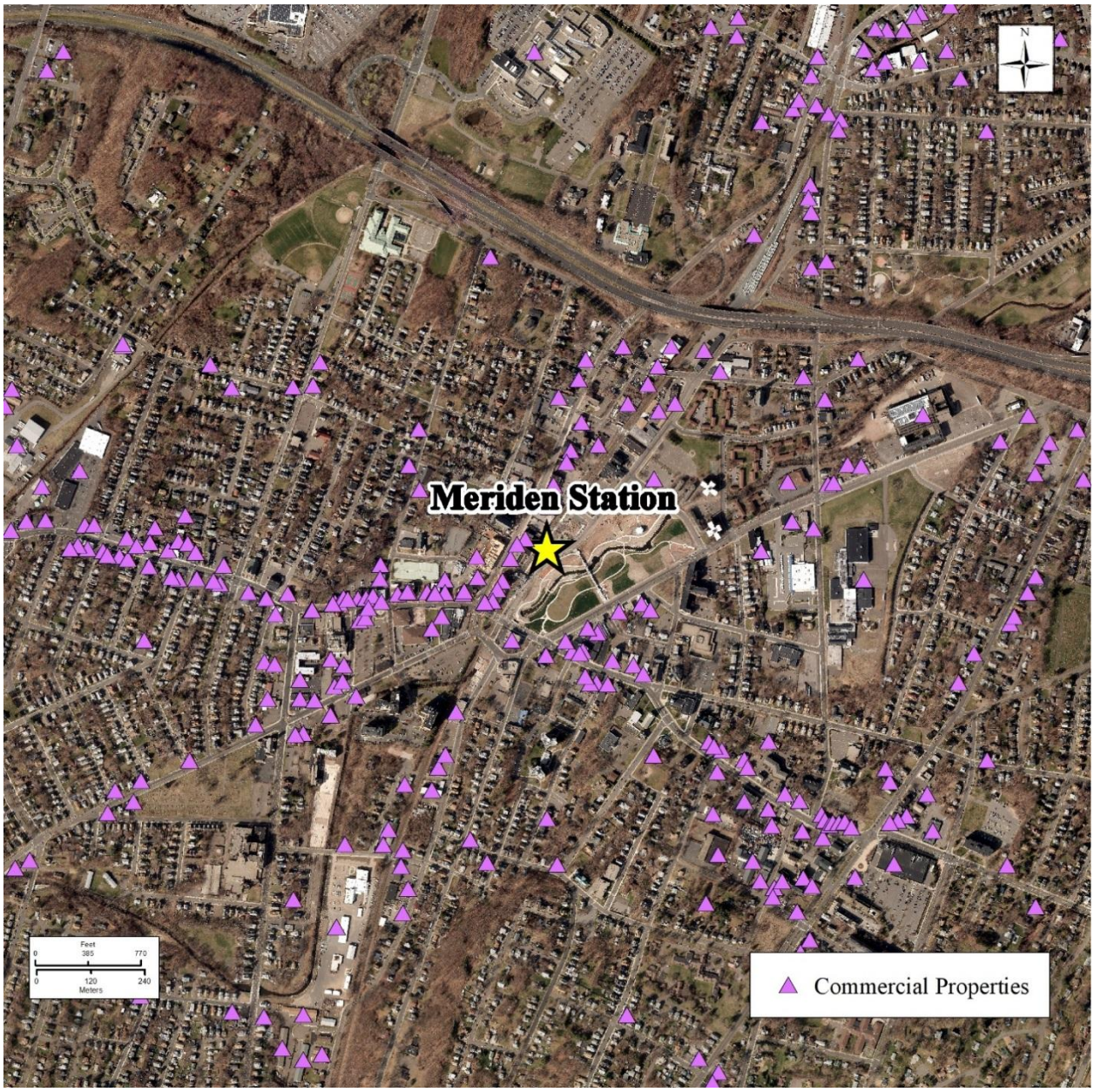

Figure 4. *Commercial properties near the Meriden CTrail station (yellow star) in 2017, superimposed on 2016 aerial photography (sources: property data from Meriden Assessor Office and aerial photography from DEEP)*

3.6 Assessed Values

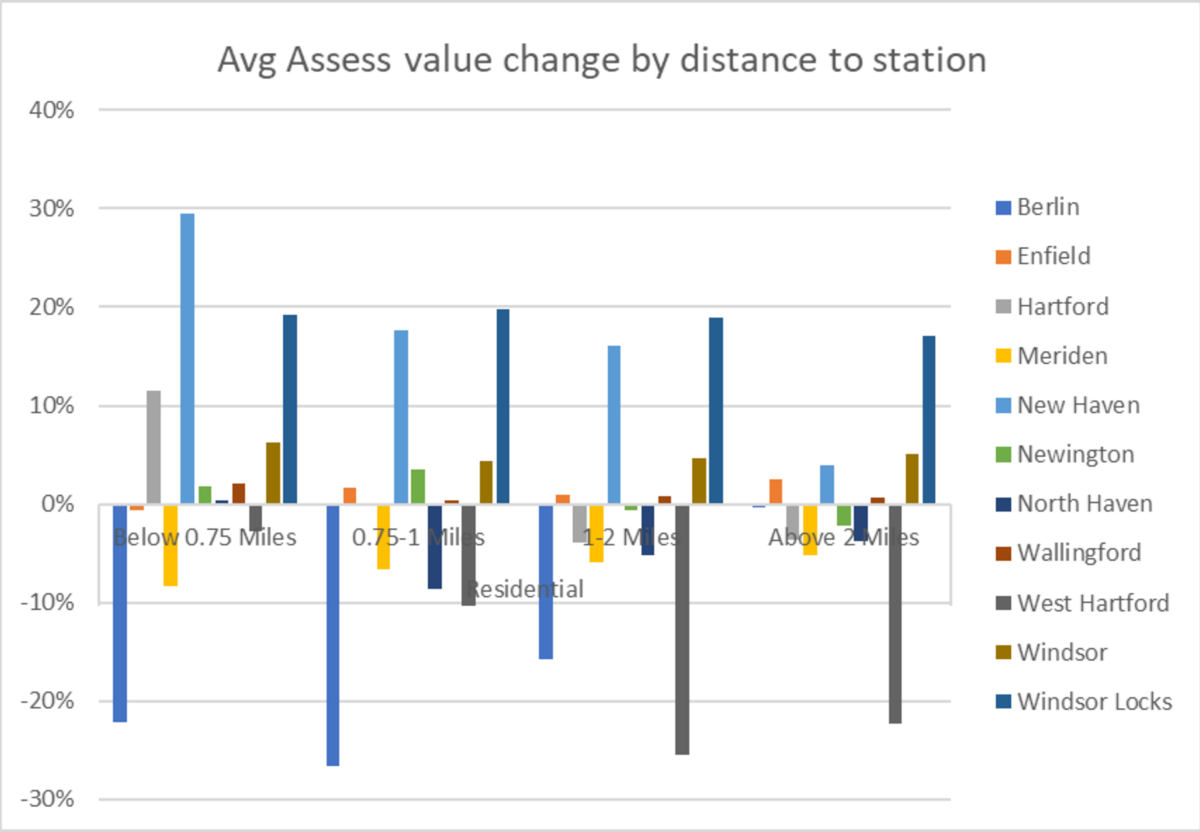

Figure 5. *Average Residential Assessed Value Change by Distance to Station (source: authors' calculations based on data from municipal assessors and GIS distance calculations)*

As shown in Figure 5 above, residential assessed values drop notably for residential properties in the ranges of 0-0.75 miles, 0.75-1 miles, and 1-2 miles from the nearest Hartford Line station, between periods 1 and 2. West Hartford and Meriden residential properties assessed values drop in all ranges of distances from the Hartford Line stations. Residential properties in North Haven drop for the ranges of 0.75-1 miles, 1-2 miles, and above 2 miles. Hartford residential assessed values rise in the range of 0-0.75 miles, but fall for properties located 1-2 miles and above 2 miles. New Haven, Windsor Locks and Wallingford residential assessed values rise for all ranges.

Below, in Table 4, are a set of descriptive statistics tables for residential assessed values, broken out by various radii from each of the existing and planned stations.

Table 4. *Descriptive statistics of assessed values of residential properties (Period 1 - 2011 or 2012 values)*

CTrail Station		1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius	2 mile radius
Enfield	**n =**	88	479	950	1,599	3,795
	Avg.	309,767	148,472	130,963	126,410	125,662
	Med.	118,625	113,320	112,490	110,850	114,450
	S.D.	1,744,951	748,954	536,575	439,737	308,003
	Min	4,000	2,670	840	370	320
	Max	16,482,760	16,482,760	16,482,760	16,482,760	16,482,760
Windsor Locks	**n =**	6	192	553	851	3,447
	Avg.	84,983	133,819	139,661	142,216	141,620
	Med.	93,450	128,600	133,000	133,100	131,900
	S.D.	28,502	28,531	33,006	35,004	115,318
	Min	30,100	5,100	5,100	1,400	1,400
	Max	106,200	232,500	256,000	296,200	5,634,600
Windsor	**n =**	46	381	710	1,052	4,160
	Avg.	372,169	157,875	156,203	149,035	136,053
	Med.	128,205	125,160	124,110	125,720	126,210
	S.D.	1,576,989	549,034	510,294	419,965	248,979
	Min	700	490	490	490	280
	Max	10,830,540	10,830,540	10,830,540	10,830,540	10,830,540
Hartford Union	**n =**	12	138	865	1,905	8,948
	Avg.	2,091,954	508,324	271,210	249,495	230,023
	Med.	1,199,300	177,800	169,100	168,500	165,000
	S.D.	2,722,719	1,234,867	633,578	536,513	482,650
	Min	240,400	1,100	800	800	800
	Max	10,088,400	10,088,400	10,088,400	10,088,400	24,861,300
West Hartford	**n =**	117	509	1,622	3,681	15,890
	Avg.	169,543	150,547	151,821	157,671	233,401
	Med.	133,490	132,860	130,445	136,290	158,270
	S.D.	130,804	104,056	274,814	253,841	1,116,372
	Min	770	770	770	770	700
	Max	955,850	1,431,500	7,294,980	7,294,980	28,927,010
Newington	**n =**	16	300	533	981	6,521
	Avg.	185,346	153,814	151,236	152,409	151,620
	Med.	161,635	142,275	139,870	138,610	140,350
	S.D.	55,187	39,069	39,145	180,955	134,339
	Min	121,230	99,720	98,150	57,830	29,540
	Max	269,600	361,910	361,910	5,664,960	5,664,960
Berlin	**n =**	65	394	1,002	1,554	4,736
	Avg.	408,526	241,280	222,977	211,491	222,200
	Med.	176,800	157,950	161,000	163,300	168,400
	S.D.	714,302	437,963	395,560	329,485	1,165,915
	Min	73,400	2,396	2,396	2,396	1,300
	Max	4,673,600	4,673,600	5,444,000	5,444,000	76,577,100
Meriden	**n =**	178	921	2,188	3,926	10,564
	Avg.	70,859	86,475	93,410	100,160	112,067
	Med.	75,800	88,830	94,210	98,980	107,590
	S.D.	40,705	30,296	28,292	29,648	53,302
	Min	2,940	1,820	1,820	1,820	1,400
	Max	182,070	215,110	240,380	382,060	3,816,400
Wallingford	**n =**	206	740	1,521	2,341	6,726
	Avg.	144,833	153,304	158,357	161,895	173,101
	Med.	144,300	146,000	150,100	152,800	162,200

	S.D.	23,368	36,323	40,270	41,312	49,434
	Min	83,200	82,200	61,900	61,900	47,300
	Max	244,400	422,600	422,600	422,600	956,400
North Haven	**n =**	6	97	409	1,117	4,399
	Avg.	195,813	219,582	260,828	247,612	215,803
	Med.	182,280	211,960	224,000	207,130	193,480
	S.D.	42,026	45,643	432,885	511,363	269,038
	Min	153,230	980	980	980	420
	Max	268,730	340,550	8,881,600	13,890,660	13,890,660
New Haven State Street	**n =**	115	349	743	2,019	11,822
	Avg.	453,630	449,852	430,379	279,036	165,637
	Med.	245,000	217,560	234,360	150,360	91,140
	S.D.	1,095,309	1,353,658	1,300,095	841,944	426,036
	Min	1,680	1,610	210	210	210
	Max	9,995,720	13,635,440	15,172,570	15,172,570	15,172,570
New Haven Union	**n =**	78	421	1,469	2,563	8,878
	Avg.	210,883	140,176	140,729	155,947	165,729
	Med.	61,040	66,570	67,970	69,090	89,740
	S.D.	577,040	451,190	578,071	704,617	453,197
	Min	210	210	210	210	210
	Max	3,902,220	5,986,820	13,871,970	15,172,570	15,172,570

(source: authors' calculations based on data from municipal assessors and GIS distance calculations)

Table 5. *Descriptive statistics of assessed values of residential properties (Period 2 - 2017 or 2018 values)*

CTrail Station		1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius	2 mile radius
Enfield	**n =**	88	480	951	1,600	3,796
	Avg.	322,013	148,730	130,064	126,654	126,445
	Med.	112,665	110,300	110,250	110,300	114,325
	S.D.	1,890,004	810,195	580,747	475,157	331,020
	Min	3,190	2,670	840	370	320
	Max	17,840,230	17,840,230	17,840,230	17,840,230	17,840,230
Windsor Locks	**n =**	7	200	574	875	3,528
	Avg.	124,129	158,273	164,653	168,349	165,209
	Med.	121,700	154,150	157,250	158,000	155,000
	S.D.	37,594	35,638	43,312	44,772	125,470
	Min	52,500	1,200	200	200	200
	Max	163,200	264,600	390,100	390,100	5,951,400
Windsor	**n =**	46	381	710	1,052	4,160
	Avg.	412,210	170,200	165,871	157,492	142,813
	Med.	143,640	132,370	131,180	132,370	133,000
	S.D.	1,771,652	616,874	552,017	454,254	268,213
	Min	700	490	490	490	280
	Max	12,161,100	12,161,100	12,161,100	12,161,100	12,161,100
Hartford Union	**n =**	13	139	868	1,912	8,956
	Avg.	2,790,893	666,390	318,533	275,833	229,809
	Med.	2,000,405	172,800	163,200	161,450	162,900
	S.D.	3,548,639	1,691,760	959,198	768,970	539,757
	Min	217,500	2,400	800	800	800
	Max	13,690,600	13,690,600	16,083,000	16,083,000	27,177,000
West Hartford	**n =**	115	504	1,618	3,675	15,897
	Avg.	152,502	141,000	148,285	149,630	199,957
	Med.	119,630	121,450	123,200	128,600	154,500
	S.D.	126,951	124,034	344,520	273,493	394,373
	Min	560	560	560	560	190
	Max	979,650	2,055,300	9,201,080	9,201,080	27,177,000
Newington	**n =**	20	316	564	1,027	6,752
	Avg.	168,421	153,907	154,689	156,918	150,884
	Med.	158,675	144,220	141,985	140,700	141,060
	S.D.	71,530	45,669	90,492	215,544	148,176
	Min	1,310	370	370	370	370
	Max	257,720	324,420	1,756,650	6,144,600	6,144,600
Berlin	**n =**	65	394	1,035	1,594	4,840
	Avg.	147,809	152,604	154,773	160,695	179,153
	Med.	140,200	147,850	149,500	156,050	168,000
	S.D.	37,077	35,414	33,143	34,471	86,723
	Min	92,200	85,900	81,600	81,600	130
	Max	326,100	370,200	370,200	376,200	3,698,200
Meriden	**n =**	178	922	2,191	3,929	10,569
	Avg.	63,245	78,932	85,424	92,536	104,464
	Med.	64,505	80,885	86,380	92,050	100,800
	S.D.	35,127	28,506	26,923	28,779	35,677
	Min	3,430	1,820	1,820	1,820	1,120
	Max	175,140	206,150	206,150	350,350	1,192,190
Wallingford	**n =**	206	744	1,529	2,353	6,788
	Avg.	148,450	156,344	161,611	164,241	174,782
	Med.	145,800	147,050	151,800	154,500	163,000

	S.D.	25,880	38,356	42,945	44,100	51,465
	Min	89,800	78,700	53,200	53,200	53,200
	Max	283,100	382,700	410,200	725,500	920,700
North Haven	**n =**	7	106	473	4,664	4,664
	Avg.	136,560	238,575	261,843	206,066	206,066
	Med.	146,790	198,135	206,290	181,580	181,580
	S.D.	62,470	421,915	566,520	313,585	313,585
	Min	5,180	630	630	210	210
	Max	210,000	4,513,530	9,412,130	15,940,470	15,940,470
New Haven State Street	**n =**	115	349	744	11,845	11,845
	Avg.	488,640	618,637	557,130	196,942	196,942
	Med.	282,030	253,470	272,895	112,560	112,560
	S.D.	1,107,682	2,029,782	1,777,620	589,028	589,028
	Min	1,260	1,260	350	140	140
	Max	10,288,600	18,727,800	19,315,450	22,373,330	22,373,330
New Haven Union	**n =**	79	424	1,473	8,899	8,899
	Avg.	179,106	160,226	186,128	201,605	201,605
	Med.	75,390	87,290	88,200	111,510	111,510
	S.D.	474,082	485,464	844,648	648,937	648,937
	Min	350	350	140	140	140
	Max	4,009,670	5,905,410	18,727,800	22,373,330	22,373,330

(source: authors' calculations based on data from municipal assessors and GIS distance calculations)

Condominiums

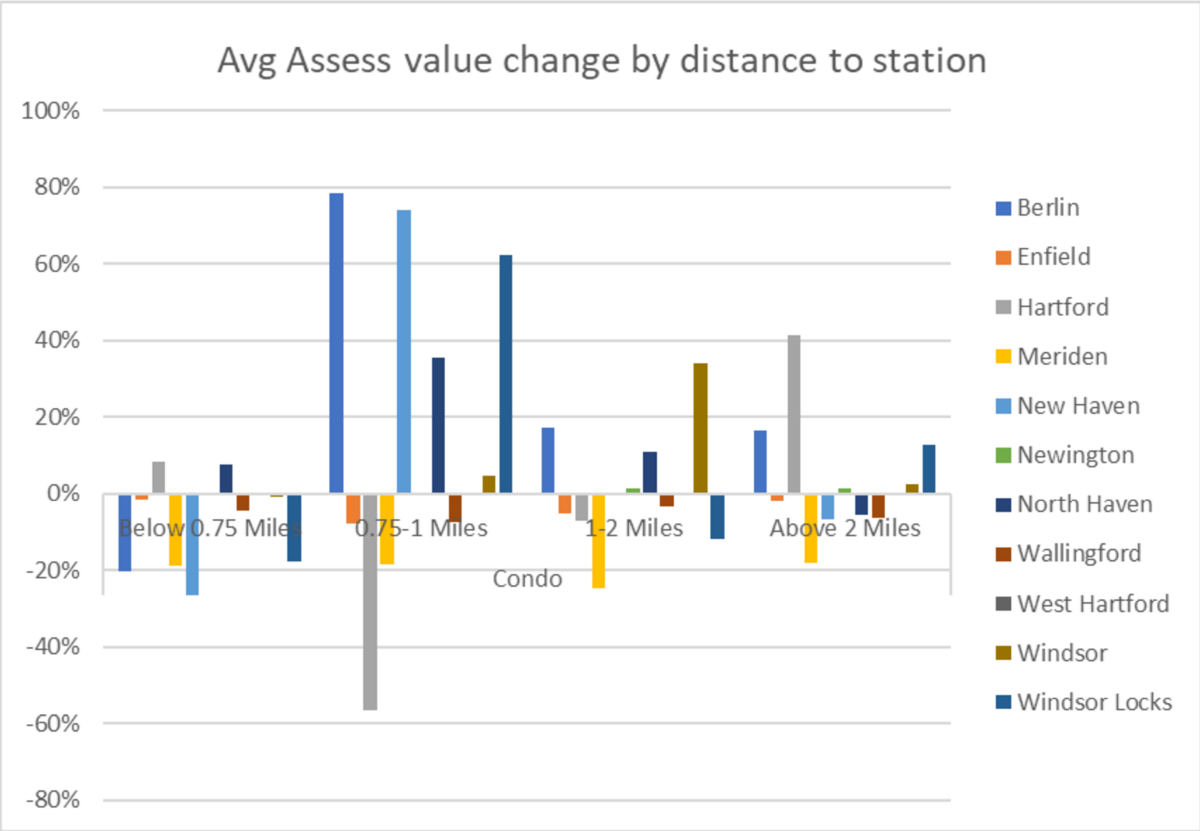

Figure 6. ***Average Condo Assessed Value Change by Distance to Station (source: authors' calculations based on data from municipal assessors and GIS distance calculations)***

Average assessed values for condos within 0.75 miles from the nearest station fall in all municipalities between Periods 1 and 2, except for Hartford and North Haven. Between 0.75 miles and 1 mile, Berlin, New Haven, North Haven, and Windsor Locks all experience substantial rises in condo assessed values between the two periods, while Windsor experiences a small rise in this range. The remaining municipalities see either negative changes in assessed values or no change between Periods 1 and 2.

Below in Tables 6 (Period 1) and 7 (Period 2) are a set of descriptive statistics tables for condo assessed values, broken out by various radii from each of the existing and planned stations.

Table 6. *Descriptive statistics of assessed values of condominiums (Period 1 - 2011 or 2012 values)*

CTrail Station		1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius	2 mile radius
Enfield	**n =**	12	23	23	40	233
	Avg.	68,526	66,213	66,213	78,779	110,061
	Med.	62,720	55,030	55,030	76,345	121,070
	S.D.	21,219	21,684	21,684	22,114	30,406
	Min	55,030	51,350	51,350	51,350	51,350
	Max	129,120	130,390	130,390	130,390	174,520
Windsor Locks	**n =**	-	56	86	183	598
	Avg.	N/A	126,045	125,107	93,599	111,846
	Med.	N/A	124,000	123,600	113,800	113,650
	S.D.	N/A	10,925	10,996	47,665	48,550
	Min	N/A	100,100	100,100	12,300	12,300
	Max	N/A	155,700	155,700	155,700	252,980
Windsor	**n =**	52	66	66	84	723
	Avg.	142,196	128,488	128,488	128,700	60,495
	Med.	132,475	130,935	130,935	130,900	40,600
	S.D.	27,478	48,378	48,378	42,899	40,656
	Min	43,540	42,210	42,210	42,210	14,630
	Max	231,000	276,150	276,150	276,150	276,150
Hartford Union	**n =**	65	839	1,448	1,910	3,518
	Avg.	102,228	96,971	82,912	98,799	91,600
	Med.	72,930	55,900	36,100	38,200	54,000
	S.D.	183,350	318,690	246,193	272,395	208,459
	Min	39,200	18,400	7,100	7,100	3,200
	Max	1,541,000	7,352,400	7,352,400	7,352,400	7,352,400
West Hartford	**n =**	-	31	62	68	807
	Avg.	N/A	19,174	19,179	22,924	82,396
	Med.	N/A	18,700	18,900	19,400	59,070
	S.D.	N/A	2,795	2,524	12,370	150,653
	Min	N/A	13,500	13,000	13,000	7,100
	Max	N/A	25,500	25,500	64,500	887,600
Newington	**n =**	-	-	-	-	1,053
	Avg.	N/A	N/A	N/A	N/A	118,890
	Med.	N/A	N/A	N/A	N/A	111,420
	S.D.	N/A	N/A	N/A	N/A	58,252
	Min	N/A	N/A	N/A	N/A	35,000
	Max	N/A	N/A	N/A	N/A	1,133,944
Berlin	**n =**	8	235	331	339	405
	Avg.	103,288	126,178	159,056	159,551	168,986
	Med.	77,000	109,800	116,300	116,300	117,700
	S.D.	56,418	219,213	411,032	406,183	391,246
	Min	71,300	19,600	19,600	19,600	19,600
	Max	230,600	3,300,300	6,679,600	6,679,600	6,679,600
Meriden	**n =**	60	755	839	915	1,719
	Avg.	45,037	65,948	63,545	64,183	68,373
	Med.	28,350	70,630	63,280	66,850	70,770
	S.D.	30,215	62,404	60,339	57,935	45,656
	Min	19,960	18,690	18,690	18,690	18,690
	Max	150,920	1,464,890	1,464,890	1,464,890	1,464,890
Wallingford	**n =**	4	61	402	524	2,121
	Avg.	44,250	113,580	80,554	83,867	106,369
	Med.	44,250	126,900	72,850	73,200	106,400

	S.D.	8,949	46,256	47,270	49,677	57,351
	Min	36,500	4,300	3,600	3,600	3,600
	Max	52,000	208,900	650,800	650,800	650,800
North Haven	**n =**	20	27	129	224	372
	Avg.	162,617	168,321	133,428	126,032	139,822
	Med.	147,140	154,280	153,650	140,595	147,980
	S.D.	78,082	67,860	65,401	63,822	57,544
	Min	97,790	97,790	18,690	11,970	11,970
	Max	476,910	476,910	476,910	476,910	476,910
New Haven State Street	**n =**	294	577	642	799	2,111
	Avg.	621,924	495,690	459,415	398,193	211,112
	Med.	155,400	167,650	161,945	150,920	103,320
	S.D.	6,650,855	4,784,635	4,536,893	4,070,060	2,507,878
	Min	61,390	26,390	26,390	21,770	16,100
	Max	113,457,120	113,457,120	113,457,120	113,457,120	113,457,120
New Haven Union	**n =**	1	75	458	598	1,786
	Avg.	40,110	153,279	479,618	452,548	227,699
	Med.	40,110	137,900	132,755	138,383	102,375
	S.D.	-	82,317	5,361,034	4,701,152	2,726,135
	Min	40,110	21,770	21,770	21,770	16,100
	Max	40,110	359,310	113,457,120	113,457,120	113,457,120

Notes: "N/A" values indicate there were no properties in that range in this period. *(source: authors' calculations based on data from municipal assessors and GIS distance calculations)*

Table 7. *Descriptive statistics of assessed values of condominiums (Period 2 - 2017 or 2018 values)*

CTrail Station		1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius	2 mile radius
Enfield	**n =**	12	23	23	40	233
	Avg.	67,660	65,113	65,113	75,018	104,359
	Med.	60,575	53,160	53,160	73,750	112,400
	S.D.	25,170	24,617	24,617	21,957	34,027
	Min	53,160	49,560	49,560	49,560	49,560
	Max	142,340	142,340	142,340	142,340	168,290
Windsor Locks	**n =**	-	56	86	176	656
	Avg.	N/A	104,725	102,914	109,556	110,117
	Med.	N/A	106,550	104,200	99,550	98,550
	S.D.	N/A	12,859	12,405	30,658	42,630
	Min	N/A	76,700	76,700	30,700	30,000
	Max	N/A	139,000	139,000	177,300	225,890
Windsor	**n =**	52	66	66	84	723
	Avg.	135,465	127,308	127,308	129,073	84,143
	Med.	127,435	119,280	119,280	128,835	85,330
	S.D.	29,482	48,915	48,915	43,533	33,596
	Min	43,540	43,540	43,540	43,540	23,380
	Max	234,710	315,700	315,700	315,700	315,700
Hartford Union	**n =**	65	850	1,636	2,518	4,942
	Avg.	136,677	117,344	89,331	82,457	81,851
	Med.	118,400	41,500	43,800	39,300	41,900
	S.D.	130,553	687,654	497,418	419,250	308,439
	Min	19,800	12,000	4,600	4,600	3,200
	Max	901,500	16,304,300	16,304,300	16,304,300	16,304,300
West Hartford	**n =**	-	38	263	734	3,274
	Avg.	N/A	631,116	138,114	93,649	95,876
	Med.	N/A	24,300	47,180	41,580	49,580
	S.D.	N/A	2,296,071	887,031	533,898	487,440
	Min	N/A	15,800	4,900	4,900	2,450
	Max	N/A	10,920,490	10,920,490	10,920,490	22,959,930
Newington	**n =**	-	-	-	-	1,053
	Avg.	N/A	N/A	N/A	N/A	120,591
	Med.	N/A	N/A	N/A	N/A	100,110
	S.D.	N/A	N/A	N/A	N/A	65,050
	Min	N/A	N/A	N/A	N/A	35,000
	Max	N/A	N/A	N/A	N/A	1,173,720
Berlin	**n =**	8	228	351	359	428
	Avg.	86,800	93,851	104,078	107,418	121,608
	Med.	86,800	92,300	111,500	111,800	111,900
	S.D.	3,250	35,186	36,022	43,102	59,341
	Min	82,500	22,000	22,000	22,000	22,000
	Max	91,100	294,000	294,000	367,900	398,600
Meriden	**n =**	60	756	840	916	1,721
	Avg.	37,318	53,127	51,494	52,035	53,424
	Med.	26,180	53,340	50,400	52,290	53,480
	S.D.	22,136	54,997	52,827	50,729	40,077
	Min	20,230	15,400	15,400	15,400	15,400
	Max	116,060	1,323,630	1,323,630	1,323,630	1,323,630
Wallingford	**n =**	4	60	403	525	2,128
	Avg.	47,450	107,485	76,963	79,460	102,303
	Med.	47,450	117,150	68,200	68,500	102,100

	S.D.	9,642	42,530	45,920	47,084	54,008
	Min	39,100	6,000	5,700	5,700	5,700
	Max	55,800	194,400	620,600	620,600	620,600
North Haven	**n =**	-	-	7	9	13
	Avg.	N/A	N/A	143,630	146,658	156,337
	Med.	N/A	N/A	141,470	141,470	164,920
	S.D.	N/A	N/A	52,985	49,227	50,827
	Min	N/A	N/A	72,590	72,590	72,590
	Max	N/A	N/A	226,240	226,240	255,150
New Haven State Street	**n =**	294	585	650	811	2,145
	Avg.	343,108	354,349	331,912	315,780	179,585
	Med.	146,965	164,640	156,730	138,950	100,660
	S.D.	2,791,440	2,089,267	1,983,123	1,849,215	1,142,932
	Min	50,400	26,740	26,740	21,000	15,330
	Max	47,799,986	47,799,986	47,799,986	47,799,986	47,799,986
New Haven Union	**n =**	1	75	458	602	1,820
	Avg.	42,070	141,400	305,446	344,158	190,752
	Med.	42,070	124,600	117,460	124,950	99,330
	S.D.	-	76,007	2,332,479	2,139,081	1,240,129
	Min	42,070	21,000	21,000	21,000	15,330
	Max	42,070	391,300	47,799,986	47,799,986	47,799,986

Notes: "N/A" values indicate there were no properties in that range in this period. *(source: authors' calculations based on data from municipal assessors and GIS distance calculations)*

Commercial Property Assessed Values

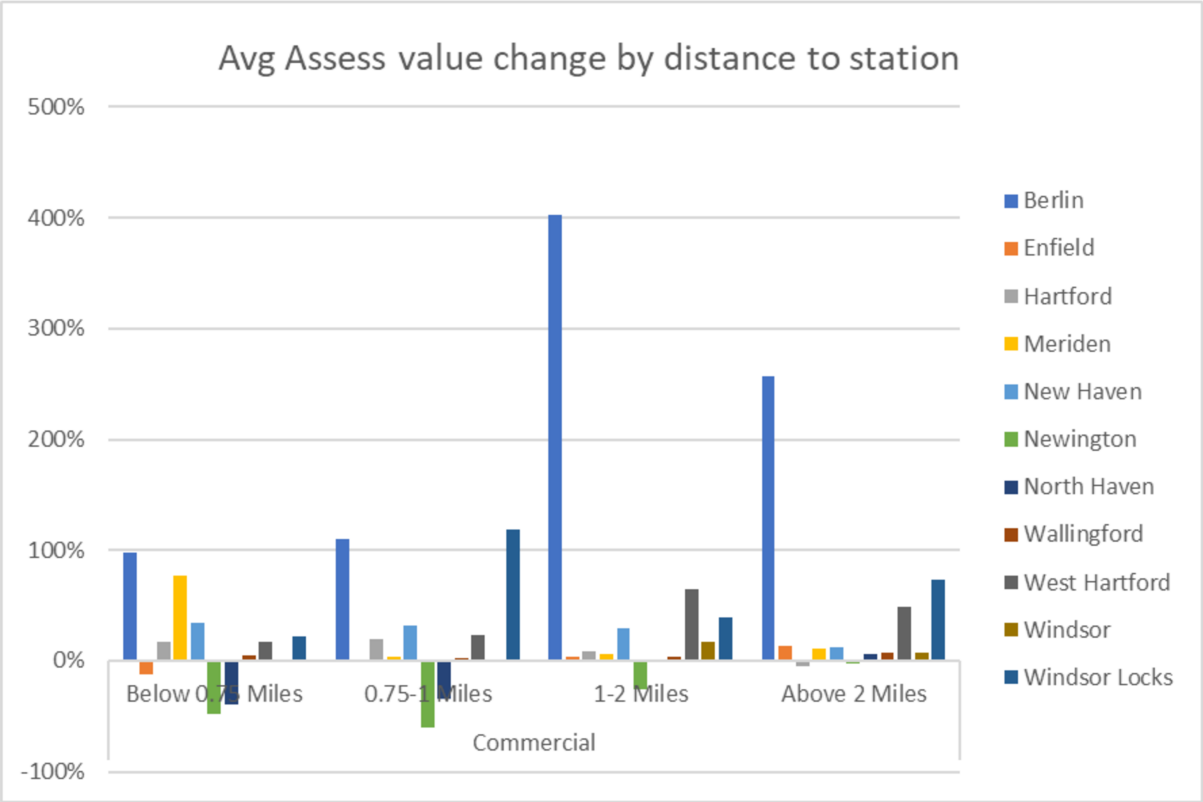

Figure 7. *Average Commercial Property Assessed Value Change by Distance to Station (source: authors' calculations based on data from municipal assessors and GIS distance calculations)*

Berlin commercial properties experience a substantial increase in average assessed values in all distance ranges, but particularly so in the range of 1-2 miles from the station, between Periods 1 and 2. In the closest range (0-0.75 miles from the nearest station), Enfield, Newington and North Haven experience decreases in average commercial assessed values. Newington and North Haven also see decreases (on average) in the 0.75-1 miles range. In the 1-2 miles range, all municipalities (except for Newington and North Haven) experience increases in average assessed values, while all municipalities (except for Hartford and Newington) see rises in average assessed values above 2 miles from the nearest station.

Below, in Tables 8 (Period 1) and 9 (Period 2), are a set of descriptive statistics tables for commercial property assessed values, broken out by various radii from each of the existing and planned stations.

Table 8. *Descriptive statistics of assessed values of commercial properties (Period 1 - 2011 or 2012 values)*

CTrail Station		1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius	2 mile radius
Enfield	**n =**	18	61	101	127	289
	Avg.	439,595	343,598	468,659	460,857	1,508,296
	Med.	132,810	151,450	182,400	184,960	327,050
	S.D.	917,001	700,944	766,665	726,644	4,025,819
	Min	2,940	2,940	2,940	2,940	2,940
	Max	3,885,530	3,885,530	3,885,530	3,885,530	34,333,610
Windsor Locks	**n =**	3	11	30	42	132
	Avg.	4,267	179,045	313,524	401,728	910,792
	Med.	5,000	127,100	247,250	253,900	282,120
	S.D.	3,656	175,927	360,152	496,583	1,851,455
	Min	300	300	300	300	300
	Max	7,500	588,900	1,799,300	2,310,000	10,720,570
Windsor	**n =**	42	74	89	96	162
	Avg.	349,942	280,162	277,817	283,814	812,175
	Med.	252,875	221,235	222,810	225,540	283,570
	S.D.	297,604	252,492	247,433	248,618	1,667,231
	Min	6,650	140	140	140	140
	Max	1,253,000	1,253,000	1,253,000	1,253,000	13,196,890
Hartford Union	**n =**	60	206	421	618	1,386
	Avg.	1,204,783	2,720,933	2,410,222	1,834,783	1,168,630
	Med.	516,300	413,050	278,100	254,050	254,050
	S.D.	2,124,226	9,969,486	9,686,884	8,144,521	5,537,219
	Min	42,700	5,000	3,100	1,500	1,000
	Max	12,798,200	87,193,000	87,935,700	87,935,700	87,935,700
West Hartford	**n =**	70	246	452	624	1,719
	Avg.	747,730	1,012,142	933,301	1,115,113	1,471,957
	Med.	314,405	344,435	327,810	372,575	361,900
	S.D.	1,703,690	1,629,694	1,502,747	1,983,956	4,002,960
	Min	800	800	500	500	500
	Max	10,053,300	10,053,300	10,053,300	13,994,540	38,224,200
Newington	**n =**	8	19	37	47	199
	Avg.	1,139,587	1,593,647	1,127,825	1,171,178	776,623
	Med.	550,060	605,178	494,942	599,613	331,180
	S.D.	1,705,599	2,361,134	1,818,842	1,701,584	1,295,078
	Min	244,380	222,481	54,850	54,850	18,890
	Max	5,309,647	9,252,698	9,252,698	9,252,698	9,252,698
Berlin	**n =**	46	87	143	183	336
	Avg.	292,191	268,449	255,898	290,867	433,243
	Med.	166,550	166,900	166,600	166,500	187,350
	S.D.	374,712	361,455	321,187	470,781	1,193,651
	Min	65,900	19,600	19,600	19,600	9,100
	Max	1,860,900	2,270,200	2,270,200	4,822,700	19,268,750
Meriden	**n =**	86	241	390	534	836
	Avg.	258,954	320,852	363,603	511,691	533,526
	Med.	182,560	171,570	177,240	176,120	193,935
	S.D.	325,842	688,318	809,481	2,648,806	2,201,941
	Min	6,440	6,440	6,440	910	316
	Max	2,071,510	5,845,840	9,289,700	55,219,080	55,219,080
Wallingford	**n =**	40	185	358	423	749
	Avg.	443,250	418,842	711,454	732,596	1,116,619
	Med.	168,900	189,500	222,400	232,100	314,000

	S.D.	761,960	1,052,242	2,418,854	2,282,309	3,290,214
	Min	60,600	16,300	16,300	16,300	16,300
	Max	4,441,900	11,855,500	38,234,300	38,234,300	44,873,900
North Haven	**n =**	18	44	108	168	456
	Avg.	1,046,722	1,315,799	1,055,477	1,276,415	1,076,204
	Med.	427,105	427,105	418,180	373,030	292,705
	S.D.	1,402,153	1,981,639	1,562,150	4,305,938	3,415,111
	Min	10,710	9,100	5,320	3,500	490
	Max	5,659,360	10,636,850	10,636,850	50,472,380	50,472,380
New Haven State Street	**n =**	154	353	619	905	1,871
	Avg.	1,477,508	1,559,644	2,318,036	2,023,183	1,421,133
	Med.	392,000	422,170	396,060	338,380	245,140
	S.D.	4,462,580	4,597,391	13,041,268	11,562,884	9,956,144
	Min	19,880	19,880	910	350	350
	Max	48,183,940	55,881,210	256,388,790	256,388,790	256,388,790
New Haven Union	**n =**	21	123	397	722	1,731
	Avg.	1,352,833	1,581,775	3,273,085	2,275,509	1,510,178
	Med.	623,210	298,970	324,520	297,045	252,490
	S.D.	2,027,432	3,583,898	16,450,876	12,537,871	10,345,053
	Min	44,100	490	490	350	350
	Max	7,451,080	26,959,590	256,388,790	256,388,790	256,388,790

(source: authors' calculations based on data from municipal assessors and GIS distance calculations)

Table 9. *Descriptive statistics of assessed values of commercial properties (Period 2 - 2017 or 2018 values)*

CTrail Station		1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius	2 mile radius
Enfield	**n =**	18	62	102	129	291
	Avg.	330,038	271,526	404,688	408,063	1,524,899
	Med.	129,785	132,730	175,595	183,540	337,110
	S.D.	598,654	447,139	619,929	602,308	4,449,481
	Min	2,940	2,940	2,940	2,940	2,940
	Max	2,537,830	2,537,830	3,622,410	3,622,410	46,326,580
Windsor Locks	**n =**	3	12	30	47	147
	Avg.	7,733	236,417	388,014	594,363	1,123,773
	Med.	9,200	232,750	280,740	281,680	288,900
	S.D.	6,525	206,248	493,596	1,078,023	2,340,077
	Min	600	600	600	600	600
	Max	13,400	738,500	2,610,800	6,729,300	12,826,000
Windsor	**n =**	42	74	89	96	162
	Avg.	348,505	281,024	274,599	279,774	917,884
	Med.	229,005	205,660	203,770	205,660	265,685
	S.D.	288,349	246,699	238,170	242,014	2,070,293
	Min	6,650	140	140	140	140
	Max	1,186,640	1,186,640	1,186,640	1,186,640	13,477,170
Hartford Union	**n =**	60	206	424	622	1,393
	Avg.	1,651,677	3,213,680	2,835,850	2,175,606	1,355,100
	Med.	635,400	441,700	275,100	251,050	246,500
	S.D.	3,466,875	12,289,981	11,691,979	9,882,311	6,726,449
	Min	47,600	11,700	3,300	1,600	1,600
	Max	24,495,800	108,126,400	108,126,400	108,126,400	108,126,400
West Hartford	**n =**	77	257	469	644	1,791
	Avg.	910,265	1,249,279	1,078,821	1,302,610	2,091,335
	Med.	445,620	403,130	385,070	403,130	392,800
	S.D.	2,541,702	2,919,678	2,381,036	2,728,067	6,087,591
	Min	1,200	1,200	500	500	130
	Max	20,238,100	25,711,700	25,711,700	25,711,700	45,327,900
Newington	**n =**	9	31	79	110	420
	Avg.	753,689	947,059	603,647	576,238	517,406
	Med.	542,500	357,420	213,310	164,630	177,335
	S.D.	564,856	1,820,477	1,269,086	1,193,155	1,098,781
	Min	91,660	350	350	350	130
	Max	1,960,000	9,450,000	9,450,000	9,450,000	9,450,000
Berlin	**n =**	46	87	147	187	368
	Avg.	516,543	507,187	587,122	604,817	772,158
	Med.	236,700	241,200	241,800	296,300	324,250
	S.D.	730,644	668,579	982,502	912,674	1,667,638
	Min	86,500	86,500	45,800	45,800	420
	Max	3,360,300	3,360,300	6,999,600	6,999,600	20,163,550
Meriden	**n =**	86	243	395	539	842
	Avg.	366,694	373,629	635,366	717,883	676,529
	Med.	196,315	176,960	179,830	177,940	190,960
	S.D.	912,881	963,696	5,033,999	4,929,734	3,994,291
	Min	6,440	6,440	6,440	840	583
	Max	8,038,940	8,134,630	98,701,327	98,701,327	98,701,327
Wallingford	**n =**	41	186	357	421	748
	Avg.	489,273	428,869	741,585	761,089	1,157,235
	Med.	191,700	210,350	235,300	251,000	330,250

	S.D.	876,899	933,510	2,388,643	2,249,995	3,238,946
	Min	70,800	17,700	17,700	17,700	17,700
	Max	4,962,800	9,676,600	37,145,300	37,145,300	43,395,900
North Haven	**n =**	37	64	170	261	562
	Avg.	563,404	983,537	636,159	796,756	878,474
	Med.	183,890	287,420	202,850	183,890	212,205
	S.D.	924,888	1,798,334	1,239,782	3,400,571	3,084,107
	Min	25,900	5,460	5,320	3,990	630
	Max	4,846,380	10,854,620	10,854,620	49,406,560	49,406,560
New Haven State Street	**n =**	156	360	628	917	1,892
	Avg.	1,349,773	1,568,623	3,032,260	2,658,900	1,856,201
	Med.	410,235	461,650	429,240	373,940	272,125
	S.D.	3,221,580	4,507,992	21,622,024	19,047,944	15,530,024
	Min	21,140	21,140	1,050	770	420
	Max	30,992,640	65,666,440	465,881,990	465,881,990	465,881,990
New Haven Union	**n =**	21	125	405	733	1,752
	Avg.	1,292,403	1,656,835	4,571,752	2,999,710	1,972,349
	Med.	457,310	332,920	381,080	330,120	283,500
	S.D.	2,250,816	3,911,457	27,467,775	20,642,348	16,130,410
	Min	48,300	1,050	1,050	420	420
	Max	7,941,920	25,909,030	465,881,990	465,881,990	465,881,990

(source: authors' calculations based on data from municipal assessors and GIS distance calculations)

3.7 Property Tax Revenue

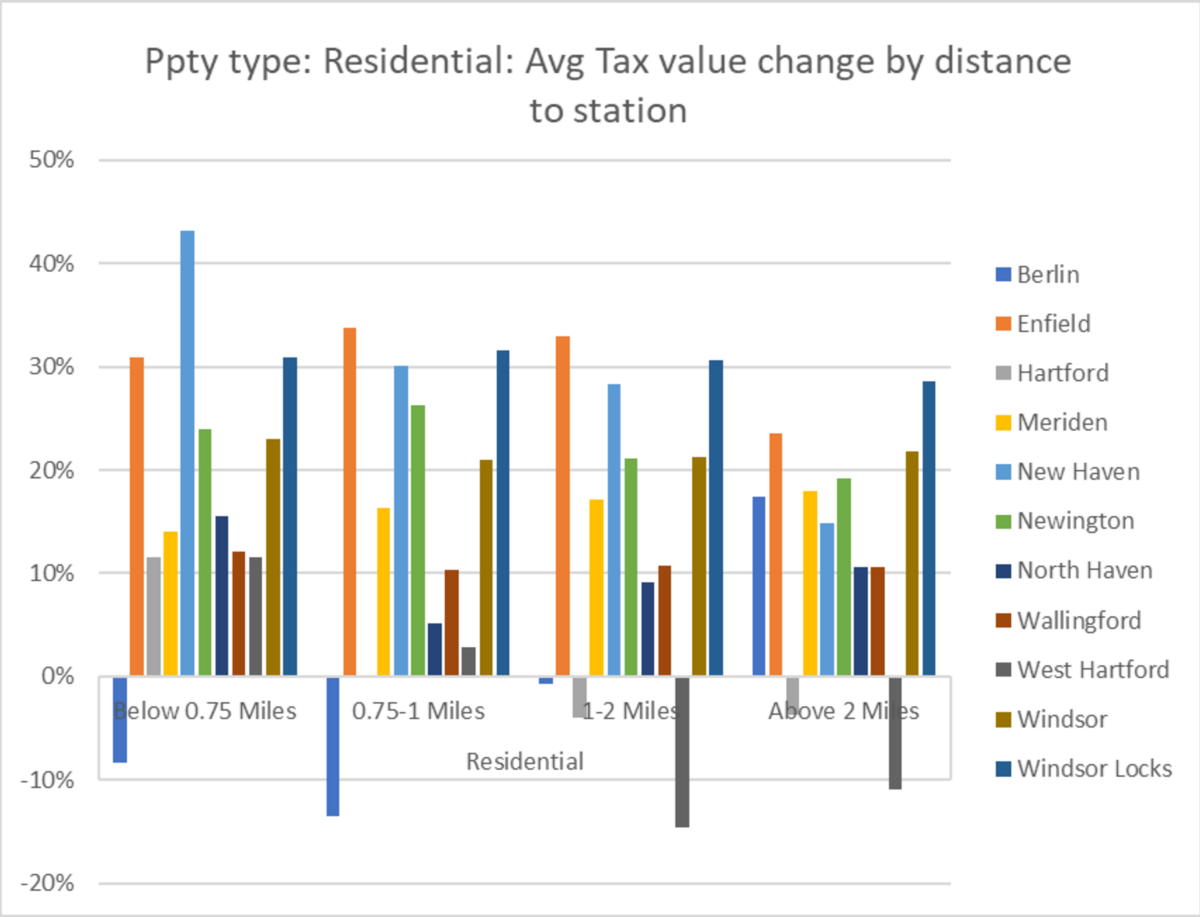

Figure 8. *Average Residential Property Tax Revenue Changes, by Municipality and Distance to Nearest Station (source: municipal assessors and authors' calculations)*

The figure above shows the change in average residential property tax revenue between Period 1 and Period 2, by municipality and distance to the nearest station. For the ranges of 0-0.75 miles and 0.75-1 miles, Berlin is the only municipality that experience a decline in average residential property tax revenues. In both the 1-2 miles and above 2 miles ranges, Hartford and West Hartford experience decreases in residential average property tax revenues, and Berlin sees a very small decline in the 1-2 miles range. For all other municipalities and ranges, there are increases in the average residential property tax revenues between the two periods.

Tables 10 (Period 1) and 11 (Period 2), below, demonstrate the descriptive statistics for various ranges from the stations, for residential property tax revenues, separately for Period 1 and Period 2.

Table 10. *Descriptive statistics of estimated residential property tax revenue (Period 1 - 2011 or 2012 values)*

CTrail Station		1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius	2 mile radius
Enfield	**n =**	88	479	950	1,599	3,795
	Avg.	7,397	3,546	3,127	3,019	3,001
	Med.	2,833	2,706	2,686	2,647	2,733
	S.D.	41,669	17,885	12,813	10,501	7,355
	Min	96	64	20	9	8
	Max	393,608	393,608	393,608	393,608	393,608
Windsor Locks	**n =**	6	192	553	851	3,447
	Avg.	2,063	3,248	3,390	3,458	3,488
	Med.	2,268	3,121	3,230	3,235	3,218
	S.D.	692	692	801	848	2,814
	Min	731	124	124	39	39
	Max	2,577	5,643	6,213	7,189	136,752
Windsor	**n =**	46	381	710	1,052	4,160
	Avg.	10,402	4,413	4,366	4,166	3,803
	Med.	3,583	3,498	3,469	3,514	3,528
	S.D.	44,077	15,345	14,263	11,738	6,959
	Min	20	14	14	14	8
	Max	302,714	302,714	302,714	302,714	302,714
Hartford Union	**n =**	12	138	865	1,905	8,948
	Avg.	155,411	37,763	20,148	18,535	16,508
	Med.	89,096	13,209	12,562	12,518	12,076
	S.D.	202,271	91,738	47,069	39,858	35,495
	Min	17,859	82	59	59	43
	Max	749,467	749,467	749,467	749,467	1,846,946
West Hartford	**n =**	117	509	1,622	3,681	15,890
	Avg.	6,061	6,328	7,803	8,657	11,726
	Med.	4,772	4,787	5,562	7,058	8,611
	S.D.	4,676	6,376	11,491	10,709	42,610
	Min	28	28	28	28	25
	Max	34,172	106,346	260,796	260,796	1,846,946
Newington	**n =**	16	300	533	981	6,521
	Avg.	5,564	4,617	4,540	4,575	4,594
	Med.	4,852	4,271	4,199	4,161	4,236
	S.D.	1,657	1,173	1,175	5,432	4,044
	Min	3,639	2,994	2,946	1,736	1,056
	Max	8,093	10,865	10,865	170,062	170,062
Berlin	**n =**	65	394	1,002	1,554	4,736
	Avg.	11,753	6,942	6,415	6,085	6,412
	Med.	5,087	4,544	4,632	4,698	4,859
	S.D.	20,550	12,600	11,380	9,479	33,543
	Min	2,112	69	69	69	37
	Max	134,459	134,459	156,624	156,624	2,203,123
Meriden	**n =**	178	921	2,188	3,926	10,564
	Avg.	2,459	3,001	3,241	3,476	3,877
	Med.	2,630	3,082	3,269	3,435	3,732
	S.D.	1,412	1,051	982	1,029	1,363
	Min	102	63	63	63	49
	Max	6,318	7,464	8,341	13,257	56,065
Wallingford	**n =**	206	740	1,521	2,341	6,726
	Avg.	3,763	3,983	4,114	4,206	4,497
	Med.	3,749	3,793	3,900	3,970	4,214

	S.D.	607	944	1,046	1,073	1,284
	Min	2,162	2,136	1,608	1,608	1,229
	Max	6,350	10,979	10,979	10,979	24,847
North Haven	**n =**	6	97	409	1,117	4,399
	Avg.	5,197	5,828	6,922	6,572	5,727
	Med.	4,838	5,625	5,945	5,497	5,135
	S.D.	1,115	1,211	11,489	13,572	7,140
	Min	4,067	26	26	26	11
	Max	7,132	9,038	235,718	368,658	368,658
New Haven State Street	**n =**	115	349	743	2,019	11,822
	Avg.	17,637	17,490	16,733	10,849	6,440
	Med.	9,526	8,459	9,112	5,846	3,544
	S.D.	42,586	52,630	50,548	32,735	16,564
	Min	65	63	8	8	8
	Max	388,634	530,146	589,910	589,910	589,910
New Haven Union	**n =**	78	421	1,469	2,563	8,878
	Avg.	8,199	5,450	5,472	6,063	6,444
	Med.	2,373	2,588	2,643	2,686	3,489
	S.D.	22,435	17,542	22,475	27,396	17,620
	Min	8	8	8	8	8
	Max	151,718	232,768	539,342	589,910	589,910

(source: authors' calculations based on data from municipal assessors and GIS distance calculations)

Table 11. *Descriptive statistics of estimated residential property tax revenue (Period 2 - 2017 or 2018 values)*

CTrail Station		1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius	2 mile radius
Enfield	**n =**	88	480	951	1,600	3,796
	Avg.	10,121	4,675	4,088	3,981	3,974
	Med.	3,541	3,467	3,465	3,467	3,593
	S.D.	59,403	25,464	18,253	14,934	10,404
	Min	100	84	26	12	10
	Max	560,718	560,718	560,718	560,718	560,718
Windsor Locks	**n =**	7	200	574	875	3,528
	Avg.	3,309	4,220	4,391	4,498	4,491
	Med.	3,245	4,110	4,195	4,218	4,170
	S.D.	1,002	950	1,154	1,189	3,359
	Min	1,400	32	5	5	5
	Max	4,351	7,054	10,400	10,400	158,664
Windsor	**n =**	46	381	710	1,052	4,160
	Avg.	13,347	5,511	5,371	5,100	4,624
	Med.	4,651	4,286	4,248	4,286	4,307
	S.D.	57,366	19,974	17,874	14,709	8,685
	Min	23	16	16	16	9
	Max	393,776	393,776	393,776	393,776	393,776
Hartford Union	**n =**	13	139	868	1,912	8,956
	Avg.	207,335	49,506	23,664	20,492	16,551
	Med.	148,610	12,837	12,124	11,994	11,953
	S.D.	263,628	125,681	71,259	57,127	39,679
	Min	16,158	178	59	59	46
	Max	1,017,075	1,017,075	1,194,806	1,194,806	2,018,979
West Hartford	**n =**	115	504	1,618	3,675	15,897
	Avg.	6,253	6,635	8,086	8,642	11,109
	Med.	4,905	5,050	6,132	7,720	9,212
	S.D.	5,205	8,154	15,516	12,557	23,192
	Min	23	23	23	23	7
	Max	40,166	152,688	377,244	377,244	2,018,979
Newington	**n =**	20	316	564	1,027	6,752
	Avg.	6,163	5,631	5,660	5,742	5,551
	Med.	5,806	5,277	5,195	5,148	5,195
	S.D.	2,617	1,671	3,311	7,887	5,426
	Min	48	14	14	14	14
	Max	9,430	11,871	64,276	224,831	224,831
Berlin	**n =**	65	394	1,035	1,594	4,840
	Avg.	5,015	5,178	5,251	5,452	6,121
	Med.	4,757	5,017	5,073	5,295	5,738
	S.D.	1,258	1,202	1,125	1,170	3,011
	Min	3,128	2,915	2,769	2,769	5
	Max	11,065	12,561	12,561	12,764	125,480
Meriden	**n =**	178	922	2,191	3,929	10,569
	Avg.	2,733	3,411	3,691	3,998	4,514
	Med.	2,787	3,495	3,732	3,977	4,356
	S.D.	1,518	1,232	1,163	1,244	1,542
	Min	148	79	79	79	48
	Max	7,568	8,908	8,908	15,139	51,515
Wallingford	**n =**	206	744	1,529	2,353	6,788
	Avg.	4,238	4,464	4,614	4,689	4,990
	Med.	4,163	4,198	4,334	4,411	4,654

	S.D.	739	1,095	1,226	1,259	1,469
	Min	2,564	2,247	1,519	1,519	1,519
	Max	8,083	10,926	11,711	20,713	26,286
North Haven	**n =**	7	106	473	1,246	4,664
	Avg.	4,169	7,284	7,994	7,202	6,291
	Med.	4,481	6,049	6,298	5,798	5,544
	S.D.	1,907	12,881	17,296	17,887	9,574
	Min	158	19	19	19	6
	Max	6,411	137,798	287,352	486,663	486,663
New Haven State Street	**n =**	115	349	744	2,024	11,845
	Avg.	21,002	26,589	23,945	14,849	8,465
	Med.	12,122	10,894	11,729	7,719	4,838
	S.D.	47,608	87,240	76,402	48,389	25,316
	Min	54	54	15	15	6
	Max	442,204	804,921	830,178	830,178	961,606
New Haven Union	**n =**	79	424	1,473	2,568	8,899
	Avg.	7,698	6,887	8,000	8,782	8,665
	Med.	3,240	3,752	3,791	3,950	4,793
	S.D.	20,376	20,865	36,303	41,447	27,891
	Min	15	15	6	6	6
	Max	172,336	253,815	804,921	830,178	961,606

(source: authors' calculations based on data from municipal assessors and GIS distance calculations)

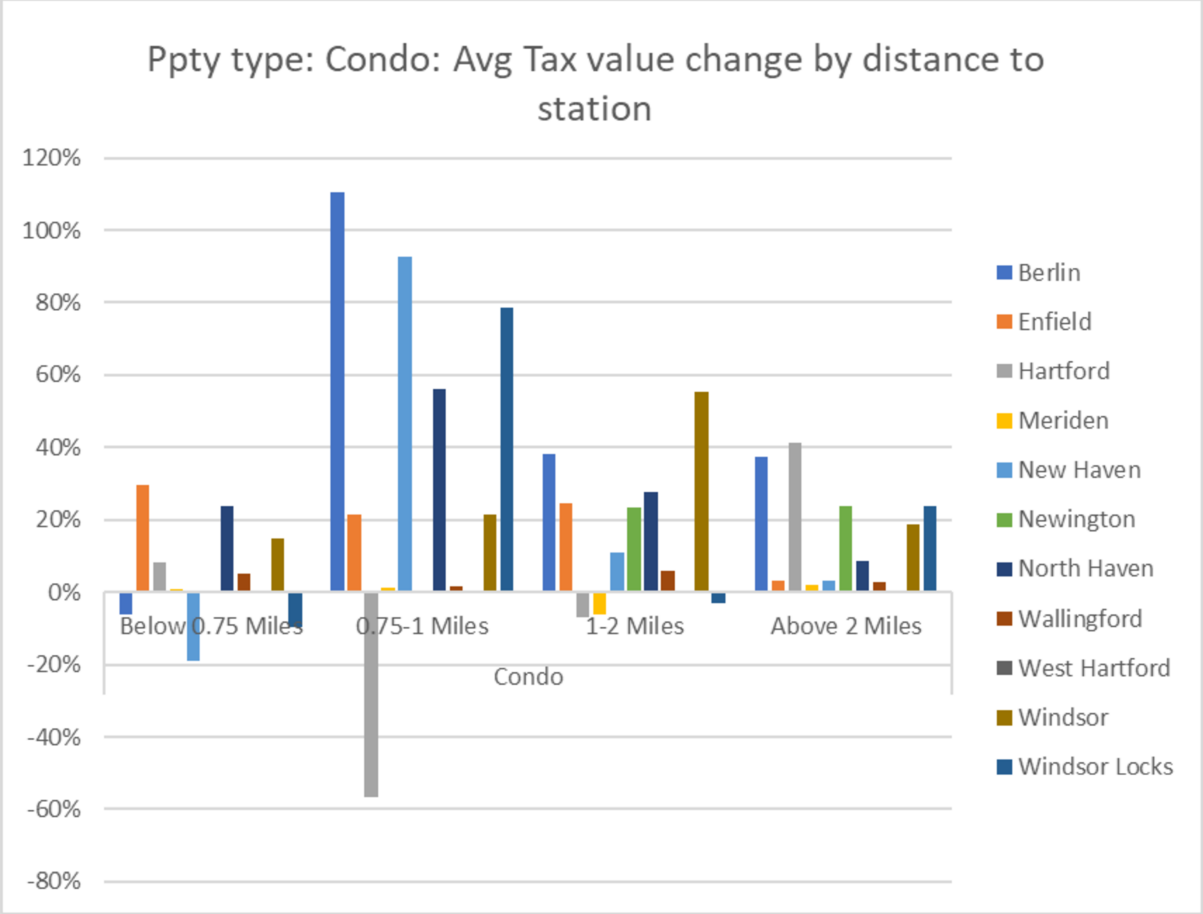

Figure 9. *Average Condo Property Tax Revenue Changes, by Municipality and Distance to Nearest Station (source: municipal assessors and authors' calculations)*

The changes in average condo tax revenues between Period 1 and Period 2, by municipality and various ranges for distance from the nearest stations, are shown in the figure above. Below 0.75 miles from the nearest station, Berlin, New Haven and Windsor Locks experience a decline in average condo tax revenues between the two periods, while all other municipalities experience a positive change or no substantial change.[7] For properties that are 0.75-1 miles from the nearest station, Hartford experiences a nearly 60% decline in average condo property tax revenue, and all other municipalities experience increases in condo average tax revenue.[8] For 1-2 miles from the nearest station, Hartford, Meriden, and

[7] Note that the Newington condo data properties less than 1 mile from the nearest station are missing information on assessed values for period 1 that are needed to calculate the period 1 property tax revenues (and in turn, the change in average property tax revenues).

[8] Note that all West Hartford condo data is missing information on assessed values for period 1 that are needed to calculate the period 1 property tax revenues (and in turn, the change in average property tax revenues).

Windsor Locks see small declines, Windsor is relatively flat, and average condo property tax revenues rise between Period 1 and 2 for the remaining municipalities. Finally, above 2 miles, all municipalities' condo average tax revenues rise. Tables 12 (Period 1) and 13 (Period 2) show the condo tax revenues descriptive statistics by various radii from stations.

Table 12. *Descriptive statistics of estimated condominium property tax revenue (Period 1 - 2011 or 2012 values)*

CTrail Station		1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius	2 mile radius
Enfield	**n =**	12	23	23	40	233
	Avg.	1,636	1,581	1,581	1,881	2,628
	Med.	1,498	1,314	1,314	1,823	2,891
	S.D.	507	518	518	528	726
	Min	1,314	1,226	1,226	1,226	1,226
	Max	3,083	3,114	3,114	3,114	4,168
Windsor Locks	**n =**	-	56	86	183	598
	Avg.	N/A	3,059	3,036	2,272	2,820
	Med.	N/A	3,009	3,000	2,762	2,797
	S.D.	N/A	265	267	1,157	1,309
	Min	N/A	2,429	2,429	299	299
	Max	N/A	3,779	3,779	3,779	7,071
Windsor	**n =**	52	66	66	84	723
	Avg.	3,974	3,591	3,591	3,597	1,691
	Med.	3,703	3,660	3,660	3,659	1,135
	S.D.	768	1,352	1,352	1,199	1,136
	Min	1,217	1,180	1,180	1,180	409
	Max	6,456	7,718	7,718	7,718	7,718
Hartford Union	**n =**	65	839	1,448	1,910	3,518
	Avg.	7,594	7,204	6,160	7,340	6,805
	Med.	5,418	4,153	2,682	2,838	4,012
	S.D.	13,621	23,676	18,290	20,236	15,486
	Min	2,912	1,367	527	527	238
	Max	114,481	546,210	546,210	546,210	546,210
West Hartford	**n =**	-	31	62	68	807
	Avg.	N/A	1,424	1,425	1,703	5,240
	Med.	N/A	1,389	1,404	1,441	2,719
	S.D.	N/A	208	188	919	11,333
	Min	N/A	1,003	966	966	527
	Max	N/A	1,894	1,894	4,792	65,940
Newington	**n =**	-	-	-	-	1,053
	Avg.	N/A	N/A	N/A	N/A	3,569
	Med.	N/A	N/A	N/A	N/A	3,345
	S.D.	N/A	N/A	N/A	N/A	1,749
	Min	N/A	N/A	N/A	N/A	1,051
	Max	N/A	N/A	N/A	N/A	34,041
Berlin	**n =**	8	235	331	339	405
	Avg.	2,972	3,630	4,576	4,590	4,862
	Med.	2,215	3,159	3,346	3,346	3,386
	S.D.	1,623	6,307	11,825	11,686	11,256
	Min	2,051	564	564	564	564
	Max	6,634	94,950	192,172	192,172	192,172
Meriden	**n =**	60	755	839	915	1,719
	Avg.	1,563	2,288	2,205	2,227	2,373
	Med.	984	2,451	2,196	2,320	2,456
	S.D.	1,048	2,165	2,094	2,010	1,584
	Min	693	649	649	649	649
	Max	5,237	50,832	50,832	50,832	50,832
Wallingford	**n =**	4	61	402	524	2,121
	Avg.	1,150	2,951	2,093	2,179	2,763
	Med.	1,150	3,297	1,893	1,902	2,764

	S.D.	232	1,202	1,228	1,291	1,490
	Min	948	112	94	94	94
	Max	1,351	5,427	16,908	16,908	16,908
North Haven	**n =**	20	27	129	224	372
	Avg.	4,316	4,467	3,541	3,345	3,711
	Med.	3,905	4,095	4,078	3,731	3,927
	S.D.	2,072	1,801	1,736	1,694	1,527
	Min	2,595	2,595	496	318	318
	Max	12,657	12,657	12,657	12,657	12,657
New Haven State Street	**n =**	294	577	642	799	2,111
	Avg.	24,180	19,272	17,862	15,482	8,208
	Med.	6,042	6,518	6,296	5,868	4,017
	S.D.	258,585	186,027	176,394	158,244	97,506
	Min	2,387	1,026	1,026	846	626
	Max	4,411,213	4,411,213	4,411,213	4,411,213	4,411,213
New Haven Union	**n =**	1	75	458	598	1,786
	Avg.	1,559	5,959	18,648	17,595	8,853
	Med.	1,559	5,362	5,162	5,380	3,980
	S.D.	-	3,200	208,437	182,781	105,992
	Min	1,559	846	846	846	626
	Max	1,559	13,970	4,411,213	4,411,213	4,411,213

Notes: "N/A" values indicate there were no properties in that range in this period. *(source: authors' calculations based on data from municipal assessors and GIS distance calculations)*

Table 13. *Descriptive statistics of estimated condominium property tax revenue (Period 2 - 2017 or 2018 values)*

CTrail Station		1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius	2 mile radius
Enfield	**n =**	12	23	23	40	233
	Avg.	2,127	2,047	2,047	2,358	3,280
	Med.	1,904	1,671	1,671	2,318	3,533
	S.D.	791	774	774	690	1,069
	Min	1,671	1,558	1,558	1,558	1,558
	Max	4,474	4,474	4,474	4,474	5,289
Windsor Locks	**n =**	-	56	86	176	656
	Avg.	N/A	2,792	2,744	2,921	3,086
	Med.	N/A	2,841	2,778	2,654	2,627
	S.D.	N/A	343	331	817	1,351
	Min	N/A	2,045	2,045	818	800
	Max	N/A	3,706	3,706	4,727	7,314
Windsor	**n =**	52	66	66	84	723
	Avg.	4,386	4,122	4,122	4,179	2,725
	Med.	4,126	3,862	3,862	4,172	2,763
	S.D.	955	1,584	1,584	1,410	1,088
	Min	1,410	1,410	1,410	1,410	757
	Max	7,600	10,222	10,222	10,222	10,222
Hartford Union	**n =**	65	850	1,636	2,518	4,942
	Avg.	10,154	8,718	6,636	6,126	5,903
	Med.	8,796	3,083	3,254	2,920	3,090
	S.D.	9,699	51,086	36,953	31,146	22,876
	Min	1,471	891	342	342	164
	Max	66,972	1,211,246	1,211,246	1,211,246	1,211,246
West Hartford	**n =**	-	38	263	734	3,274
	Avg.	N/A	26,520	5,852	4,211	4,728
	Med.	N/A	1,805	2,028	2,326	2,667
	S.D.	N/A	93,964	36,346	21,856	20,333
	Min	N/A	1,174	201	201	100
	Max	N/A	447,740	447,740	447,740	941,357
Newington	**n =**	-	-	-	-	1,053
	Avg.	N/A	N/A	N/A	N/A	4,412
	Med.	N/A	N/A	N/A	N/A	3,663
	S.D.	N/A	N/A	N/A	N/A	2,380
	Min	N/A	N/A	N/A	N/A	1,281
	Max	N/A	N/A	N/A	N/A	42,946
Berlin	**n =**	228	228	351	359	428
	Avg.	3,184	3,184	3,531	3,645	4,126
	Med.	3,132	3,132	3,783	3,793	3,797
	S.D.	1,194	1,194	1,222	1,462	2,013
	Min	746	746	746	746	746
	Max	9,975	9,975	9,975	12,483	13,524
Meriden	**n =**	756	756	840	916	1,721
	Avg.	2,296	2,296	2,225	2,248	2,308
	Med.	2,305	2,305	2,178	2,259	2,311
	S.D.	2,376	2,376	2,283	2,192	1,732
	Min	665	665	665	665	665
	Max	57,194	57,194	57,194	57,194	57,194
Wallingford	**n =**	60	60	403	525	2,128
	Avg.	3,069	3,069	2,197	2,269	2,921
	Med.	3,345	3,345	1,947	1,956	2,915

	S.D.	1,214	1,214	1,311	1,344	1,542
	Min	171	171	163	163	163
	Max	5,550	5,550	17,718	17,718	17,718
North Haven	**n =**	-	-	7	9	13
	Avg.	N/A	N/A	4,385	4,477	4,773
	Med.	N/A	N/A	4,319	4,319	5,035
	S.D.	N/A	N/A	1,618	1,503	1,552
	Min	N/A	N/A	2,216	2,216	2,216
	Max	N/A	N/A	6,907	6,907	7,790
New Haven State Street	**n =**	294	585	650	811	2,145
	Avg.	14,747	15,230	14,266	13,572	7,719
	Med.	6,317	7,076	6,736	5,972	4,326
	S.D.	119,976	89,797	85,235	79,479	49,123
	Min	2,166	1,149	1,149	903	659
	Max	2,054,443	2,054,443	2,054,443	2,054,443	2,054,443
New Haven Union	**n =**	1	75	458	602	1,820
	Avg.	1,808	6,077	13,128	14,792	8,199
	Med.	1,808	5,355	5,048	5,370	4,269
	S.D.	-	3,267	100,250	91,938	53,301
	Min	1,808	903	903	903	659
	Max	1,808	16,818	2,054,443	2,054,443	2,054,443

Notes: "N/A" values indicate there were no properties in that range in this period. *(source: authors' calculations based on data from municipal assessors and GIS distance calculations)*

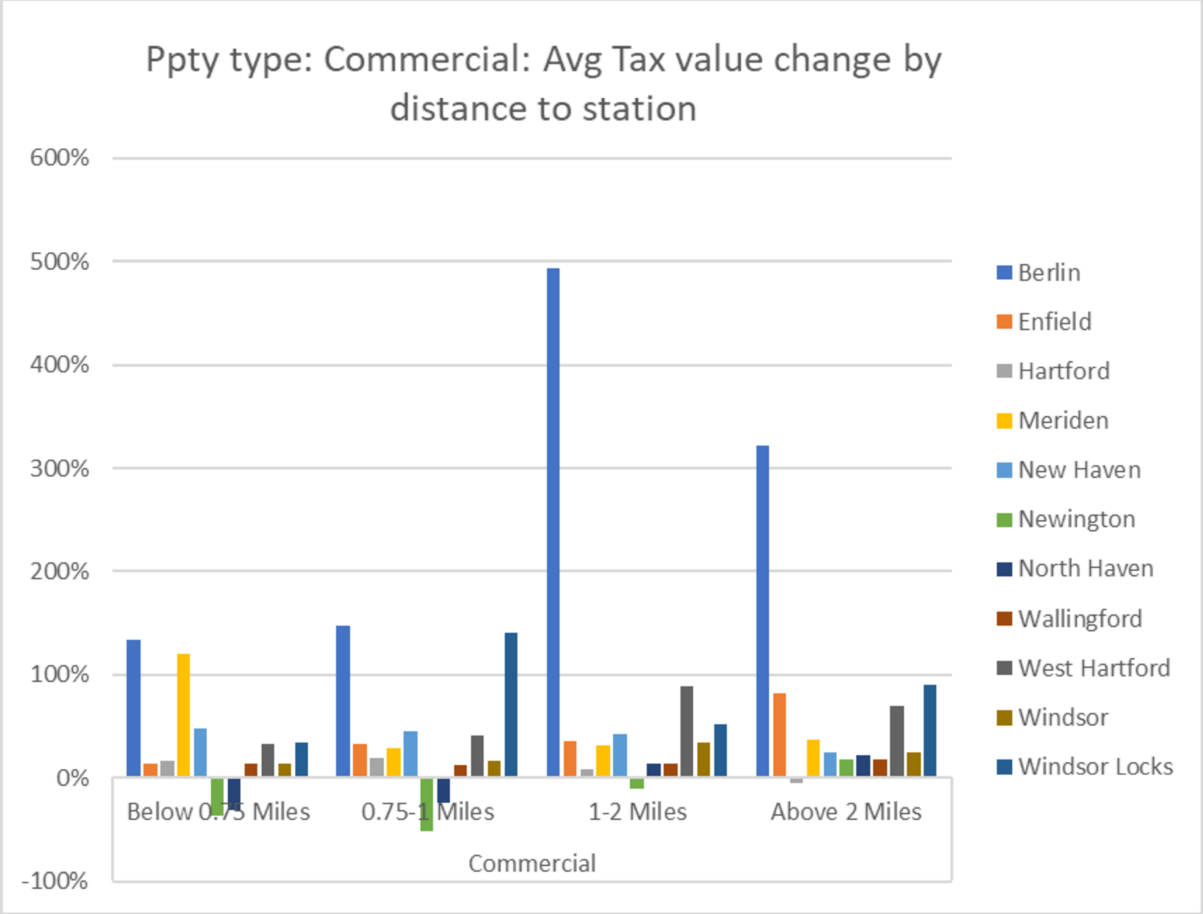

Figure 10. *Average Commercial Property Tax Revenue Changes, by Municipality and Distance to Nearest Station (source: municipal assessors and authors' calculations)*

The Town of Berlin experiences high increases in average commercial property tax revenues between Periods 1 and 2 for all distances from the nearest station. This can be attributed to a revaluation that results in much higher assessed values for commercial properties in that town. In the ranges of 0-0.75 miles and 0.75-1 miles, Newington and North Haven's commercial average property tax revenues fall, while all other municipalities rise. For 1-2 miles to the nearest station, Newington average property tax revenues fall slightly while all other municipalities' rise. Finally, for above 2 miles, commercial average tax revenues rise everywhere except for Hartford. Tables 14 and 15 show descriptive statistics for commercial property tax revenues in Periods 1 and 2, respectively, for various radii from the stations.

Table 14. *Descriptive statistics of estimated commercial property tax revenue (Period 1 - 2011 or 2012 values)*

CTrail Station		1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius	2 mile radius
Enfield	**n =**	18	61	101	127	289
	Avg.	10,498	8,205	11,192	11,005	36,018
	Med.	3,172	3,617	4,356	4,417	7,810
	S.D.	21,898	16,739	18,308	17,352	96,137
	Min	70	70	70	70	70
	Max	92,786	92,786	92,786	92,786	819,887
Windsor Locks	**n =**	3	11	30	42	132
	Avg.	104	4,345	7,703	10,076	23,712
	Med.	121	3,085	6,001	6,162	7,024
	S.D.	89	4,270	8,767	12,429	48,225
	Min	7	7	7	7	7
	Max	182	14,293	43,669	56,064	299,640
Windsor	**n =**	42	74	89	96	162
	Avg.	9,781	7,831	7,765	7,933	22,700
	Med.	7,068	6,184	6,228	6,304	7,926
	S.D.	8,318	7,057	6,916	6,949	46,599
	Min	186	4	4	4	4
	Max	35,021	35,021	35,021	35,021	368,853
Hartford Union	**n =**	60	206	421	618	1386
	Avg.	89,503	202,138	179,055	136,306	84,707
	Med.	38,356	30,685	20,660	18,873	18,082
	S.D.	157,809	740,633	719,639	605,056	410,507
	Min	3,172	371	230	111	74
	Max	950,778	6,477,568	6,532,743	6,532,743	6,532,743
West Hartford	**n =**	70	246	452	624	1,719
	Avg.	40,611	42,617	37,658	45,310	58,397
	Med.	11,719	13,371	13,371	13,905	16,154
	S.D.	123,796	90,869	74,657	88,126	154,906
	Min	59	59	37	37	37
	Max	746,860	746,860	746,860	746,860	2,311,140
Newington	**n =**	70	19	37	47	199
	Avg.	40,611	47,841	33,857	35,159	23,413
	Med.	11,719	18,167	14,858	18,000	9,942
	S.D.	123,796	70,881	54,602	51,082	39,105
	Min	59	6,679	1,647	1,647	567
	Max	746,860	277,766	277,766	277,766	277,766
Berlin	**n =**	46	87	143	183	336
	Avg.	8,406	7,723	7,362	8,368	12,534
	Med.	4,792	4,802	4,793	4,790	5,390
	S.D.	10,780	10,399	9,241	13,544	34,467
	Min	1,896	564	564	564	262
	Max	53,538	65,314	65,314	138,749	554,362
Meriden	**n =**	86	241	390	534	836
	Avg.	8,986	11,134	12,617	17,756	18,513
	Med.	6,335	5,953	6,150	6,111	6,730
	S.D.	11,307	23,885	28,089	91,914	76,407
	Min	223	223	223	32	11
	Max	71,881	202,851	322,353	1,916,102	1,916,102
Wallingford	**n =**	40	185	358	423	749
	Avg.	11,516	10,882	18,484	19,033	29,010
	Med.	4,388	4,923	5,778	6,030	8,158

	S.D.	19,796	27,337	62,842	59,294	85,480
	Min	1,574	423	423	423	423
	Max	115,401	308,006	993,327	993,327	1,165,824
North Haven	**n =**	18	44	108	168	456
	Avg.	27,780	34,921	28,012	33,876	28,562
	Med.	11,335	11,335	11,098	9,900	7,768
	S.D.	37,213	52,593	41,459	114,280	90,637
	Min	284	242	141	93	13
	Max	150,199	282,302	282,302	1,339,537	1,339,537
New Haven State Street	**n =**	154	353	619	905	1871
	Avg.	57,445	60,639	90,125	78,661	55,254
	Med.	15,241	16,414	15,399	13,156	9,531
	S.D.	173,505	178,747	507,045	449,565	387,095
	Min	773	773	35	14	14
	Max	1,873,392	2,172,661	9,968,396	9,968,396	9,968,396
New Haven Union	**n =**	21	123	397	722	1731
	Avg.	52,598	61,499	127,258	88,472	58,716
	Med.	24,230	11,624	12,617	11,549	9,817
	S.D.	78,827	139,342	639,610	487,472	402,216
	Min	1,715	19	19	14	14
	Max	289,698	1,048,189	9,968,396	9,968,396	9,968,396

(source: authors' calculations based on data from municipal assessors and GIS distance calculations)

Table 15. *Descriptive statistics of estimated commercial property tax revenue (Period 2 - 2017 or 2018 values)*

CTrail Station		1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius	2 mile radius
Enfield	**n =**	18	62	102	129	291
	Avg.	10,373	8,534	12,719	12,825	47,928
	Med.	4,079	4,172	5,519	5,769	10,595
	S.D.	18,816	14,054	19,484	18,931	139,847
	Min	92	92	92	92	92
	Max	79,764	79,764	113,852	113,852	1,456,044
Windsor Locks	**n =**	3	12	30	47	147
	Avg.	206	6,303	10,481	16,313	32,810
	Med.	245	6,205	7,581	7,702	8,571
	S.D.	174	5,499	13,165	28,935	67,570
	Min	16	16	16	16	16
	Max	357	19,688	69,604	179,403	359,163
Windsor	**n =**	42	74	89	96	162
	Avg.	11,285	9,100	8,892	9,059	29,721
	Med.	7,415	6,659	6,598	6,659	8,603
	S.D.	9,337	7,988	7,712	7,836	67,036
	Min	215	5	5	5	5
	Max	38,423	38,423	38,423	38,423	436,391
Hartford Union	**n =**	60	206	424	622	1,393
	Avg.	122,703	238,744	210,675	161,626	98,662
	Med.	47,204	32,814	20,437	18,651	18,008
	S.D.	257,554	913,023	868,597	734,157	498,796
	Min	3,536	869	245	119	119
	Max	1,819,793	8,032,710	8,032,710	8,032,710	8,032,710
West Hartford	**n =**	77	257	469	644	1,791
	Avg.	51,538	57,424	48,363	58,383	91,064
	Med.	18,270	18,270	17,099	18,454	18,625
	S.D.	186,678	150,949	119,233	129,150	260,769
	Min	89	89	37	37	5
	Max	1,503,488	1,503,488	1,503,488	1,503,488	3,367,410
Newington	**n =**	9	31	79	110	420
	Avg.	27,577	34,653	22,087	21,085	18,973
	Med.	19,850	13,078	7,805	6,024	6,489
	S.D.	20,668	66,611	46,436	43,658	40,337
	Min	3,354	13	13	13	5
	Max	71,716	345,776	345,776	345,776	345,776
Berlin	**n =**	46	87	147	187	368
	Avg.	17,526	17,209	19,921	20,521	26,358
	Med.	8,031	8,184	8,204	10,053	11,212
	S.D.	24,791	22,685	33,336	30,967	56,743
	Min	2,935	2,935	1,554	1,554	15
	Max	114,015	114,015	237,496	237,496	684,149
Meriden	**n =**	86	243	395	539	842
	Avg.	15,845	16,145	27,454	31,020	29,233
	Med.	8,483	7,646	7,770	7,689	8,251
	S.D.	39,446	41,641	217,519	213,014	172,593
	Min	278	278	278	36	25
	Max	347,363	351,497	4,264,884	4,264,884	4,264,884
Wallingford	**n =**	41	186	357	421	748
	Avg.	13,969	12,244	21,172	21,729	33,039
	Med.	5,473	6,005	6,718	7,166	9,429

	S.D.	25,035	26,652	68,196	64,237	92,472
	Min	2,021	505	505	505	505
	Max	141,688	276,267	1,060,498	1,060,498	1,238,953
North Haven	**n =**	37	64	170	261	562
	Avg.	17,201	30,027	19,422	24,325	26,820
	Med.	5,614	8,775	6,193	5,614	6,479
	S.D.	28,237	54,903	37,851	103,819	94,158
	Min	791	167	162	122	19
	Max	147,960	331,392	331,392	1,508,382	1,508,382
New Haven State Street	**n =**	156	360	628	917	1,892
	Avg.	58,013	67,419	130,327	114,280	79,780
	Med.	17,632	19,842	18,449	16,072	11,696
	S.D.	138,464	193,753	929,315	818,681	667,480
	Min	909	909	45	33	18
	Max	1,332,064	2,822,344	20,023,608	20,023,608	20,023,608
New Haven Union	**n =**	21	125	405	733	1,752
	Avg.	55,547	71,211	196,494	128,928	84,772
	Med.	19,655	14,309	16,379	14,189	12,185
	S.D.	96,740	168,114	1,180,565	887,208	693,285
	Min	2,076	45	45	18	18
	Max	341,344	1,113,570	20,023,608	20,023,608	20,023,608

(source: authors' calculations based on data from municipal assessors and GIS distance calculations)

3.8 Sales Values

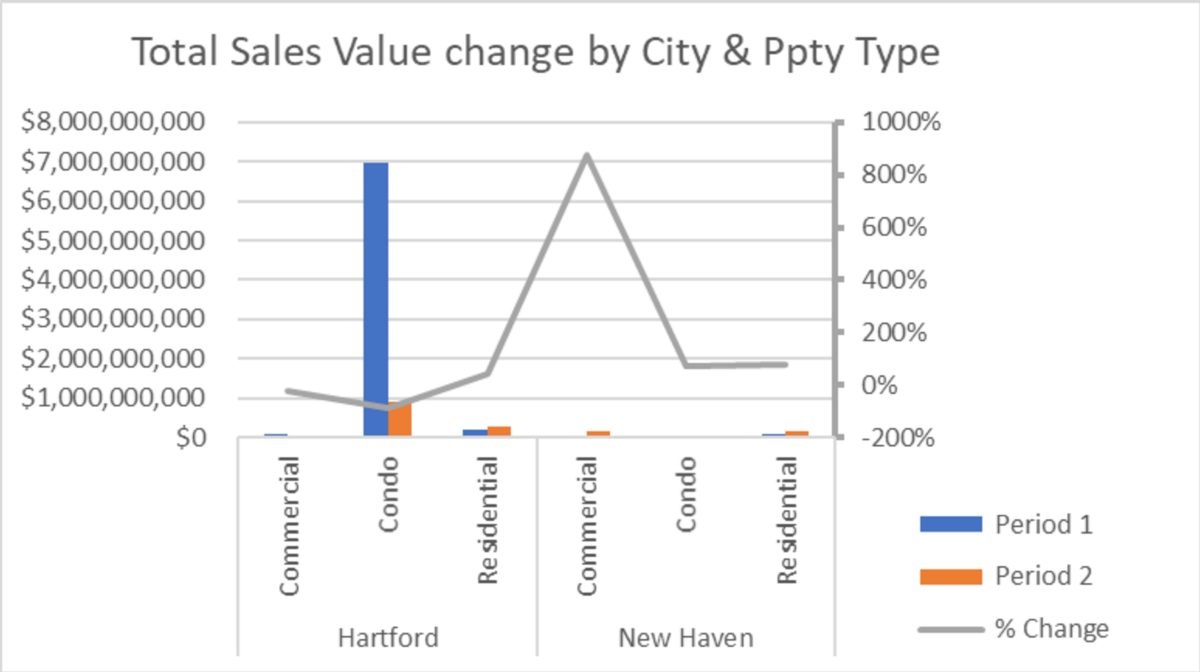

Figure 11. *Change in Value of Total Sales by Property Type and City (Hartford, New Haven), Period 2 versus Period 1*

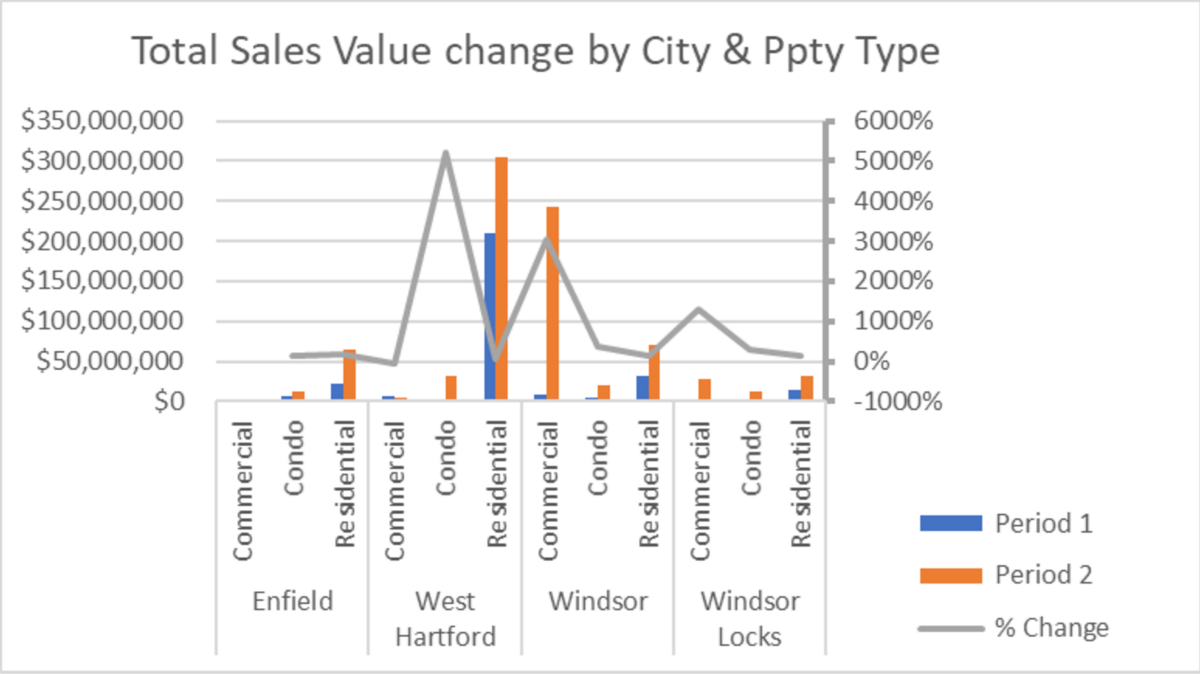

Figure 12. *Change in Value of Total Sales by Property Type and City (Enfield, West Hartford, Windsor, Windsor Locks), Period 2 versus Period 1*

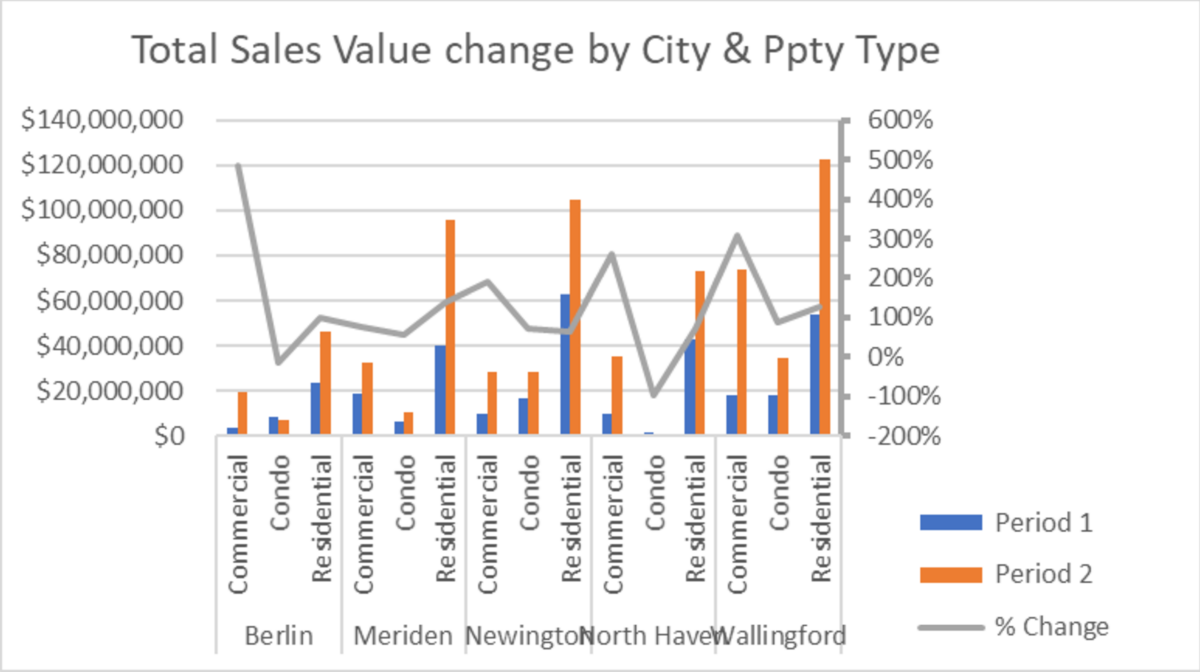

Figure 13. *Change in Value of Total Sales by Property Type and City (Berlin, Meriden, Newington, North Haven, Wallingford), Period 2 versus Period 1*

Figures 11, 12, and 13, above, show the change in total sales values by municipality and property class, between Period 1 and Period 2. Note this is distinct from the average sales values, which are presented as the "average" values in the two sets of radius tables below for each station. The first figure above breaks out the changes (in terms of dollars and percentages) for the two largest cities along the Hartford Line corridor, Hartford and New Haven. While total sales values rise in commercial, condo, and residential properties between the two periods, there are stark differences between the condo total sales values increases in New Haven (which rise approximately 2%) and Hartford (which rise approximately 800%). The second figure shows the total sales values and changes in Enfield, West Hartford, Windsor and Windsor Locks. Commercial total sales value in West Hartford decline by approximately 43%, while for all other property classes in all 4 municipalities, total sales value increase.[9] Finally, the third table above shows the total sales values in all 3 classes for Berlin, Meriden, Newington, North Haven, and Wallingford. Total condo sales values fall in Berlin and North Haven between Period 1 and 2, but for Meriden, Newington and Wallingford there is a rise in the total sales value of condos between these two periods. For all 5 of these municipalities in the residential and commercial property classes, total sales values rise between the two periods.

[9] Commercial sales value data from Enfield are missing from the data acquired from that town's assessor, therefore the commercial sales information is missing in the above figure and the radius tables below.

Below are a series of radius descriptive statistics tables for all the stations, one set for Period 1 and another for Period 2, separately for residential, condo, and commercial. To demonstrate the separate effects of adjusting for general property "inflation", a separate set of tables for each property class are also presented using the "deflators" described in the Data section above. Note that using the deflators does affect the Period 1 descriptive statistics (in addition to the Period 2 statistics), since the "base" year when considering the two periods to be compared is broken into 4 quarters; 2011 Q1 is the base value of 1.00 in the deflators. Period 2 descriptive statistics exhibit somewhat more variation than the non-deflated descriptive statistics since the deflators which adjust for "inflation" exhibit substantial variation.

Table 16. *Descriptive statistics of sales value of residential properties (Period 1 - 2011 or 2012 values)*

CTrail Station		1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius	2 mile radius
Enfield	**n =**	-	1	5	15	37
	Avg.	N/A	160,000	201,940	182,287	179,389
	Med.	N/A	160,000	189,900	179,900	168,500
	S.D.	N/A	-	65,605	42,115	51,344
	Min	N/A	160,000	147,000	132,000	128,000
	Max	N/A	160,000	312,800	312,800	395,800
Windsor Locks	**n =**	1	7	14	20	76
	Avg.	25,000	144,200	156,021	157,302	162,610
	Med.	25,000	160,000	169,750	171,000	162,750
	S.D.	-	56,599	71,070	69,075	53,232
	Min	25,000	25,000	15,500	15,500	15,500
	Max	25,000	186,900	254,000	254,000	300,000
Windsor	**n =**	1	10	18	25	107
	Avg.	220,000	180,970	212,055	201,992	207,928
	Med.	220,000	190,000	185,600	182,500	188,000
	S.D.	-	62,942	144,471	125,797	102,754
	Min	220,000	30,000	30,000	30,000	30,000
	Max	220,000	255,730	700,000	700,000	700,000
Hartford Union	**n =**	-	30	133	274	847
	Avg.	N/A	1,046,332	902,497	562,192	420,173
	Med.	N/A	120,000	120,000	102,830	120,000
	S.D.	N/A	1,186,782	1,111,439	922,069	1,369,991
	Min	N/A	7,500	7,500	7,000	7,000
	Max	N/A	2,400,000	2,400,000	2,400,000	15,649,397
West Hartford	**n =**	2	12	57	151	743
	Avg.	166,750	85,863	112,735	123,493	239,010
	Med.	166,750	34,333	125,000	125,000	165,000
	S.D.	13,081	70,456	64,842	63,733	861,028
	Min	157,500	34,333	20,000	10,000	9,001
	Max	176,000	203,000	220,000	253,000	15,649,397
Newington	**n =**	-	5	12	23	189
	Avg.	N/A	224,200	217,757	209,939	199,210
	Med.	N/A	219,000	215,393	209,900	196,000
	S.D.	N/A	49,312	40,262	43,803	58,433
	Min	N/A	155,000	155,000	155,000	22,500
	Max	N/A	290,000	290,000	333,000	400,000
Berlin	**n =**	1	4	7	13	74
	Avg.	187,000	161,250	207,000	213,223	259,933
	Med.	187,000	163,000	187,000	215,000	250,500
	S.D.	-	29,341	64,643	52,185	99,388
	Min	187,000	132,000	132,000	132,000	10,000
	Max	187,000	187,000	299,000	299,000	665,000
Meriden	**n =**	10	29	69	126	351
	Avg.	73,750	104,077	97,160	113,780	144,635
	Med.	73,500	99,000	90,000	117,000	138,500
	S.D.	26,056	45,747	46,412	61,614	73,792
	Min	48,000	44,000	40,000	30,000	4,500
	Max	100,000	179,000	206,186	390,000	500,000
Wallingford	**n =**	5	22	46	65	225
	Avg.	245,250	257,636	230,145	229,651	240,618
	Med.	245,250	243,000	227,500	225,000	225,000

	S.D.	88,742	101,579	79,090	70,260	92,132
	Min	182,500	155,000	85,000	85,000	17,500
	Max	308,000	515,000	515,000	515,000	515,000
North Haven	**n =**	-	3	15	40	126
	Avg.	N/A	218,750	266,786	249,806	310,829
	Med.	N/A	218,750	250,000	229,000	240,000
	S.D.	N/A	44,194	69,560	132,632	246,594
	Min	N/A	187,500	187,500	30,000	3,500
	Max	N/A	250,000	370,000	540,000	1,150,000
New Haven State Street	**n =**	5	17	27	85	405
	Avg.	415,500	345,019	411,581	333,519	198,077
	Med.	330,000	310,000	348,500	300,000	138,500
	S.D.	261,581	196,930	243,011	261,619	213,401
	Min	205,000	59,500	59,500	51,000	4,573
	Max	797,000	797,000	860,000	860,000	1,300,000
New Haven Union	**n =**	-	14	59	103	312
	Avg.	N/A	369,626	208,841	194,346	193,000
	Med.	N/A	103,255	68,663	85,740	131,450
	S.D.	N/A	499,430	321,326	265,666	205,115
	Min	N/A	65,299	10,000	10,000	4,573
	Max	N/A	1,300,000	1,300,000	1,300,000	1,300,000

Notes: "N/A" values indicate there were no sales in that range in this period. *(source: authors' calculations based on data from municipal assessors and GIS distance calculations)*

Table 17. *Descriptive statistics of sales value of residential properties (Period 2 - 2017 or 2018 values)*

CTrail Station		1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius	2 mile radius
Enfield	**n =**	-	7	13	37	106
	Avg.	N/A	160,571	158,915	171,589	180,263
	Med.	N/A	162,000	152,000	169,300	170,000
	S.D.	N/A	45,427	36,824	37,020	43,410
	Min	N/A	94,000	94,000	94,000	90,000
	Max	N/A	230,000	230,000	249,700	360,000
Windsor Locks	**n =**	-	34	63	92	320
	Avg.	N/A	171,792	159,937	160,679	166,681
	Med.	N/A	160,839	158,339	160,000	172,000
	S.D.	N/A	80,882	61,135	61,372	64,401
	Min	N/A	39,667	39,667	39,667	3,000
	Max	N/A	306,000	306,000	306,000	350,000
Windsor	**n =**	5	25	45	64	217
	Avg.	326,263	202,399	193,185	196,641	188,407
	Med.	300,000	176,900	177,700	179,450	178,500
	S.D.	142,433	90,002	80,192	78,018	74,421
	Min	198,790	110,000	35,000	35,000	35,000
	Max	480,000	480,000	480,000	480,000	644,000
Hartford Union	**n =**	-	28	130	271	925
	Avg.	N/A	122,857	1,230,205	889,455	500,564
	Med.	N/A	70,000	199,000	164,220	147,250
	S.D.	N/A	92,563	2,069,540	1,704,966	1,144,614
	Min	N/A	25,379	19,000	5,000	5,000
	Max	N/A	336,000	5,902,476	5,962,200	5,962,200
West Hartford	**n =**	3	16	75	222	1034
	Avg.	223,333	205,150	242,712	205,125	290,172
	Med.	195,000	194,500	159,000	170,000	195,000
	S.D.	115,145	85,859	535,215	357,068	611,961
	Min	125,000	118,000	46,500	11,250	5,000
	Max	350,000	450,000	3,950,000	3,950,000	8,500,000
Newington	**n =**	1	14	20	37	277
	Avg.	300,000	217,984	219,926	206,911	253,343
	Med.	300,000	220,000	214,000	200,000	205,000
	S.D.	-	61,508	66,513	66,095	555,371
	Min	300,000	91,500	91,500	91,500	51,550
	Max	300,000	300,000	339,800	339,800	6,850,000
Berlin	**n =**	3	12	30	49	133
	Avg.	205,333	224,946	217,316	237,842	250,215
	Med.	200,000	229,500	220,250	230,000	240,000
	S.D.	32,332	37,497	54,831	68,094	87,827
	Min	176,000	157,450	43,500	43,500	9,000
	Max	240,000	285,000	323,000	525,000	555,000
Meriden	**n =**	20	72	166	287	699
	Avg.	62,314	87,677	94,291	109,437	132,712
	Med.	42,000	62,500	70,000	115,000	136,500
	S.D.	43,216	61,855	56,773	58,049	59,795
	Min	8,200	8,200	8,200	8,200	2,000
	Max	152,500	220,000	220,000	250,000	306,000
Wallingford	**n =**	14	61	125	182	460
	Avg.	178,275	195,946	205,516	213,413	229,215
	Med.	192,500	200,500	203,000	210,000	223,000

	S.D.	61,525	73,024	82,045	78,103	79,666
	Min	100,000	51,000	35,000	1,670	1,670
	Max	247,500	335,000	550,000	550,000	550,000
North Haven	**n =**	-	2	19	62	228
	Avg.	N/A	500,000	320,200	319,724	276,731
	Med.	N/A	500,000	313,750	283,000	252,000
	S.D.	N/A	-	93,603	130,536	113,039
	Min	N/A	500,000	160,000	125,000	75,000
	Max	N/A	500,000	500,000	830,000	830,000
New Haven State Street	**n =**	6	20	45	114	740
	Avg.	477,500	467,377	500,466	452,248	286,466
	Med.	455,000	435,000	510,000	395,500	180,000
	S.D.	126,260	179,820	198,704	551,841	375,222
	Min	350,000	225,000	58,000	11,500	11,500
	Max	650,000	800,000	900,000	4,000,000	4,000,000
New Haven Union	**n =**	3	22	97	159	554
	Avg.	58,000	174,709	181,095	274,445	284,116
	Med.	58,000	184,315	127,950	155,000	180,000
	S.D.	-	91,836	184,270	514,502	383,853
	Min	58,000	58,000	11,500	11,500	11,500
	Max	58,000	312,500	900,000	4,000,000	4,000,000

Notes: "N/A" values indicate there were no sales in that range in this period *(source: authors' calculations based on data from municipal assessors and GIS distance calculations)*

Descriptive statistics of deflated sales values of residential properties, in Periods 1 and 2 (Tables 18 and 19, respectively), are presented below.

Table 18. *Descriptive statistics of deflated sales value of residential properties (Period 1 - 2011 or 2012 values)*

CTrail Station		1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius	2 mile radius
Enfield	**n =**	-	1	5	15	37
	Avg.	N/A	160,000	200,212	180,436	177,430
	Med.	N/A	160,000	186,585	179,560	167,202
	S.D.	N/A	-	64,237	41,389	50,501
	Min	N/A	160,000	145,868	129,696	125,766
	Max	N/A	160,000	308,607	308,607	390,494
Windsor Locks	**n =**	-	6	13	19	69
	Avg.	N/A	162,576	164,355	162,405	162,761
	Med.	N/A	168,315	176,629	176,629	162,737
	S.D.	N/A	22,281	61,521	62,316	50,134
	Min	N/A	127,000	15,292	15,292	15,292
	Max	N/A	184,394	249,566	249,566	294,763
Windsor	**n =**	1	9	14	19	68
	Avg.	217,051	178,687	175,057	173,624	192,752
	Med.	217,051	187,453	182,816	177,587	183,915
	S.D.	-	61,821	52,426	45,978	59,030
	Min	217,051	30,000	30,000	30,000	30,000
	Max	217,051	251,266	251,266	251,266	375,000
Hartford Union	**n =**	-	17	68	124	377
	Avg.	N/A	1,026,736	838,612	514,530	400,936
	Med.	N/A	119,076	113,578	100,132	118,397
	S.D.	N/A	1,185,090	1,089,767	883,526	1,354,764
	Min	N/A	7,399	7,399	7,000	7,000
	Max	N/A	2,400,000	2,400,000	2,400,000	15,439,608
West Hartford	**n =**	2	11	31	81	417
	Avg.	165,466	85,132	111,771	122,168	236,269
	Med.	165,466	34,069	123,324	124,037	165,000
	S.D.	12,981	69,709	64,194	63,026	849,490
	Min	156,287	34,069	19,651	9,923	8,880
	Max	174,645	199,456	216,160	249,608	15,439,608
Newington	**n =**	-	5	12	23	189
	Avg.	N/A	222,241	215,590	207,726	196,949
	Med.	N/A	219,000	214,577	206,236	195,000
	S.D.	N/A	47,681	38,794	43,103	57,687
	Min	N/A	155,000	155,000	155,000	22,107
	Max	N/A	286,112	286,112	330,436	396,920
Berlin	**n =**	-	3	6	12	73
	Avg.	N/A	150,002	207,703	212,978	258,172
	Med.	N/A	137,556	203,010	218,306	251,052
	S.D.	N/A	28,635	69,984	53,924	98,672
	Min	N/A	129,696	129,696	129,696	9,923
	Max	N/A	182,753	296,697	296,697	659,879
Meriden	**n =**	4	13	33	63	195
	Avg.	72,897	102,793	96,098	113,924	144,814
	Med.	72,926	96,935	88,123	117,497	136,982
	S.D.	26,068	45,124	45,965	60,952	71,834
	Min	47,266	43,327	39,388	39,388	4,500
	Max	98,470	176,261	206,186	390,000	494,854
Wallingford	**n =**	2	11	26	35	125
	Avg.	241,497	253,305	226,815	226,372	237,243
	Med.	241,497	237,931	224,019	221,557	221,557

	S.D.	87,384	99,423	77,515	68,883	90,604
	Min	179,707	153,405	83,227	83,227	17,320
	Max	303,287	504,257	504,257	504,257	504,257
North Haven	**n =**	-	2	7	18	66
	Avg.	N/A	214,187	262,545	246,080	286,250
	Med.	N/A	214,187	244,785	224,223	236,262
	S.D.	N/A	43,272	70,099	130,866	197,906
	Min	N/A	183,589	183,589	29,374	9,791
	Max	N/A	244,785	370,000	531,737	1,138,163
New Haven State Street	**n =**	4	10	14	32	198
	Avg.	411,867	369,787	432,027	338,042	197,330
	Med.	328,405	328,405	347,456	303,405	137,040
	S.D.	258,871	179,952	228,777	257,857	211,637
	Min	201,863	157,552	157,552	50,475	10,000
	Max	788,797	788,797	860,000	860,000	1,286,619
New Haven Union	**n =**	-	7	23	47	146
	Avg.	N/A	365,788	212,983	195,240	192,776
	Med.	N/A	103,255	69,106	84,857	133,553
	S.D.	N/A	494,315	323,623	265,488	202,981
	Min	N/A	63,937	10,000	10,000	10,000
	Max	N/A	1,286,619	1,286,619	1,286,619	1,286,619

Notes: "N/A" values indicate there were no sales in that range in this period *(source: authors' calculations based on data from municipal assessors, the Lincoln Institute of Land Policy, and GIS distance calculations)*

Table 19. *Descriptive statistics of deflated sales value of residential properties (Period 2 - 2017 or 2018 values)*

CTrail Station		1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius	2 mile radius
Enfield	**n =**	-	7	13	37	106
	Avg.	N/A	158,094	156,297	168,761	177,180
	Med.	N/A	159,080	149,702	165,054	166,886
	S.D.	N/A	44,966	36,348	36,405	42,829
	Min	N/A	92,306	92,306	92,306	87,382
	Max	N/A	227,730	227,730	247,236	353,511
Windsor Locks	**n =**	-	14	30	43	163
	Avg.	N/A	171,019	158,971	159,586	167,198
	Med.	N/A	158,974	157,995	159,653	171,673
	S.D.	N/A	80,684	60,988	60,965	63,010
	Min	N/A	39,495	39,495	39,495	3,012
	Max	N/A	304,673	304,673	304,673	346,546
Windsor	**n =**	3	15	27	39	144
	Avg.	319,968	198,876	195,639	197,520	186,152
	Med.	297,039	173,711	176,294	176,738	174,715
	S.D.	136,060	87,319	73,288	72,756	72,507
	Min	196,828	108,017	108,017	64,359	35,645
	Max	466,035	466,035	466,035	466,035	637,644
Hartford Union	**n =**	-	19	73	143	473
	Avg.	N/A	120,717	1,215,976	867,816	489,052
	Med.	N/A	67,963	185,593	159,442	143,569
	S.D.	N/A	91,305	2,074,231	1,697,848	1,128,901
	Min	N/A	24,922	18,658	14,476	4,924
	Max	N/A	330,921	5,844,226	5,844,226	5,844,226
West Hartford	**n =**	3	16	51	148	655
	Avg.	220,178	201,816	237,837	201,384	286,891
	Med.	193,076	191,789	156,134	165,995	193,037
	S.D.	112,439	84,955	519,545	347,835	603,192
	Min	123,766	116,835	46,041	11,139	11,139
	Max	343,691	445,559	3,835,083	3,835,083	8,371,506
Newington	**n =**	1	13	19	35	274
	Avg.	294,592	213,842	215,978	203,242	249,273
	Med.	294,592	216,034	210,765	198,026	202,141
	S.D.	-	60,617	65,679	65,309	548,577
	Min	294,592	88,838	88,838	88,838	50,050
	Max	294,592	294,592	333,675	333,875	6,782,399
Berlin	**n =**	3	12	30	49	133
	Avg.	205,105	223,860	216,382	236,954	249,046
	Med.	199,133	228,747	218,035	225,277	238,959
	S.D.	33,258	37,639	54,807	68,495	87,775
	Min	175,237	154,217	42,607	42,607	8,815
	Max	240,945	284,382	321,600	527,066	543,602
Meriden	**n =**	18	52	111	184	455
	Avg.	60,935	73,221	87,015	104,357	129,727
	Med.	41,253	55,013	65,668	110,876	133,582
	S.D.	42,184	47,083	50,316	54,360	57,193
	Min	7,919	7,919	7,919	7,919	7,919
	Max	148,723	190,170	190,551	245,555	299,443
Wallingford	**n =**	6	32	68	106	281
	Avg.	174,933	191,818	200,912	208,582	224,163
	Med.	188,993	195,701	197,163	206,125	218,053

	S.D.	60,572	71,835	80,000	76,210	77,977
	Min	98,222	49,737	34,362	1,640	1,640
	Max	242,991	328,897	531,140	531,140	531,140
North Haven	**n =**	-	1	12	41	141
	Avg.	N/A	490,891	313,790	312,242	270,413
	Med.	N/A	490,891	305,905	276,004	247,221
	S.D.	N/A	-	91,852	127,082	110,692
	Min	N/A	490,891	157,155	120,714	73,667
	Max	N/A	490,891	490,891	801,538	801,538
New Haven State Street	**n =**	4	11	25	53	352
	Avg.	466,378	454,769	488,617	457,914	283,205
	Med.	446,806	427,266	500,933	381,938	179,049
	S.D.	123,929	174,291	194,407	544,973	368,421
	Min	337,998	220,901	56,011	11,296	11,296
	Max	633,900	772,567	883,603	3,927,125	3,927,125
New Haven Union	**n =**	1	6	33	61	255
	Avg.	56,011	170,013	182,026	272,381	280,515
	Med.	56,011	178,875	126,683	156,037	176,800
	S.D.	-	90,128	181,087	508,030	376,615
	Min	56,011	56,011	11,296	11,296	11,296
	Max	56,011	306,944	883,603	3,927,125	3,927,125

Notes: "N/A" values indicate there were no sales in that range in this period *(source: authors' calculations based on data from municipal assessors, the Lincoln Institute of Land Policy, and GIS distance calculations)*

Tables 20 and 21 below (for Periods 1 and 2, respectively) present descriptive statistics, for various ranges from each of the stations, of deflated sales value per square foot of residential properties near each station.

Table 20. *Descriptive statistics of deflated sales value per square foot of residential properties (Period 1 - 2011 or 2012 values)*

CTrail Station		1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius	2 mile radius
Enfield	**n =**	-	1	5	15	37
	Avg.	N/A	59.79	76.59	106.92	122.29
	Med.	N/A	59.79	76.22	109.92	120.36
	S.D.	N/A	-	16.89	28.36	26.86
	Min	N/A	59.79	59.79	59.79	59.79
	Max	N/A	59.79	102.15	156.50	184.89
Windsor Locks	**n =**	-	6	13	19	69
	Avg.	N/A	118.31	105.74	110.23	115.02
	Med.	N/A	110.40	106.24	108.83	116.29
	S.D.	N/A	20.96	38.61	41.48	34.92
	Min	N/A	100.55	8.92	8.92	8.92
	Max	N/A	153.92	166.58	169.52	174.71
Windsor	**n =**	1	9	14	19	68
	Avg.	125.46	106.95	110.75	115.81	126.87
	Med.	125.46	125.46	122.50	121.77	127.95
	S.D.	-	38.99	31.75	29.42	33.63
	Min	125.46	27.50	27.50	27.50	27.50
	Max	125.46	154.63	154.63	154.63	211.41
Hartford Union	**n =**	-	17	68	124	377
	Avg.	N/A	159.88	126.40	84.01	72.91
	Med.	N/A	49.98	30.14	24.98	37.16
	S.D.	N/A	211.34	177.16	140.33	144.98
	Min	N/A	2.36	2.36	2.00	2.00
	Max	N/A	725.95	725.95	725.95	1,814.08
West Hartford	**n =**	2	11	31	81	417
	Avg.	162.92	66.82	84.37	84.80	104.38
	Med.	162.92	14.56	87.31	87.31	97.87
	S.D.	43.15	70.87	57.62	53.89	108.59
	Min	132.41	14.56	9.09	3.18	2.32
	Max	193.42	193.42	193.42	193.42	1,814.08
Newington	**n =**	-	5	12	23	189
	Avg.	N/A	170.14	160.99	151.63	140.93
	Med.	N/A	175.89	153.77	149.70	145.27
	S.D.	N/A	18.21	40.76	34.29	40.65
	Min	N/A	149.70	89.96	89.96	17.71
	Max	N/A	193.58	233.84	233.84	244.81
Berlin	**n =**	-	3	6	12	73
	Avg.	N/A	125.71	155.44	165.53	154.28
	Med.	N/A	118.18	160.62	168.84	161.27
	S.D.	N/A	28.28	39.85	32.06	38.35
	Min	N/A	101.96	101.96	101.96	15.41
	Max	N/A	157.00	209.44	209.44	217.49
Meriden	**n =**	4	13	33	63	195
	Avg.	30.86	45.94	41.81	58.81	97.03
	Med.	32.88	38.02	38.02	53.74	97.73
	S.D.	8.28	22.85	20.41	35.06	46.17
	Min	19.68	19.47	16.87	14.12	2.55
	Max	38.02	85.50	87.76	189.41	194.74
Wallingford	**n =**	2	11	26	35	125
	Avg.	136.53	143.49	139.50	148.41	156.19
	Med.	136.53	132.52	134.07	148.84	153.43

	S.D.	44.88	42.73	43.40	46.44	45.89
	Min	104.80	101.57	67.61	67.61	13.36
	Max	168.27	217.49	219.46	244.10	268.05
North Haven	**n =**	-	2	7	18	66
	Avg.	N/A	114.34	141.74	133.59	155.55
	Med.	N/A	114.34	137.44	138.00	160.55
	S.D.	N/A	32.67	46.88	56.58	59.04
	Min	N/A	91.25	91.25	13.40	6.97
	Max	N/A	137.44	218.36	227.53	350.20
New Haven State Street	**n =**	4	10	14	32	198
	Avg.	127.07	117.37	137.88	106.37	69.96
	Med.	137.01	115.88	136.35	104.10	58.21
	S.D.	38.13	29.13	47.99	65.66	53.48
	Min	72.82	72.82	72.82	15.19	7.14
	Max	161.44	161.44	248.73	248.73	248.73
New Haven Union	**n =**	-	7	23	47	146
	Avg.	N/A	43.52	50.89	62.57	68.17
	Med.	N/A	27.81	30.77	58.63	58.93
	S.D.	N/A	30.64	42.84	44.81	51.61
	Min	N/A	15.19	7.14	7.14	7.14
	Max	N/A	80.98	161.44	161.44	248.73

Notes: "N/A" values indicate there were no sales and/or square footage data in that range in this period *(source: authors' calculations based on data from municipal assessors, the Lincoln Institute of Land Policy, and GIS distance calculations)*

Table 21. *Descriptive statistics of deflated sales value per square foot of residential properties (Period 2 - 2017 or 2018 values)*

CTrail Station		1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius	2 mile radius
Enfield	**n =**	-	7	13	37	106
	Avg.	N/A	67.41	80.95	109.43	121.31
	Med.	N/A	62.48	85.06	104.29	121.12
	S.D.	N/A	18.74	21.77	35.12	31.09
	Min	N/A	45.58	45.58	45.58	45.58
	Max	N/A	98.93	115.35	177.26	192.78
Windsor Locks	**n =**	-	14	30	43	163
	Avg.	N/A	125.43	116.65	114.81	113.15
	Med.	N/A	139.84	116.85	113.36	119.47
	S.D.	N/A	45.65	36.61	36.13	38.98
	Min	N/A	41.14	41.14	40.55	1.52
	Max	N/A	175.28	175.28	175.28	211.58
Windsor	**n =**	3	15	27	39	144
	Avg.	100.78	104.59	108.37	111.35	116.18
	Med.	94.00	110.06	116.23	116.23	116.63
	S.D.	26.66	26.20	26.31	27.74	32.47
	Min	78.17	61.43	61.43	60.37	34.81
	Max	130.18	138.54	155.33	161.94	258.16
Hartford Union	**n =**	-	19	73	143	473
	Avg.	N/A	39.38	205.76	156.24	92.15
	Med.	N/A	24.54	51.49	44.48	46.48
	S.D.	N/A	32.19	484.28	453.41	260.80
	Min	N/A	7.95	5.90	4.91	1.40
	Max	N/A	95.16	3,363.99	3,476.06	3,476.06
West Hartford	**n =**	3	16	51	148	655
	Avg.	108.67	108.81	105.87	102.38	111.61
	Med.	113.71	114.15	111.23	104.04	108.21
	S.D.	9.51	46.64	42.89	44.83	84.02
	Min	97.69	38.26	31.70	3.00	3.00
	Max	114.60	174.45	174.45	222.70	1,567.24
Newington	**n =**	1	13	19	35	274
	Avg.	140.82	158.39	155.72	144.66	143.07
	Med.	140.82	167.04	161.26	145.89	145.61
	S.D.	-	55.47	48.80	48.62	39.80
	Min	140.82	38.03	38.03	38.03	36.19
	Max	140.82	244.77	244.77	244.77	260.22
Berlin	**n =**	3	12	30	49	133
	Avg.	130.65	152.79	164.89	165.90	159.55
	Med.	106.85	151.57	168.44	164.94	162.29
	S.D.	73.26	44.43	43.09	37.92	42.51
	Min	72.25	72.25	63.59	63.59	11.24
	Max	212.85	212.85	241.26	244.84	280.89
Meriden	**n =**	18	52	111	184	455
	Avg.	37.43	43.90	47.19	60.92	90.09
	Med.	40.14	37.29	42.41	51.49	92.88
	S.D.	13.53	26.70	27.71	36.79	45.30
	Min	7.36	7.36	7.36	5.25	5.25
	Max	58.32	121.30	123.46	158.08	223.49
Wallingford	**n =**	6	32	68	106	281
	Avg.	117.88	125.04	127.16	132.48	150.47
	Med.	125.33	129.91	130.18	134.78	155.12

	S.D.	44.07	45.35	44.52	46.45	45.84
	Min	41.43	39.63	23.95	1.71	1.71
	Max	159.34	202.64	241.23	241.23	251.08
North Haven	**n =**	-	1	12	41	141
	Avg.	N/A	217.40	156.82	152.78	160.29
	Med.	N/A	217.40	160.79	149.54	160.88
	S.D.	N/A	-	30.14	37.79	39.67
	Min	N/A	217.40	114.40	65.42	50.60
	Max	N/A	217.40	217.40	237.30	296.15
New Haven State Street	**n =**	4	11	25	53	352
	Avg.	228.67	191.94	169.87	138.71	96.69
	Med.	224.28	138.24	143.98	122.52	77.36
	S.D.	87.93	108.34	86.70	83.34	63.27
	Min	137.96	107.97	40.47	7.68	7.68
	Max	328.16	440.25	440.25	440.25	440.25
New Haven Union	**n =**	1	6	33	61	255
	Avg.	40.47	62.36	74.95	90.25	97.52
	Med.	40.47	54.60	49.54	60.07	77.18
	S.D.	-	32.61	72.55	80.46	65.68
	Min	40.47	38.54	7.68	7.68	7.68
	Max	40.47	126.67	328.16	440.25	440.25

Notes: "N/A" values indicate there were no sales and/or square footage data in that range in this period *(source: authors' calculations based on data from municipal assessors, the Lincoln Institute of Land Policy, and GIS distance calculations)*

Tables 22 and 23 below present the descriptive statistics of sales values of condos for various radii in each town, for Periods 1 and 2, respectively.

Table 22. *Descriptive statistics of sales value of condominiums (Period 1 - 2011 or 2012 values)*

CTrail Station		1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius	2 mile radius
Enfield	**n =**	-	-	-	-	3
	Avg.	N/A	N/A	N/A	N/A	183,000
	Med.	N/A	N/A	N/A	N/A	187,500
	S.D.	N/A	N/A	N/A	N/A	7,794
	Min	N/A	N/A	N/A	N/A	174,000
	Max	N/A	N/A	N/A	N/A	187,500
Windsor Locks	**n =**	-	2	3	7	21
	Avg.	N/A	157,450	162,300	191,609	179,826
	Med.	N/A	157,450	159,900	204,900	165,950
	S.D.	N/A	3,465	8,750	29,080	59,890
	Min	N/A	155,000	155,000	155,000	43,500
	Max	N/A	159,900	172,000	229,660	307,759
Windsor	**n =**	1	1	1	2	8
	Avg.	190,000	190,000	190,000	190,000	101,800
	Med.	190,000	190,000	190,000	190,000	96,000
	S.D.	-	-	-	-	58,328
	Min	190,000	190,000	190,000	190,000	28,000
	Max	190,000	190,000	190,000	190,000	190,000
Hartford Union	**n =**	15	385	659	703	1210
	Avg.	221,667	10,189,497	13,956,981	13,201,236	9,516,877
	Med.	181,250	15,649,397	15,649,397	15,649,397	8,260,000
	S.D.	140,158	7,459,110	4,843,950	5,668,456	6,620,945
	Min	127,500	9,000	9,000	9,000	4,000
	Max	500,000	15,649,397	15,649,397	15,649,397	15,649,397
West Hartford	**n =**	-	2	6	6	300
	Avg.	N/A	18,500	19,400	19,400	8,512,465
	Med.	N/A	18,500	20,000	20,000	8,260,000
	S.D.	N/A	2,121	1,342	1,342	4,856,733
	Min	N/A	17,000	17,000	17,000	7,000
	Max	N/A	20,000	20,000	20,000	15,649,397
Newington	**n =**	-	-	-	-	26
	Avg.	N/A	N/A	N/A	N/A	175,858
	Med.	N/A	N/A	N/A	N/A	162,400
	S.D.	N/A	N/A	N/A	N/A	88,951
	Min	N/A	N/A	N/A	N/A	66,500
	Max	N/A	N/A	N/A	N/A	531,601
Berlin	**n =**	-	7	7	15	16
	Avg.	N/A	165,929	165,929	177,380	187,544
	Med.	N/A	130,000	130,000	184,900	189,900
	S.D.	N/A	73,886	73,886	51,773	64,456
	Min	N/A	88,500	88,500	88,500	88,500
	Max	N/A	285,000	285,000	285,000	340,000
Meriden	**n =**	2	22	27	28	54
	Avg.	28,000	105,286	84,361	83,079	97,872
	Med.	28,000	135,000	69,750	60,000	95,500
	S.D.	-	63,992	69,329	67,607	69,581
	Min	28,000	6,000	2,500	2,500	2,500
	Max	28,000	195,000	195,000	195,000	248,700
Wallingford	**n =**	-	3	21	27	98
	Avg.	N/A	184,000	140,265	138,452	166,959
	Med.	N/A	184,000	173,500	125,000	173,500

	S.D.	N/A	14,849	73,118	69,773	83,282
	Min	N/A	173,500	20,000	20,000	20,000
	Max	N/A	194,500	214,900	214,900	373,900
North Haven	**n =**	-	-	2	2	6
	Avg.	N/A	N/A	228,000	228,000	223,110
	Med.	N/A	N/A	228,000	228,000	215,000
	S.D.	N/A	N/A	-	-	43,922
	Min	N/A	N/A	228,000	228,000	167,550
	Max	N/A	N/A	228,000	228,000	290,000
New Haven State Street	**n =**	4	14	27	30	64
	Avg.	270,250	340,056	314,269	272,025	212,833
	Med.	291,000	243,000	243,000	230,000	180,000
	S.D.	141,269	214,022	182,295	187,025	155,418
	Min	100,000	100,000	100,000	68,000	14,000
	Max	399,000	692,500	692,500	692,500	692,500
New Haven Union	**n =**	-	11	23	26	48
	Avg.	N/A	258,000	216,500	293,542	195,580
	Med.	N/A	235,000	217,000	230,000	156,250
	S.D.	N/A	63,695	120,905	210,641	171,284
	Min	N/A	209,000	68,000	68,000	14,000
	Max	N/A	330,000	399,000	692,500	692,500

Notes: "N/A" values indicate there were no sales in that range in this period *(source: authors' calculations based on data from municipal assessors and GIS distance calculations)*

Table 23. *Descriptive statistics of sales value of condominiums (Period 2 - 2017 or 2018 values)*

CTrail Station		1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius	2 mile radius
Enfield	**n =**	-	-	-	-	12
	Avg.	N/A	N/A	N/A	N/A	176,408
	Med.	N/A	N/A	N/A	N/A	192,500
	S.D.	N/A	N/A	N/A	N/A	49,690
	Min	N/A	N/A	N/A	N/A	75,000
	Max	N/A	N/A	N/A	N/A	225,000
Windsor Locks	**n =**	-	13	20	35	100
	Avg.	N/A	164,163	153,969	171,924	160,340
	Med.	N/A	167,450	156,500	156,500	149,000
	S.D.	N/A	27,927	32,169	57,564	71,909
	Min	N/A	132,500	95,000	90,000	39,000
	Max	N/A	199,500	199,500	289,900	359,039
Windsor	**n =**	4	4	4	6	26
	Avg.	210,667	210,667	210,667	209,250	120,656
	Med.	189,000	189,000	189,000	197,000	104,000
	S.D.	61,436	61,436	61,436	50,242	72,520
	Min	163,000	163,000	163,000	163,000	32,000
	Max	280,000	280,000	280,000	280,000	280,000
Hartford Union	**n =**	2	95	270	494	896
	Avg.	2,567,500	813,286	1,309,389	1,759,333	1,380,545
	Med.	2,567,500	285,000	1,125,000	1,464,750	1,210,000
	S.D.	3,440,074	817,217	969,730	1,219,560	1,131,061
	Min	135,000	20,000	19,500	19,500	5,150
	Max	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000
West Hartford	**n =**	-	23	30	49	248
	Avg.	N/A	304,088	235,604	238,591	626,950
	Med.	N/A	450,000	142,750	258,000	450,000
	S.D.	N/A	203,885	204,584	169,444	540,023
	Min	N/A	19,000	13,000	13,000	13,000
	Max	N/A	450,000	450,000	512,000	1,500,000
Newington	**n =**	-	-	-	-	72
	Avg.	N/A	N/A	N/A	N/A	169,753
	Med.	N/A	N/A	N/A	N/A	138,950
	S.D.	N/A	N/A	N/A	N/A	94,144
	Min	N/A	N/A	N/A	N/A	40,000
	Max	N/A	N/A	N/A	N/A	439,900
Berlin	**n =**	-	12	12	12	14
	Avg.	N/A	140,354	140,354	140,354	162,304
	Med.	N/A	139,375	139,375	139,375	154,375
	S.D.	N/A	55,480	55,480	55,480	75,651
	Min	N/A	75,000	75,000	75,000	75,000
	Max	N/A	272,500	272,500	272,500	300,000
Meriden	**n =**	8	52	60	64	116
	Avg.	32,792	77,748	71,895	72,644	72,885
	Med.	33,000	62,500	37,000	39,000	57,700
	S.D.	6,315	52,908	52,232	51,886	46,000
	Min	26,375	11,000	11,000	11,000	11,000
	Max	39,000	170,000	170,000	170,000	240,900
Wallingford	**n =**	-	8	31	45	170
	Avg.	N/A	172,771	101,496	129,724	187,642
	Med.	N/A	184,900	80,500	137,500	159,000

	S.D.	N/A	38,862	67,835	85,347	121,739
	Min	N/A	110,000	16,000	16,000	10,000
	Max	N/A	212,000	212,000	375,000	480,000
North Haven	**n =**	-	-	-	-	-
	Avg.	N/A	N/A	N/A	N/A	N/A
	Med.	N/A	N/A	N/A	N/A	N/A
	S.D.	N/A	N/A	N/A	N/A	N/A
	Min	N/A	N/A	N/A	N/A	N/A
	Max	N/A	N/A	N/A	N/A	N/A
New Haven State Street	**n =**	21	42	46	54	113
	Avg.	221,000	217,299	216,849	214,788	186,647
	Med.	222,000	211,250	211,250	211,250	181,500
	S.D.	82,747	91,640	89,320	87,933	108,658
	Min	103,000	38,000	38,000	38,000	31,000
	Max	338,500	452,000	452,000	452,000	452,000
New Haven Union	**n =**	-	4	29	38	107
	Avg.	N/A	192,333	185,772	210,039	185,379
	Med.	N/A	178,000	168,000	193,750	178,000
	S.D.	N/A	71,584	95,993	94,182	106,595
	Min	N/A	129,000	38,000	38,000	34,000
	Max	N/A	270,000	452,000	452,000	452,000

Notes: For North Haven, data were not available on condo sales in Period 2, and this is the reason for "N/A" values there. Other "N/A" values indicate there were no sales in that range in this period *(source: authors' calculations based on data from municipal assessors and GIS distance calculations)*

The following two tables (Tables 24 and 25) present the deflated sales values of condos, by town, for various radii from the stations, for Periods 1 and 2, respectively.

Table 24. *Descriptive statistics of deflated sales value of condominiums (Period 1 - 2011 or 2012 values)*

CTrail Station		1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius	2 mile radius
Enfield	**n =**	-	-	-	-	3
	Avg.	N/A	N/A	N/A	N/A	180,668
	Med.	N/A	N/A	N/A	N/A	184,986
	S.D.	N/A	N/A	N/A	N/A	8,422
	Min	N/A	N/A	N/A	N/A	170,963
	Max	N/A	N/A	N/A	N/A	186,056
Windsor Locks	**n =**	-	2	3	7	20
	Avg.	N/A	155,015	159,908	189,004	177,781
	Med.	N/A	155,015	157,109	201,323	163,402
	S.D.	N/A	2,960	8,729	28,915	59,241
	Min	N/A	152,922	152,922	152,922	42,917
	Max	N/A	157,109	169,694	226,581	307,759
Windsor	**n =**	1	1	1	1	5
	Avg.	187,453	187,453	187,453	187,453	100,535
	Med.	187,453	187,453	187,453	187,453	96,000
	S.D.	-	-	-	-	57,528
	Min	187,453	187,453	187,453	187,453	27,625
	Max	187,453	187,453	187,453	187,453	187,453
Hartford Union	**n =**	6	64	323	342	722
	Avg.	218,606	11,138,294	14,065,500	13,288,207	9,505,134
	Med.	178,441	15,439,608	15,439,608	15,439,608	8,149,270
	S.D.	138,289	6,930,705	4,382,085	5,332,365	6,489,273
	Min	125,274	22,692	12,000	12,000	3,930
	Max	493,297	15,439,608	15,439,608	15,439,608	15,439,608
West Hartford	**n =**	-	2	5	5	273
	Avg.	N/A	18,252	19,140	19,140	8,398,586
	Med.	N/A	18,252	19,732	19,732	8,149,270
	S.D.	N/A	2,093	1,324	1,324	4,791,223
	Min	N/A	16,772	16,772	16,772	6,878
	Max	N/A	19,732	19,732	19,732	15,439,608
Newington	**n =**	-	-	-	-	26
	Avg.	N/A	N/A	N/A	N/A	173,925
	Med.	N/A	N/A	N/A	N/A	161,784
	S.D.	N/A	N/A	N/A	N/A	87,305
	Min	N/A	N/A	N/A	N/A	65,609
	Max	N/A	N/A	N/A	N/A	522,321
Berlin	**n =**	-	7	7	15	16
	Avg.	N/A	164,096	164,096	175,013	185,325
	Med.	N/A	127,731	127,731	181,672	186,980
	S.D.	N/A	72,624	72,624	50,862	64,154
	Min	N/A	88,500	88,500	88,500	88,500
	Max	N/A	281,179	281,179	281,179	340,000
Meriden	**n =**	1	14	18	19	37
	Avg.	27,712	104,007	83,360	82,130	96,795
	Med.	27,712	133,272	69,019	60,000	94,039
	S.D.	-	63,288	68,523	66,807	68,926
	Min	27,712	5,938	2,462	2,462	2,462
	Max	27,712	195,000	195,000	195,000	246,140
Wallingford	**n =**	-	2	17	21	63
	Avg.	N/A	181,619	138,477	136,764	165,021
	Med.	N/A	181,619	171,714	125,000	171,349

	S.D.	N/A	14,008	72,070	68,659	82,181
	Min	N/A	171,714	20,000	20,000	20,000
	Max	N/A	191,524	212,688	212,688	368,179
North Haven	**n =**	-	-	1	1	5
	Avg.	N/A	N/A	225,653	225,653	220,330
	Med.	N/A	N/A	225,653	225,653	212,787
	S.D.	N/A	N/A	-	-	41,812
	Min	N/A	N/A	225,653	225,653	167,550
	Max	N/A	N/A	225,653	225,653	283,950
New Haven State Street	**n =**	4	9	13	16	41
	Avg.	267,783	335,608	310,453	268,713	209,955
	Med.	287,109	240,499	240,499	228,279	178,147
	S.D.	140,265	210,809	179,436	184,252	153,002
	Min	97,914	97,914	97,914	67,300	13,786
	Max	399,000	685,372	685,372	685,372	685,372
New Haven Union	**n =**	-	3	10	12	28
	Avg.	N/A	255,705	214,015	289,721	193,224
	Med.	N/A	235,000	215,279	228,279	153,828
	S.D.	N/A	59,809	119,670	207,443	168,888
	Min	N/A	209,000	67,300	67,300	13,786
	Max	N/A	323,116	399,000	685,372	685,372

Notes: "N/A" values indicate there were no sales in that range in this period *(source: authors' calculations based on data from municipal assessors, the Lincoln Institute of Land Policy, and GIS distance calculations)*

Table 25. *Descriptive statistics of deflated sales value of condominiums (Period 2 - 2017 or 2018 values)*

CTrail Station		1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius	2 mile radius
Enfield	**n =**	-	-	-	-	12
	Avg.	N/A	N/A	N/A	N/A	173,644
	Med.	N/A	N/A	N/A	N/A	189,590
	S.D.	N/A	N/A	N/A	N/A	49,179
	Min	N/A	N/A	N/A	N/A	73,648
	Max	N/A	N/A	N/A	N/A	221,599
Windsor Locks	**n =**	-	8	12	22	60
	Avg.	N/A	164,070	153,700	171,734	159,812
	Med.	N/A	166,916	155,990	155,990	148,582
	S.D.	N/A	28,067	32,578	57,654	71,826
	Min	N/A	131,926	94,588	89,610	38,831
	Max	N/A	200,285	200,285	291,041	358,261
Windsor	**n =**	3	3	3	4	16
	Avg.	206,933	206,933	206,933	204,959	118,209
	Med.	183,501	183,501	183,501	191,269	101,806
	S.D.	62,002	62,002	62,002	50,778	71,349
	Min	160,062	160,062	160,062	160,062	31,069
	Max	277,237	277,237	277,237	277,237	277,237
Hartford Union	**n =**	2	50	196	398	645
	Avg.	2,493,551	939,027	1,359,524	1,779,396	1,385,583
	Med.	2,493,551	1,422,136	1,092,270	1,422,136	1,225,287
	S.D.	3,338,936	826,021	948,416	1,187,532	1,111,037
	Min	132,566	29,459	18,933	18,933	7,767
	Max	4,854,535	4,854,535	4,854,535	4,854,535	4,854,535
West Hartford	**n =**	-	17	24	43	227
	Avg.	N/A	300,974	233,083	235,075	618,262
	Med.	N/A	445,559	140,826	253,349	445,559
	S.D.	N/A	202,028	202,725	167,426	532,295
	Min	N/A	18,447	12,803	12,803	12,803
	Max	N/A	445,559	445,559	497,104	1,485,197
Newington	**n =**	-	-	-	-	72
	Avg.	N/A	N/A	N/A	N/A	166,935
	Med.	N/A	N/A	N/A	N/A	136,695
	S.D.	N/A	N/A	N/A	N/A	92,580
	Min	N/A	N/A	N/A	N/A	39,279
	Max	N/A	N/A	N/A	N/A	435,559
Berlin	**n =**	-	12	12	12	14
	Avg.	N/A	139,141	139,141	139,141	161,298
	Med.	N/A	137,707	137,707	137,707	153,163
	S.D.	N/A	54,081	54,081	54,081	75,174
	Min	N/A	75,295	75,295	75,295	75,295
	Max	N/A	266,904	266,904	266,904	299,350
Meriden	**n =**	3	30	34	37	75
	Avg.	32,141	75,717	70,037	70,754	71,052
	Med.	32,413	60,952	36,334	38,289	56,674
	S.D.	6,288	51,375	50,716	50,335	44,712
	Min	25,722	10,728	10,728	10,728	10,728
	Max	38,289	165,789	165,789	165,789	234,933
Wallingford	**n =**	-	7	26	37	128
	Avg.	N/A	169,544	99,334	126,830	183,758
	Med.	N/A	181,531	79,051	134,995	156,138

	S.D.	N/A	38,360	66,550	83,225	119,530
	Min	N/A	107,275	15,604	15,604	9,657
	Max	N/A	208,231	208,231	362,141	468,111
North Haven	**n =**	-	-	-	-	-
	Avg.	N/A	N/A	N/A	N/A	N/A
	Med.	N/A	N/A	N/A	N/A	N/A
	S.D.	N/A	N/A	N/A	N/A	N/A
	Min	N/A	N/A	N/A	N/A	N/A
	Max	N/A	N/A	N/A	N/A	N/A
New Haven State Street	**n =**	16	36	38	46	88
	Avg.	215,749	212,579	212,180	210,145	182,598
	Med.	218,053	207,494	207,494	207,494	178,193
	S.D.	80,398	89,533	87,264	85,947	106,247
	Min	101,169	37,324	37,324	37,324	30,232
	Max	326,892	443,765	443,765	443,765	443,765
New Haven Union	**n =**	-	3	23	32	85
	Avg.	N/A	188,548	181,672	205,345	181,341
	Med.	N/A	174,757	163,839	189,581	174,757
	S.D.	N/A	70,655	93,749	91,907	104,248
	Min	N/A	125,805	37,324	37,324	33,381
	Max	N/A	265,081	443,765	443,765	443,765

Notes: For North Haven, data were not available on condo sales in Period 2, and this is the reason for "N/A" values there. Other "N/A" values indicate there were no sales in that range in this period *(source: authors' calculations based on data from municipal assessors, the Lincoln Institute of Land Policy, and GIS distance calculations)*

Tables 26 and 27, below, present the descriptive statistics for deflated sales value per square foot of condos, for Periods 1 and 2 (respectively), classified by radius from the stations.

Table 26. *Descriptive statistics of deflated sales value per square foot of condominiums (Period 1 - 2011 or 2012 values)*

CTrail Station		1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius	2 mile radius
Enfield	**n =**	-	-	-	-	3
	Avg.	N/A	N/A	N/A	N/A	133.91
	Med.	N/A	N/A	N/A	N/A	132.89
	S.D.	N/A	N/A	N/A	N/A	5.75
	Min	N/A	N/A	N/A	N/A	128.74
	Max	N/A	N/A	N/A	N/A	140.10
Windsor Locks	**n =**	-	2	3	7	20
	Avg.	N/A	137.24	143.77	152.82	137.83
	Med.	N/A	137.24	156.83	158.45	143.53
	S.D.	N/A	31.48	24.97	16.79	28.46
	Min	N/A	114.98	114.98	114.98	65.82
	Max	N/A	159.50	159.50	162.78	184.29
Windsor	**n =**	1	1	1	1	5
	Avg.	168.72	168.72	168.72	168.72	97.92
	Med.	168.72	168.72	168.72	168.72	95.24
	S.D.	-	-	-	-	46.03
	Min	168.72	168.72	168.72	168.72	40.45
	Max	168.72	168.72	168.72	168.72	168.72
Hartford Union	**n =**	6	71	330	349	731
	Avg.	145.20	16,778.57	24,251.10	22,908.44	15,761.17
	Med.	148.07	20,531.39	21,684.84	21,684.84	15,598.68
	S.D.	63.14	11,410.84	10,661.91	11,750.70	12,452.00
	Min	40.58	33.82	19.15	19.15	7.22
	Max	216.23	36,073.85	47,653.11	47,653.11	47,653.11
West Hartford	**n =**	-	2	5	5	273
	Avg.	N/A	35.94	32.81	32.81	12,878.53
	Med.	N/A	35.94	31.17	31.17	12,441.63
	S.D.	N/A	6.74	4.60	4.60	8,422.17
	Min	N/A	31.17	29.45	29.45	7.22
	Max	N/A	40.71	40.71	40.71	47,653.11
Newington	**n =**	-	-	-	-	26
	Avg.	N/A	N/A	N/A	N/A	129.80
	Med.	N/A	N/A	N/A	N/A	131.55
	S.D.	N/A	N/A	N/A	N/A	30.12
	Min	N/A	N/A	N/A	N/A	88.90
	Max	N/A	N/A	N/A	N/A	213.45
Berlin	**n =**	-	7	7	15	16
	Avg.	N/A	143.72	143.72	151.56	153.63
	Med.	N/A	138.69	138.69	155.94	160.50
	S.D.	N/A	34.48	34.48	26.93	27.31
	Min	N/A	106.27	106.27	106.27	106.27
	Max	N/A	200.70	200.70	200.70	200.70
Meriden	**n =**	1	14	18	19	37
	Avg.	41.48	90.27	73.00	71.77	80.99
	Med.	41.48	102.83	74.80	62.86	75.80
	S.D.	-	43.82	51.33	50.17	45.82
	Min	41.48	8.48	2.69	2.69	2.69
	Max	41.48	149.08	149.08	149.08	155.94
Wallingford	**n =**	-	2	17	21	63
	Avg.	N/A	141.09	127.06	122.67	134.29
	Med.	N/A	141.09	125.71	122.07	150.98

	S.D.	N/A	21.76	53.54	51.55	47.51
	Min	N/A	125.71	30.77	30.77	30.77
	Max	N/A	156.47	184.15	184.15	209.95
North Haven	**n =**	-	-	1	1	5
	Avg.	N/A	N/A	161.64	161.64	162.89
	Med.	N/A	N/A	161.64	161.64	162.54
	S.D.	N/A	N/A	-	-	12.26
	Min	N/A	N/A	161.64	161.64	143.45
	Max	N/A	N/A	161.64	161.64	173.85
New Haven State Street	**n =**	4	9	13	16	41
	Avg.	268.15	260.26	249.30	216.55	166.77
	Med.	260.24	261.81	261.81	254.22	174.91
	S.D.	23.35	44.57	65.47	91.70	89.81
	Min	249.78	164.85	131.67	66.18	17.90
	Max	302.33	325.00	328.85	328.85	328.85
New Haven Union	**n =**	-	3	10	12	28
	Avg.	N/A	176.79	188.24	201.92	169.83
	Med.	N/A	140.05	202.10	244.56	142.65
	S.D.	N/A	71.03	85.17	83.44	102.00
	Min	N/A	131.67	66.18	66.18	17.90
	Max	N/A	258.66	302.33	302.33	328.85

Note: "N/A" values indicate there were no sales in that range in this period *(source: authors' calculations based on data from municipal assessors, the Lincoln Institute of Land Policy, and GIS distance calculations)*

Table 27. *Descriptive statistics of deflated sales value per square foot of condominiums (Period 2 - 2017 or 2018 values)*

CTrail Station		1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius	2 mile radius
Enfield	**n =**	-	-	-	-	12
	Avg.	N/A	N/A	N/A	N/A	122.65
	Med.	N/A	N/A	N/A	N/A	121.16
	S.D.	N/A	N/A	N/A	N/A	25.63
	Min	N/A	N/A	N/A	N/A	89.60
	Max	N/A	N/A	N/A	N/A	166.87
Windsor Locks	**n =**	-	8	12	22	60
	Avg.	N/A	157.36	141.56	143.34	123.13
	Med.	N/A	154.00	145.44	145.44	121.01
	S.D.	N/A	15.44	29.28	33.01	36.33
	Min	N/A	141.60	81.54	77.25	53.05
	Max	N/A	185.97	185.97	204.38	208.29
Windsor	**n =**	3	3	3	4	16
	Avg.	154.93	154.93	154.93	144.44	93.75
	Med.	158.87	158.87	158.87	149.52	84.28
	S.D.	13.25	13.25	13.25	23.61	37.09
	Min	140.16	140.16	140.16	112.96	45.80
	Max	165.76	165.76	165.76	165.76	165.76
Hartford Union	**n =**	2	50	196	398	645
	Avg.	105.42	905.05	2,303.60	3,857.57	2,877.01
	Med.	105.42	1,074.12	1,384.37	2,989.20	1,862.66
	S.D.	70.95	704.81	2,249.85	3,660.57	3,207.27
	Min	55.25	31.68	18.65	18.65	3.37
	Max	155.59	2,366.28	9,516.05	13,425.14	13,425.14
West Hartford	**n =**	-	17	24	43	227
	Avg.	N/A	390.91	295.85	257.12	1,056.29
	Med.	N/A	566.15	125.08	227.15	532.12
	S.D.	N/A	255.02	262.08	204.75	1,106.63
	Min	N/A	38.19	19.25	19.25	19.25
	Max	N/A	596.46	596.46	596.46	4,163.34
Newington	**n =**	-	-	-	-	72
	Avg.	N/A	N/A	N/A	N/A	115.44
	Med.	N/A	N/A	N/A	N/A	108.52
	S.D.	N/A	N/A	N/A	N/A	31.48
	Min	N/A	N/A	N/A	N/A	55.71
	Max	N/A	N/A	N/A	N/A	197.36
Berlin	**n =**	-	12	12	12	14
	Avg.	N/A	132.28	132.28	132.28	140.15
	Med.	N/A	129.87	129.87	129.87	135.27
	S.D.	N/A	24.16	24.16	24.16	30.44
	Min	N/A	94.12	94.12	94.12	94.12
	Max	N/A	190.51	190.51	190.51	201.99
Meriden	**n =**	3	30	34	37	75
	Avg.	39.49	69.11	65.77	65.62	65.36
	Med.	41.85	62.66	49.92	50.73	56.05
	S.D.	10.41	35.37	34.54	33.85	29.67
	Min	28.11	15.33	15.33	15.33	15.33
	Max	48.52	139.52	139.52	139.52	139.52
Wallingford	**n =**	-	7	26	37	128
	Avg.	N/A	127.16	112.26	121.49	220.81
	Med.	N/A	126.33	118.95	123.17	139.21

	S.D.	N/A	24.45	31.56	44.75	282.24
	Min	N/A	85.14	48.37	36.21	7.05
	Max	N/A	156.79	166.26	265.79	2,232.32
North Haven	**n =**	-	-	-	-	-
	Avg.	N/A	N/A	N/A	N/A	N/A
	Med.	N/A	N/A	N/A	N/A	N/A
	S.D.	N/A	N/A	N/A	N/A	N/A
	Min	N/A	N/A	N/A	N/A	N/A
	Max	N/A	N/A	N/A	N/A	N/A
New Haven State Street	**n =**	16	36	38	46	88
	Avg.	228.37	223.19	225.38	214.51	166.21
	Med.	225.08	225.08	228.80	222.60	165.89
	S.D.	35.47	63.83	63.26	71.55	86.38
	Min	170.78	60.69	60.69	30.70	28.51
	Max	299.90	351.36	351.36	351.36	351.36
New Haven Union	**n =**	-	3	23	32	85
	Avg.	N/A	237.25	193.85	208.48	166.55
	Med.	N/A	246.59	178.60	206.31	165.30
	S.D.	N/A	17.31	67.22	63.39	85.64
	Min	N/A	217.28	60.69	60.69	28.51
	Max	N/A	247.88	351.36	351.36	351.36

Note: For North Haven, data were not available on condo sales in Period 2, and this is the reason for "N/A" values there. Other "N/A" values indicate there were no sales in that range in this period *(source: authors' calculations based on data from municipal assessors, the Lincoln Institute of Land Policy, and GIS distance calculations)*

Tables 28 and 29 contain descriptive statistics for sales values of commercial properties in Periods 1 and 2, respectively, for various radii from the stations.

Table 28. *Descriptive statistics of sales value of commercial properties (Period 1 - 2011 or 2012 values)*

CTrail Station		1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius	2 mile radius
Enfield	**n =**	-	-	-	-	-
	Avg.	N/A	N/A	N/A	N/A	N/A
	Med.	N/A	N/A	N/A	N/A	N/A
	S.D.	N/A	N/A	N/A	N/A	N/A
	Min	N/A	N/A	N/A	N/A	N/A
	Max	N/A	N/A	N/A	N/A	N/A
Windsor Locks	**n =**	-	-	-	-	1
	Avg.	N/A	N/A	N/A	N/A	530,000
	Med.	N/A	N/A	N/A	N/A	530,000
	S.D.	N/A	N/A	N/A	N/A	-
	Min	N/A	N/A	N/A	N/A	530,000
	Max	N/A	N/A	N/A	N/A	530,000
Windsor	**n =**	1	2	2	2	5
	Avg.	375,000	537,500	537,500	537,500	717,500
	Med.	375,000	537,500	537,500	537,500	700,000
	S.D.	-	229,810	229,810	229,810	396,429
	Min	375,000	375,000	375,000	375,000	300,000
	Max	375,000	700,000	700,000	700,000	1,237,500
Hartford Union	**n =**	6	23	36	49	106
	Avg.	50,000	1,192,554	1,049,796	791,919	608,001
	Med.	50,000	1,116,520	412,500	350,000	250,000
	S.D.	-	991,413	1,005,300	878,443	856,058
	Min	50,000	50,000	32,000	32,000	5,000
	Max	50,000	2,400,000	2,400,000	2,400,000	4,100,000
West Hartford	**n =**	4	5	12	15	34
	Avg.	475,000	466,667	578,338	538,522	532,085
	Med.	475,000	475,000	475,000	475,000	387,500
	S.D.	-	14,434	228,481	244,838	604,592
	Min	475,000	450,000	289,500	220,000	50,000
	Max	475,000	475,000	863,600	863,600	2,500,000
Newington	**n =**	1	1	1	3	10
	Avg.	600,000	600,000	600,000	289,667	398,492
	Med.	600,000	600,000	600,000	187,000	341,750
	S.D.	-	-	-	273,836	253,537
	Min	600,000	600,000	600,000	82,000	82,000
	Max	600,000	600,000	600,000	600,000	800,000
Berlin	**n =**	-	-	-	-	-
	Avg.	N/A	N/A	N/A	N/A	N/A
	Med.	N/A	N/A	N/A	N/A	N/A
	S.D.	N/A	N/A	N/A	N/A	N/A
	Min	N/A	N/A	N/A	N/A	N/A
	Max	N/A	N/A	N/A	N/A	N/A
Meriden	**n =**	6	8	9	16	31
	Avg.	288,000	248,167	269,857	265,636	918,923
	Med.	310,000	310,000	310,000	310,000	310,000
	S.D.	73,621	117,712	121,820	151,427	2,433,064
	Min	160,000	49,000	49,000	49,000	49,000
	Max	350,000	350,000	400,000	565,000	11,188,968
Wallingford	**n =**	1	7	11	13	25
	Avg.	1,200,000	390,000	387,400	400,818	816,591
	Med.	1,200,000	210,000	312,000	315,000	535,000

	S.D.	-	416,463	342,080	327,563	876,180
	Min	1,200,000	80,000	80,000	80,000	80,000
	Max	1,200,000	1,200,000	1,200,000	1,200,000	3,714,420
North Haven	**n =**	-	-	4	6	11
	Avg.	N/A	N/A	356,500	356,500	358,100
	Med.	N/A	N/A	356,500	356,500	350,000
	S.D.	N/A	N/A	499,924	499,924	251,340
	Min	N/A	N/A	3,000	3,000	3,000
	Max	N/A	N/A	710,000	710,000	710,000
New Haven State Street	**n =**	9	9	13	20	44
	Avg.	748,750	748,750	1,199,000	1,040,556	930,412
	Med.	677,500	677,500	880,000	880,000	600,000
	S.D.	396,703	396,703	1,063,793	904,653	1,087,108
	Min	390,000	390,000	390,000	265,000	15,000
	Max	1,250,000	1,250,000	3,000,000	3,000,000	3,975,000
New Haven Union	**n =**	-	5	10	15	42
	Avg.	N/A	677,500	748,750	553,333	978,563
	Med.	N/A	677,500	677,500	432,500	675,000
	S.D.	N/A	286,378	396,703	441,335	1,103,879
	Min	N/A	475,000	390,000	15,000	15,000
	Max	N/A	880,000	1,250,000	1,250,000	3,975,000

Note: The Enfield assessor was unable to provide data for commercial property sales values. Other "N/A" values (including all radii for Berlin) indicate there were no sales in that range in this period *(source: authors' calculations based on data from municipal assessors and GIS distance calculations)*

Table 29. *Descriptive statistics of sales value of commercial properties (Period 2 - 2017 or 2018 values)*

CTrail Station		1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius	2 mile radius
Enfield	**n =**	-	-	-	-	-
	Avg.	N/A	N/A	N/A	N/A	N/A
	Med.	N/A	N/A	N/A	N/A	N/A
	S.D.	N/A	N/A	N/A	N/A	N/A
	Min	N/A	N/A	N/A	N/A	N/A
	Max	N/A	N/A	N/A	N/A	N/A
Windsor Locks	**n =**	-	-	1	1	5
	Avg.	N/A	N/A	390,000	390,000	322,500
	Med.	N/A	N/A	390,000	390,000	322,500
	S.D.	N/A	N/A	-	-	95,459
	Min	N/A	N/A	390,000	390,000	255,000
	Max	N/A	N/A	390,000	390,000	390,000
Windsor	**n =**	1	1	1	2	3
	Avg.	310,000	310,000	310,000	355,000	953,333
	Med.	310,000	310,000	310,000	355,000	400,000
	S.D.	-	-	-	63,640	1,037,320
	Min	310,000	310,000	310,000	310,000	310,000
	Max	310,000	310,000	310,000	400,000	2,150,000
Hartford Union	**n =**	6	20	28	36	76
	Avg.	1,068,167	992,727	1,542,397	1,198,575	1,007,673
	Med.	591,000	591,000	591,000	591,000	545,500
	S.D.	973,886	839,314	1,926,744	1,719,348	1,359,772
	Min	591,000	211,522	136,000	60,600	25,000
	Max	3,025,000	3,025,000	5,902,476	5,902,476	5,902,476
West Hartford	**n =**	-	2	4	6	28
	Avg.	N/A	1,150,000	781,611	648,708	508,898
	Med.	N/A	1,150,000	844,833	597,417	325,000
	S.D.	N/A	-	403,730	423,459	508,050
	Min	N/A	1,150,000	350,000	250,000	54,250
	Max	N/A	1,150,000	1,150,000	1,150,000	1,900,000
Newington	**n =**	1	1	1	1	8
	Avg.	350,000	350,000	350,000	350,000	3,207,524
	Med.	350,000	350,000	350,000	350,000	337,500
	S.D.	-	-	-	-	7,770,334
	Min	350,000	350,000	350,000	350,000	54,250
	Max	350,000	350,000	350,000	350,000	22,414,743
Berlin	**n =**	2	5	6	8	16
	Avg.	201,330	302,132	518,443	830,496	951,498
	Med.	201,330	220,000	222,500	490,000	560,000
	S.D.	26,403	256,115	577,252	766,443	943,497
	Min	182,660	128,000	128,000	128,000	128,000
	Max	220,000	755,000	1,600,000	2,000,000	3,300,000
Meriden	**n =**	4	16	28	32	48
	Avg.	175,000	555,333	351,188	327,304	618,761
	Med.	175,000	250,000	192,500	184,000	205,000
	S.D.	-	764,751	561,803	520,340	1,501,475
	Min	175,000	175,000	60,000	60,000	36,821
	Max	175,000	2,112,000	2,112,000	2,112,000	6,900,000
Wallingford	**n =**	3	8	15	19	45
	Avg.	1,675,000	1,839,000	1,206,464	1,076,508	2,424,861
	Med.	750,000	750,000	525,000	512,500	675,000

	S.D.	2,027,468	1,984,781	1,481,541	1,332,337	3,488,584
	Min	275,000	170,000	170,000	170,000	170,000
	Max	4,000,000	4,000,000	4,000,000	4,000,000	10,400,000
North Haven	**n =**	-	2	4	6	10
	Avg.	N/A	11,766,273	6,151,887	4,996,509	3,524,838
	Med.	N/A	11,766,273	6,200,000	850,000	750,000
	S.D.	N/A	305,856	6,490,357	6,186,116	4,900,672
	Min	N/A	11,550,000	225,000	225,000	225,000
	Max	N/A	11,982,546	11,982,546	11,982,546	11,982,546
New Haven State Street	**n =**	6	16	40	50	96
	Avg.	1,252,500	4,399,710	2,008,383	1,892,455	2,714,411
	Med.	1,275,000	1,705,000	668,841	646,500	600,000
	S.D.	561,864	6,381,731	3,950,751	3,673,572	9,311,058
	Min	600,000	600,000	10,000	10,000	10,000
	Max	1,860,000	19,500,000	19,500,000	19,500,000	69,400,000
New Haven Union	**n =**	-	3	14	32	84
	Avg.	N/A	7,093,333	11,304,444	6,684,864	3,087,554
	Med.	N/A	1,550,000	1,600,000	1,175,000	600,000
	S.D.	N/A	10,764,740	22,617,280	16,819,099	9,975,100
	Min	N/A	230,000	230,000	10,000	10,000
	Max	N/A	19,500,000	69,400,000	69,400,000	69,400,000

Note: The Enfield assessor was unable to provide data for commercial property sales values. Other "N/A" values indicate there were no sales in that range in this period
(source: authors' calculations based on data from municipal assessors and GIS distance calculations)

Tables 30 and 31 contain descriptive statistics for deflated sales values of commercial properties in Periods 1 and 2, respectively, for various radii from the stations.

Table 30. *Descriptive statistics of deflated sales value of commercial properties (Period 1 - 2011 or 2012 values)*

CTrail Station		1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius	2 mile radius
Enfield	**n =**	-	-	-	-	-
	Avg.	N/A	N/A	N/A	N/A	N/A
	Med.	N/A	N/A	N/A	N/A	N/A
	S.D.	N/A	N/A	N/A	N/A	N/A
	Min	N/A	N/A	N/A	N/A	N/A
	Max	N/A	N/A	N/A	N/A	N/A
Windsor Locks	**n =**	-	-	-	-	1
	Avg.	N/A	N/A	N/A	N/A	525,918
	Med.	N/A	N/A	N/A	N/A	525,918
	S.D.	N/A	N/A	N/A	N/A	-
	Min	N/A	N/A	N/A	N/A	525,918
	Max	N/A	N/A	N/A	N/A	525,918
Windsor	**n =**	-	-	-	-	-
	Avg.	N/A	N/A	N/A	N/A	N/A
	Med.	N/A	N/A	N/A	N/A	N/A
	S.D.	N/A	N/A	N/A	N/A	N/A
	Min	N/A	N/A	N/A	N/A	N/A
	Max	N/A	N/A	N/A	N/A	N/A
Hartford Union	**n =**	-	6	9	19	53
	Avg.	N/A	1,157,581	849,328	587,069	522,199
	Med.	N/A	1,109,817	405,299	347,305	250,000
	S.D.	N/A	804,294	786,335	621,098	756,865
	Min	N/A	176,858	176,858	48,000	5,000
	Max	N/A	2,071,848	2,071,848	2,071,848	4,028,431
West Hartford	**n =**	1	2	7	8	24
	Avg.	468,632	459,316	587,654	541,329	547,824
	Med.	468,632	459,316	468,632	459,316	387,285
	S.D.	-	13,175	240,286	258,181	612,599
	Min	468,632	450,000	287,271	217,051	50,000
	Max	468,632	468,632	856,949	856,949	2,466,486
Newington	**n =**	1	1	1	3	10
	Avg.	591,957	591,957	591,957	286,619	394,724
	Med.	591,957	591,957	591,957	187,000	340,091
	S.D.	-	-	-	269,699	250,933
	Min	591,957	591,957	591,957	80,901	80,901
	Max	591,957	591,957	591,957	591,957	793,839
Berlin	**n =**	-	-	-	-	-
	Avg.	N/A	N/A	N/A	N/A	N/A
	Med.	N/A	N/A	N/A	N/A	N/A
	S.D.	N/A	N/A	N/A	N/A	N/A
	Min	N/A	N/A	N/A	N/A	N/A
	Max	N/A	N/A	N/A	N/A	N/A
Meriden	**n =**	4	5	6	9	16
	Avg.	277,928	231,992	258,603	223,938	1,020,811
	Med.	303,533	303,533	303,533	210,000	277,316
	S.D.	80,972	124,369	128,930	121,883	2,724,651
	Min	160,000	48,250	48,250	48,250	48,250
	Max	344,644	344,644	391,656	391,656	11,188,968
Wallingford	**n =**	1	7	10	11	21
	Avg.	1,187,649	387,625	385,357	398,217	808,809
	Med.	1,187,649	207,839	312,000	315,000	526,814

	S.D.	-	412,862	339,167	324,577	871,674
	Min	1,187,649	79,177	79,177	79,177	79,177
	Max	1,187,649	1,187,649	1,187,649	1,187,649	3,714,420
North Haven	**n =**	-	-	1	1	4
	Avg.	N/A	N/A	695,189	695,189	438,109
	Med.	N/A	N/A	695,189	695,189	368,289
	S.D.	N/A	N/A	-	-	174,109
	Min	N/A	N/A	695,189	695,189	320,668
	Max	N/A	N/A	695,189	695,189	695,189
New Haven State Street	**n =**	3	3	3	7	14
	Avg.	829,267	829,267	829,267	830,522	816,980
	Med.	870,942	870,942	870,942	870,942	492,993
	S.D.	423,983	423,983	423,983	586,109	1,030,965
	Min	385,986	385,986	385,986	262,272	14,687
	Max	1,230,873	1,230,873	1,230,873	1,880,444	3,914,176
New Haven Union	**n =**	-	1	3	5	13
	Avg.	N/A	870,942	829,267	561,859	867,705
	Med.	N/A	870,942	870,942	385,986	600,000
	S.D.	N/A	-	423,983	484,379	1,054,721
	Min	N/A	870,942	385,986	14,687	14,687
	Max	N/A	870,942	1,230,873	1,230,873	3,914,176

Note: The Enfield assessor was unable to provide data for commercial property sales values. Other "N/A" values (including all radii for Berlin) indicate there were no sales in that range in this period *(source: authors' calculations based on data from municipal assessors, the Lincoln Institute of Land Policy, and GIS distance calculations)*

Table 31. *Descriptive statistics of deflated sales value of commercial properties (Period 2 - 2017 or 2018 values)*

CTrail Station		1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius	2 mile radius
Enfield	**n =**	-	-	-	-	-
	Avg.	N/A	N/A	N/A	N/A	N/A
	Med.	N/A	N/A	N/A	N/A	N/A
	S.D.	N/A	N/A	N/A	N/A	N/A
	Min	N/A	N/A	N/A	N/A	N/A
	Max	N/A	N/A	N/A	N/A	N/A
Windsor Locks	**n =**	-	-	-	-	1
	Avg.	N/A	N/A	N/A	N/A	253,894
	Med.	N/A	N/A	N/A	N/A	253,894
	S.D.	N/A	N/A	N/A	N/A	-
	Min	N/A	N/A	N/A	N/A	253,894
	Max	N/A	N/A	N/A	N/A	253,894
Windsor	**n =**	-	-	-	-	-
	Avg.	N/A	N/A	N/A	N/A	N/A
	Med.	N/A	N/A	N/A	N/A	N/A
	S.D.	N/A	N/A	N/A	N/A	N/A
	Min	N/A	N/A	N/A	N/A	N/A
	Max	N/A	N/A	N/A	N/A	N/A
Hartford Union	**n =**	2	3	5	10	28
	Avg.	1,986,042	1,557,445	1,014,276	629,133	856,156
	Med.	1,986,042	1,001,613	700,252	199,521	395,663
	S.D.	1,392,192	1,232,958	1,146,977	908,106	989,221
	Min	1,001,613	700,252	132,043	59,508	24,549
	Max	2,970,471	2,970,471	2,970,471	2,970,471	2,970,471
West Hartford	**n =**	-	1	3	4	18
	Avg.	N/A	1,129,270	764,744	635,113	444,997
	Med.	N/A	1,129,270	820,254	582,482	320,874
	S.D.	N/A	-	395,215	413,940	395,610
	Min	N/A	1,129,270	344,709	246,221	53,715
	Max	N/A	1,129,270	1,129,270	1,129,270	1,129,270
Newington	**n =**	1	1	1	1	8
	Avg.	339,817	339,817	339,817	339,817	3,158,827
	Med.	339,817	339,817	339,817	339,817	330,805
	S.D.	-	-	-	-	7,652,947
	Min	339,817	339,817	339,817	339,817	53,715
	Max	339,817	339,817	339,817	339,817	22,075,901
Berlin	**n =**	2	5	6	8	16
	Avg.	199,431	300,324	516,359	829,145	949,231
	Med.	199,431	215,482	219,753	488,694	558,092
	S.D.	22,700	256,198	576,659	766,704	941,425
	Min	183,379	125,371	125,371	125,371	125,371
	Max	215,482	753,363	1,596,532	1,995,665	3,285,693
Meriden	**n =**	1	6	11	13	19
	Avg.	171,889	545,129	362,298	334,136	658,480
	Med.	171,889	244,561	201,355	184,658	225,810
	S.D.	-	751,305	575,209	529,577	1,533,514
	Min	171,889	171,889	58,907	58,907	58,907
	Max	171,889	2,074,452	2,074,452	2,074,452	6,729,095
Wallingford	**n =**	3	5	11	14	28
	Avg.	1,643,010	1,804,065	1,182,018	1,054,514	2,368,175
	Med.	736,336	736,336	515,435	503,273	660,737

	S.D.	1,992,057	1,950,066	1,454,487	1,307,824	3,402,884
	Min	265,570	164,171	164,171	164,171	164,171
	Max	3,927,125	3,927,125	3,927,125	3,927,125	10,142,404
North Haven	**n =**	-	2	4	5	9
	Avg.	N/A	11,474,836	6,001,390	4,874,779	3,434,297
	Med.	N/A	11,474,836	6,049,404	834,888	736,336
	S.D.	N/A	298,281	6,327,502	6,031,105	4,776,165
	Min	N/A	11,263,920	221,000	221,000	221,000
	Max	N/A	11,685,752	11,685,752	11,685,752	11,685,752
New Haven State Street	**n =**	4	7	18	20	45
	Avg.	1,227,645	4,329,678	2,140,984	2,190,255	3,213,129
	Med.	1,252,112	1,522,443	654,527	654,527	589,333
	S.D.	555,784	6,652,157	4,368,964	4,196,270	10,241,520
	Min	579,425	579,425	9,818	9,818	9,818
	Max	1,826,932	18,831,324	18,831,324	18,831,324	67,020,200
New Haven Union	**n =**	-	3	9	14	41
	Avg.	N/A	6,859,859	10,935,971	7,541,568	3,490,990
	Med.	N/A	1,522,443	1,545,134	1,338,018	624,331
	S.D.	N/A	10,387,844	21,834,779	17,801,273	10,698,993
	Min	N/A	225,810	225,810	9,818	9,818
	Max	N/A	18,831,324	67,020,200	67,020,200	67,020,200

Note: The Enfield assessor was unable to provide data for commercial property sales values. Other "N/A" values indicate there were no sales in that range in this period
(source: authors' calculations based on data from municipal assessors, the Lincoln Institute of Land Policy, and GIS distance calculations)

Tables 32 and 33 present descriptive statistics for the deflated sales values per square foot of commercial properties, in Period 1 and 2, respectively.

Table 32. *Descriptive statistics of deflated sales value per square foot of commercial properties (Period 1 - 2011 or 2012 values)*

CTrail Station		1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius	2 mile radius
Enfield	**n =**	-	-	-	-	-
	Avg.	N/A	N/A	N/A	N/A	N/A
	Med.	N/A	N/A	N/A	N/A	N/A
	S.D.	N/A	N/A	N/A	N/A	N/A
	Min	N/A	N/A	N/A	N/A	N/A
	Max	N/A	N/A	N/A	N/A	N/A
Windsor Locks	**n =**	-	-	-	-	1
	Avg.	N/A	N/A	N/A	N/A	36.02
	Med.	N/A	N/A	N/A	N/A	36.02
	S.D.	N/A	N/A	N/A	N/A	-
	Min	N/A	N/A	N/A	N/A	36.02
	Max	N/A	N/A	N/A	N/A	36.02
Windsor	**n =**	-	-	-	-	-
	Avg.	N/A	N/A	N/A	N/A	N/A
	Med.	N/A	N/A	N/A	N/A	N/A
	S.D.	N/A	N/A	N/A	N/A	N/A
	Min	N/A	N/A	N/A	N/A	N/A
	Max	N/A	N/A	N/A	N/A	N/A
Hartford Union	**n =**	-	6	9	19	53
	Avg.	N/A	11.71	30.24	42.82	112.99
	Med.	N/A	6.36	19.64	33.77	37.88
	S.D.	N/A	12.80	31.60	46.60	281.20
	Min	N/A	2.07	2.07	2.07	1.62
	Max	N/A	33.77	80.13	201.61	1,468.15
West Hartford	**n =**	1	2	7	8	24
	Avg.	33.66	45.57	104.19	114.71	115.04
	Med.	33.66	45.57	87.05	99.66	83.21
	S.D.	-	16.85	74.86	75.43	104.28
	Min	33.66	33.66	28.54	28.54	17.64
	Max	33.66	57.49	205.15	205.15	422.05
Newington	**n =**	1	1	1	3	10
	Avg.	16.04	16.04	16.04	27.40	50.39
	Med.	16.04	16.04	16.04	19.98	46.12
	S.D.	-	-	-	16.38	32.49
	Min	16.04	16.04	16.04	16.04	16.04
	Max	16.04	16.04	16.04	46.17	129.94
Berlin	**n =**	-	-	-	-	-
	Avg.	N/A	N/A	N/A	N/A	N/A
	Med.	N/A	N/A	N/A	N/A	N/A
	S.D.	N/A	N/A	N/A	N/A	N/A
	Min	N/A	N/A	N/A	N/A	N/A
	Max	N/A	N/A	N/A	N/A	N/A
Meriden	**n =**	4	5	6	9	16
	Avg.	37.33	32.92	40.67	57.91	133.34
	Med.	38.64	31.64	38.64	45.64	47.05
	S.D.	11.75	14.18	22.84	43.51	289.17
	Min	23.58	15.26	15.26	15.26	15.26
	Max	48.46	48.46	79.44	136.75	1,205.36
Wallingford	**n =**	1	7	10	11	21
	Avg.	77.24	38.44	60.02	58.40	69.29
	Med.	77.24	37.89	43.77	42.28	44.05

	S.D.	-	20.13	45.70	43.68	51.37
	Min	77.24	18.54	18.54	18.54	18.54
	Max	77.24	77.24	152.58	152.58	212.93
North Haven	**n =**	-	-	1	1	4
	Avg.	N/A	N/A	315.99	315.99	250.72
	Med.	N/A	N/A	315.99	315.99	251.78
	S.D.	N/A	N/A	-	-	100.83
	Min	N/A	N/A	315.99	315.99	144.19
	Max	N/A	N/A	315.99	315.99	355.13
New Haven State Street	**n =**	3	3	3	7	14
	Avg.	109.26	109.26	109.26	114.91	98.09
	Med.	50.84	50.84	50.84	113.98	70.24
	S.D.	103.30	103.30	103.30	64.14	75.72
	Min	48.40	48.40	48.40	48.40	11.66
	Max	228.53	228.53	228.53	228.53	272.62
New Haven Union	**n =**	-	1	3	5	13
	Avg.	N/A	228.53	109.26	82.93	101.74
	Med.	N/A	228.53	50.84	50.84	75.20
	S.D.	N/A	-	103.30	84.50	77.53
	Min	N/A	228.53	48.40	11.66	11.66
	Max	N/A	228.53	228.53	228.53	272.62

Note: The Enfield assessor was unable to provide data for commercial property sales values. Also, some assessors were unable to provide square footage data, which accounts for some of the "N/A" values in this table that were not in the other sales values tables. Other "N/A" values (including all radii for Berlin) indicate there were no sales in that range in this period *(source: authors' calculations based on data from municipal assessors, the Lincoln Institute of Land Policy, and GIS distance calculations)*

Table 33. *Descriptive statistics of deflated sales value per square foot of commercial properties (Period 2 - 2017 or 2018 values)*

CTrail Station		1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius	2 mile radius
Enfield	**n =**	-	-	-	-	-
	Avg.	N/A	N/A	N/A	N/A	N/A
	Med.	N/A	N/A	N/A	N/A	N/A
	S.D.	N/A	N/A	N/A	N/A	N/A
	Min	N/A	N/A	N/A	N/A	N/A
	Max	N/A	N/A	N/A	N/A	N/A
Windsor Locks	**n =**	-	-	-	-	1
	Avg.	N/A	N/A	N/A	N/A	64.47
	Med.	N/A	N/A	N/A	N/A	64.47
	S.D.	N/A	N/A	N/A	N/A	-
	Min	N/A	N/A	N/A	N/A	64.47
	Max	N/A	N/A	N/A	N/A	64.47
Windsor	**n =**	-	-	-	-	-
	Avg.	N/A	N/A	N/A	N/A	N/A
	Med.	N/A	N/A	N/A	N/A	N/A
	S.D.	N/A	N/A	N/A	N/A	N/A
	Min	N/A	N/A	N/A	N/A	N/A
	Max	N/A	N/A	N/A	N/A	N/A
Hartford Union	**n =**	2	3	5	10	28
	Avg.	56.47	55.67	60.77	68.49	107.22
	Med.	56.47	54.07	54.07	23.51	37.52
	S.D.	39.22	27.76	41.12	105.92	255.24
	Min	28.74	28.74	18.28	6.52	6.52
	Max	84.20	84.20	118.56	349.84	1,347.88
West Hartford	**n =**	-	1	3	4	18
	Avg.	N/A	46.24	60.01	55.79	83.77
	Med.	N/A	46.24	46.24	44.67	54.34
	S.D.	N/A	-	27.52	24.01	95.34
	Min	N/A	46.24	42.09	42.09	6.52
	Max	N/A	46.24	91.70	91.70	349.84
Newington	**n =**	1	1	1	1	8
	Avg.	85.81	85.81	85.81	85.81	64.54
	Med.	85.81	85.81	85.81	85.81	39.87
	S.D.	-	-	-	-	52.53
	Min	85.81	85.81	85.81	85.81	9.87
	Max	85.81	85.81	85.81	85.81	151.07
Berlin	**n =**	2	5	6	8	16
	Avg.	143.14	77.82	350.96	387.70	335.19
	Med.	143.14	64.51	74.31	74.31	109.56
	S.D.	83.49	75.37	672.46	619.16	481.13
	Min	84.11	10.29	10.29	10.29	10.29
	Max	202.18	202.18	1,716.70	1,716.70	1,716.70
Meriden	**n =**	1	6	11	13	19
	Avg.	90.56	159.35	121.23	115.67	110.18
	Med.	90.56	91.19	90.56	90.56	90.56
	S.D.	-	215.70	163.72	150.79	124.97
	Min	90.56	33.89	16.80	16.80	16.80
	Max	90.56	596.35	596.35	596.35	596.35
Wallingford	**n =**	3	5	11	14	28
	Avg.	298.05	212.31	175.51	168.78	187.19
	Med.	183.74	137.82	111.23	102.50	116.30

	S.D.	238.86	207.41	172.73	161.97	156.29
	Min	137.82	46.04	35.12	35.12	23.12
	Max	572.58	572.58	572.58	572.58	572.58
North Haven	**n =**	-	2	4	5	9
	Avg.	N/A	146.13	120.51	172.43	200.72
	Med.	N/A	146.13	100.90	162.50	252.96
	S.D.	N/A	151.08	107.38	148.75	127.12
	Min	N/A	39.30	27.28	27.28	27.28
	Max	N/A	252.96	252.96	380.12	380.12
New Haven State Street	**n =**	4	7	18	20	45
	Avg.	102.09	170.54	139.81	132.63	134.19
	Med.	91.26	138.35	137.12	122.55	101.68
	S.D.	35.31	128.13	99.85	97.65	142.65
	Min	73.83	73.83	0.16	0.16	0.16
	Max	152.00	442.21	442.21	442.21	834.75
New Haven Union	**n =**	-	3	9	14	41
	Avg.	N/A	109.07	181.57	149.43	141.71
	Med.	N/A	73.83	152.00	123.78	102.70
	S.D.	N/A	83.94	128.07	117.27	146.51
	Min	N/A	48.50	48.50	0.16	0.16
	Max	N/A	204.88	442.21	442.21	834.75

Note: The Enfield assessor was unable to provide data for commercial property sales values. Also some assessors were unable to provide square footage data, which accounts for some of the "N/A" values in this table that were not in the other sales values tables
(source: authors' calculations based on data from municipal assessors, the Lincoln Institute of Land Policy, and GIS distance calculations)

Tables 34 and 35, below, present descriptive statistics of the "gross living area" for residential and commercial properties, respectively, within a given radius from each station. It is noteworthy that the Windsor Locks and Berlin assessors were unable to provide the "gross living area" (i.e., square footage) data for the complete universe of properties in those municipalities.

Table 34. *Descriptive statistics of gross living area in 2017 of residential properties*

CTrail Station		1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius	2 mile radius
Enfield	**n =**	79	456	886	1,513	3,605
	Avg.	12,968	4,236	3,252	2,625	2,005
	Med.	2,614	2,356	2,086	1,643	1,453
	S.D.	89,529	37,297	26,899	20,937	13,823
	Min	650	564	437	312	312
	Max	798,563	798,563	798,563	798,563	798,563
Windsor Locks*	**n =**	6	194	552	850	3,438
	Avg.	1,391	1,488	1,564	1,570	1,625
	Med.	1,337	1,265	1,484	1,428	1,416
	S.D.	249	635	623	611	1,953
	Min	1,104	700	672	672	529
	Max	1,728	4,122	8,548	8,548	81,508
Windsor	**n =**	43	375	695	1,027	4,069
	Avg.	2,211	1,856	1,776	1,730	1,579
	Med.	2,068	1,714	1,648	1,598	1,428
	S.D.	851	606	621	619	526
	Min	960	768	768	625	486
	Max	5,962	5,962	6,057	6,057	6,057
Hartford Union	**n =**	13	133	816	1,803	8,662
	Avg.	54,818	18,941	8,252	6,990	4,398
	Med.	35,988	3,912	3,665	3,692	3,229
	S.D.	58,338	49,734	24,009	18,646	10,815
	Min	7,836	1,230	960	960	564
	Max	227,403	314,949	314,949	314,949	314,949
West Hartford	**n =**	112	491	1,575	3,609	15,616
	Avg.	2,047	1,864	1,724	1,766	2,430
	Med.	1,494	1,404	1,332	1,352	1,708
	S.D.	1,733	2,312	2,927	2,606	4,091
	Min	738	480	480	120	120
	Max	17,166	39,614	51,491	63,426	307,643
Newington	**n =**	17	306	543	993	6,543
	Avg.	1,836	1,490	1,483	1,546	1,518
	Med.	1,775	1,323	1,318	1,351	1,358
	S.D.	598	512	576	1,004	1,304
	Min	1,008	922	894	704	400
	Max	3,397	4,300	7,470	24,660	69,552
Berlin*	**n =**	-	-	-	-	438
	Avg.	N/A	N/A	N/A	N/A	1,486
	Med.	N/A	N/A	N/A	N/A	1,314
	S.D.	N/A	N/A	N/A	N/A	682
	Min	N/A	N/A	N/A	N/A	984
	Max	N/A	N/A	N/A	N/A	11,776
Meriden	**n =**	176	888	2,113	3,807	10,248
	Avg.	1,736	2,005	2,042	1,920	1,621
	Med.	1,514	1,907	1,934	1,758	1,419
	S.D.	904	828	812	803	703
	Min	672	176	176	176	144
	Max	4,871	4,871	5,556	6,227	16,145
Wallingford	**n =**	206	744	1,529	2,353	6,788
	Avg.	1,766	1,747	1,797	1,750	1,630
	Med.	1,703	1,601	1,632	1,576	1,444
	S.D.	586	696	707	699	635

	Min	690	554	550	550	504
	Max	3,716	4,576	5,752	6,538	6,538
North Haven	**n =**	6	104	464	1,226	4,573
	Avg.	2,122	2,489	2,148	2,011	1,827
	Med.	1,417	1,743	1,788	1,695	1,560
	S.D.	1,912	7,141	3,504	3,689	2,613
	Min	1,017	636	636	636	528
	Max	6,000	74,316	74,316	104,904	104,904
New Haven State Street	**n =**	110	325	684	1,852	11,155
	Avg.	5,713	7,670	6,858	4,862	3,215
	Med.	2,761	2,790	2,756	2,650	2,518
	S.D.	15,565	26,263	23,439	15,300	7,327
	Min	1,120	880	880	520	393
	Max	146,512	276,599	276,599	276,599	276,599
New Haven Union	**n =**	68	382	1,319	2,323	8,332
	Avg.	4,160	4,060	3,523	3,790	3,352
	Med.	1,936	2,456	2,329	2,320	2,494
	S.D.	7,404	10,237	10,806	13,348	8,281
	Min	928	520	393	393	393
	Max	54,922	132,935	229,462	276,599	276,599

*Indicates this municipal assessor did not have the complete universe of property GLA to provide for this analysis

(source: authors' calculations based on data from municipal assessors and GIS distance calculations)

Table 35. *Descriptive statistics of gross living area in 2017 of commercial properties*

CTrail Station		1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius	2 mile radius
Enfield	**n =**	13	54	91	116	264
	Avg.	8,024	6,905	7,912	7,259	21,796
	Med.	4,220	5,522	5,553	4,584	5,522
	S.D.	8,064	6,098	9,103	8,677	51,126
	Min	774	510	510	286	286
	Max	27,720	27,720	65,615	65,615	472,536
Windsor Locks*	**n =**	-	7	23	29	64
	Avg.	N/A	6,164	8,967	14,170	31,085
	Med.	N/A	4,568	4,992	5,664	7,611
	S.D.	N/A	5,956	10,794	23,298	64,104
	Min	N/A	1,000	1,000	1,000	1,000
	Max	N/A	17,724	52,416	112,820	368,938
Windsor	**n =**	3	4	6	6	97
	Avg.	2,447	2,260	2,484	2,484	2,300
	Med.	1,163	1,432	2,211	2,211	1,701
	S.D.	2,437	2,024	1,611	1,611	1,549
	Min	920	920	920	920	920
	Max	5,257	5,257	5,257	5,257	5,257
Hartford Union	**n =**	27	115	240	367	930
	Avg.	57,622	98,078	90,319	64,469	35,237
	Med.	28,229	14,531	8,805	7,224	6,128
	S.D.	83,180	242,632	273,328	224,618	144,665
	Min	120	120	120	120	120
	Max	327,630	1,835,910	2,416,538	2,416,538	2,416,538
West Hartford	**n =**	58	218	397	548	1,507
	Avg.	17,164	13,227	11,493	12,937	14,097
	Med.	5,836	4,941	4,881	5,000	5,215
	S.D.	30,501	28,723	24,889	25,651	27,859
	Min	510	392	300	300	220
	Max	178,466	238,965	238,965	238,965	265,265
Newington	**n =**	6	16	38	48	211
	Avg.	64,519	48,050	31,012	28,735	17,693
	Med.	2,771	6,418	6,196	7,834	5,414
	S.D.	136,832	90,804	62,497	56,416	51,917
	Min	798	798	798	798	441
	Max	342,358	342,358	342,358	342,358	622,262
Berlin*	**n =**	-	-	-	-	23
	Avg.	N/A	N/A	N/A	N/A	12,398
	Med.	N/A	N/A	N/A	N/A	6,200
	S.D.	N/A	N/A	N/A	N/A	13,873
	Min	N/A	N/A	N/A	N/A	1,200
	Max	N/A	N/A	N/A	N/A	53,082
Meriden	**n =**	69	202	341	464	724
	Avg.	13,810	13,299	14,134	15,637	15,273
	Med.	9,280	5,904	5,183	5,015	5,000
	S.D.	17,785	25,595	36,270	43,214	37,980
	Min	1,279	480	119	119	119
	Max	129,073	198,907	435,206	542,055	542,055
Wallingford	**n =**	41	186	357	421	748
	Avg.	9,808	7,500	10,998	12,462	16,070
	Med.	3,072	3,803	4,204	4,342	5,460
	S.D.	18,306	11,403	27,892	37,439	35,382

	Min	1,286	780	240	240	140
	Max	105,252	105,252	322,926	459,976	459,976
North Haven	**n =**	35	60	151	229	445
	Avg.	11,879	20,695	18,347	16,579	15,185
	Med.	2,248	4,670	3,839	2,646	3,280
	S.D.	24,875	44,288	38,373	37,386	34,736
	Min	520	520	364	240	120
	Max	112,550	286,597	286,597	286,597	286,597
New Haven State Street	**n =**	115	272	479	665	1,398
	Avg.	26,941	27,037	28,317	25,370	18,406
	Med.	8,294	8,145	7,725	7,095	5,405
	S.D.	57,788	57,104	65,756	60,206	49,293
	Min	840	704	704	624	120
	Max	495,934	495,934	516,500	516,500	516,500
New Haven Union	**n =**	15	82	289	529	1,288
	Avg.	30,396	34,299	38,393	29,186	19,398
	Med.	14,520	8,786	8,543	6,968	5,529
	S.D.	47,647	57,287	80,801	67,925	51,160
	Min	1,196	728	704	326	120
	Max	187,648	322,750	516,500	516,500	516,500

*Indicates this municipal assessor did not have the complete universe of property GLA to provide for this analysis

(source: authors' calculations based on data from municipal assessors and GIS distance calculations)

3.9 Travel Time and Cost Comparison

A time and cost comparison for travel via Hartford Line versus private automobile was performed for two urban Connecticut destinations: the XL Center located at 1 Civic Center Plaza in Hartford, and the New Haven Green, located at 250 Temple St. in New Haven.[10] One analysis includes round trip travel via automobile between home residences and a public parking area near each destination (assuming the walk time from the parking lot/garage to the landmark is negligible). The second analysis includes walking from home residences to the Hartford Line train station, riding on the train, and walking to the destination point from the destination train station. This is calculated in both directions, for a round trip analysis.[11] All of the residences located within a one-mile radius of each of the train stations are included in the analyses. The result is reported as the difference in travel costs per average household person-trip.

[10] The cost savings data are for travel to the XL Center in Hartford, from each residence within one mile to the closest station in Meriden, New Haven, Wallingford, Windsor, and Windsor Locks. Similarly, the cost savings data for travel to New Haven Green in New Haven are from each residence within one mile to the closest station in Hartford, Meriden, Wallingford, Windsor and Windsor Locks. These are the 7 of the 8 existing stations (as of initial service date of June 2018). Travel time between the two New Haven stations - State Street Station and New Haven Station - are not calculated, given their close proximity with each other. Since travel time on the Hartford Line is not available at this point for "future stations", the VTTS data does not include estimates for properties near those future stations.

[11] Travel times were calculated one-way, during a typical weekday morning rush hour period, then doubled to obtain an estimate of the round-trip travel time.

The following assumptions are made for the time and cost comparison:

1. All trips analyzed are defined as **personal travel**. Business travel is defined as travel while on the job, "on the clock," and it is not considered in this analysis for commuting to one of the two destinations. This is because typically workers are not paid for their commuting time, unless they can be productive while traveling (hence the US DOT (2016) guidance on surface factor adjustments for transit commuting, as described below).

2. All train travel is defined as **"local"** as opposed to "intercity". Intercity is typically defined as travel occurring between major metropolitan areas greater than 50 miles apart, e.g., Boston to New York City.[12]

3. Costs associated with travel[13] are divided into two categories: **value of travel time**, and **travel expenses**.[14] The value of travel time can be a complex issue, as drivers of various economic and cultural backgrounds might value the cost of travel time quite differently. The type of travel is also a factor. Whereas, a drive to work under congested, and therefore stressful, conditions might garner a maximum cost to many commuters, a drive for the primary purpose of vacationing in a national park might be identified as a desirable expense or negative cost.

a. The procedures used for calculating **travel time[15]** are based loosely on recommendations from the Office of the Secretary of the US DOT, updated through 2016, (USDOT (2016)). The USDOT method provides the value of travel time savings (VTTS) for an existing travel mode (road, transit, train, etc.), for evaluating reductions or increases in passenger travel time resulting from infrastructure upgrades or operational changes. Both travel time costs and travel expenses are summed to compare two modes for each trip, and the difference in total cost is thus developed. It is possible for travel time by the Hartford Line to be longer, yet produce a net positive cost savings for the household travel.

b. Median household income for the recent 5-years (2013-2017) at the census block group from the Census Bureau's American Community Survey, is used for determining the cost per

[12] The train station in Springfield, MA is not included in this analysis, given the study's focus on real estate in CT.

[13] The costs of greenhouse gas (GHG) emissions are ignored for both the driving and bus travel modes. If it were feasible to include GHG emissions costs, it is hypothesized that the total cost savings from using Hartford Line opposed to personal automobiles would be higher.

[14] The train fare is not included in the VTTS calculations; this would likely lower the VTTS estimates for each property by a few dollars per day. For instance, as of February 2022, a monthly pass for Wallingford to New Haven cost $73.50 per month (as of February 2022), or $3.68 per day round trip (assuming 20 round trips per month); while a monthly pass for Windsor Locks to New Haven cost $210 per month (as of February 2022), or $10.50 per day round trip (assuming 20 round trips per month). Source: https://www.hartfordline.com/pdf/fare_schedule.pdf (accessed 5/30/2022).

[15] Travel time on Hartford Line was collected from the Weekday Schedule: https://www.hartfordline.com/fares-schedules/ (accessed 8/21/2021).

residence, expressed as travel time per minute. Data on the census block group was collected as it is the smallest unit where the income data are publicly available.

4. The value of travel time during the commute is assigned to be 50% of annual household income per minute (US DOT (2016)). The other components of travel, such as the walk from stations to and from destinations[16], and the drive from home to the destination parking garage/lot, are considered at 100% of personal income per minute. This assumption is recommended by US DOT (2016) because the bus allows for more productive use of personal time than driving a car.

5. **Travel expenses** include fixed and variable costs of vehicle ownership, and estimated parking fees.

a. The automobile ownership costs used are those listed by the American Automobile Association (AAA); $8,849 per year, as of September 2018 (AAA (2018)). The AAA figure is calculated based on the cost of fuel, maintenance, repairs, insurance, license/registration/taxes, depreciation and loan interest, and is determined as an average of nine types of vehicles ranging from small sedans to pickup trucks, including some hybrid and electric vehicles. For this analysis, the ownership value is converted to a per-travel-day value by dividing the annual ownership cost by 260 working days, giving a result of $34.03 per day.

b. It is assumed for this analysis that people who live within ¾ mile of existing Hartford Line stations would be able to eliminate ownership of one of their vehicles. Therefore, the cost of auto ownership is applied only to the driving portion of the analysis.

A sample calculation comparing travel by Hartford Line train and by automobile is provided below for one case: Meriden station to the XL Center in Hartford.

The travel times assigned to each one-way trip for this example are given in Table 36. The value of travel time is estimated at a certain percent of the hourly median household income for the municipalities in which the Hartford Line is located.

[16] An additional benefit to walking to/from the stations is the health benefits, which are difficult to quantify and not considered in this analysis.

Table 36. *Example of Daily Travel Times and Cost Comparison Analysis, Travel Between 175 Main Street, Berlin, CT and the XL Center in Hartford, Typical Morning Rush Hour Commute*

Travel Mode	*From/to*	*Travel Time one way (minutes)*	*Daily Cost (round trip travel)*
Personal Automobile	Home to XL Center Parking	18.66	$32.37
Parking			$8.00
Car Ownership			$34.03
Walking to station[17]	Residence to Berlin station	9.84	$17.07
Hartford Line ride	Berlin station to Union Station	16[18]	$13.88
Walking to destination (from train station)	Union station to XL Center	7	$12.14
Daily R.T. Cost Savings from using Hartford Line			**$31.31**

Source: authors' calculations using data described in this section in the report.

First, Table 36 demonstrates that for travel from 175 Main Street, Berlin, CT, to the XL Center in Hartford, CT, the majority of the savings from using the Hartford Line come from the expenses of owning and operating an automobile. The travel time on the Hartford Line is also shorter than the drive time, on average. [19] While the travel time between modes may not always result in time savings, the value of travel time between modes likely results in cost savings. This is often due to the assumption that households with at least one commuter who rides the Hartford line will own one fewer automobile, which results in additional cost savings. Similar results are apparent for the other residents in the 1-mile radius from each Hartford Line station. The above table shows that the daily cost savings estimate for traveling by Hartford Line instead of driving is $31.31 for this individual residence. Annually, this is $8,140[20] for this one resident.[21] Adding up the annual cost savings to the XL Center for all residences within 1 mile of a Hartford Line station, for all stations (not including future stations), and multiplying by the number of average working/commuting days per year of 260, yields an annual cost savings of over $21.1

[17] It is assumed the wait time at the train stations is negligible.

[18] This estimate is obtained after adjusting the travel time on the train for surface factor per US DOT (2016)

[19] However, when the walk time to-and-from the stations is included, the total trip time in the above example is longer than the drive time. But this is not necessarily the case for all properties in the sample.

[20] The daily savings of $31.31 is multiplied by 260 working days, to arrive at $7,514 per year.

[21] As of February 28, 2022, the monthly pass cost for the route between Berlin and Hartford was $68.25, or $3.41 per day. This would reduce the annual VTTS for this particular example by $887. In other words, if the train fare were considered in this example, the annual VTTS would be $7,253 assuming 260 work days per year.

million. If, instead, all residents were to commute to the New Haven Green instead of to the XL Center, the cost savings estimate would be over $19.7 million.[22]

Note that these savings are only realized if one automobile is given up at each address and one resident switches to taking the Hartford Line to the XL Center, instead of driving. This estimate would be different if more than one car were given up, or if multiple residents from each address were commuting by Hartford Line instead of driving. While this is clearly an exercise that relies on several assumptions, it is instructive in the sense that it demonstrates how the Hartford Line has the potential to save society millions of dollars annually if it were to become fully utilized by a broad swath of the population.

In this Phase 1 report, maps and descriptive statistics for estimated travel time savings are presented in the geospatial database for existing Hartford stations. According to CT DOT, at the time of writing this report, the agency was in the process of finalizing a scope that includes modeling for planned improvements to the Hartford line. That work will not incorporate all of the proposed station stops and has not been completed at the time of the writing of this report. While the real estate data around the proposed stations exist, at this point in time the rail service at these stops does not. Even if there were available travel time estimates for these stops, they would merely be estimated projections, which may not be ideal for establishing baseline travel conditions.

Below, in Tables 37 and 38, are the descriptive statistics for the value of travel time savings in neighborhoods near each of the Hartford Line stations, to the XL Center and to UCONN-Hartford, respectively.

[22] These overall savings were calculated by adding up the savings for each individual property for taking the Hartford Line vs. driving to the XL Center in Hartford; and, for taking the Hartford Line vs. driving to New Haven Green.

Table 37. *Descriptive statistics of cost savings (in dollars) per household round-trip to Hartford XL Center*

CTrail Station		1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius
Windsor Locks	**n =**	4	183	509	603
	Avg.	46.77	37.96	37.70	37.03
	Med.	46.84	34.92	37.24	35.77
	S.D.	0.75	7.84	6.09	5.93
	Min	45.83	26.86	26.86	26.27
	Max	47.57	49.26	49.26	49.26
	Sum	187.08	6946.58	19191.68	22329.91
Windsor	**n =**	47	374	693	884
	Avg.	27.17	16.24	5.95	-0.47
	Med.	28.32	16.34	6.02	0.49
	S.D.	5.15	9.81	15.71	20.28
	Min	10.70	-32.85	-57.05	-61.24
	Max	32.89	32.89	32.89	32.89
	Sum	1277.05	6073.49	4120.20	-415.53
Berlin	**n =**	46	332	891	1030
	Avg.	39.24	33.29	28.78	27.78
	Med.	39.55	32.77	28.86	27.99
	S.D.	2.12	4.03	5.27	5.78
	Min	28.37	24.17	12.82	-12.57
	Max	42.56	42.56	42.56	42.56
	Sum	1805.09	11051.37	25642.97	28616.27
Meriden	**n =**	109	773	1940	2580
	Avg.	38.52	35.41	32.62	31.31
	Med.	38.68	36.07	32.70	31.76
	S.D.	1.63	3.52	4.26	5.47
	Min	32.53	2.16	2.16	0.77
	Max	42.21	42.21	42.21	42.21
	Sum	4198.98	27370.91	63289.48	80777.32
Wallingford	**n =**	188	667	1367	1684
	Avg.	40.28	36.94	33.21	31.13
	Med.	40.19	37.09	34.02	31.88
	S.D.	2.13	3.33	5.37	6.82
	Min	36.59	27.87	15.86	13.85
	Max	46.43	46.43	46.43	46.43
	Sum	7573.45	24637.21	45398.48	52418.09
New Haven State Street	**n =**	134	344	671	1433
	Avg.	46.23	44.01	42.72	41.93
	Med.	45.48	44.00	41.48	40.68
	S.D.	8.07	6.76	5.50	4.68
	Min	31.72	28.95	28.95	28.95
	Max	56.73	56.73	56.73	56.73
	Sum	6194.72	15139.36	28662.65	60085.45
New Haven Union	**n =**	106	552	1436	1903
	Avg.	43.26	43.24	43.50	43.04
	Med.	44.45	45.10	43.63	43.08
	S.D.	4.13	3.78	3.60	3.79
	Min	38.04	35.50	28.95	28.95
	Max	48.64	50.08	56.73	56.73
	Sum	4585.90	23871.20	62462.74	81904.65

*Cost savings calculated for existing Hartford Line stations at the time of writing this report; does not include future planned stations due to no availability of rail travel times for future stations.

Table 38. *Descriptive statistics of cost savings (in dollars) per household round-trip to New Haven Green*

CTrail Station		1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius
Windsor Locks	**n =**	4	183	509	603
	Avg.	49.87	40.00	36.57	34.50
	Med.	46.02	39.17	35.22	33.00
	S.D.	10.05	15.21	15.14	15.70
	Min	42.69	17.45	4.54	-1.83
	Max	64.76	68.03	68.03	68.03
	Sum	199.49	7319.30	18613.36	20800.86
Windsor	**n =**	47	374	693	883
	Avg.	97.51	75.66	55.16	47.00
	Med.	97.00	83.00	46.00	41.72
	S.D.	18.01	34.53	38.17	39.22
	Min	21.56	-22.00	-45.89	-45.89
	Max	135.01	135.01	135.01	135.01
	Sum	4582.93	28296.29	38227.50	41503.74
Hartford Union	**n =**	-	69	573	867
	Avg.	N/A	37.95	35.43	34.43
	Med.	N/A	38.26	35.90	34.61
	S.D.	N/A	1.17	2.10	2.48
	Min	N/A	35.08	28.23	27.01
	Max	N/A	41.20	41.20	41.20
	Sum	N/A	2618.49	20302.87	29846.87
Berlin	**n =**	46	332	891	1030
	Avg.	44.30	38.86	34.52	33.57
	Med.	44.86	38.98	33.76	32.94
	S.D.	2.40	4.91	5.36	5.76
	Min	31.21	29.19	21.86	-4.73
	Max	47.27	49.61	49.61	49.61
	Sum	2037.98	12900.47	30754.77	34573.73
Meriden	**n =**	109	773	1940	2580
	Avg.	36.45	33.53	30.58	29.20
	Med.	36.89	34.01	30.71	29.70
	S.D.	1.91	3.41	4.43	5.76
	Min	28.45	12.03	0.69	-6.49
	Max	38.73	38.73	38.73	38.73
	Sum	3973.24	25915.77	59319.84	75342.06
Wallingford	**n =**	188	667	1367	1683
	Avg.	30.83	27.42	23.29	21.16
	Med.	30.61	27.52	23.94	21.27
	S.D.	2.21	3.49	5.76	7.07
	Min	26.95	18.15	5.24	-8.70
	Max	37.31	37.31	37.31	37.31
	Sum	5796.44	18286.10	31838.78	35607.94

*Cost savings calculated for existing Hartford Line stations at the time of writing this report; does not include future planned stations due to no availability of rail travel times for future stations.

3.10 Planned and Proposed Developments

For each municipality with a Hartford Line station, a list of current plans/proposals for new real estate development in each of the municipalities was compiled and mapped. For Meriden station, this is shown in Figure 14. This map shows the locations of all 16 projects within ¾ mile of the Meriden station. The information used to create this list was provided by members of the municipal economic development and planning departments in these municipalities, or in some cases (e.g., New Haven), the information was obtained by examining the minutes of the Planning and Zoning Committee meetings. The benefit of mapping this data is that it can start to show evidence of a relationship between the proximity of the station and real estate development. For example, a map of the new plans and proposals near the Meriden Hartford Line station demonstrates increasing planned development in the surrounding areas, including 16 near the station (within ¼ mile), and it will be of interest to examine the dynamics of proposed and planned new development over time in Phase 2.

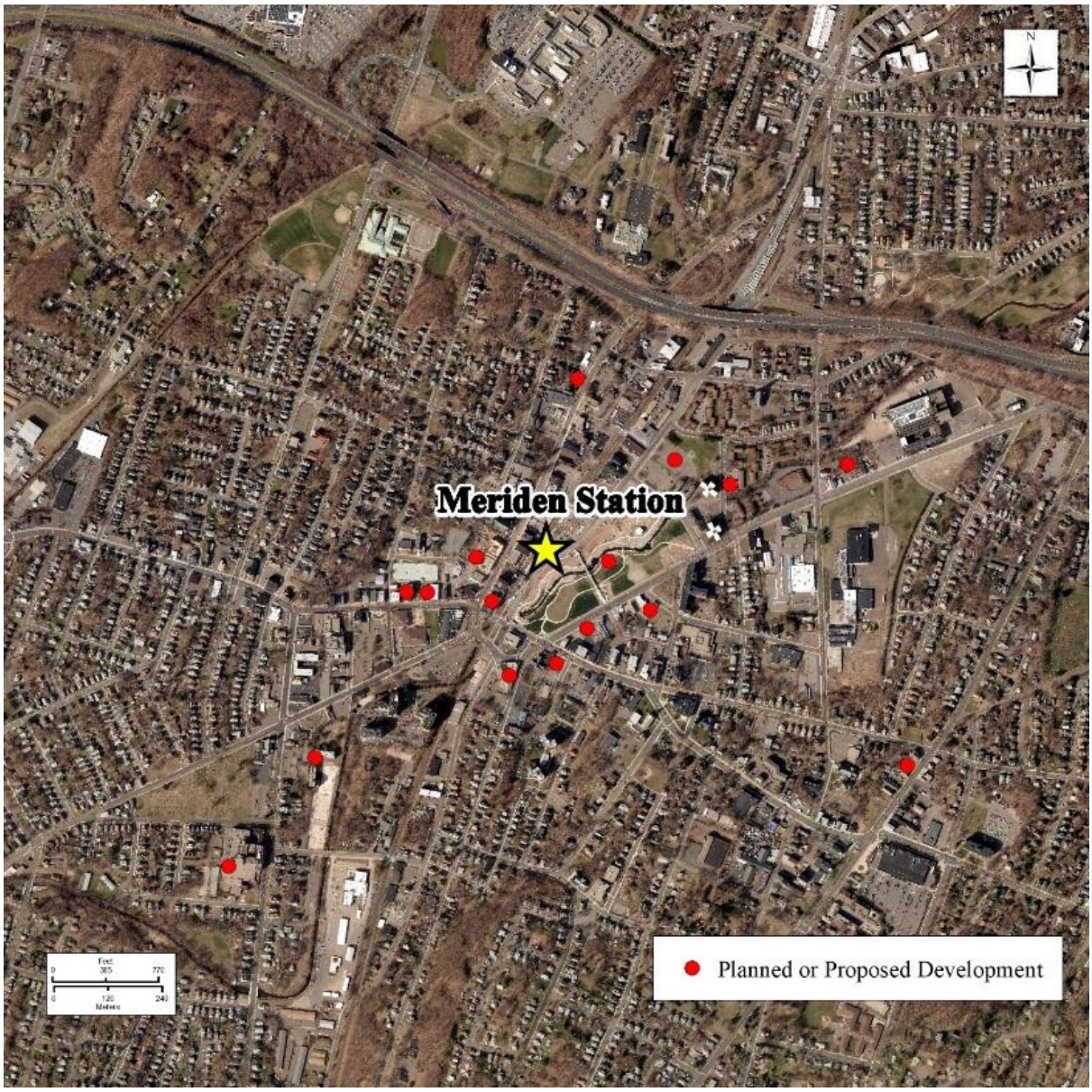

Figure 14. *Planned and Proposed Developments Near Meriden Station*

Table 39. *Number of planned or proposed development projects as of December 2018 (sources: redevelopment data from municipal economic development and planning departments)*

CTrail Station	1/4 mile radius	1/2 mile radius	3/4 mile Radius	1 mile radius	2 mile radius
Enfield	4	6	7	7	7
Windsor Locks	2	2	4	6	11
Windsor	3	4	4	5	6
Hartford Union	3	5	9	9	9
West Hartford	0	1	1	1	1
Newington	1	1	1	1	1
Berlin	3	3	3	3	3
Meriden	11	14	16	16	16
Wallingford	0	0	0	0	0
North Haven	0	0	0	0	0
New Haven State Street	18	38	66	80	107
New Haven Union	2	22	52	73	102

Sources: authors' communications with members of the municipal economic development and planning departments in these municipalities, and/or minutes of the Planning and Zoning Committee meetings.

While some of the descriptive analysis above on property sales prices and assessed values are indicators of the economic aspects of the five years of service, another important issue is that of equity. With gentrification comes displacement of some residents and their need for affordable housing increases. Table 40 below presents data on the total number of "assisted units" for each of the municipalities with Hartford Line stations in each year of Period 1 and Period 2. There appears to be an upward trend in the number of assisted units in Hartford Windsor Locks, Berlin, North Haven, Meriden, and Newington in most years of Period 2 relative to years in Period 1. But West Hartford and Wallingford tend to have fewer assisted units in most years of Phase 2 relative to the individual years of Phase 1. These numbers for West Hartford and Wallingford may be indicative of a possible gentrification effect arising due to the transit-oriented development associated with the Hartford Line's service in these towns. Enfield is fairly stable in the number of units across most years.

3.11 Assisted Units

Table 40. *Number of Assisted Units by Municipality, 2011-2020*

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Hartford	18,432	19,245	19,588	19,634	20,850	19,839	19,875	20,039	20,382	20,659
West Hartford	2,069	2,075	2,136	2,056	1,981	1,928	1,991	1,968	2,091	2,119
Newington	912	933	956	1,111	1,124	1,058	1,078	1,116	1,155	1,168
New Haven	15,940	16,020	16,286	15,985	16,620	16,432	17,464	17,523	17,615	17,800
Wallingford	957	955	967	941	969	758	783	789	821	846
Enfield	2,108	2,108	2,143	2,139	2,194	2,104	2,155	2,179	2,218	2,233
Windsor	778	841	861	878	824	769	797	806	885	891
Windsor Locks	468	497	502	477	486	460	489	489	533	696
Meriden	3,772	3,810	3,833	4,136	4,268	4,077	4,157	4,077	4,260	4,274
North Haven	447	446	448	456	474	467	482	507	516	566
Berlin	586	585	684	699	719	715	729	751	758	752

Source: Connecticut Housing Finance Authority (CHFA), https://portal.ct.gov/DOH/DOH/Programs/Affordable-Housing-Appeals-Listing (accessed 5/30/2022).

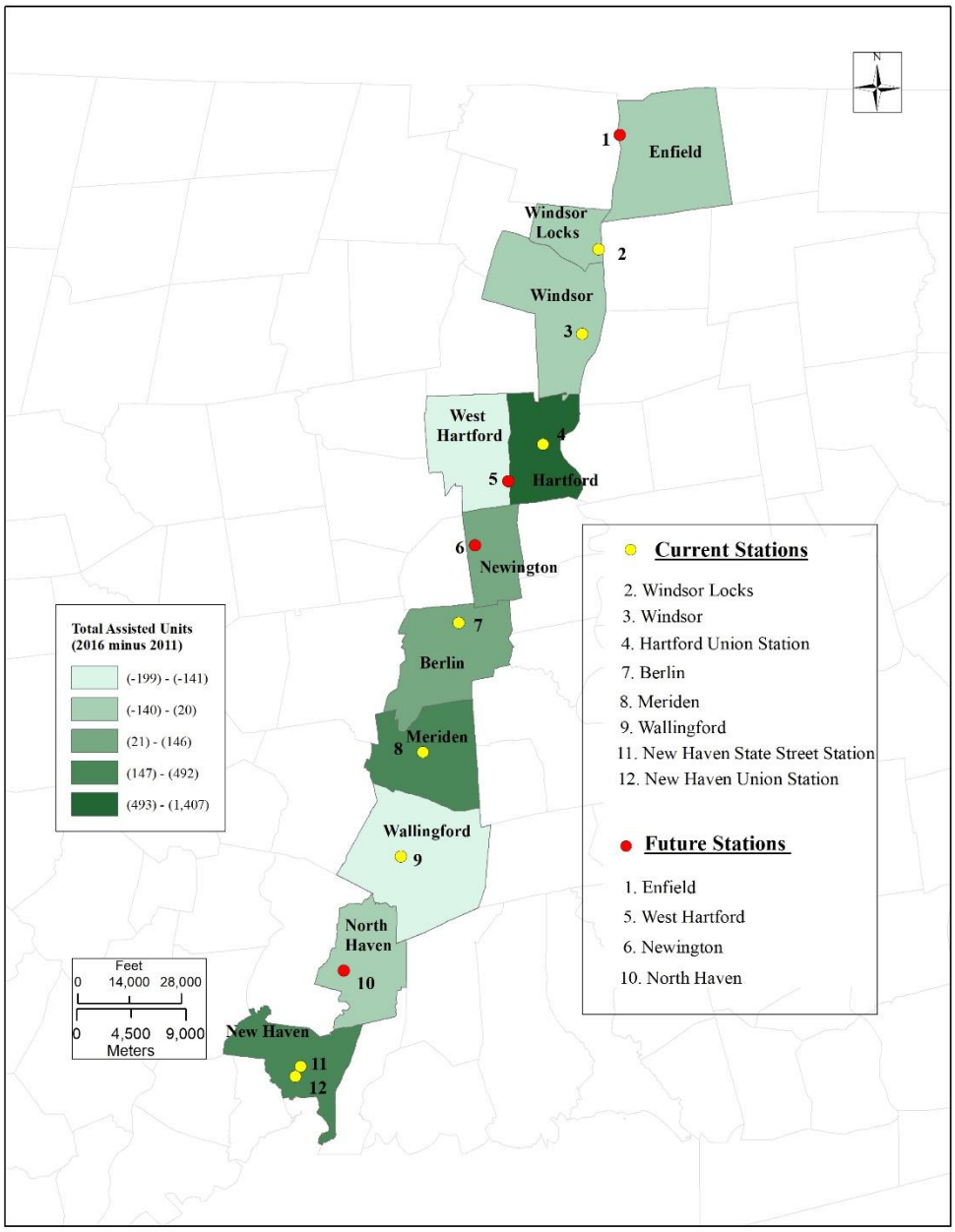

Figure 15. *Change in the number of assisted units between 2011 and 2016 (source: CHFA) and the locations of* CTrail *Hartford Line stations (yellow dots)*

Figure 15, above, shows the change in number of assisted units between 2011 and 2016 for all municipalities. Although the number of assisted units is rising between 2011 and 2016 in all towns except for Wallingford, North Haven, West Hartford, Windsor, Windsor Locks and Enfield, Hartford has added the most assisted units, with Meriden and New Haven having the next highest increase in assisted units.

3.12 Vacancies

Quarterly vacancy rate information was acquired and geocoded at the Census tract level, from 2011-2017 (with the changes in vacancies near Meriden Station by Figure 16 and 17). These data are from the USPS vacancy database, which is also associated with the United States Department of Housing and Urban Development. The data in Table 41 show, for example, that the residential vacancies to the east of Meriden station are increasing between the first quarter of 2011 and 2017, while residential vacancies are decreasing in most other adjacent census tracts. In contrast, the data in Table 42 show that commercial vacancies are decreasing in the tract to the east of Meriden station, but are increasing in most other adjacent tracts.

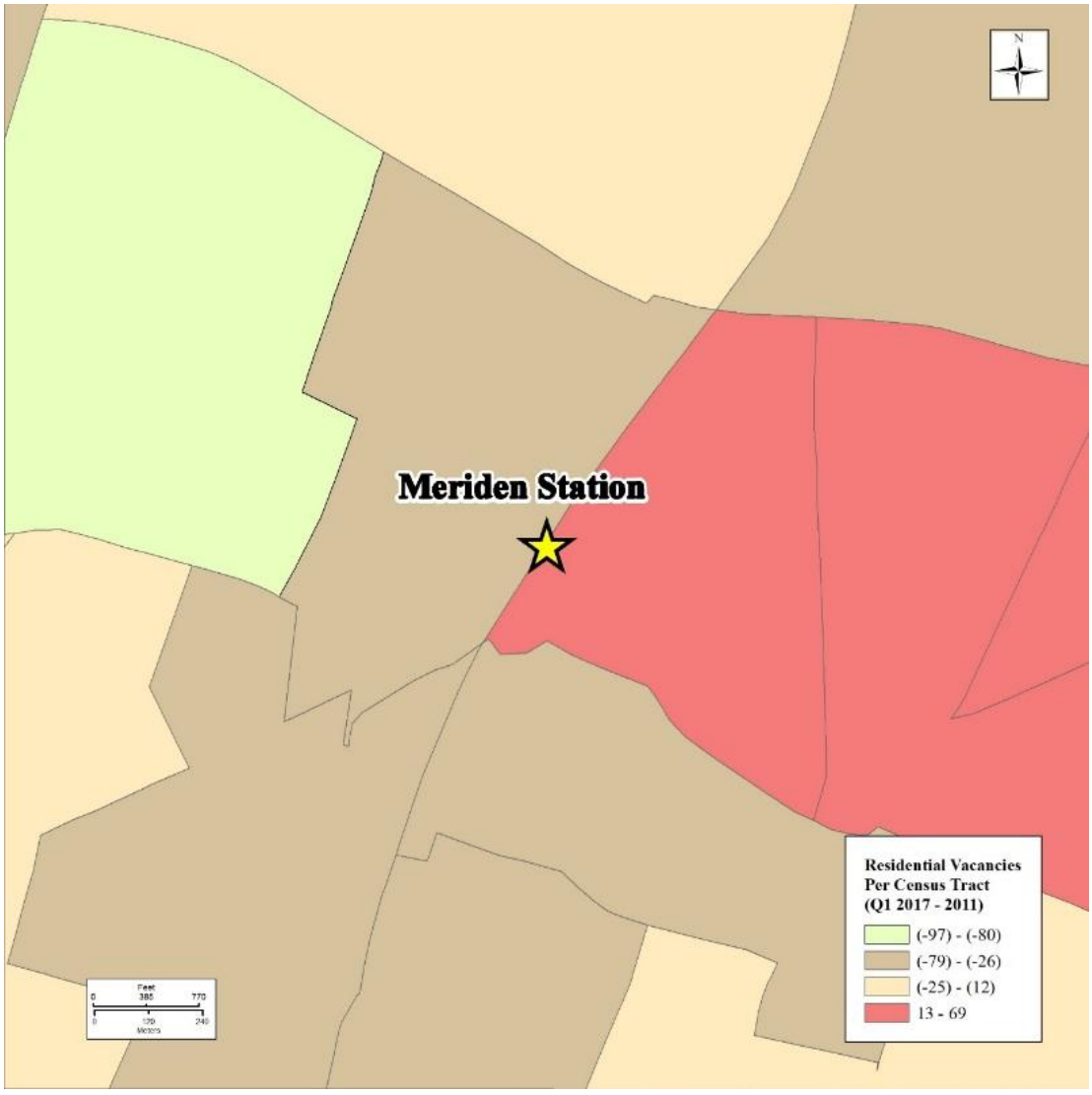

Figure 16. *Change in the residential vacancies per census tract near the Meriden station (yellow star) between the first quarter of 2011 and the first quarter of 2017 (sources: HUD and USPS)*

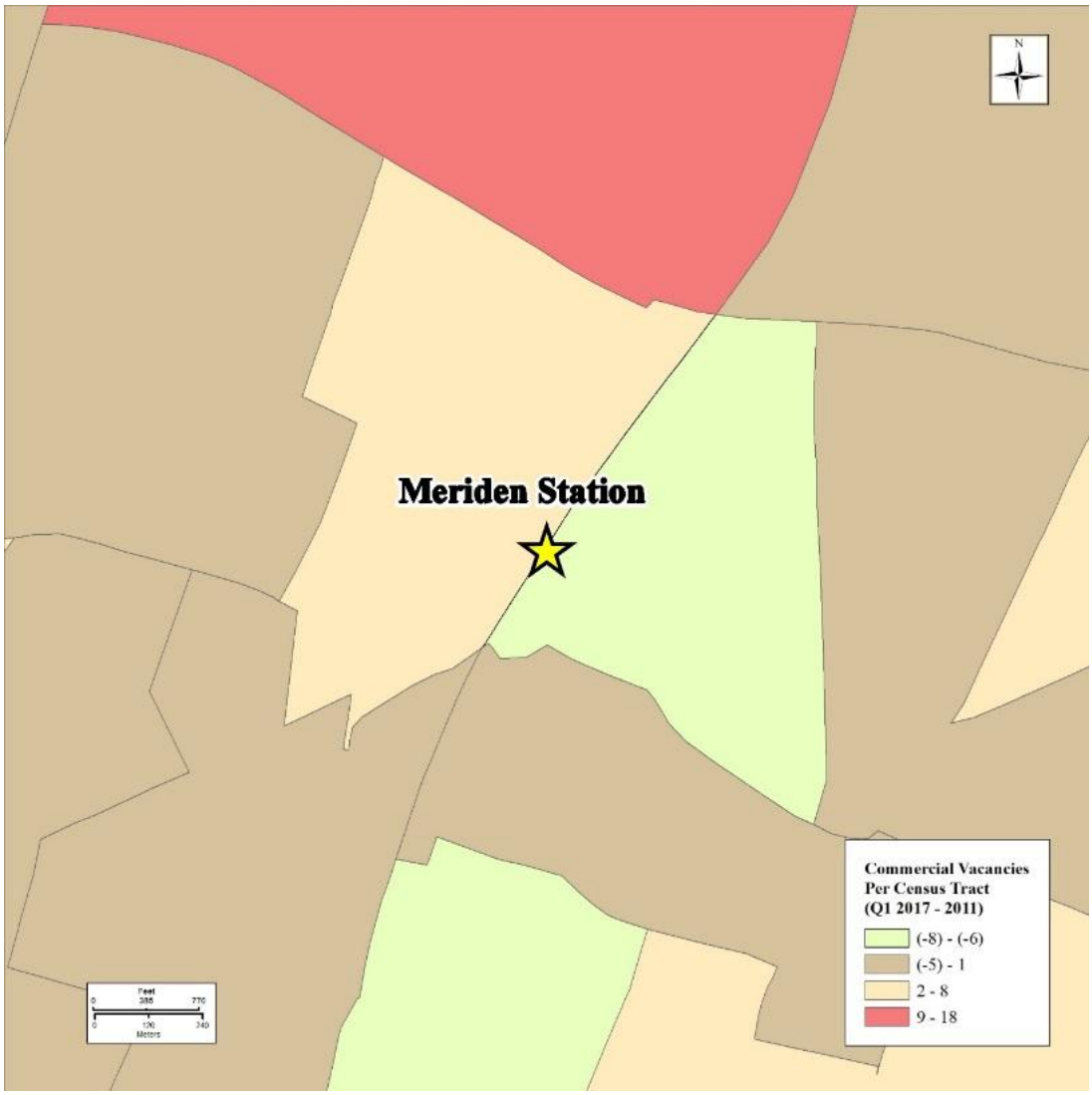

Figure 17. *Change in the commercial vacancies per census tract near the Meriden station (yellow star) between the first quarter of 2011 and the first quarter of 2017 (sources: HUD and USPS)*

Table 41. *Change in the number of residential vacancies of the census tract where each* CTrail *Hartford Line station is located between 2011 and 2017*

CTrail Station	2011	2017	Difference (2017 minus 2011)
Enfield	60	144	84
Windsor Locks	24	25	1
Windsor	25	13	-12
Hartford Union	62	117	55
West Hartford	22	12	-10
Newington	15	9	-6
Berlin	39	22	-17
Meriden	30	102	72
Wallingford	96	59	-37
North Haven	35	24	-11
New Haven State Street	53	16	-37
New Haven Union	1	2	1

(sources: HUD and USPS)

Table 42. *Change in the number of commercial vacancies of the census tract where each* CTrail *Hartford Line station is located between 2011 and 2017*

CTrail Station	2011	2017	Difference (2017 minus 2011)
Enfield	33	28	-5
Windsor Locks	38	40	2
Windsor	10	19	9
Hartford Union	291	290	-1
West Hartford	117	105	-12
Newington	6	5	-1
Berlin	48	64	16

Meriden	24	16	-8
Wallingford	148	120	-28
North Haven	28	34	6
New Haven State Street	233	197	-36
New Haven Union	18	28	10

(sources: HUD and USPS)

Vacant and Undeveloped Parcels

Additionally, a list of vacant or undeveloped land parcels in 2017 were obtained from the municipal assessors' offices (Table 43). New Haven, Newington and Enfield appear to have the greatest numbers of vacant/undeveloped parcels as of 2017 (Period 2). It will be of interest to compare the numbers of vacant/undeveloped parcels from Period 2 with those present in Period 3 (after several years of Hartford Line service).

Table 43. *Number of vacant or undeveloped parcels in 2017*

CTrail Station	1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius	2 mile radius
Enfield	13	40	67	97	223
Windsor Locks	0	0	0	0	5
Windsor	0	0	0	0	0
Hartford Union	0	0	0	0	11
West Hartford	4	15	34	49	164
Newington	1	12	22	52	305
Berlin	3	15	57	74	159
Meriden	2	9	16	30	57
Wallingford	3	6	14	22	74
North Haven	0	2	9	19	79
New Haven State Street	9	23	56	143	668
New Haven Union	17	44	140	231	528

*Parcel-level data collected did not have land use classifications for the following towns: Windsor Locks, Windsor, and Hartford. (sources: CRCOG, SCRCOG and municipal assessor's offices)

Another measure of the health of the local real estate markets is the residential absorption rate at a given point in time. The absorption rate is the ratio of sold properties in a month to the total inventory of homes for sale in that month. The data underlying the calculations in Table 44 below was compiled from information obtained from publicly available data maintained by Zillow ®. Table 25 shows the absorption rates in each town in January 2013, June 2013, January 2018, and June 2018. The focus on 2013 is due to the data being available only going back to 2013, but this can still provide some insights of the health of the residential markets around the time of the interagency workgroup formation. Differences in absorption rates due to seasonality is addressed here by focusing on one summer month (June) and one winter month (January), in each of the two years. Table 25 demonstrates that in all municipalities except for West Hartford, there was a dramatic increase in the absorption rate between 2013 and 2018. While this does not necessarily imply that the planning for the *CTrail* Hartford Line caused these sharp increases in absorption rate, this is still strong evidence that there is a correlation between the *CTrail* Hartford Line and the higher absorption rates. Also, while there was a relatively small change in the rate in West Hartford, that town is the site of a future *CTrail* Hartford Line station so perhaps the effects are not evident there because of the uncertainties of the timeframe in which the *CTrail* Hartford Line will become operational in West Hartford.

Table 44. *Absorption Rates by Municipality, January and June in 2013 and 2018*

Municipality:	*Jun-18*	*Jan-18*	*Jun-13*	*Jan-13*	*Pct Change, 6/13 to 6/18*	*Pct Change, 1/13 to 1/18*
Berlin	29.91	17.44	12.99	11.11	130.34	56.98
Enfield	34.27	13.33	16.23	7.89	111.10	69.09
Hartford	17.44	16.06	7.37	5.75	136.60	179.48
Meriden	22.97	18.10	11.65	10.82	97.18	67.33
New Haven	38.27	16.27	10.60	7.09	260.95	129.56
Newington	30.00	15.75	8.65	11.89	246.88	32.47
North Haven	18.18	13.04	11.58	6.32	57.02	106.32
Wallingford	34.83	16.94	8.76	10.32	297.56	64.19
West Hartford	25.88	12.77	26.01	12.92	-0.50	-1.19
Windsor	27.78	17.05	12.23	10.61	127.18	60.80
Windsor Locks	17.91	18.33	13.95	9.47	28.36	93.52

(Sources: Zillow ® and authors' calculations)

Condominium Teardowns

For condominiums, the maps of the sales data presented earlier cannot easily distinguish how many units are in each location. In order to drill down further and visualize the number of units at each location, the condominium density map in Figures 17 and 18 below can aid in understanding how many units are in each location in 2017. This updated information will be gathered in Phase 2 (i.e., Period 3) to determine how density has changed from the time of the start of Hartford Line service and several years subsequent to commencement of service.

Figure 18. *Meriden Teardown properties followed by new construction, condominiums, between 2011-2017 (sources: authors' calculations by comparing assessor's data from multiple years)*

Note that while there are 22 condominiums that were torn down and rebuilt during this period (shown in Figure 18), there were no single-family residential properties within ¾ mile of the station that were torn down and rebuilt.

Figure 19. *Meriden Teardowns followed by new construction, commercial property, 2011-2017 (sources: authors' calculations by comparing assessor's data from multiple years)*

The single commercial property shown in Figure 19 is a mixed-use property directly across the street from the Hartford Line station. Apartments, the Meriden Housing Authority, and a parking garage is located on this site.

Remediated brownfields can be expected to positively impact property values. In Phase 1, data on the distance to remediated brownfields is collected, for use in a statistical analysis in Phase 2 on how their proximity impacts real estate values.

A list of all remediated brownfield sites in all of the municipalities, from 2011-2018, was obtained. This list was geocoded and the sites were classified by distance from the nearest Hartford Line station. Two separate maps for the entire corridor are presented – one for 2011-2014 (Figure 20) and another for 2015-2018 (Figure 21). These records and coordinates were obtained from DECD and the Northeast branch of the EPA. Between 2011 and 2014, there does not appear to be many examples of brownfield remediation occurring near Hartford Line stations in most towns, with the exception of Hartford, which had several. There were more remediated brownfields in other towns during the period 2015-2018.

Table 45. *Number of remediated brownfields between 2006 and 2014*

	2006 - 2009					2010 - 2014				
CTrail Station	1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius	2 mile radius	1/4 mile radius	1/2 mile radius	3/4 mile radius	1 mile radius	2 mile radius
Enfield	0	1	1	1	2	0	0	0	0	0
Windsor Locks	0	0	0	0	0	0	0	0	0	0
Windsor	0	0	0	1	1	0	0	0	0	0
Hartford Union	0	0	0	0	1	0	0	1	3	11
West Hartford	0	0	0	0	3	0	0	0	0	0
Newington	0	0	0	0	2	0	0	0	0	1
Berlin	0	0	0	0	1	3	3	3	3	3
Meriden	0	0	0	0	0	0	0	1	1	1
Wallingford	0	0	0	0	0	0	0	0	0	0
North Haven	0	0	0	0	0	0	0	0	0	0
New Haven State Street	0	0	0	0	1	0	0	0	1	3
New Haven Union	0	0	0	0	1	0	0	0	0	3

(sources: EPA and CRCOG)

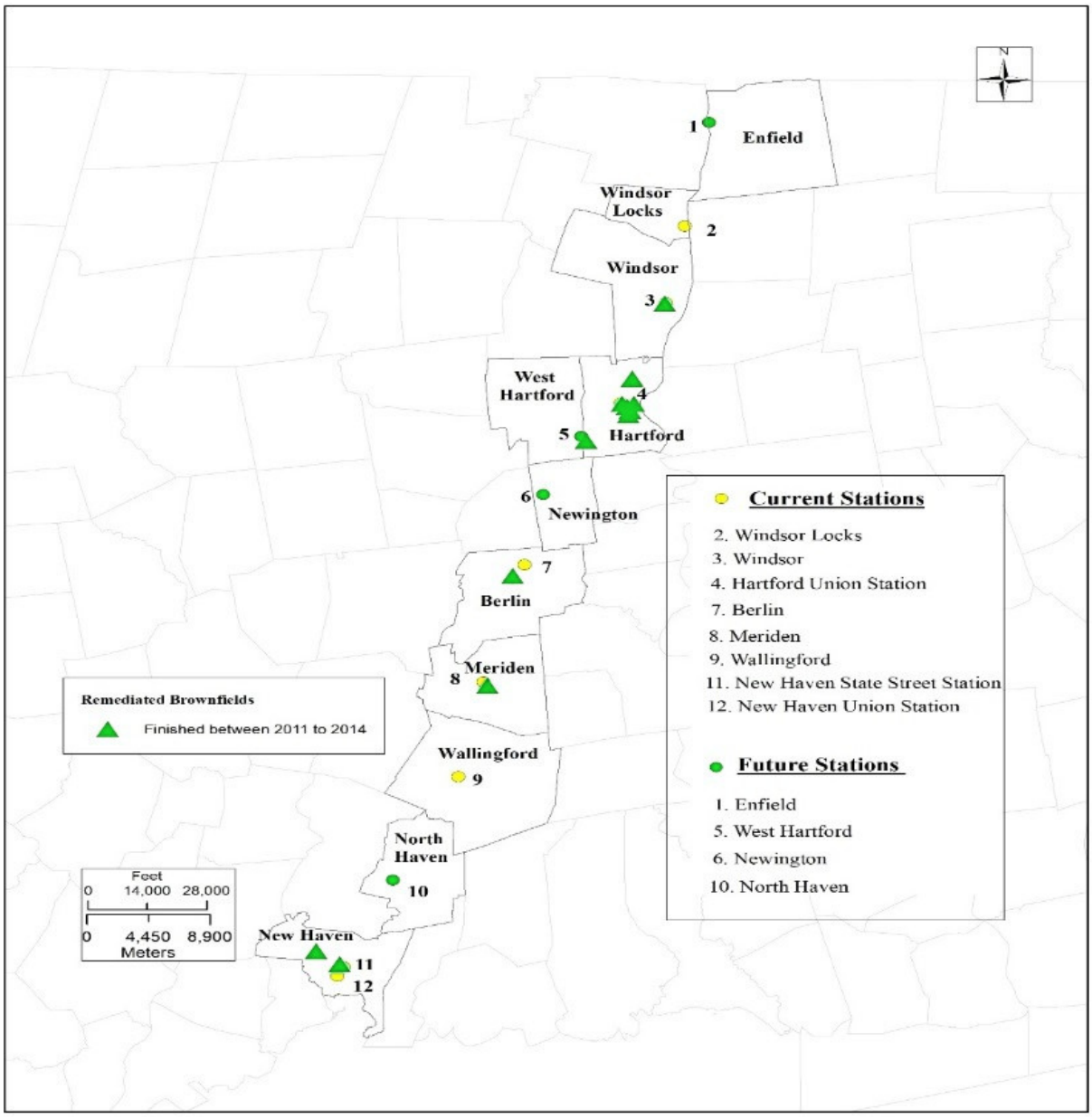

Figure 20. *The proximity of* CTrail *Hartford Line stations (yellow dots) and remediated brownfields (red triangles) between 2011 and 2014 (source: EPA)*

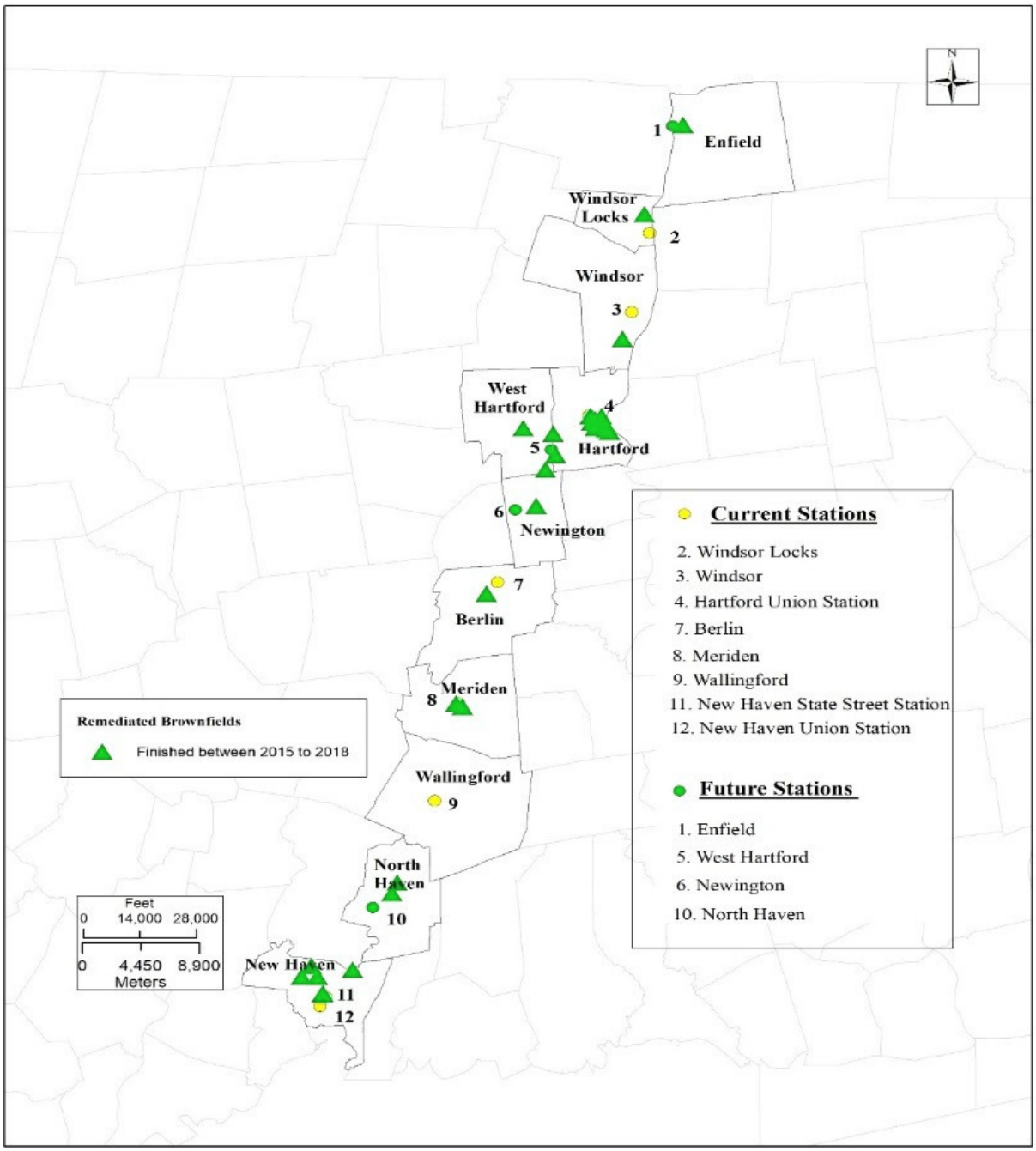

Figure 21. *The proximity of* CTrail *Hartford Line stations (yellow dots) and remediated brownfields (red triangles) between 2015 and 2018 (source: EPA)*

3.13 Aerial Photography

DEEP provided their entire collection of aerial photographs, which can be seen superimposed on the locations of the Hartford Line stations in each municipality in Figure 1. Aerial photography is available for all 11 municipalities in 2012 (superimposed on 2011 data) and 2016 (superimposed on 2017 data). An example below in Figures 22 and 23 are shown for the area surrounding Meriden station. The historical aerial photography can be used to illustrate changes in the built environment over time near Hartford Line stations, as in Figures 22 and 23.

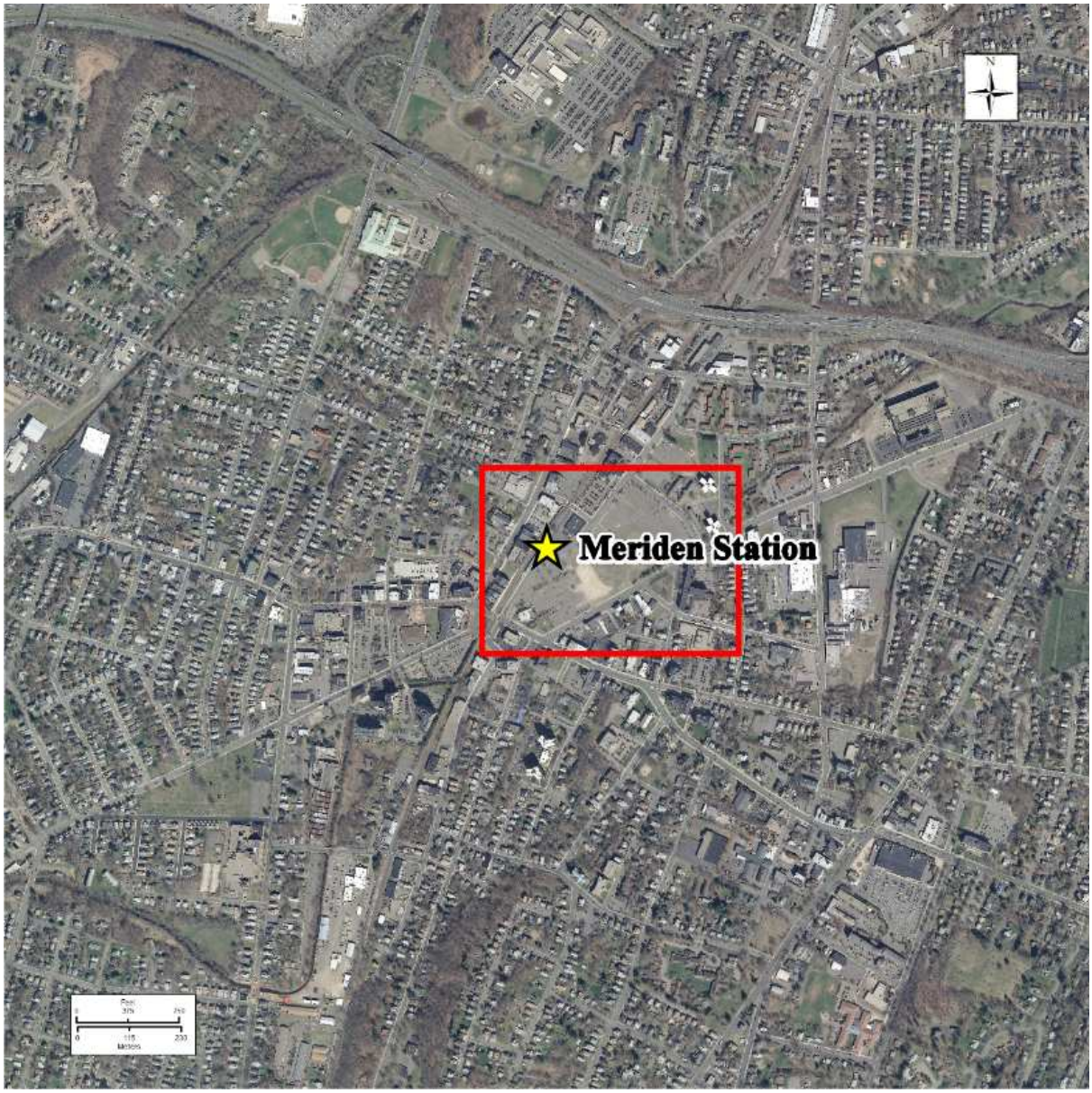

Figure 22. *Aerial View of the Hartford Line Station in Meriden, 2011 (source: DEEP)*

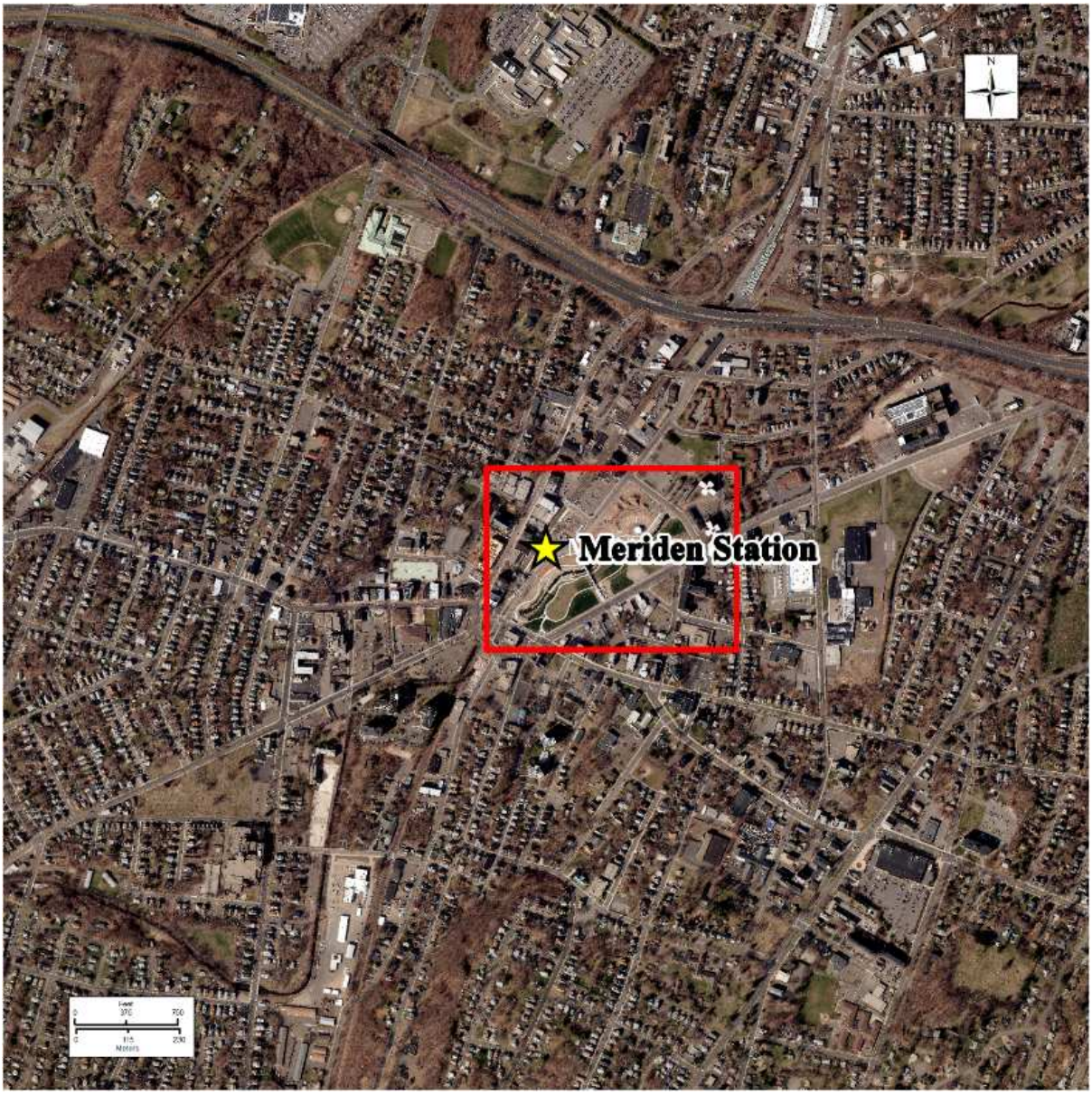

Figure 23. *Aerial View of the Hartford Line Station in Meriden, 2017 (source: DEEP)*

3.14 Techniques Used to Study the Impact of Commuter Rail Service on Property Values

There is a vast literature on hedonic price modeling as a methodology for estimating how rail impacts real estate prices, including Cohen and Brown (2017), Diao et al. (2010), among others.[23] In addition, other methods include the difference-in-differences approach (Dubé et al. (2011); Bocarejo et al. (2013)) and propensity score matching (Perdomo-Calvo et al. (2007); Perdomo (2011)). Some studies have utilized more than one methodology, and have relied on the incorporation of multiple techniques, including Dubé et al. (2011), who consider difference-in-differences in a hedonic framework. The most commonly-used approach in the transit literature is hedonic housing price regression. The hedonic approach was first introduced by Rosen (1974), who proposed that the value of a property can be broken down into the value of its structural characteristics. Later, others proposed that the value of nearby amenities and/or disamenities can be included in the hedonic price regressions (Kuminoff et al. (2010), among others).[24]

To complete an event study (i.e., a before-and-after analysis) for the *CTrail* Hartford Line during the second phase of this project, the use of hedonic price regression and/or the difference-in-differences approach are the most promising methodologies. Both techniques have long been accepted as the conventional methods to identify the impacts of new infrastructure on property values. The difference-in-differences approach compares the average change over time for a treatment group (e.g., in the case of the *CTrail* Hartford Line, the properties "near" the station after the opening of the the *CTrail* Hartford Line) compared to a control group (e.g., "far" from the station after the opening of the *CTrail* Hartford Line, and close to the station before opening of the the *CTrail* Hartford Line). Also, the aerial photography will enable one to visually demonstrate how the changes in various aspects of the neighborhoods near the stations have evolved over time. In "Phase 2", the geospatial database will be embedded in an online tool to facilitate the public's use of these maps, photographs, and data.

[23] Other examples include Perk and Catala (2009); Rodriguez and Mojica (2009); Flores-Dewey (2010); Muñoz-Raskin (2010); Cervero and Kang (2011); Dubé et al. (2011); Perdomo (2011); Zhang and Wang (2013); Deng (2016); Calvo (2017).

[24] Hedonic methods have been used in many studies, including: Bowes and Ihlanfeldt (2001); Cervero and Duncan (2002); Hess and Almeida (2007); Goetz et al. (2010); Bartholomew and Ewing (2011).

CHAPTER 4: Next Steps

The aim of this chapter is to draw conclusions from the first phase of this project and make recommendations for the subsequent phases. Additionally, a suggested work plan for the second phase is proposed. This work plan will outline the steps that need to be completed to address the overarching objective of this research.

4.1 Phase 1 Conclusions and Recommendations for Subsequent Phases

There are three main recommendations for the subsequent phases of this research:

1. Proceed with Phase 2 of this project within 3 to 5 years after the time period considered in Phase 1. Phase 2 will first entail updating the data to cover the period starting in 2018 (the commencement of Hartford Line service) through the 5 years following the commencement of service. Waiting several years before commencement of Phase 2 will allow for adequate data that will be needed in statistical analyses that are to be performed in Phase 2, as described below.

2. In Phase 2, complete a set of event studies (before-and-after analyses), as follows. First, use a statistical analysis to document the impacts of Hartford Line on real estate and urban economic development comparing the periods of 2011 (before the inter-agency workgroup on Transit Oriented Development) and 2017 (before the start of Hartford Line service. Second, use a statistical analysis to examine the impact of Hartford Line on real estate and economic development after a reasonable period of time of service (e.g., 5 years) has elapsed, as noted in the first recommendation.

3. As a part of Phase 2, develop the final updated geodatabase that will enable the users to select certain variables, locations, dates, etc., and generate maps and/or photographs showing the before versus after conditions of those locations.

The changes in the Hartford Line catchment areas could easily be illustrated with the information provided in the geodatabase generated in this first phase of the project. Although maps, tables and graphs could be used to show some of the effects, these figures might lack the ability to fully capture the changing geographies of the areas with commuter rail access. The geospatial database, on the other hand, best lends itself to showing these spatial changes to the catchment areas via photographic evidence (e.g., the aerial photographs of the areas) as well as descriptive maps and/or maps of analytical results of the statistical analyses (e.g., the hedonic regressions and/or the difference-in-differences).

4.2 Proposed Work Plan for Phase 2

Long-Term Objective

Long-term objective: Determine how the Hartford Line becomes capitalized into property values.

Phase 2 Steps in Achieving Objective

There will be several approaches used in Phase 2 to achieve the long-term objective. These will include first updating the data for all of the Phase 1 objectives. Then, the data will be presented in several different formats. One of these is a tabular and graphical summary of the data for the two periods. Another approach will employ maps and photography, based on comparisons over time of the aerial photography that are obtained during Phase 1 and Phase 2. In some instances, such as the impacts of brownfield redevelopment on property values, regression analysis will be used to estimate the causal effects of proximity to these remediated brownfields on property values. Finally, the geospatial database that was compiled in Phase 1, and at the end of Phase 2 will continue to be developed in order to deliver an online tool that can be used by the public for data queries based on the maps, photographs, and data that have been compiled throughout Phases 1 and 2.

Below are the proposed specific steps in Phase 2:

1. Determine what data is currently available for collection in "Phase 2".
2. Examine the conditions between the time of the commencement of Hartford Line service in June 2018, and June 2022. Also, this objective will necessitate a thorough update of the literature review of commuter rail studies.
3. Collect updated data necessary to examine how property value changes are correlated with proximity to the Hartford Line stations.
4. Collect the updated data needed to examine how property value changes are correlated with changes in travel costs, and updated data needed to determine how sale price and/or property value changes are correlated with travel time changes.
5. Gather updated data that will be useful in "controlling" for general price movements. In this "Phase 2", this will enable distinguishing between changes in property values due to Hartford Line versus other unrelated factors, such as general inflation and/or general fluctuations in real estate prices in the Metro-Hartford and Metro-New Haven areas and elsewhere in Connecticut.
6. Obtain updated assessed residential property values for the subsequent years after what had been collected in Phase 1.
7. Determine the current levels of local property tax revenues that accrue to the municipalities where the Hartford Line stations are located.

8. Address the questions: What is the number of dwelling units within a ¾ mile range of reasonable distances from the stations at the time of the start of Hartford Line service and 5 years later? What share of these are considered "affordable housing"? How have these changed between 2018 and 2022?

9. Collect updated information on total building square footage within a ¾ mile radius of the rail stations, and use this updated information to examine how these have changed since Phase 1.

10. Investigate what are the current plans/proposals for new real estate development. How have the number of plans near each station changed in 2022 compared with 2018?

11. Collect the updated data, beyond what was gathered in Phase 1, needed for this "Phase 2" analysis on the cleanup of the land where there had been brownfields. Then perform a statistical analysis to determine the impacts of the cleanup on property values.

12. Examine the role of vacancies. Collect data to determine the vacancy rates in the Census tracts near the Hartford Line stations. How have these vacancy rates changed between 2018 and 2022? Also, gather data on absorption rates of residential properties, and compare the absorption rates in 2022 with those from 2018.

13. Aerial Photography and/or remote sensing: obtain an updated snapshot of land use in the neighborhoods near the stations from the most recent time period available.

14. Geospatial database. To the extent possible, data will be compiled in a parcel-level geospatial database, and also merged with the data collected in Phase 1. This geospatial database will be set up in a manner that will facilitate easy tracking of changes in parcels between Phase 1 and Phase 2 (use, change in use, building type and square footage, sales, sale prices, assessed values, etc.), and it will be possible to query the database to obtain desired information.

15. Data analyses. The techniques of regression analysis will be used to determine the relationships between property values as the dependent variable (sales prices, from #3 above, and separately, assessed values, from #6 above), and the independent variables, which will include some combination of change in travel costs/time (from #4 above), changes in neighborhood vacancy rates (from #12 above), distance from the stations (near vs far, from #3 above), before vs after the *CTrail* Hartford Line started operating. Two separate sets of regressions will be run, one using sales prices changes as the dependent variable, and the other using assessed value changes as the dependent variable. The sales price and assessed value data will be adjusted using the inflation factor from #5 above, to control for general price changes. In addition, from #11 above, an analysis will be conducted on how proximity to brownfields that were cleaned up impact

property values. Also, in a separate analysis, a spatial correlation measure may be applied to the data, to estimate how the accrued real estate wealth in some properties may spill over to nearby properties.

In Phase 2, all of the updated data will be compiled into a parcel-level geospatial database, and then combined with the data already compiled into a geospatial database for Phase 1. The database will facilitate easy tracking of changes in parcels (use, change in use, building type and square footage, sales, sale prices, assessed values, etc.).

Moreover, as a part of Phase 2, an electronic query tool will be developed in order to enable users to easily search for various properties near the individual Hartford Line stations, create maps from the data, and superimpose these maps onto aerial and/or highway photographs that may have changed over time. Development of this tool will be a key output of the Phase 2 project, which will facilitate the dissemination of the final data to the public.

Approximate Timeframe for "Phase 2": 18 months.

Approximate Budget for "Phase 2": $295,000.

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Appendix A

	***Commuter Rail Service*[3]**	***Service Location***	***Annual Ridership*[2] *(2019 unlinked passenger trips) (millions)***	***Economic Studies (and Notes)***
1	MTA Long Island Railroad	Metropolitan Transit Authority, New York	117	1a.HR&A Advisors, Inc. and Parsons Brinkerhoff (2014) *Long Island Third Track Study* 1b.Regional Plan Association, RPA (2013) *East Side Access to Grand Central Terminal 2019*
2	New Jersey Transit Rail	New Jersey; Philadelphia, PA; NYC	88	2a.TFPLUD, New Jersey Transit (2013) *Building transit friendly places* 2b.New Jersey Transit (1994) *Transit friendly places Handbook* 2c.Regional Plan Association, RPA (2010) *ARC study, metro New York-New Jersey*
3	MTA Metro North Railroad –	Metropolitan Transit Authority, New York, NY; CT; & NJ	86	3a.PCAC (2012) *Metro North Railroad provides mobility and market access and spatial agglomeration economies.* 3b.MTA (2011) *Economic Impact of MTA on New York State*
4	RTA Metra Rail	Regional Transit Authority, Chicago, IL	67	4a.Gruen (1997) *positive 20% increase in single-family home value within 1,000 ft of station*. 4b.EI (2010) *METRA has positive impacts on energy and environment for Illinois*
5	SEPTA Regional Rail	Southeastern Pennsylvania Transit Authority, Philadelphia, PA;NJ;DE	36	5.SEPTA (2018) *SEPTA operations generate $2.3 billion in economic impact in Pennsylvania each year, supporting nearly 18,000 jobs and more than $1.4 billion in earnings p22, annual tax revenue of $68 million for Pennsylvania*
6	MBTA Commuter Rail	Massachusetts Bay Transportation Authority, Boston, MA; Providence, RI	32	6a.Armstrong et al. (2006) *some evidence of the capitalization of accessibility to MBTA commuter rail stations was found.* 6b.Diao and Ferreira (2010) *residential property values are found to be positively associated with accessibility to transit and jobs*

				6c.A Better City (2018) *Boston's economic efficiency and productivity are tied to public transit. Quantifiable benefits amount to $11.4 billion in annual economic benefits. p 54 The transportation benefits are worth an average $6700 per Metro Boston household per year. p 56* https://www.baystatebanner.com/2018/02/14/report-mbta-is-vital-for-economy-worthy-of-investment/ 7d.Beaton (2006) *commuter rail is most likely to impact land use patterns when it is explicitly and clearly linked to local and regional policies for land use and development*.
7	Caltrain	San Francisco, CA	19	7a.Haveman (2012) 7b.Bay Area Council (2012) *In 2012 the $1.5 billion Caltrain modernization project was projected to create about 10,000 construction and manufacturing jobs, and generate billions of dollars in economic benefit through long-term increases in property values.*
8	MetroLink	Los Angeles, CA	11	8. Orange County Business Council (Cambridge Systematics (2008)), The Regional Economic Impact of High Speed Rail. http://www.hsr.ca.gov/docs/newsroom/reports/2008/The_Economic_Impact_of_High_Speed_Trains_for_OC.pdf Accessed 10-18-18
9	*MARC* Train Service	Maryland Commuter Rail, Baltimore,MD Washington, DC Martinsburg, WV	9.1	9. MD MTA (2007) *Growth and Investment plan through 2035*
10	Denver A Line, B Line, G Line	Regional Transportation District, Denver, CO	9.7	10.New *Electric commuter rail G-Line delayed opening until 2019*. A-line opened April 2016; B-Line opened July 25, 2016. Source: Wikipedia.
11	*FrontRunner*	Utah Transit Authority, Salt Lake City-Provo, UT	5.2	11.EDR (2015) The UTA *Trax light rail and FrontRunner commuter rail lines are attributed with spurring development that has resulted in nearly 1,300 net new jobs generating over $66 million in income and $227 million in business sales annually p1*

12	Virginia Railway Express	Washington, DC – Fredericksburg, VA	4.5	12.Railway Age - *every dollar Virginia invests in Washington Metropolitan Area Transit Authority (WMATA) rail and Virginia Railway Express (VRE), it receives $2.50 in return*. https://www.railwayage.com/passenger/intercity/report-va-rail-investment-provides-250-return/ Railway Age, Nov 7, 2017.
13	*Sounder* Commuter Rail	Central Puget Sound Regional Transit Authority Seattle, WA	4.6	13.Seattle Times H*ow much more you'd have to pay for a home near Sounder light rail*, https://www.seattletimes.com/business/study-to-live-near-transit-in-seattle-youll-have-to-pay-up/ Seattle Times, June 27, 2016.
14	*Tri-Rail*	Tri-County Commuter Rail Authority -South Florida Miami, Fort Lauderdale, West Palm Beach, FL	4.5	14.PB (2013). *28 stations could provide $1.4 billion of development within ½ mile of stations during 2015 – 2025.*
15	South Shore Line (Northern IN Commuter Train)	Chicago, IL – South Bend, IN	3.3	15.Policy Analytics (2014) *A substantial improvement or increased efficiency in transportation assets within a region produces upward movement on wages, increased rates of return on invested dollars, and a higher quality of life*.p2 *A benefit to cost ratio of 19.6 is determined for this line including its expansion.*
16	Trinity Rail Express	Dallas Area Rapid Transit Authority, Dallas TX	2.0	16.NCTCG (2018) *A BUILD Grant Application for multimodal Improvements with the projected benefit cost ratio of 3.51 to Improve transit and freight travel time, reduce automobile congestion and travel cost for new riders, improve air quality, reduce automobile crashes, save on maintenance cost, and add to the transportation assets in the region.*
17	*SunRail*	Orlando, FL	1.6	17. Florida DOT (2016) *The purpose of this project was to assess the development impacts and property tax increases that could be attributed to investments in the SunRail commuter rail system in the metropolitan Orlando area.* Study *identifies the important role of focused, strategic land use planning around stations and*

				complementary infrastructure investments in promoting successful (re)development initiatives around SunRail stations p.ii
18	*Coaster*	San Diego County, CA	1.4	18. NCTD (2020). San Diego Pathing Study Creates New Opportunities for Expansion of Rail Services https://gonctd.com/new-opportunities-for-expansion-of-rail-services/
19	Capital Metro Rail	Leander - Austin, TX	0.7	19. CMTA, 32 miles, 6 trains, 9 stations
20	New Mexico *Rail Runner* Express	NMDOT, Albuquerque, NM	0.7	20.McKay (2017) Albuquerque Journal *Ridership was close to 1.1 million in fiscal years 2013 and 2014, and it fell to about 836,000 in the most recent fiscal year – a drop of 23% over a five-year period.*
21	Shoreline East	CTDOT, New Haven - New London, CT	0.66	https://shorelineeast.com/
22	Hartford Line	CTDOT, New Haven, Hartford, CT & Springfield, MA	0.63	22a. CTDOT (2005) Implementation Study, *Report of recommended action for implementation of initial commuter rail service including bi-directional service M-F, extended double tracking to 18 miles, and use of existing nine passenger stations, plus three additional stations added at North Haven, Newington and Enfield* . https://www.ct.gov/dot/cwp/view.asp?a=3535&q=425114 22b. CTDOT (2019b). One Year Report, *The Hartford Line has spurred $430 million in transit-oriented development in Wallingford, Meriden, Berlin, Windsor, and Windsor Locks*

Notes: (1) Table 1 is not a complete listing of CRS in North America. Some rail lines such as for example MARTA of Atlanta, BART of San Francisco-Oakland are categorized as Metro or Heavy Rail Service rather than CRS, and are not included in Table 1.
(2) Annual ridership from *Public Transportation Ridership Report*, 4th Quarter 2019 (APTA (2020))
(3) Wikipedia-contributors "Commuter Rail in North America"
https://en.wikipedia.org/w/index.php?title=Commuter_rail_in_North_America&oldid=878488505